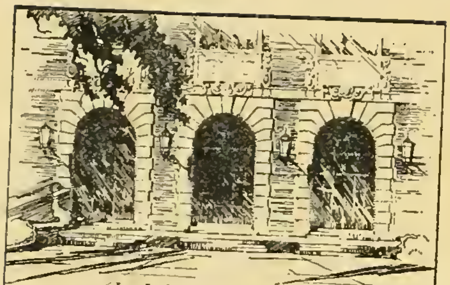
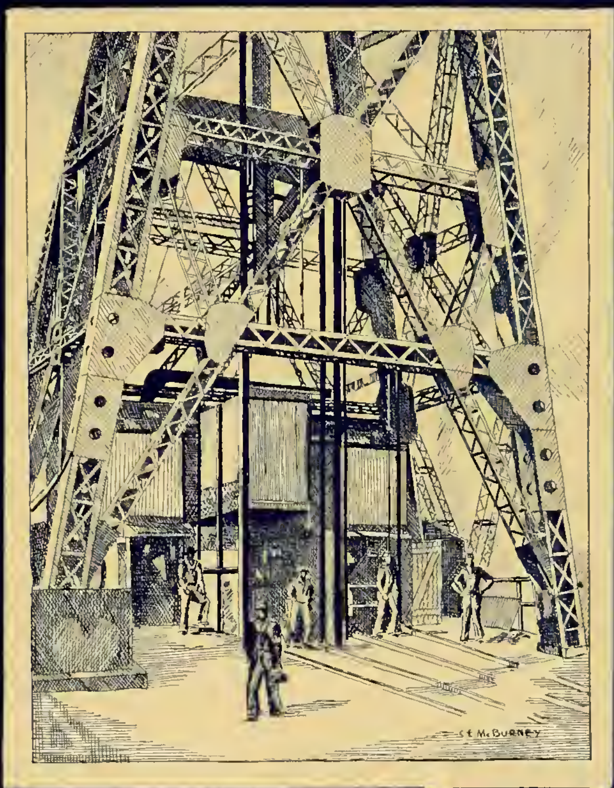


THE ILLINOIS TECHNOGRAPH



SEPTEMBER, 1937 » » 20 CENTS

MEMBER OF E. C. M. A.

THE ILLINOIS

TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

SEPTEMBER, 1937

Volume 52 Number 1

DEDICATING to Dr. Arthur Newell Talbot this first issue of the 1937-38 Technograph gives the staff one of the greatest pleasures of the season. It is very fitting and proper that our humble appreciation of his great work be shown at the time when he will soon celebrate his eightieth birthday. Tom Morrow has written an account of Dr. Talbot's past achievements for the readers of the Tech.

● You would undoubtedly like to know of your R. O. T. C. Engineer friends' escapades during their summer camp at Camp Custer. A series of "shorts" of the "Engineers at Camp" will give you a brief picture of the highlights during their stay in Michigan.

● Deans Enger and Jordan have each contributed a few words of wisdom to those who will look for them on "The Deans' Page."

● For those of you who are interested in keeping up your "Beau Engineer" appearance, we have included a page of suggestions to help you in the purchase of your fall wardrobe.

● All of you interested in your school friends' activities this past summer will find some bits of interest among the "Summer Snapshots" and the "Alumni Notes."

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The 3,000,000 Pound Testing Machine

THE ILLINOIS TECHNOGRAPH

Published Six Times Yearly by the Students of the College of Engineering, University of Illinois

Volume LII | SEPTEMBER, 1937 | Number 1

For Distinguished Service

Dr. Arthur Newell Talbot

THE MODERN American listens to his radio and thinks of the wonders of Marconi; he stares and listens while his favorite actors and actresses move on the screen before him, and he marvels at the genius of Edison; he also thinks of Edison when he is reminded of the modern miracle of light; and few Americans hear the drone of an airplane overhead without paying silent tribute to the Wright brothers. It is an entirely different story, however, when we consider the men who are responsible for such things as the great advances in public health, for the modern paved highway with its graceful high-speed curves, for the great bulk and beauty of the huge bridges of our day, or for the lowly roadbeds of the great railways upon which the success of the new one-hundred mile-per-hour trains depends so much. We must admit that most of us have much further off the tips of our tongues the names of the men responsible for these great achievements of our day.

Eighty Years Old

One of the men who is largely responsible for much of the development in public health, highways, bridges, and railways is Doctor Arthur Newell Talbot. Here is a scientist in the fullest sense of the word, for Doctor Talbot, as he approaches his eightieth birthday, still carries on with the research that has made him, besides one of the outstanding educators of his day, one of the most prominent engineers in the world.

Easy to Interview

Although I had been slightly acquainted with Doctor Talbot for over a year, I was nevertheless, ill at ease when I went over to his home one evening to get from him some of the facts presented in this account. Doctor Talbot, however, in his warm and friendly manner, soon had me feeling perfectly at home. Tall and straight, his white hair giving him a dignity well fitting to his position, there is little to remind one that he is to celebrate his eightieth birthday on October 21st of this year.

Doctor Talbot was born in 1857, at Cortland, Illinois, not many miles west of Chicago. His parents had been brought as children from England and Canada to newly settled northern Illinois, where the construction of railroads west from Chicago was stimulating the growth of new villages and attracting settlers from the East and from foreign countries.

He received his early education in the Cortland grade school and in the high school at Sycamore, Illinois, about five miles from Cortland. This distance Doctor Talbot traversed morning and night on the train. After graduation from high school he taught a country district school for two years. In 1877, just 60 years ago this fall, he entered the University of Illinois, where he enrolled in the small but progressive engineering school. As a student he was noted for thoroughness of scholarship, breadth of interests, steadiness of purpose, and maturity of judgment. The average grade of his undergraduate studies was 98 per cent. Not only was his work in the engineering school outstanding, but in the terminology of the present he was a "big-shot," being college editor of the Illini (at that time a monthly publication), a member of the senate and of the supreme court, a prominent member of a leading literary society, and was active in debate. He was also a student assistant in physics and taught make-up courses in mathematics.

In 1881, he received his degree of Bachelor of Science in civil engineering. After graduation he followed the practice of many young engineers of the time and obtained a position in the West, and in the four years following, he received much valuable experience working for such railroads as the Denver and Rio Grande; the Atchison, Topeka, and Santa Fe; and the Northern Pacific. This work consisted mainly of location, construction, and maintenance, in the states of Colorado, New Mexico, Kansas, and Idaho.

Called Back to the University

Because of his record at the University and the excellent experience received in the West, Doctor Talbot was called back to the University in 1885. In that year he was given the degree of Civil Engineer, and was made assistant professor of engineering and mathematics. As was common in small schools in the older days, the subjects taught in the first years covered a diversified list, which included mathematics, surveying, engineering drawing, contracts and specifications, roads and pavements, railroad engineering, mechanics and materials, hydraulics, tunneling and explosives, and water supply and sewerage. From the beginning of his service as an educator, he showed thorough knowledge of the subjects he taught, was clear in his methods of presentation, and had excellent command of his classes. In 1892, he was made professor of municipal and sanitary engineering and put in charge of the newly created department of theoretical and applied mechanics. Doctor Talbot has done an important part in creating the fine laboratories which the University of Illinois now has in the

Greetings to Freshmen

By

ARTHUR N. TALBOT

SIXTY years ago I came to the campus of the University of Illinois as a freshman. Then, as now, the new scenes and new surroundings brought to the entering student novelty, thrill, anticipation, misgivings, ambition. As then, you now have the chance to profit greatly by the opportunities in college life—in classroom, in contact with your fellows in all the ways that will be open to you as you take up your present responsibilities. Remember that college work is your main job and that the results and the rewards of your student work depend largely on the way you handle yourself. Choose carefully and wisely your closer friends—they will be a help or a hindrance now and afterward. If you learn how to manage yourselves; if you do your best; I have no doubt your college life will add fullness and success to your later life as it has done to the greater part of the multitude of students who have gone before you. My best wishes go with you.

department of theoretical and applied mechanics. After the era of expansion in engineering schools began, mechanics and engineering materials absorbed his attention even more than sanitary engineering, and without a change in his title, the emphasis of his work continued to be placed on mechanics and engineering materials. For more than 40 years he moulded and inspired generations of young men and was a leader in the development and advances made in this important engineering school. He has always regarded teaching as the important part of his life work. Upon reaching the age limit of the University in September, 1926, he was retired from teaching and administration, but he has continued in research activities.

Performs Invaluable Research

From the very beginning of his University teaching, Doctor Talbot conducted research of recognized value. Early work on maximum rates of rainfall, requirements for waterway openings, hydraulic phenomena, iron removal from well water, pioneer work in sewage treatment by means of the septic tank, and the standardization of testing of paving brick for strength and abrasion, were welcomed by engineers the world over. After all of these preliminary experiments, it is not strange that he should become active in the formation and development of the Engineering Experiment Station of the University of Illinois. That institution, the first of its kind to be connected with an engineering school, was made a valuable agency in producing contributions to knowledge. His leadership in formulating policies, ideals, and methods has been recognized as an important asset in the development of the work of the station.

Some of Doctor Talbot's most important work has been done in the field of reinforced concrete. A comprehensive and thorough investigation upon this subject was started by the Experiment Station in 1904, conducted and directed by him. It consisted of experiments in reinforced concrete beams, slabs, columns, footings, pipes, frames, and buildings. This experimental work became a principal source of the early knowledge on which the properties and requirements for the design of reinforced concrete structures were based by engineers and engineering organizations, and on which principles and methods of practice were formulated. The conception of relations existing between the strength of a concrete mixture, and the items involving the absolute volume of the cement, the fine and course aggregate, and the voids of the mixture, as well as the so-called relative water content of the mixture, put forth in a paper in 1921 and in a later bulletin, has proved useful to concrete engineers. His tests of stone, brick, and concrete, the investigation of steel columns and timber stringers, and a variety of other experimental and analytical work have also added to engineering knowledge. Contributions were also made by him in experimental hydraulics.

Important Rail Investigation

An outstanding piece of research which Doctor Talbot has directed for twenty years and upon which he is still working, is the investigation of railroad track, commonly called "Stresses in Railroad Track." This investigation has been conducted with a view of obtaining definite and authoritative information on the properties, mode of action, and resistances developed in the various parts of the track structure (rail, ties, ballast, and roadbed), under the application of locomotives and cars moving at various speeds. At the time the work was begun, comparatively little of a scientific nature was known of the stresses in rail and other parts of the track, or of the effect on the track of the many variations in action of the rolling stock in its operation. Through twenty years, with the help of a trained staff, and the cooperation of some of the major railroads, manufacturers of track, the American Society of Civil Engineers, and the American Railway Engineering Association, a multitude of tests have been made with various types of locomotives and cars on tracks of more than twenty railroads in various parts of the country. Experimental work has also been conducted in the laboratory. At the present time, the scene of the investigation is on the Santa Fe tracks northeast of Peoria, Illinois, near the town of Wenona, where a section of track nine miles long has been laid with new track. Each mile of this new track has a different type of joint bar, and the characteristic effects of the traffic on the various bars is being studied very closely. An important series of tests of track, with steam and electric locomotives and a very elaborate set-up of electrically recording strain measuring and depression instruments, has recently been conducted on the Pennsylvania Railroad at Elkton, Maryland. Data from all of these tests have been interpreted and coordinated with analytical treatment to establish principles and findings. Besides various minor reports of this engineering research, six formal reports have been printed in the Proceedings of the A. R. E. A. and part of them in the Transactions of the A. S. C. E. This research project has produced reliable knowledge on the interrelation between track and rolling stock, and thus has aided in putting on a more nearly rational basis, the design and construction of the track structure to carry locomotives and cars under modern traffic conditions, as well as giving valuable information applicable to the design of rolling stock. Commendation by railroad engineers in important executive and supervisory positions is indicative of the value placed on the investigation by men fitted to pass judgment. The leading technical journal of this country, in reviewing the first of the progress reports upon this investigation said: "The committee, headed by Doctor Talbot, has written a new page in the book of engineering. The investigation is a classic . . . The problem was a difficult one. It had grown up out of nearly a century of empirical development. The committee brought railway track within the scope of engineering science."

Numerous Written Contributions

Doctor Talbot's written contributions (perhaps 400 titles) are along numerous lines. The reports of the Illinois Engineering Experiment Station researches on concrete and reinforced concrete are given in seventeen Station bulletins, with five other bulletins on hydraulics, timber, steel columns, etc. Reports on concrete, reinforced concrete, cast iron water pipe, methods of testing and other topics may be found in the Proceedings of the American Society for Testing Materials. The publication of the reports of the Track Stress investigation has already been mentoined. The report of the first Joint Committee on Concrete and Reinforced Concrete, in the preparation of which he participated, was published by several technical societies. A small treatise on a very flexible method of laying out easement curves at the ends of circular railroad curves, The Railway Transition Spiral, published first in 1899, has gone through several editions and has been used by many railroads. Various non-technical articles and addresses have also been written by Doctor Talbot.

Influential in Committee Work

Doctor Talbot exercised a far-reaching influence on engineering developments through committee activity in engineering societies. Taking a leading part in the work of the first joint committee on Concrete and Reinforced Concrete (1904-16) as a representative of the American Society of Civil Engineers, he was influential in formulating principles and methods of design based upon the tests he had made and upon other data and analysis. As chairman of the sub-committee on design, he formulated and advocated many of the views that were adopted by the committee. The report of this committee exercised a marked influence on the ideas and the practices in engineering design ond on building regulations in the pioneer period of reinforced concrete construction among engineers and architects in this country, and most of the fundamentals of design then put forth are still accepted. The tests of reinforced concrete made at the Illinois laboratory were widely used by engineering schools and thus the information spread even more rapidly to engineering offices. In the field of testing materials he has been active in the American Society for Testing Materials since its formation and has taken a leading part in the work of several of the technical committees that have done constructive work. In sanitary engineering, in railway engineering, and in municipal lines he has contributed to technical committee work and in other ways as well.

Has High Ranking as a Teacher

Doctor Talbot has attained high rank among engineering teachers and has been influential in the Society for the Promotion of Engineering Education since its formation in 1893, holding various offices, including that of president. He has been prominent in the work of the American Society of Civil Engineers, serving on its research committee and on other committees and on its Board of Directors. He was president of the Society in 1918. He has been active in the affairs of the American Society for Testing Materials in many ways since its organization, and was president in 1913-14. He is a member of other engineering societies, including the Institution of Civil Engineers (London), American Society of Mechanical Engineers, Western Society of Engineers, American Railway Engineering Association, American Concrete Institute, American Water Works Association, American Public Health Association, and the American Association for the Advancement of Science. In all of these, he has given service in one way or another by writing or by direction.

With this great output of teaching

(Continued on Page 10)

R.O.T.C. Engineers Enjoy "Vacation"

... Camp Custer Furnishes Relaxing Atmosphere

THE FIRST SIGHT greeting my eyes as I pulled into camp after a rather long, tiresome drive was a detail all dressed up in their new fatigues, carrying picks and shovels! Rather encouraging, eh what? (One consolation though—those of us not yet "processed" could "goldbrick" and not have anybody squawk).

The next morning Company C was all out for rifle inspection in our pretty "whistle" breeches. Harry Atkinson came through at the head of the class by having the cleanest rifle in the Illinois platoon (reference, Lt. Lothrop).

While planoing the camp program, the "big shots" had decided we should have a lesson in chemical warfare. Most of us enjoyed the demonstrations very much with the exception of the trip through the tear gas without gas masks—that we endured.

The Famous "Weeneepee"

On the first time off, the boys, of course, went to Battle Creek, Gull Lake, Gugac, etc. to discover all of the "jernts." Noteable among the numerous explorers was "Frog" Andre Dechaene. His goal was the Wee Nippy; however, he was sidetracked by his French and spent the next few hours huoting the "Weeneepee." (Say, Andre, why didn't you ask any of the girls where you could find the "Weeneepee"?)

It seemed that all during camp the second platoon, Illinois, was just too fast (take that any way you please) for the rest of the company. At least we succeeded in beating the other platoons in putting up the wire entanglements by at least five minutes and in building the trestle bridge by almost an hour. Of course, you understand that we'd never brag about it!

Everyone got a kick out of our extensive (?) horsemanship training.

Well-Earned Rest on the Hike

Houkal got more fun out of it than anyone else, we thought. His favorite snoozing position was to lean on the cleaning racks and there enjoy the lecture. "Cowboy" Holt showed his true worth as an ex-cavalryman during those sessions.

The new O. R.'s seemed to enjoy their inspection trips out to our trenches very much—mostly at our expense. We grant that it must have been amusing to see a replica of WPA work, but our main fun was in thinking how we may be able to do the laughing next year.

Our "Home on the Range"

While we spent the two weeks on the range, our home theme song developed into "I Get a Kick Out of You." Vernetti and McCleish seemed to have a contest to find out who could do the most damage to their respective faces, and McKibben almost needed a new pair of fatigue trousers when he finished sliding back and forth after firing each shot. Dechaene had the problem of the backward slide all figured out, though. He dug some small holes so that he could get a good toe hold, but poor Andre hadn't reckoned on any hip action and up he went—right in the middle. Rudy Houkal had the prize rapid fire bolt operation. He fired left-handed, but all he needed was a little vocal inspiration after each shot and he finished ahead of all the others. Ed Holt (he sings the sweetest version of "Mexicali Rose") surpassed the rest of the company and shot high score with the rifle. His buddy, Dechaene, fired a score of 95 per cent with the pistol—which was, so far as we know, the camp's highest.

Maurie Adams was the company representative for the R. O. T. C. dance and as usual, "G. I." dates were provided for the boys. Fred White drew a girl whom he considered to be the best in the lot—some of the others did too, because Red had a tough time keeping her with him. Was he mad? (Ask him, but duck in a hurry).

The Fighting Illini

During the whole camp period, Company C was spending a great deal of time trying to pick a fight with someone. The first scrap was with our friends across the street—the signal corps. It all started when the signal corps boys invaded the engineer's portion of the company street while playing with a medicine ball. Of course, a contest was soon in progress to see who would keep the ball. Everyone was having a good healthy workout until Swede Nelson picked up one of the signal corps men too high and let him drop—then the whole thing was dropped. There was also the night when the signal corps glee club had to be quenched by a dose from fire buckets. Just as soon as reenforcements had gone for more water, the S. C. lieutenant came around to see why so many persons were running about with buckets of water when they should be asleep.

It should not go unmentioned that Company C won the totem pole which is awarded to the company making the highest average score on the rifle range. This pole caused no end of midnight scraps between the schools composing the company. Finally, by order of Col. Flint, commandant, the Michigan Tech boys had to walk guard on it at night to prevent further disorder.

About that time, the mustache removal committee was also busy. Gilberman with his new electric razor acted as chairman. They were a rather lazy crew, though, because they'd only take off half of the "lip adorner." Atkinson didn't like that particular part when they picked on him as victim, nor did Perla, of Mich. Tech, when he was given his half-shave.

Pontoon Bridge Construction

The situation became so exciting for a time that Fred Linn and Jim Davitt of the signal corps decided to shear off their own.

On Sunday evening, on Sergeant Slavens' birthday, the company turned out as a singing chorus for his benefit. The only number on the program was "Happy Birthday, Dear Sergeant." The blanket gang then gave "Dear Sergeant," a demonstration of how floating power acts. By the way, he was plenty worried about losing his "cookie duster," too!

On the hike, everything was just about as expected except that there wasn't enough rain to cause any discomfort. The main excitement came at the time when the engineers' machine gun company was left out in the field for an extra hour after the "armistice" was signed. You see, Runner Bassett couldn't find them—they were hidden so well.

This year the field day activities of the engineers weren't very successful. However, Ulmer, of Wisconsin, did suc-

(Continued on Page 16)

Dean M. L. Enger

THE DEAN'S PAGE

THE beginning of a new year is usually a time for making good resolutions. Resolutions of the day-dream type, weakly made with no real expectation of fulfillment, are worse than useless. Repeated failures of a feeble will produces a growing sense of inferiority. Budget your time to do your school work promptly and well and also allow for a reasonable amount of extra-curricular activity. Studies come first, but worth-while activities outside of the class room have an exceedingly important place in a well-rounded education. Men who have made good scholastic records and who have, at the same time, engaged in activities are in demand upon graduation. Time wasters are usually failures in college and in life.

Best wishes for a busy and a profitable year.

—M. L. Enger.

ENGINEERING HALL

PREPAIRING one's self for the engineering profession should be a stimulating and challenging job. Part of this preparation must be a well-balanced scientific, technical, and cultural education. This is provided in an engineering course.

Any one of the several engineering courses at the University of Illinois lays heavy demands upon the student's time. To secure satisfactory accomplishment requires close planning, and to attain distinction, the student must exercise his mental capabilities to a degree infrequently attained by undergraduates. Most every personal resource of initiative, training, and character is drawn upon and developed in carrying on our carefully planned programs of scientific and technical studies, that do not, withal, overlook the cultural and esthetic needs of the future engineer.

The college of engineering is looking forward to the school year 1937-38 with the hope that it will be greater in accomplishment than any yet recorded. This is high expectation in the light of past history. The realization of this expectancy can come only through the united efforts and loyalties of its faculty, its students, and its graduates. To this cooperative enterprise I welcome each student who registers in the college during the year. May his dividends be large indeed.

—H. H. Jordan.

Associate Dean H. H. Jordan

WHO'S WHO IN ILLINI • • ENGINEERING WORLD

Howard Miner

Warren Johnson

Carroll Dunn

HOWARD MINER hails from Batavia, Illinois. He came to the University to study metallurgy, a desire developed while working in a foundry. After graduation from high school, where he played football and basketball, steered the class of '33 through their last year, and ranked high scholastically, he spent the summer working on his grandmother's farm. That winter he spent following a trap line, which he deems his favorite sport. At the University he is a member of the American Society of Metals, the Mineral Industries Society, and wears a Tau Beta Pi key which he won during his junior year. His chief love is to tinker and invent strange mechanisms. In the evenings, he likes to devote his time to tripping the light fantastic but claims to be still driving in single harness.

WARREN R. JOHNSON, after being valedictorian of the class of 1931 at Pecatonia Community High School, turned agriculturist (fancy for farmer) for three years, and then enrolled in ceramic engineering in the fall of 1934. Since that date, he has found sufficient time to study enough to make a 4.66 average; serve as N. Y. A. flunky in the bacteriology lab for a year; work as draftsman in the ceramics engineering department for two years; join the Student Branch of the American Ceramic Society, where he will wield the gavel this year; become a member of both Keramos and Tau Beta Pi, whose financial problems it will be his duty to settle; be a member of the Advanced Corps; and win an Illinois Scholarship key. Since he has had too much leisure, this year he takes over a seat on the Engineering Student Council. In the summer of 1935, he turned his farming experience to value as a field supervisor of the AAA. The last two summers, excepting the six weeks spent at military camp, he has been employed by a pottery company, first at Kenosha, Wisconsin, and last summer at Camden, New Jersey. He likes to travel, and has done so by the thumb method since 1934. Fishing and baseball are his sports interests. Next June he hopes that some company, in the refractory or glass industries, will need his services.

CARROLL H. DUNN first saw the light of day at Lake Village, Arkansas on Aug. 11, 1916. Lakeside High School of Lake Village turned him out in the class of 1934, third from the top. In high school, he belonged to the French and Latin clubs and participated on the track and football squads. He was president of the student body and editor of the school paper during his senior year. In the fall of 1934, he enrolled in the M. E. course here at the U. of I. During his freshman and junior years, he won scholastic honors and membership in Pi Tau Sigma, honorary M. E. fraternity. He has been secretary of the organization and will be vice president for the first semester of 1937-38. Tau Nu Tau, Advanced Corps Engineers' fraternity, claims him as brother. He is a student member of A. S. M. E. and was its publicity manager during the second semester of last year. The University Baptist Church has his religious affiliation. He has served on its Student Council for three years and will be president this year. The summer of 1936 and the last of this past summer was spent in the Inspection Dept. of International Harvester Co., at Rock Island. He plans for production engineering and factory management after graduation. Hobbies—motors and more motors. Carroll has a girl friend (fiancee) in Moline (next door to Rock Island?).

• TECHNOFASHIONS •

Technograph Specifications for College Men's Wear

Everywhere in the United States, wherever fraternity men and young business men gather, Illinois has been known as the most collegiate of the American colleges. And now, as Engineers that we are, for the glory and honor of the campus "North of Green Street" we must set the pace in Illini Collegiatism. In eager pursuance of this goal therefore, (whereas and whereas) this illustrious Technograph inaugurates in this first issue of our new year an Engineer Fashion Page—compiled with the aid of Esquire, Apparel Arts, and our own observation.

Now that the hot days of summer are about to fade away, the engineer, if he wants to look like an engineer, will be wearing jackets and sweaters when he goes to class. And what jackets they have now—ranging from fall sport shirts to blazers and to heavy fur-lined or fur-trimmed jackets. One of the sport shirts is styled very much like a summer polo shirt, with wide collar and V-neck. Of gabardine; it has knitted back and sleeves and a knitted bib to keep out the wind. Pretty nice!

For the fellows who must wear coats of some kind when they dress for school or coke dates, the blazers are just the thing. With free-action backs they are very comfortable. Large patterns of checks and other designs in grey, brown and tan match with most any slacks. Camel's hair and leather are used for many other popular sport coats.

Sweaters are of all weights, shapes, and colors, but most of them seem to be designed for wear with coats—long sleeves for the cold days and sleeveless for the ordinary ones. Along with the trend for brightly colored wool socks, the sleeveless sweaters are being matched with the socks for added distinction. Knitted waistcoats, they look like vests, are fine for wear with colored shirts and your slacks. And engineers can use plenty of odd slacks, with all the chair sliding we do.

You'll find all kinds of shirts in the stores and around about, but for college the favored ones are in solid colors or stripes. Button-down collars that help keep the ties straight are in demand by those engineers who hate to be fussing.

Once it was right to have a bright and striking contrast between shirt, suit and tie, but the conservative engineer is leaving that stage in his development. Today it is harmony, and especialy of subdued tones. Brown, tan, and green are this year's fall colors. Green things are everywhere—hats, ties, shirts, suits, and topcoats—and no color could better please Saint Patrick's Engineers.

But the brightest things of the fall are the ties and socks. No one could possibly catch cold while wearing a pair of red, yellow, and blue wool socks and a necktie to match. Here on the North Campus we might think the socks were the result of an architect's nightmare, but for the fact that they are attractive. They're healthful too, as only wool socks can be.

The tie manufacturers have all gone military and produced regimental and chevron stripes from barber poles to zebras. And the ties mix, like gin, with practically anything you please. With large-pattern fall suits the regimental colors will just blossom all over the campus in no time at all.

That's all for this time, but we serve warning now that in the next issue this page will be especially interested in campus sights. And we will soon stage a Best-Dressed Engineer contest. Be careful, fellows! It'll be worth while!!!


Nation-wide in service
AMERICAN TELEPHONE & TELEGRAPH CO.
BELL SYSTEM
AND ASSOCIATED COMPANIES
ABC in set-up

Doctor Arthur Newell Talbot

(Continued from Page 4)

and laboratories and research and writing, it is not strange that a by-product appeared which in itself has had far-reaching influence on engineering knowledge—the selection and development and training of young men to teach, test, and delve into the unknown, and thus to carry on high ideals and methods in teaching and research through their lives. A group of workers associated with Doctor Talbot from time to time have themselves become leaders in education and research, as would readily be recognized if a list of names were given.

After taking up teaching work, he continued during vacations and at other times to engage in engineering work on railroad construction, on pavements, sewerage and water works, and on reinforced concrete design and construction. He has acted as consultant to cities and business organizations on various occasions. He served on a board to determine the type of structure for the Galveston causeway and was one of a board in 1927 to make a preliminary report on the location of a bridge over the San Francisco Bay between San Francisco and Oakland. However, his research, administrative work, and his connections with technical committees have so occupied his time and energy that he has limited the principal contributions of his life to engineering education, engineering research, and the utilization of the fruits of research through engineering society channels.

Many honors have been bestowed on Doctor Talbot in recognition of his achievements. The honorary degree of Doctor of Science was conferred by the University of Pennsylvania (1915), Doctor of Engineering by the University of Michigan (1916), and Doctor of Laws by the University of Illinois (1931). Honorary memberships have been conferred by the American Society of Civil Engineers (1925), American Society for Testing Materials (1923), American Railway Engineering Association (1933), American Water Works Association (1930), American Concrete Institute (1932), Western Society of Engineers (1927), Illinois Society of Engineers (1924), and the Institution of Structural Engineers (London), (1924). Medals have been presented in further appreciation of the merits of his contributions to engineering as follows: Award of the Western Society of Engineers for work as student and teacher, investigator and writer, and for his enduring contributions to the science of engineering (1924); George R. Henderson Medal of the Franklin Institute for discoveries in the field of railway engineering (1931); Turner Medal of the American Concrete Institute for outstanding contributions to the knowledge of reinforced concrete design and construction (1928); Lamme Medal of the Society for the Promotion of Engineering Education for achievements in engineering education (1932); the American Railway Engineering Association in recognition of his enduring achievements as educator, scientist, writer, and for outstanding contribution to the science of engineering (1933); and the John Fritz Medal given by the American Societies of Civil Engineers, Mechanical Engineers, Electrical Engineers, and the Institute of Mining and Metallurgical Engineers for notable scientific acheivement (1937).

This fall, Doctor Talbot is celebrating his 80th birthday. Active even today, Doctor Talbot still resides in Urbana, close to the campus to which he has been attached since 1877, when he entered as a freshman. To get into conversation with him is an experience one never forgets, for Doctor Talbot will talk very fluently on practically any subject. Whether the subject be about his experiences in handling local Urbana-Champaign sanitary systems as he once did, of his travels, of the University, whatever it is, one will find in him as keen and as interesting a mind as there is in the country.

To a great man, loyal Illini, we doff our hats.

T. M.

NOTE:—The author of this article is indebted to the "History of the Engineering College" by I. O. Baker, the "Biography of A. N. Talbot" as written for the "John Fritz Medal Book," and to Doctor Talbot, personally, for the information included in the above article.

BITS ABOUT 'EM

Dick Gade '37, is surveying for the Pennsylvania Railroad near Lancaster, Penn.

J. Laurance Barker '37, M. E., is working for the Carbide and Carbon Chemicals Corporation in Charleston, W. Virginia. This summer he worked in the Maintenance Department. Laurance is planning on affiliating with A. S. M. E. very soon. He is not married yet—"but has his eyes in that direction."

R. C. A. Purl '37, Gen. Eng., went to work for the same company a short time later in the summer.

Al Bourgo '37, C. E., spent most of the summer at Camp Custer. Last month he went to work for the T. V. A. at Knoxville, Tennessee. His work is connected with the central planning section. Money is his principle reason for not being married.

George Batterton '37, M. E., seems to be completely settled. He is working for the Pure Oil Co., in Dawes, W. Virginia and is established with a wife and a home.

Ray Penner '37, Chem. Eng., is located with the Goodrich Co. at Akron, Ohio in their analytical lab. He is affiliated with the local chapter of Alpha Chi Sigma and plans to work nights for his masters degree at the Akron university. **Ward Fisher** and **Clyde Segner** are also working with Ray. Segner is the only one that is married.

Bob Foster '37, C. E., completed his training course given by the American Bridge Co. in Ambridge, Pennsylvania and has been transferred to Gary, Indiana. At present he is doing detail work. He likes Gary quite well—especially the tennis courts.

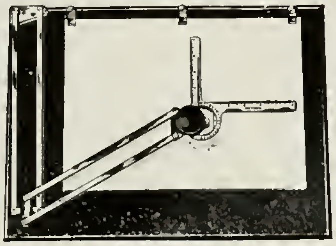
Matt Wilson '37, M. E., is working with the Chicago Bridge and Iron Co. in their erection department. This summer he worked on welded stoves for a blast furnace at the Carrie Furnace Works of the Carnegie-Illinois Steel Co. in Rankin, Pennsylvania. Matt recently saw **Ray Moore**, **Carl Mulenbrook**, and **Marshall Hole ('37 C. E.'s)** who are employed by the Aluminum Company of America.

Jack Rogers '37, C. E., is working with the St. Louis Health Department in the milk control division as a sanitary engineer. Jack highly recommends this type of work and states that there is unlimited opportunity in the field of sanitary engineering. He has been married for the past two years. **Mr. Feagan '36**, is working in the same department.

Edwin Link '37, E. E., is taking a 25 weeks' course at the Union Electric Light and Power Co. in St. Louis. His work was along the line of power plants this summer. **Orville J. Eilers '37, E. E.**, is also taking the same course; he enrolled last month.

B. Norval McDonald '37, M. E., took a long vacation before he started the year-and-a-half training course with Babcock and Wilcox Co. He is planning to return to campus for Homecoming at least.

Guy Robins '37, C. E., is working for the Portland Cement association in Chicago where he is experimenting on stabilized secondary roads. **Joe Leodabrand '36** is one of Guy's co-workers.



SUMMER SNAPSHOTS

Ira Chapman '39 chose the hard way of learning about "liquid gold" in the oil fields of southern Illinois while **Louis Schumm '40**, obtained some of the much-talked-of practical experience running levels and twirling the drawing compass for **C. K. Willett '29**, in Dixon, Illinois.

Willard Neininger '40, went back to his old job in St. Louis. He worked in the foundry of the Curtis Manufacturing Co.

Stanton Smith '40 and **T. J. Putz '38** had their summer's job with the Western Clock Co. of Peru, Illinois. According to Smith, the work was easy compared with school, and some of the "big shots" are Illinois graduates.

From **Paul Kaar '38**, comes the information that he was in the American Bridge Company's office in Gary, struggling with details for the U. S. Steel Company's new Irving works. **Bob Day '38, Ceramic Eng.**, worked in a glass factory in Lancaster, Ohio.

Fred Marisch '37 and **Maurice Carr '39**, were engaged at the Pittsburgh Testing Laboratory on a refrigerator car test.

In Chicago, **Erwood Beck '38** and **John Wenger, trans.**, were engaged by the Webster Sound Equipment Co. Erwood was planning to spend a month or so out West before school began.

Walt Renner '37, C. E., plans to return to Illinois this fall for graduate work. Walt has been working with **Bob Zaborowski** at the Roberts and Schaefer Co. of Chicago. Walt will work on concrete flat slabs in his graduate work. His work has brought him in contact with **T. B. Sear '36, L. H. Sentman '31**, and **C. Cooper '26**.

Jack Robinson '38, and **Leo LeBron** '38 were employed by the Dixon division of the State Highway Dept.

Here's news from the U. S. Engineers' office, Rock Island, where **Capt. Matthews** is recovering from a severe attempt at pedagogy. Instead of Charlie Jones' test grades, the Captain worries about the backwater from any or all of the thirteen nine-foot-channel dams in the Rock Island district. The Captain says, "Everything is lovely (except 'Ole Miss' is down to zero stage and boats are getting stuck outside the channel); even the subcontractors seem to be as reasonably happy as the Creator intended a subcontractor to become." For those who don't read the papers—Capt. Matty marched up to the altar this summer and became firmly tied to the proverbial hitching post.

• TECKNOKRAKS •

Fond father: "Don't you think, dear, that it's about time the baby learned to say 'daddy'?"

Fond mother: "Well, I hadn't intended telling him who you are until he becomes a little stronger—so he can stand the shock."

* * *

McKibbin says: "She isn't my best girl—just necks best."

* * *

Ed Holt: "Dearest, your stockings are wrinkled."

Blind Date: "You brute! I haven't any on."

* * *

Guest: "Are you the bridegroom, sir?"

Dale Shick: "No, sir, I was eliminated in the semi-finals."

* * *

And then there was engineer Fred White who was so unversed in the ways of the world that he thought a hope chest was a bust developer.

Wife (to husband in the kitchen): "My dear, what are you opening that can with?"

Lt. Lothrop: "Why, with a can-opener. How did you think I was doing it?"

Wife: "Well, from your remarks, I thought that you were opening it with a prayer."

* * *

"Yes, my boy, I'm a self-made man."

"Gee, Pop, that's what I admire about you. You always take the blame for everything."

* * *

We just heard about the world's most absent-minded engineer. He invited a girl to his apartment for an hour to see his drawings and spent the hour showing her the drawing.

* * *

Don Fahrnkopf: "I have a picture of you in my mind all of the time."

Girl: "How small you make me feel."

* * *

Small boy: "I'm not afraid of going to the hospital, mother. I'll be brave and take what's coming to me, but I ain't going to let them palm off a baby on me like they did on you."

* * *

Battle Creek girl: "Do you wanna spoon?"

Asman: "Spoon? What's spooning?"

B. C. G.: "Why, look at those other couples over there, that's spooning."

Asman: "Well, if that's spooning, let's shovel!"

* * *

Taxi Driver: "I take the next turn, don't I?"

Rasmussen from rear seat: "Oh, yeah?"

NOTICE

Freshmen • Sophomores

Would you like your name engraved on a bronze tablet in Engineering Hall? If you would—write the winning article on any subject of engineering interest in a competition being sponsored by Theta Tau, professional engineering fraternity, this fall. The contest will be judged by a committee of five, composed of three faculty and two student members. If of sufficient general interest, the winning composition will be published in the Technograph.

Prof. Knight (waking up the front row): "What do you expect to get out of the course? Why don't you wake up and take notes?"

Fred Linn: "What for? I've got my father's set."

* * *

A widow is the luckiest female in the world. She knows all about men and all the men that know about her are dead.

* * *

"Why did Stephens get sore at his B. C. girl?"

"She forgot and asked him for a ticket after each dance!"

* * *

Swede Nelson: "Just between you and me and the lamp post, what do you see in that girl?"

Dick Schwar: "Not a thing. But with the girl between me and the lamp post, well, that's a different story."

* * *

Prof. Severns: "What would be your definition of steam?"

C. Dunn: "It's water in a high state of perspiration."

* * *

Mother (to town girl student): "Mary, come upstairs this minute; it's terribly late."

Mary: "But, mother, I'm all wrapped up in my sociology project."

Mother: "Well, tell him to go home, and come on upstairs."

* * *

Social tact is making your company feel at home even though you wish they were there.

* * *

Shop Girl: "Could I interest you in a bathing suit, sir?"

Dechaene: "You certainly could, baby."

Engineers at Camp

(Continued from Page 5)

ceed in stealing the cavalry's guidon and sticking it up about 200 yards down the field. Later a counter attack came, but the defense was ready. A free-for-all then ensued with Maj.-Gen. Herron acting as judge. Col. Flint promptly stepped in, however, and brought the affair to an abrupt halt—emphasized with some dirty seats on the "whistle" breeches.

Perhaps Asman will always remember the last night's bed check. He and Bassett were in the tent when Maj. Simkins called in and asked if everyone was there. "Yes, sir," answered Asman. He must have not liked Asman's tone of voice, or something, so he made a personal check—there were only six vacant beds in there!

Maurie Adams is another one who shouldn't forget the last night, for he just got back to camp in time for breakfast. His tentmates were hoping they'd have to draw his pay because they'd had to turn in all of the equipment he had that morning.

On the whole, the entire company had a swell time at camp—even Lt. Lothrop, who enjoyed an impromptu bath when he paddled his canoe too close to the swimming pier.

G-E *Campus News*

ICE WATER

New electric drinking-water coolers introduced by General Electric have replaced the antiquated ice-cooled type on several prominent Midwestern railroads. This is another step in the modernization program being carried on by railroads to increase passenger traffic.

The new coolers are designed to overcome many disadvantages of the ice-cooled units. With foot operation of the self-contained units, only one hand need be used to get a drink. Cleanliness is promoted because of the absence of ice-filling operations, and the expense for maintenance and service is reduced to a minimum.

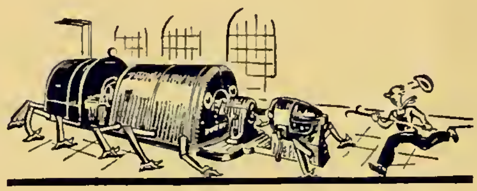
The water is automatically maintained at a healthful and refreshing temperature through thermostatic control. Coolers are designed either as self-contained units or as separate cooling and refrigerant condensing units for remote installations in the car.

AS VACUUM TUBES GREW UP

As the vacuum tubes grew, they found their style cramped because metal could be sealed to glass only in thin strips. Research took up the problem, and it is now possible to fabricate glass and metal together, in any size or shape, very much as two metals are fabricated.

In a successful glass-to-metal seal, the temperature coefficients of expansion of the glass and the metal must agree exactly over a wide range of temperature. Painstaking investigation—much of it in the General Electric Research Laboratory, at Schenectady—developed new alloys and new glasses, which could be used for this application.

The first application of this new knowledge has been in metal radio tubes, now standard in almost all radio receivers. Power thyratrons, switches, capacitor bushings—all these follow along the new trail. We cannot predict how far this new technique will go, but the possibilities are numerous and inviting.



TURBINE STEEL CREEPS

If the wrong kind of steels were used in turbine construction, the machine would not go creeping across the floor with the operator in hot pursuit, but the results might be even more disastrous.

Part of the increase in efficiency that has come about in the power-generating field in the last few years has been due to increased steam temperatures and pressures. As a result, the modern turbine shell runs, almost literally, red hot. This shell must withstand pressures such as exist half a mile down in the ocean and must keep a 20-ton rotor spinning perfectly in line. Heat softens metal, just as it softens candy, and permits it to stretch. This stretch, however, must be kept to the merest creep—about one part in 1000, if the changes are uniform.

In the Schenectady Works turbine shop, automatic electric furnaces hold samples of turbine steel at the temperature which will occur in the turbine. Gauges, which indicate changes of one part in a million, measure the creep as the pieces are exposed to heat for years at a time. From these tests, the best steel is selected.

It has been largely due to this research carried on by General Electric that the temperature and pressure of steam used in power generation have been raised to unexpected highs in the last few years.

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GENERAL ELECTRIC

HE ILLINOIS
TECHNOGRAPH

NOVEMBER, 1937 » » 20 CENTS

MEMBER OF E. C. M. A.

THE TECH'S WHO'S WHO page has been renovated! Half of the space is now being devoted to faculty members and the other half to the students who are the engineer "big shots." The reason for the change from the old double page spread of only students is to give the readers a better idea of how well our Illinois faculty rates in the outside world. If you have time to look, you will find that all of the professors who are featured in this issue of the Technograph are also among those written up in "Who's Who in America."

● More about some of the important research being conducted in the University Experiment Station. Tom Morrow '39 has written a short article about the important work in the investigation of steel railroad rails.

● Have you ever considered the desirability of taking a five year engineering course rather than the four years of work given here at Illinois. See what some of your friends think about the matter. Look for "Your Opinions."

● Rigid frame bridges are now capturing the time and thoughts of many engineers. Harry Schmielau '40 has written an explanation of this engineering "brain-child."

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UNIVERSITY OF ILLINOIS

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—Courtesy of U. S. Steel News.

THE "BIG DIPPER" OF THE IRON COUNTRY

THE ILLINOIS TECHNOGRAPH

Published Six Times Yearly by the Students of the College of Engineering, University of Illinois

Volume LII — NOVEMBER, 1937 — Number 2

Rigid Frame Bridges

U. of I. Men Prominent In Their Development

THE rigid frame bridge is not just another offshoot. It has a proper place in structural engineering practice and is in direct line of modern structural development. Contrary to public opinion, the first rigid frame bridge was not built in 1922, but some thirty or forty years earlier. Nearly every bridge designer of note built or hoped to build a structure of this type. The most famous bridge of that time was the Stephanie Bridge over the Danube Canal at Vienna, Austria which for many years was considered one of the most beautiful structures of its kind in the world. It was erected in 1885, and had a steel girder with a span of 200 feet and a depth of one-forty fourth of the span at the crown. Construction of rigid frame bridges has advanced rapidly in the United States since Westchester County, N. Y., first built a bridge of this type 15 years ago. Virtually every engineer is aware of the fact that the rigid frame bridge is well established as a desirable form of construction from a structural as well as an artistic point of view. Its field of use for special purposes, such as grade-crossing eliminations where headroom is limited, is widely recognized.

Monolithic Construction

A clear conception of a typical rigid frame bridge can best be obtained by first visualizing an ordinary simple span bridge supported by bearings on two abutments. If the bearings are replaced by concrete that continues monolithically from the abutments to the deck, the altered structure becomes a frame with rigid corners, or a structure which is called a rigid frame bridge. This name can also be applied to two or more continuous spans, the deck being monolithic with the abutments and continuous over, but not fastened or rigidly tied to the intermediate supports. Such monolithic conditions of abutments and decks, while simplifying construction, make the stresses in the structure beyond may be consideerably reduced and that sequently special methods of design had to be developed to analyze the structures.

The basic idea of the rigid frame bridge is that the abutments and the decking work together as one unit, each helping the other. Thus flexure of the decking is resisted partly by the abutments and the strength of the decking is brought into play to resist the lateral earth pressure on the abutment. This means that the deck slab may be considerably reduced and that the abutments may be extremely light in construction compared with the ordinary gravity abutments.

Many engineers, societies, colleges, and universities have been making numerous investigations into all phases of the rigid-frame bridge. Columbia University and the Massachusetts Institute of Technology first conducted tests, and investigations for Westchester County. The University of Illinois has played an important part in the development of this bridge. Professor Hardy Cross, while at the University, made an analysis of this type of bridge known as the method of distributing fixed end moments, which is widely used in the United States.

During the past five years Prof. W. M. Wilson and R. Kluge have performed numerous tests on models and full size rigid-frame bridges. At present they are testing a bridge with a span of 48 feet and a width of 18 inches. They have just completed a test on the flow of the structure. That is they alter the span .06 of an inch and then read all reacting moments at each base, the horizontal thrust at each base and leave the structure stand for a week. After this period they again read the reactions and find that they have changed a small amount; this phenomenon is called flow of concrete. They are now starting a live load test with a load equivalent to a truck on the structure. The above tests will be repeated, but the span will be adjusted in increments of .01 of an inch. The live load will be increased until failure occurs.

The vertical reactions at each base and the horizontal thrust measured by scales. The span adjustment is made by having a rod running from one base to the other with the temperature either the same for each reading or correcting the length of the rod for the individual readings; either way, the length can be determined within .001 of an inch. Jacks are placed on the bases so that the bases will rotate. At each base there is a level bubble which must be centered before a reading is taken. At each end of the top of the structure is a hook gauge which is connected one to the other by a pipe; this is to be sure that the bridge is level.

In a rigid frame bridge the members are not all of uniform thickness, but the material is more efficiently disposed. A bridge whose members are not all of uniform width requires only about 60 per cent as much material of a constant section frame bridge. The frame bridge has the advantage over the arch bridge in the saving of material in the approaches, saving of concrete in the abutments, and the saving of the excavation for the abutments. These economies are not just theoretical but have been demonstrated by a number of comparative designs and estimates of actual bridges.

Long Span in Brazil

Although one rigid frame bridge has been built in Herval, Brazil, with a span length of 224 feet, the majority of the structures erected with this type of construction have varied from 30 to 100 feet in span length. The actual economic span limit of this type of bridge is still in doubt and will not be determined until considerable study and research has been carried out.

The use of the rigid frame concrete bridge has not only proven to be more economical than the ordinary type of bridges but is also proving to be a step towards a more pleasing type of bridge architecture. It is just another case of the most economical also being the most beautiful structure. It readily adapts itself to architectural developments, many of them have been faced with stone; in addition to these advantages, the very fact that it is a deck bridge gives it a pleasing and substantial appearance. Its architectural features also give it an added margin of safety to traffic as there are no structural parts projecting, and the bridge appears to be a link in the roadway rather than an obstruction.

SOCIAL CALENDAR

NOVEMBER

5-6	Faculty Players Play
6	YMCA-YWCA Mixer
12	MIDA-WGS Mixer
18	Star Course—Joos Ballet
19	Independent Informal
19	Theater Guild Production

DECEMBER

3	MIDA-WGS Mixer
7	Star Course—Bartlett and Robertson
10	YMCA-YWCA Mixer
10-11	Theater Guild Production
17-18	Theater Guild Production
17	MIDA-WGS Mixer
17	Officers' Ball
21	Men's Glee Club Concert

Professor W. C. Huntington

Professor Huntington Receives Norlin Medal

At the forty-second annual University of Colorado Alumni Day held last June 12th, Professor W. C. Huntington, head of the Department of Civil Engineering, was awarded the Norlin medal. This medal is given annually to that alumnus of the University of Colorado who has distinguished himself in his chosen occupation, and is the highest honor the Colorado Alumni Association can give.

After graduation from the University of Colorado in 1910, Mr. Huntington took a position as construction engineer with the firm of Crocker and Ketchum of Denver. From 1910 to 1926 he held various positions in the department of civil engineering of the University of Colorado, being head of the department during the last six years of that time. From 1918 to 1919 he was assistant dean of the College of Engineering.

In 1926 he came to the University of Illinois where he rose to his present position. In 1933 he was made chairman of the engineering advisory board of the Civil Works Administration for Illinois and was vice-chairman of the state advisory committee of the Work and Rehabilitation division of the Emergency Relief commission for Illinois. In 1935 he was chairman of the Illinois organization committee of the American Engineering council.

Professor Huntington is a member of the American Society of Civil Engineers, the American Society for Testing Materials, the Society for Promotion of Engineering Education, the American Concrete Institute, the Western Society of Engineers, the Illinois Society of Engineers, Tau Beta Pi, Sigma Xi, and Beta Theta Pi. He is the author of "Building Construction" which was published in 1929.

A popular exhibit at the Franklin Institute in Philadelphia is equipment enabling visitors to hear themselves as they sound over the telephone.

According to an ancient Roman road register, issued about 200 A. D., the Roman Empire then had 372 important paved highways, totaling about 48,000 miles.

Professor Smith Leaves to Edit Magazine

Professor C. M. Smith, research assistant professor of Mining Engineering resigned his position on Oct. 1, to take the position of editor of "Mechanization—The Magazine of Modern Coal." The new magazine that he will edit will be a small-size journal for mine managers, operators and men connected with the coal industry who want a concise, readable reference on modern trends in their field. Mr. Smith will be associated with Paul Weir, consulting mining engineer of Chicago. The headquarters for the new organization will be in Washington, D. C.

Professor Smith is a graduate of Illinois class of 1920. After graduation he worked on the research staff of Anaconda Copper Co. of Butte, Mont. From 1921 until the present time he has been with the mining department at Illinois during which time he has published several bulletins and technical articles.

His most recent undertaking was consulting work during the past summer for the Climax Molybdenum Co. of Colorado where he designed a new ventilation system for the largest mine in the state.

Mr. Smith is a member of Tau Beta Pi, Sigma Xi, Phi Kappa Phi, A. I. M. E., and several other honorary and professional societies.

Your Opinions

Question: Do you think the present engineering courses should be extended over a period of five years instead of four?

Ed. Fraser '39: "I am very much in favor of it. It is impossible for one to crowd into four years all the courses he should take."

Harry Beckerle '38: "Cut it down to three and let me out!"

Paul Kaar '38: "I think they should, but comparatively few students could afford to pay the expense of a five-year course. There are not enough cultural subjects in engineering now."

Fred Skogland '41: "I haven't been here long enough to comment."

S. K. Eisiminger '39: "The way the courses are laid out now we get about 10 hours of electives. If we went to school another year, we could take more time on technical subjects besides having more time for non-technicals."

Larry Stoneburner '41: "Not until I get out."

Harry Atkinson '38: "It is all a question of money, and until such time as fellows have more, it will be difficult to get them to take an engineering course here in five years when they can get it somewhere else in four."

Al Krivo '38: "Yes, because the last two years which are the most important could very easily be extended into three years."

Wilber Dunn '39: "I believe they should. In the first two years one gets practically no engineering courses, and to cover the curriculum thoroughly an extra year is needed."

Professor C. W. Parmelee

Parmelee Receives Award of German Society

Professor C. W. Parmelee, of the department of ceramics, received the following radiogram a short while ago:

Freiburgbreisgau, Germany
September 25

Dr. Prof. C. W. Parmelee
University of Illinois
Dear Doctor Professor:

At the annual meeting of the German Ceramic Society held today, you were unanimously elected honorary member. I hereby notify you and request your acknowledgement. With the best of good wishes.
(signed) Director Willach

This recognition conferred on Dr. Parmelee is a distinct honor to him, as well as, to the University of Illinois, as the German Ceramic Society is one of the leading organizations in the world in the field of ceramics.

Western Society of Engineers Honors Professor Wilson

Wilbur M. Wilson, research professor of structural engineering, and a member of the civil engineering faculty for the past 24 years was awarded the Octave Chanute medal for 1936-1937 at the annual dinner of the Western Society of Engineers, held at the Union League club of Chicago on September 27. This honor was conferred on Mr. Wilson for his paper entitled, "The Present Status of Structural Welding." He also received this medal in 1914 for his paper entitled, "The Analysis of Wind stresses in the Frames of Office Buildings."

The award was originated in 1901 when the late Octave Chanute, at the end of his term as president of the W. S. E., presented the society with a fund to defray the cost of three medals to be given each year to the member presenting the best paper in civil, electrical, and mechanical engineering. The medals, which bear the profile of Mr. Chanute and the name of the winner, are struck from a design by Lou Wall Moore. Mr. Chanute, after whom the Air Corps Technical School was named, held the degree of doctor of engineering from Illinois.

Born in '36 . . .

THE newest building on the engineering campus is the metallurgy building. It was built in the summer of 1936 and classes were held in it beginning in September of that year. Although the building is used extensively for both classes and laboratory work, it is not as yet fully equipped. However, the equipment which has been purchased up to the present time is of the best quality and would be of interest to any engineering student who gets pleasure in working with laboratory and scientific instruments.

The metallography laboratory is an interesting place which is equipped with a great many optical instruments to study the micro-structure of metals. The type of work done in this lab is the making of mirror-like surfaces on metal specimens in order to study their structure under a microscope. The specimens are polished on laps using a carborundum solution as a cutting agent. They are polished until no scratches appear under a high-powered microscope.

In the heat treatment laboratory, on the first floor of the building, the study of the effect of heat treatments on the physical properties of metal is pursued. The equipment consists of several different types of furnaces, hardness testing machines, and a cutting machine. The furnaces are of electrical and high-pressure gas-combustion types. The gas-combustion furnaces are capable of attaining a temperature of 2800 degrees F. and are useful in carborizing and nitriding the steels. Because of the intense heat that is required for the procedures followed in this laboratory, it is necessary to use pyrometers of the highest quality. The hardness testers are the Rockwell and Brinell apparatus. A cutting machine having a carborundum disc rotating at high speed is used to cut the finest grades of tool steel. A new testing machine will be used to study tensile strengths of these heat-treated steels.

Also on the first floor, is an electrometallurgy laboratory which is used for the studies of electro-plating and the refining of metals. It is of interest to note that a new Lincoln welding machine has been installed recently and will be in use by the students this fall. An interesting piece of apparatus in this lab is the electric arc furnace constructed by members of the department. It will attain a maximum temperature of 3000 degrees F.

At present there are several special problems being studied. One is the relation of micro-structure to the fatigue of large welds. This is being carried on with the cooperation of the T. and A. M. department. Another is the relationship which exists between micro-structure and the physical properties of metals.

Gas Carbonizing Furnace

As yet, the research work being conducted by the metallurgy department is on a small scale. From all indications, the work which can be done in this building is of the highest grade and by the examples we can see what type of work is being developed.

A private inspection trip through the new metallurgy building would be well worth while for any engineer.

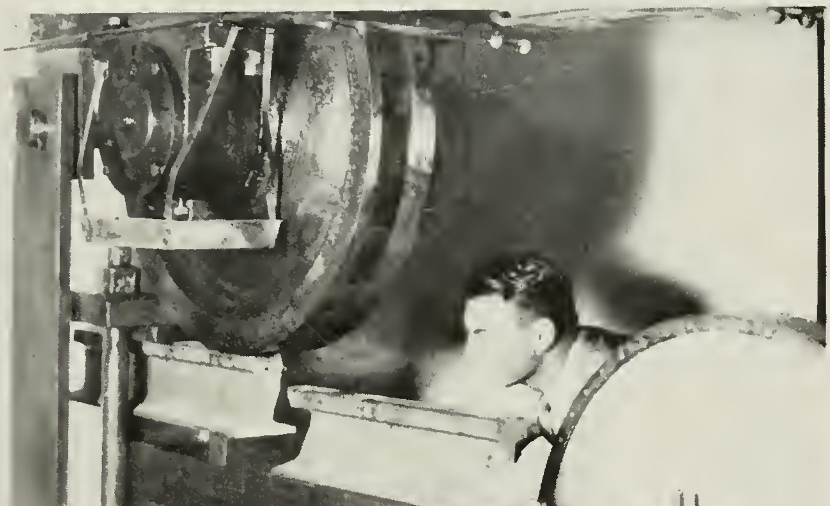
Rail Investigation in M. T. L.

ONE of the newest projects to be worked on by the University Experiment Station is the investigation of welded rails. The proposition of welding rails together rather than connecting them by the usual joint bars is being seriously considered today, and several roads have already experimented with welded track in actual use. On one railroad south of Saint Louis, there is a section of track six miles long with the rails each welded into a single length. Similar sections have been put to use on the Bessemer and Lake Erie railroad near Pittsburgh. The investigation here at the University has been under the sponsorship of the Association of American Railroads. Specimens will be subjected to a wide variety of tests, including repeated pressure and bending under a repeated heavy wheel load.

Some of the many problems to be considered can be shown in the following questions. Is the welded joint as strong and as tough as the rail itself? Is it as strong and as tough as the ordinary rail joint? Can the problem of linear expansion be handled?

Another of the more recent investigations is that of fissures in rail heads. This investigation is sponsored jointly by the Association of American Railroads and the Technical committee of the Steel Rail Manufacturers. The importance of such an investigation may be gaged by the fact that an average of 25 rails break every day on the railroads in this country. The Sperry car is useful in detecting fissures before they spread to fracture, thus diminishing the danger of railroad travel, but it cannot prevent the formation of fissures. By developing fissures in the laboratory on special testing machines, it has been discovered that they originate in minute cracks in rail heads. These defects are too small to be detected by the Sperry car, and it has been found in the course of the investigation that they exist in newly-rolled rails. The use of a slow-cooling process prevents almost entirely the formation of these cracks. During the past year over 75 per cent of the rails furnished railroads were given this special treatment.

In one of the basement rooms of the Materials Testing Laboratory, tests are now in progress to determine the amount of "batter" of rail ends produced by the repeated passage of a heavy wheel load. Special hardening processes for rail ends give promise of reducing batter ,thus increasing the life of the rails and giving smoother riding.—T. M.



Rolling-Load Machine

Bits About Them . . .

Bob Lehmpuhl '37, John Heil '27, and Les Thorson '30, are working in the distribution department of the Peoples' Gas, Light and Coke Company, in Chicago. Bob states that the opportunity for advancement is very good, so he plans to remain with the company for some time.

Kenneth Roth '37, has gone into the field of air conditioning. He is working in Bloomfield, N. J., for the General Electric Company, and likes his work well enough to plan on remaining in this field indefinitely. Kenneth will return to Illinois during his first vacation next year.

Lloyde Danielson '37, seems to be planning a trip to the altar soon; he is engaged to a Kansas State College Graduate. At the present time Lloyde is doing test work for the General Electric Company with several other Illinois men.

Walt Turner '37, and Allen Porter '37, are working on research and production problems at the Corning Glass works in connection with the recently purchased McBeth-Evans Plant at Shalroy, Pennsylvania. Both fellows are quite enthusiastic about the fine working conditions at the plant.

As service man for Edison-General Electric, William H. Blackburn '36, travels through Minnesota, North and South Dakota, and upper Michigan.

Jan Gunn '37, is taking a training course with the Crane Company which consists of 22 weeks training in the research laboratories, 30 weeks training in the shops, and several weeks spent touring the eastern plants of the company.

Dick Hull, E. E. '37, Fred Schlie, M. E. '37, and Chester Wohlberg, Chem. Eng. '37 are taking the training course of the Delco-Remy Division of General Motors Corporation. W. McCarthy '29, is assistant superintendent of the Starter plant.

Carl Campbell '37, really goes in for the night life. He is testing power transformers for General Electric Company on the 4:30 p. m. to 12:30 a. m. shift. George Logan, M. E. '37 is working the "graveyard shift" of early morning hours at the same place. Carl spends his spare time sight-seeing about the Berkshire Hills.

John Hunt '37, Reed Tullis '37, and Harold Ardall '37, are working with the Emerson Electric Company of St. Louis.

Ed Cornell '37, is working with the Hoover Company at North Canton, Ohio, where he is both designing and using testing machines. Ed and Jim Boyd '37 are roommates; Jim also works for the Hoover Company. Ed went to Yellowstone National Park during his first vacation.

From Lowell Fellinger '37, comes news of some of the graduate students. Lowell is now at Massachusetts Institute of Technology, where he is assisting a professor of Chemistry in senior chemistry engineering subjects. E. F. Jennings is in the same class as is Lowell.

Ray Purl '37, has had quite an eventful time since his graduation. After leaving Champaign, he spent a month at Camp Custer, then packed his belongings into his car, and with his parents, who were taking a vacation, journeyed eastward. Right now Ray is working as a mechanical engineer in the gas department of the Union Carbide and Carbon Company in Charleston. Ray seems to be enjoying himself in Charleston; he spends a great deal of his time in activities of the stage.

Walter Black '37, is working for the Goodyear Rubber Company in Akron. Walter says, "I don't intend to get married for a while—maybe next fall."

Myron Gossard '37, and Jack Diesenroth '37, are working for the American Bridge Company at Ambridge, Pennsylvania. The Ambridge Office of the American Bridge Company seems to be a popular place with Illinois engineers. Mr. Clark and Mr. Dell of our faculty spent their summeer working at Ambridge. Myron is planning to take graduate work at Carnegie Tech after working hours.

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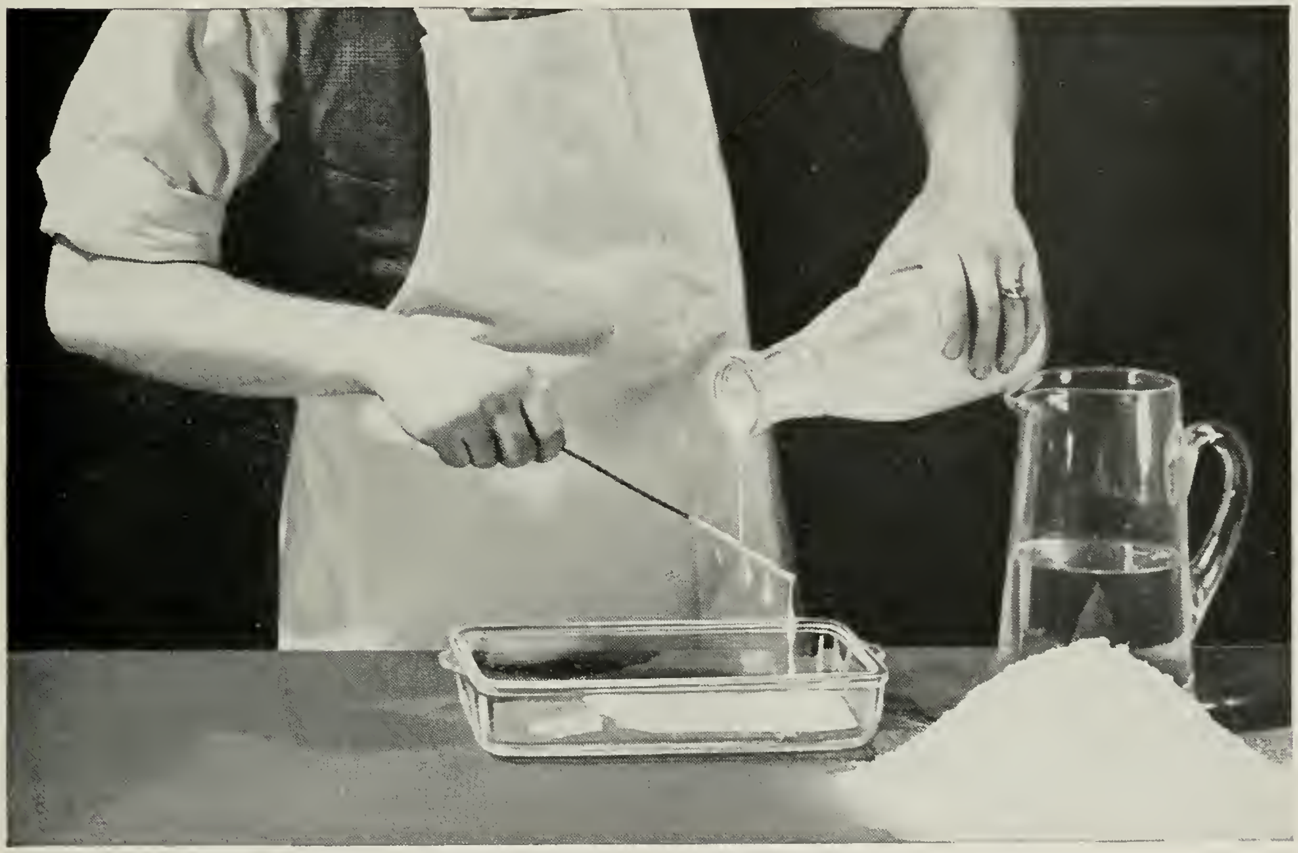


★ WHO'S WHO IN ILL

• *Melvin L. Enger*

• *Herbert F. Moore*

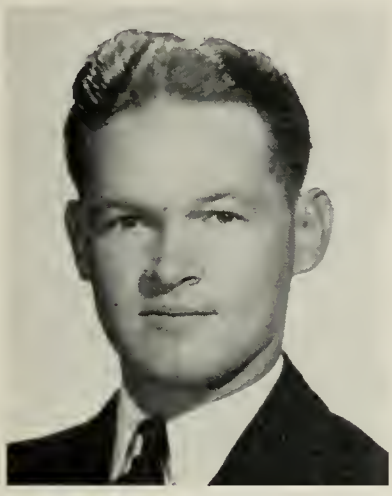
• *Wilbur M. Wilson*

DEAN MELVIN L. ENGER is a big man! Just look at him and see for yourself. Height—6 feet, 1 inch; weight—210 pounds; record—one any man could be proud of! He was born in Decorah, Iowa, took his first two years of college training at the University of Michigan, but received his B. S., C. E., and M. S. degrees here at Illinois. His first job when he was graduated from school was with the C. M. and St. P. Ry. as an instrumentman. With this outside, he came back to the University in the T. & A. M. department to begin his career as an educator. Now his position is that of Director of the Engineering Experiment Station and Dean of the College of Engineering. Societies of which he is a member include A. S. C. E., A. S. T. M., American Society for Promotion of Engineering Education, American Water Works Association, Sigma Xi, and Tau Beta Pi. His efforts as an author have been directed to the various technical journals and to the editing and compiling of the International Correspondence Schools text on hydraulics. Interests of all kinds direct his reading to general fields, while his chief hobbies are driving his automobile and putting away a good meal. During the past summer he spent his vacation in Colorado "just rusticating." In addition to all this, Dean Enger still finds time to be one of the chief backers of student projects undertaken on campus.

PROFESSOR HERBERT F. MOORE has a good many things to his credit. He has been the clerk at the Congregational Church for the past twenty years (an ex-deacon, too), a research professor of engineering materials for the Engineering Experiment Station, and is one of the executive faculty of the graduate school. He was born at Penacock, New Hampshire, and received his B. S. and Dr. of Science from the old N. H. College of Agriculture and Mechanical Arts (now U. of N. H.) Later, at Cornell University, he was given the degrees of M. E. and M. M. E. His experience as a teacher began with his classes of science and math at Colby Acadamy in New London, N. H. At Cornell he was an instructor in machine design; and for his last problem as an M. E. for Reihle Bros. Testing Machine Co., he designed the 600,000 pound testing machine which is in M. T. L. Later he taught applied mechanics at the University of Wisconsin. Now his time is devoted to the investigation of steel rails. Hiking and dramatics are his favorite pastimes when there is time for them. Gory detective stories take the place of counting sheep at night. His memberships include A. S. M. E., A. S. T. M., A. A. A. S., British Institute of Metals, Sigma Xi, Tau Beta Pi, Phi Beta Kappa, and Pi Kappa Phi.

PROFESSOR WILBUR M. WILSON, research professor at the University Engineering Experiment Station, has a reputation in the engineering world which is seldom surpassed by anyone. He has been twice the recipient of the Octave Chanute medal and was awarded the J. James R. Croes medal last year. Mr. Wilson was born in West Liberty, Iowa, and attended college at Iowa State. Here be won his letter as a member of the track team and also earned his B. M. E. and C. E. degrees. Following his work at Iowa State, he went to Cornell University for his M. M. E. degree. During the World War he served in the Corps of Engineers as the Regimental supply officer of the 109th Engineers. When he resigned from the service, he held the commission for examining applicants for licenses as structural engineers in the State of Illinois. His chief hobbies are flower gardening and running his ranch in Colorado. During his research work here at the University, he has written twenty-one bulletins and three circulars. He is a member of A. S. C. E., A. S. T. M., A. A. A. S., A. R. E. A., Western Society of Engineers, Engineering Society for Promotion of Engineering Education, American Welding Association, International Association of Bridge and Structural Engineers, Illinois Society of Engineers, Sigma Xi, Theta Tau, and Tau Beta Pi.

IGINEERING WORLD ★



Robert Zaborowski ●

Daniel K. Chinlund ●

Maurice V. Adams ●

MAURICE V. ADAMS is the Valentine his mother presented to his father in 1914. This important event in Maurice's life took place at Robinson, Illinois. As a youngster, he lived and worked in the oil fields in thatl vicinity. Robinson Township High School claims him as an alumnus, class of '31. His scholastic average of 93.2 placed him third from the top of the thirty-oners. High school activities included membership in the Players' Club, the basketball and track teams.

In the fall of 1932, he came up to Chambana, but missed the next two years. The U. S. Coast and Geodetic Survey, the U. S. Geological Survey, and the Crawford County Highway Department paid for his services until September of 1935, when he returned to the University. He is now studying Engineering Physics and Geology to prepare for work in the petroleum industry after graduation. In the summer of '36 he worked for the General Geophysical Company. Scholastic hon ors include Phi Eta Sigma, college honors, and a bid to Tau Beta Pi which he could not accept for lack of funds. In military he is a member of Tau Nu Tau, Pershing Rifles, presides as captain of Scabbard and Blade, and will serve this year as a major in the R. O. T. C. Corps of Engineers. He was also president of the Engineering Physics Club in 1936-37. On March 27, 1937, he conferred the MRS. degree upon Kathryn Brash of Urbana.

DANIEL K. CHINLUND began life in Chicago, his father being a graduate of Illinois in the class of '10. At Lane Technical High School he ranked fourth in his class with a four-year average of 95.4. This won for him a membership in the National Honor Society and a four-year scholastic key. The Radio and Civics Clubs of the high school are proud of the fact that his name appears on the lists of their members.

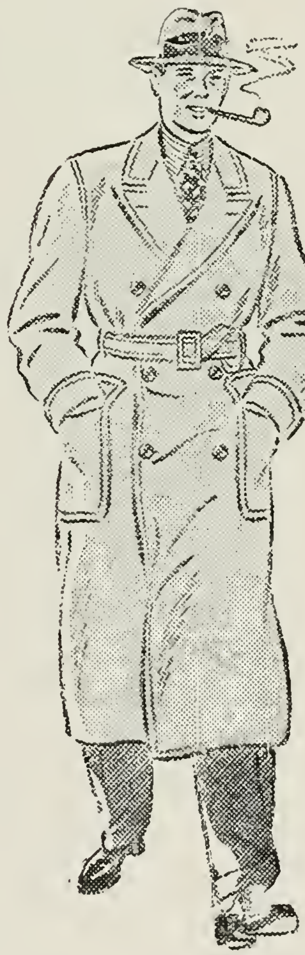
His achievements at the University are on a par with those at Lane "Tech." In scholarship he has made a three-year average of 4.56, class honors for three years, and wears a University Scholarship key. He presides at the AIEE meetings and does the same at the Tau Beta Pi gatherings when the president fails to appear. Other societies that claim his membership are Eta Kappa Nu, Phi Eta Sigma, Synton, Pi Tau Pi Sigma, and Pershing Rifles. He will also command the R. O. T. C. Signal Corps this year, as lieutenant-colonel. His hobbies are music and radio. He has worked for Postal Telegraph and Cable Company in Chicago for the past three summers, but he hopes to enter the field of power-plant engineering when he is graduated a san electrical engineer.

ROBERT ZABOROWSKI will enter and ought to be welcomed into the civil engineering professional ranks this February, when he terminates an unusually active college career. His first conquest was Phi Eta Sigma, which he quickly followed with Chi Epsilon and Tau Beta Pi. A. S. C. E. and Tau Beta Pi have elected him president for the first semester of this year. Last year he gave the Technograph many a boost upward as its editor. The same year, as a member of the Engineering Council, he had both hands full in the process of making St. Pat's Cabaret Dance and the Bi-ennial Open House the successes that they were. Both summer work and NYA jobs have enabled Bob to pay most of his school expenses. During the summers of '35 and '36 he worked for a carnival. Last summer he did design work for Roberts and Schaefer and then acted as superintendent on the construction of the first commercial thin shell concrete barrel roof built in the United States. Bob's practical mind won't allow him to narrow his life to engineering alone, however. His hobbies are many—reading (ask him about English 57), music (he made the Varsity Glee Club), clog dancing, and tennis. According to Bob's roommate, his greatest time consumer is a certain J. K. course which is not listed in the Time Table.

• TECHNOFASHIONS •

Technograph Specifications for College Men's Wear

Hats, Hats, Hats!! The drop in temperature is inversely proportional to the amount of clothing we wear—and with the cool fall days and the Champaign-Urbana rainy days playing leap-frog on the calendar, the engineers are putting on their overcoats and raincoats. With the coats, so as not to seem partly bald, they are sporting snappy hats. Felt hats in many shades are all around, but in Engineering Hall we have seen brown and grey more than any other color. There are, however, some good-looking engineers with green and blue top-pieces. Is someone going to give us a Tyrolean hat to write about? Fleece hats, to match fleece overcoats, are new and may become as popular as the coats.



In any write-up concerning topcoats and overcoats the first consideration might well be the colors. Tan and grey are the old stock colors that are still maintaining their popularity because they adapt themselves so easily to any outfit. But new topcoats are figured — checks and others — and the colors are brighter. The tendency seems to be to blend two similar colors and then cross them with a light or thin line of contrasting color. Not bad either!

Heavy overcoats take on contrasting colors for distinction and there are also some relatively new materials being used.

The choice of belts or no belts is left to you engineers when you want a coat. You can tie up tight to look streamlined or hang loosely like a tent. On topcoats the belts may be wrap-arounds or have buckles — on the North Campus the buckles seem to be the choice. Leave the knots to Commerce.

Fleece topcoats and overcoats, introduced a few seasons back, are becoming more and more popular. We have noticed a number of them here on the campus. They are soft, warm, and fine-looking. Swell for evening.

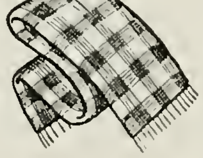
When it rains about half of every week we get little time to hang up our raincoats. Engineers like trench coats, with the belts; but new styles tend toward full, draping coats. These are made in plain colors and in patterns. Perhaps these drapes are just the thing under which we can keep our slide rules dry.

But coats and hats aren't the only things necessary to keep us warm. We need three or four pairs of gloves for various purposes — how about grey pigs for ordinary and some brown leather ones for driving or really cold days.

Plain color scarfs are coming back and a few fellows have been wearing them already — maybe they didn't have their shirts on. Hot Scotch plaids still add color when we dress up for the football games and keep us warm too. The choice is up to you.

As we said in the last issue; hot colored socks are burning up the campus and striped ties are everywhere — even on some fellows who don't usually wear ties. The regimental stripes have a competitor, college stripes, college colors that might dig up school spirit.

Who will be the "Best Dressed Engineer of 1937-38?"



Heating and Ventilating Research Residence

MAN-MADE WEATHER

• • • a la engineer

ONE HEARS or sees something concerned with air conditioning every little while, these days. We, as students, are instructed by our knowing elders to get into the field of air conditioning, as it is the coming industry. Yet, with all this talk, few people know the full meaning of the term "air conditioning," nor do they know of the background that the industry has. The Guide of the American Society of Heating and Ventilating Engineers contains the following definition: "Air conditioning has for its objective the supplying and maintaining, in a room or other enclosure, of an atmosphere having a composition, temperature, humidity, and motion which will produce desired effects upon the occupants of the room or upon materials stored or handled in it."

From the definition it can be seen that air conditioning does not refer entirely to the cooling of air in the summer, as is the popular conception of the term, but, in reality, includes also a number of other processes, some of which are quite old. The regulation of temperature includes the heating of air in the winter, and the cooling of the air in the summer. Low relative humidity, usually prevalent in winter, is remedied by blowing the air through a spray of water or steam; the excessive moisture generally existing in summer is removed by cooling the air below its dew point temperature. Experiment has placed air circulation second only to temperature in importance. Air that is perfectly conditioned so far as temperature, humidity, and composition are concerned, will feel stuffy if not in motion. On the other hand, too much motion will make the air feel uncomfortably cold. In considering the composition of air, the lack of oxygen seldom, if ever, gives the ventilating engineer trouble. Control of composition refers to the removal of dust and harmful gases, which is done by sprays or filters.

Air conditioning has three great fields of application: in industry, in public buildings and conveyances, and in the home. The first industrial application of complete air conditioning was made in 1906 by the textile manufacturers. This made it possible for them to operate the year around and still produce an article of uniform quality. The office, too, has become air conditioned, obviously making the employes more comfortable, but with the ulterior motive of increasing their efficiency.

The second field of air conditioning is also the second oldest. Although what has been called air conditioning of theatres was, until the last few years, only cooling; temperature, humidity, and motion of the air in theatres are now all controlled. From the theatre the use of air conditioning has profitably spread to the ballroom, restaurant, hotel, and train.

The use of air conditioning in the home is quite new, and, as yet, is confined to new homes and to the homes of the wealthy. The most important reason for this is the cost and trouble of installation. It is probable, however, that complete air conditioning will become as much a part of every home as the furnace is now.

Research has provided much data for the ventilating engineer. These data may be divided into two classes: physical and psychological. Physical data have to do with the construction and operation of air conditioning apparatus. Psychological data refer to the effect that different conditions have upon the human body.

There is very little that a ventilating engineer wishes to know that he cannot find among the physical data. The thermal conductivity of nearly every building material has been determined. The efficiency of heating and cooling systems has been determined. Humidification and de-humidification apparatus has been tested, and the proper type to produce the desired humidity can be determined. Thus, given a set of conditions—that is, given the structure and plan of a building, the required inside temperature, humidity, and amount of motion of the air, the extremes of outside temperatures, and the use of the building—the ventilating engineer can supply all the data necessary for constructing the conditioning system.

Psychological Troubles

The major problem confronting the ventilating engineer, now, is the difficulty of bringing the amount of psychological data to as near completion as are the physical data. The comfort chart compiled by the ASHVE comes nearest to giving a complete solution of the problem. On this chart, which is in reality a psychonometric chart with other data added, are lines which represent what has been termed the effective temperature. By tests of a large number of people, it has been determined that every point on any one of these lines feels that same to the human body. Thus the temperature of 70°F. and a relative humidity of 65 per cent feels the same as a temperature of 73°F. and a relative humudity of 30 per cent. In all of these cases, the motion of the air was set at a certain standard. But in compiling this chart they have gone further yet and established comfort zones which include that range of effective temperatures which feel comfortable to the most people. In theatre, restaurant, and other public installations, the equipment can be designed to produce the effective temperature that is comfortable to the largest percentage of the people, as determined by the comfort chart. In home installations, however, the ventilating engineer meets trouble. Although most of the people in a home may be comfortable at a certain effective temperature, the objection of one member may require that much different conditions be produced by the equipment. This makes it difficult to design apparatus for mass production. It also makes it difficult for the ventilating engineer to know just what standard to set for any home installation.

Air conditioning is becoming well established in industry and in public places. It is the air conditioning of the home, however, that interests the public most. Efficiency and operation costs of home units have reached a level that will not be altered for some years. There will be some lowering of initial cost because of mass production. Home air conditioning will soon become common, in spite of its expensiveness, simply because the people will pay the price to gratify their growing inhibition towards non-conditioned buildings.—M.K.C.

THE ENGINEER

ONE day, three men, a Lawyer, a Doctor, and an Engineer appeared before St. Peter as he stood guarding the Pearly Gates.

The first man to step forward was the Lawyer. With confidence and assurance, he proceeded to deliver an eloquent address which left St. Peter dazed and bewildered. Before the venerable Saint could recover, the Lawyer quickly handed him a writ of mandamus, pushed him aside, and strode through the open portals.

Next came the Doctor. With impressive, dignified bearing, he introduced himself. "I am Doctor Brown." St. Peter received him cordially. "I feel I know you, Doctor Brown. Many who preceded you said you sent them here. Welcome to our City!"

The Engineer, modest and diffident, had been standing in the background. He now stepped forward. "I am looking for a job," he said. St. Peter wearily shook his head. "I am sorry," he said; "we have no work here for you. If you want a job, you can go to Hell." This response sounded familiar to the Engineer, and made him feel more at home. "Very well," he said; "I have had Hell all my life and I guess I can stand it better than the others." St Peter was puzzled. "Look here, young man, what are you?" "I am an Engineer," was the reply. "Oh yes," said St. Peter; "Do you belong to the Locomotive Brotherhood?" "No, I am sorry," the Engineer responded apolegetically; "I am a different kind of Engineer." "I do not understand," said St. Peter; "What on earth do you do?" The Engineer recalled a definition and calmly replied: "I apply math-

(*Continued on Page* 15)

R.O.T.C. Commissions

The R. O. T. C. commissions for the seniors in the advanced course of the Engineer Corps, as released by the military office, are as follows:

Lieutenant Colonel—Charles E. Wright.

Majors—M. V. Adams, R. W. Dalrymple, B. T. Schwar, C. H. Dunn, and J. M. Ericson.

Captains—B. O. Larson, L. J. McCleish, R. D. Rodwell, J. D. Dayton, D. A. Bassett, W. R. Johnson, M. C. Grimm, P. A. Nilsson, E. H. Holt, W. G. Stone, R. W. Benoliel, R. O. Beitel, A. J. Dechaene, J. G. Moore, and R. D. Stephens.

First Lieutenants—H. E. Arnold, A. W. Asman, H. W. Atkinson, C. D. Farbnkopf, M. U. Fritz, G. R. Fouts, F. C. Henninger, R. J. Houkal, J. G. McKibbin, A. M. Nelson, S. W. Ryden, M. W. Schroeder, T. J. Scott, J. R. Vernetti, and J. F. White.

Thirty-eight juniors have enrolled in the advanced course of the Engineers; the second-lieutenants are:

R. C. Borman, G. J. Cahoon, E. H. Carlson, J. T. Chumley, P. J. Clementz, M. B. Crawford, C. Dillon, D. H. Dragoo, E. D. Ebert, S. K. Eisminger, C. F. Erickson, E. S. Fraser, L. C. Gatewood, H. G. Haake, W. C. Hart, J. W. Hernlund, R. L. Hicks, J. M. Hoffman, T. Jakim, A. P. Janosik.

F. A. Kocian, H. C. Langille, H. E. Lind, J. B. Lewellyn, R. V. Lohmiller, T. Meisenzahl, E. Moroni, T. M. Morrow, W. T. Pascoe, N. Pokrajac, B. R. Price, W. Price, F. J. Rasmussen, F. A. Reed, J. F. Sass, W. H. Simmons, A. R. Starr, R. Wiggins, R. L. Zierjack.

In the Signal Corps, the following seniors have been given commissions:

Lieutenant Colonel—Daniel K. Chinlund.

Majors—J. H. Davitt and S. S. Doherty.

Captains—W. R. Fahnstock, D. H. Shick, and F. M. Whitaker.

First Lieutenants—J. M. Askew, J. Blackstock, P. A. Munro, and W. M. Spurgeon.

Captain Stice reports that the influx of juniors is almost three times the usual enrollment. The new course in cryptographic analysis has caused some of this increase, as there are a number of transfers from other units. Second lieutenants are:

Communications:

R. Andermann, M. K. Carr, L. F. Cipriano, M. H. Coggins, E. T. Ebersol, J. C. Foss, K. M. Gonseth, H. D. Harback, F. V. Higgins, K. Hino, C. P. Hogan, W. D. Lyon, A. P. Rugg, W. E. Schreiber, R. E. Steinfort, J. W. Walker, C. Wayham, B. H. Weston, J. H. Wetzel, R. A. Wetzel, and R. H. Christy.

Cryptography:

F. D. Couner, R. N. Frye, R. C. Holmes, W. J. Holz, D. G. Moore, K. Naden, L. D. Summerfield, and R. J. Doney.

Richard Little, last year's lieutenant-colonel, is reported almost recovered from injuries received in an automobile wreck while enroute to Pittsburgh where he is employed by Westinghouse.

Ted Woltanski, Major of the Brigade Staff of last year, is now serving a year in active service at Forth Monmouth, New Jersey.

Asphaltic Concrete Used on Bay Bridge

So much has been written about the construction of the San Francisco-Oakland Bay bridge, that it is difficult to find an unmentioned subject. However, the unusual asphalt paving used on the bridge approach has escaped notoriety. An asphaltic concrete, designed to meet the requirements of heavy traffic, is laid on a sub-surfaced hydraulic sand fill placed on varying depths of soft material. This highway, completed for the opening of the bridge last November, is to provide adequate facilities for carrying the large volume of traffic from the East Bay area to the bridge. The asphaltic concrete was supplied by a central plant capable of producing 125 tons per hour. The asphalt content of the concrete is about six per cent. The asphalt was delivered in railroad tank cars and stored beside the plant in steel tanks. The plant was constructed with facilities for dust control and conservation of the asphalt dust. The dust is removed from the air by collectors and delivered into a room where it is reclaimed by use of a jet of steam and is then delivered to bins.

The chinese are credited with having invented more ingenious devices for catching fish than any other people.

The new Moscow-Volga canal, which divides Europe from Asia, enables steamships to voyage from Persia to the Arctic ocean.

Senior Inspection Trips

According to Professor H. E. Babbitt, chairman of the Committee on Senior Inspection Trips, the trips for all departments will be made on the third, fourth, fifth, and sixth of November.

The group, which numbers 250 men, will go to Chicago and then off on excursions to places of interest to their respective departments. The ceramisists and ceramic engineers will take off for Ottawa, LaSalle, and the upper Illinois river valley. The E. E.'s and the M. E.'s will discover what made Milwaukee famous, while the C. E.'s have their adventures in Gary, South Chicago, and the North Shore up to Waukegan. The mining and metaulrgical engineers are looking forward to visiting LaSalle, Joliet, and Wilmington, Indiana.

Hotel Atlantic in Chicago has been established as headquarters. The party will leave Champaign Tuesday evening, Nov. 2, on the Illinois Central train.

SYNTON

During the past summer the members of Synton, professional radio fraternity, have been hard at work in the Armory completing their new 500 watt transmitter. When it is finished, its call letters, W9ZOL, will probably be quite familiar all over the country to those who tune in on the regular amateur bands, as the added radiating power has greatly increased the effective working distance of the transmitter. The members of Synton look forward to a very active and interesting season during this present school year.

THE ENGINEER

(*Continued from Page 13*)

matical principles to the control of natural forces." This sounded meaningless to St. Peter, and his temper got the best of him. "Young man," he thundered, "you can go to Hell with your mathematical principles and try your hand on some of the natural forces there!" "That suits me," responded the Engineer; "I am always glad to go where there is a tough job to tackle." Whereupon he departed for the Nether Regions.

And it came to pass that strange reports began to reach St. Peter. The Celestial denizens, who had amused themselves in the past by looking down upon the less fortunate creatures in the Inferno, commenced asking for transfers to that other domain. The sounds of agony and suffering were stilled. Many new arrivals, after seeing both places, selected the Nether Region for their permanent abode. Puzzled, St. Peter sent messengers to visit Hell and to report back to him. They returned, all excited, and reported to St. Peter:

"That Engineer you sent down there," said the messengers, "has completely transformed the place so that you would not know it now. He has harnessed the Fiery Furnaces for light and power. He has cooled the entire place with artificial refrigeration. He has drained the Lakes of Brimstone and has filled the air with cool and perfumed breezes. He has flung bridges across the Bottomless Abyss and has bored tunnels through the Obsidian Cliffs. He has created paved streets, gardens, parks and playgrounds, lakes, rivers, and beautiful waterfalls. That Engineer you sent down there has gone through Hell and has made of it a realm of happiness, peace, and industry!"

—Author unknown.

• TECKNOKRAKS •

One Sunday evening Jack Robinson had taken his best girl to church. When the collection was being taken up the young man explored his pockets and finding nothing whispered to his girl: "I haven't a cent. I changed my pants." Meanwhile his girl searching her bag and finding nothing, blushed rosy red and said: "I'm in the same predicament."

* * *

Cherskove: "They've some lovely mushrooms in this hotel. What do you say?"

Girl: "Don't bother. We can use the parlor when we get home."

* * *

Sunday School Teacher: "Who was the mother of Moses?"

Little Mary: "Pharaoh's daughter."

S. S. T.: "But she found him in the bullrushes."

L. M.: "That was her story."

NOTICE

Freshmen • Sophomores

Would you like your name engraved on a bronze tablet in Engineering Hall? If you would—write the winning article on any subject of engineering interest in a competition being sponsored by Theta Tau, professional engineering fraternity, this fall. The contest will be judged by a committee of five, composed of three faculty and two student members. If of sufficient general interest, the winning composition will be published in the Technograph.

We know a man who is so lazy that he married a widow with five children.

* * *

"Mother," said the sweet young thing, "I'm not going out with Charles any more."

"Why," said the mother, "I thought you were rather fond of Charles."

"I am," was the reply, "but he knows too many naughty songs."

"Do you mean to say he sings them to you?" demanded the mother.

"No," replied the s. y. t., "but he whistles them!"

* * *

"F-e-e-t," the teacher declaimed. "What does that spell, Johnny?"

Johnny did not seem to know.

"What is it the cow has four of and I have only two?"

The commotion which resulted when Johnny gave his answer left the teacher practically a nervous wreck.

* * *

"Hello, hello!" cried an excited co-ed over the telephone. "Come up at once. Two boys are trying to climb in our window."

"Sorry, Miss, but this is the fire department. What you want is the police station."

"Oh, no," reassured the young lady. "Our room is on the second floor and they need a ladder."

* * *

"And what kind of officer does your uniform signify?" asked the inquisitive old lady.

"I am a naval surgeon, lady."

"Goodness me, how you doctors do specialize in these modern times."

A contractor, whose name it is not necessary to mention, when attending a letting in a distant city, received a telegram from his wife reading, "John, remember you are a married man."

His answer read:

"Telegram received too late."

* * *

Sister: "Was Maude in a bright red frock at the dance?"

Brother: "Some of her, sis, some of her."

* * *

Evangelist: "If I lead a donkey up to a pail of water and a pail of beer, which will he drink?"

Tom Scott: "The water."

Evangelist: "Right, why?"

Tom Scott: "Because he's an ass."

* * *

Justice: "How did the accident happen?"

Schumm: "I was just hugging a curve."

Justice: "Yeah! that's the way most of them happen."

* * *

A salesman taking his bride South on their honeymoon visited a hotel where he boasted of the fine honey.

"Sambo," he asked the colored waiter, "where's my honey?"

"Ah don't know, boss," replied Sambo, eyeing the lady cautiously. "She don't wuk here no mo'."

CAREERS OF CARRIER ENGINEERS

Willis H. Carrier... Engineer

He Established the Art of Air Conditioning

As an undergraduate at Cornell, Willis H. Carrier dreamed of the science now known as air conditioning. And in 1902, within a year after graduation, his dreams had become realities—through his installation of equipment to control troublesome humidity and temperature in a Brooklyn lithography plant.

Years passed—years devoted to experimentation, to designing new equipment, and developing new methods of installation. Then, in 1911 Mr. Carrier disclosed his now-famous Rational Psychrometric Formulae to the American Society of Mechanical Engineers—and *true* air conditioning was born.

Overnight, a new industry came into being—an industry spreading health and prosperity throughout the world—and opening new and unlimited opportunities for engineers. And these opportunities have steadily increased—just as the demand for air conditioning itself has steadily increased. New men, *young* men are needed — men with the vision, the determination, and the ability to study and carry on the principles established by Willis H. Carrier and his pioneering associates.

To such men Carrier offers a wide variety of careers—ranging from laboratory research, machine design, sales and installation, to work in the far corners of the earth—the 99 countries of the world which today know the benefits of Carrier Air Conditioning. Youth is welcomed at Carrier, its capabilities fostered—the young engineer gains recognition in keeping with his accomplishments—not with age alone—for Carrier realizes that its future development, its future expansion depends upon its engineers.

During this year, Carrier has trained 300 recent graduates from leading engineering schools in every section of the country. Carrier needs more men. If you had a good school record, and are interested in the world's most fascinating, fastest-growing industry, write us.

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Air Conditioning

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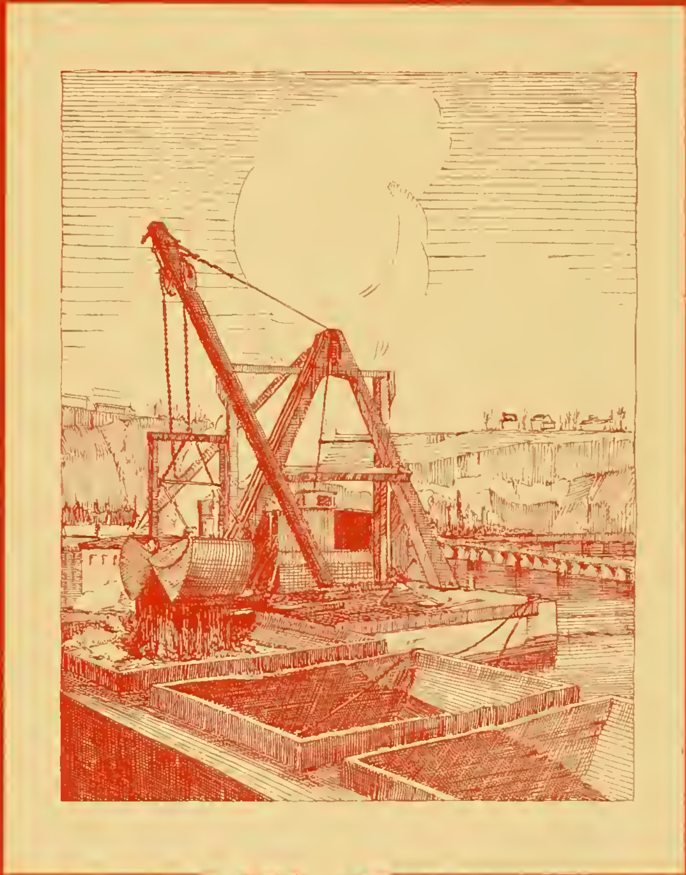

DECEMBER, 1937 » » 20 CENTS

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Merry

Christmas

And a

Happy

New Year

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THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

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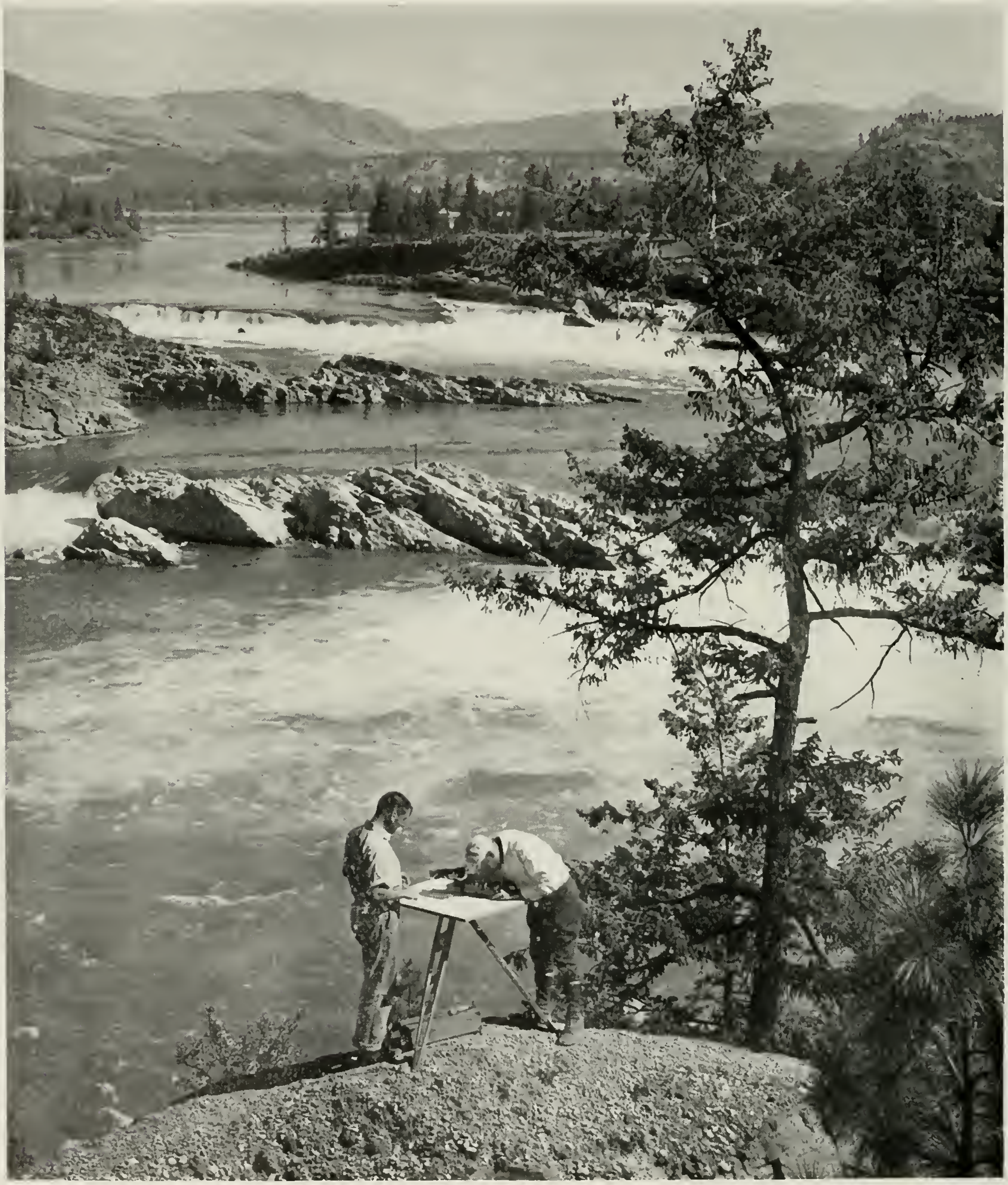

—Courtesy of Engineering News Record

ENGINEERING IN GOD'S COUNTRY

THE ILLINOIS TECHNOGRAPH

Published Six Times Yearly by the Students of the College of Engineering, University of Illinois

Volume LII | DECEMBER, 1937 | Number 3

A Review of Work Being Conducted by the

Engineering Experiment Station

SINCE the establishment of the Engineering Experiment Station at the University of Illinois in 1903, engineering research by both station and teaching staffs has been given continued encouragement and support. As a tangible result, there have been published, to date, 272 bulletins and 23 circulars, which give the results of the investigational work. Some projects are carried on entirely on station resources; others are conducted in co-operation with outside organizations that contribute to the financial support of the work in which they are interested.

The Materials Testing Laboratory, completed in 1929, houses the laboratories of the departments of theoretical and applied mechanics and civil engineering. It provides facilities for research in structural, highway, and sanitary engineering, fatigue of metals, general materials testing, hydraulics, metalography, timber, reinforced concrete and other building materials.

Some of the prinicpal current research projects of interest (including a few conducted in the field rather than in the laboratory) are described in the paragraphs which follow.

San Francisco-Oakland Bay Bridge

The repeated-load tests of riveted joints are part of the investigation of riveted steel tension members made in connection with the San Francisco-Oakland Bay Bridge. The first part of the investigation consists of tests of comparatively small joints having not more than four 1-inch rivets each. The tests are made in a specially designed machine that produces alternate stresses of tension and compression in the specimens. The magnitude of the stresses can be changed as desired.

The variables studied included the grip of the rivet, relation of maximum to minimum stress in the stress cycle, the spacing of the rivets, kind of material in the plate and rivet, and the method of making the holes in the plate. The tests on the four-rivet specimens were accompanied by tests on connections containing a larger number of rivets. This investigation is being conducted in co-operation with the California department of public works.

Fatigue Strength of Bolts and Screws

At the root of a screw thread on an ordinary machine screw there is a very high concentration of strain. Under ordinary loads this is not serious because this strain is largely plastic. However, under repeated loading there is the liability of the formation of a spreading crack, a "fatigue" failure. Studies of this stress concentration at screw threads have been carried out both by means of analysis of stress distribution by polarized light and by means of fatigue tests.

Creep of Concrete

The tests of creep or time yield in reinforced concrete columns are a continuation of the general investigation of columns begun in 1929 in co-operation with the American Concrete Institute and Lehigh University. Sixteen reinforced concrete columns have been held under a sustained design load, with a like number of comparison columns under no load. The result of creep and shrinkage of the concrete has been an increase in steel stress (to values as great as 33,000 lb. per sq. in.) and a corresponding decrease in concrete stress. The major part of the creep occurred during the first year, and there has been only a slight change in the last three years.

Flow of Water by Photographs

The object of this photographic study is to obtain information relative to turbulence, mixing lengths and other phenomena related to the flow of water in circular conduits. Motion pictures are taken of water flowing through a glass pipe. The movement of the water is made visible by projecting horizontally a thin flat sheet of light of high intensity through the diametral plane of the pipe. The fact that the light is reflected from small globules of an insoluable mixture of carbon tetrachloride and benzene makes such photography possible. An analagous set of conditions occurs when dust particles in a darkened room are made visible by a beam of sunlight.

The particles of the material are introduced with the water at the entrance of the pipe, and inasmuch as they are small and have the same density as the water, it is assumed that their presence does not influence the characteristics of flow. After the pictures are taken they are projected on a screen, enlarged a number of times and analyzed for the phenomena stated above.

Pipe Elbows as Water Meters

In the hydraulic laboratory the possibility of using an elbow in a pipe line as a means of measuring the flow of water has been investigated. Tests have been made of several elbows of different diameters and of different radii. The difference in pressure between the inside and outside of a given bend was found to be very nearly a constant times the velocity head in the pipe for velocities exceeding about one foot per second. For accurate work each elbow should be calibrated, but once the constant is known an elbow may become a very economical meter and will cause no appreciable loss in head. On the basis of the information gained from these tests a very useful device known as a flow indicator has been built and is being used successfully in the hydraulic laboratory. This instrument, which is connected to an elbow near the discharge side of a centrifugal pump located in the basement of the laboratory, lights an electric lamp above the pump-control panel, located on the first floor, when the pump is delivering water. Two of these indicators are used on two pumps having discharge capacities of 2,000 gal. per min. each.

Floodflows on Illinois Streams

The purpose of this study is to determine the frequency of floodflows of given magnitudes on 24 Illinois streams. The data used are the daily discharges that have been determined by the U. S. Geological Survey. The first gaging stations were established in 1908. In this study, records may cause some modification in the results, the present results can now be used for estimating the floodflows from any watershed in the state, and should be of value to engineers in designing bridges, culverts, spillways, drainage ditches, levees or any structures that involve the size of waterway opening.

Highway Traffic Studies

A traffic survey is being conducted in Champaign-Urbana, to determine the probable traffic that would use belt lines connecting the state highway entering the cities. From the data recorded it is possible to determine: (a) the number of vehicles which pass directly through without stops and therefore are potential users of belt

(Continued on Page 19)

SOCIAL CALENDAR

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DECEMBER

11-17—Theater Guild Production.
17—MIDA-WGS Mixer.
18—Officer's Ball.
21—Men's Glee Club Concert.

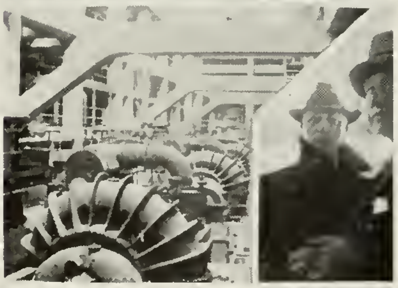
JANUARY

7-8—Illinois Union Minstrel Show.
7—MIDA-WGS Mixer.
11—Star Course: Gregor Patigorsky.
14—YMCA-YWCA Mixer.
14-15—Theater Guild Production.
21—MIDA-WGS Mixer.









Seniors Tour Industry

Electrical Engineers

With the exception of a short trip to Milwaukee the senior E. E.'s spent the entire four days of their inspection trip visiting electrical plants in Chicago. The group was under supervision of Professors E. A. Reid, C. A. Keener, H. A. Brown, and Mr. L. B. Archer of the department of electrical engineering.

The inspection began Wednesday morning with a visit to the Hawthorne Works of the Western Electric Company and then the Washington street station of the Bell Telephone Company where they looked over up-to-date electrical communication equipment. Wednesday evening, the alumni "Get-Together Dinner" was held in the cafeteria of the Y. M. C. A. Hotel for the purpose of allowing some of the alumni to become acquainted with the senior class.

Thursday was spent in Milwaukee where the morning was enjoyed at the Allis-Chalmers Company. After lunch the group visited the Harnichfeger plant.

Back in Chicago on Friday, the group went through the Stewart Warner Corporation's factory in the morning and spent the afternoon at the General Electric X-Ray Corporation and the Commonwealth Edison Company's generating station. The concluding trip was to the Carnegie-Illinois Steel Corporation on Saturday morning.

The outstanding practical joke of the trip was played on a certain signal corps officer who is reputed to have spent one morning hunting the diner on the Chicago elevated.

Mechanical Engineers

A man bites a dog; that's news. However, when an engineer drops his books in the middle of the semester to go "galvantin'" around the country-side for four days, enjoying some complimentary meals and free guide service, just to snoop around places of business, that is the "colossalest" news of all. On their inspection trips to Chicago and central Illinois, the mechanical engineers and the petroleum mechanical engineers delved into an educational paradise of practical application of science in industry. Detailed reports of the trip were made in order that a better appreciation of the general nature of the plants inspected and of their products, rather than of minor details would be obtained. With an eye toward graduation next June, the more ingenious "engine-men" placed applications for jobs and took their first steps in that knack of the business world, "learning the ropes and how to pull them." Of course, the many and varied excursions into places of amusement between long days of inspections are memories that will always be sources of conversation wherever the class of '38 gathers. Some of the memories that were told to the author will be plenty hard for some men to live down.

The highlights of the trip were the "once-overs" of the American Bridge Company, the Wisconsin Steel Works, the Nash Motor Company, and the Allis-Chalmers Company. At the American Bridge Company, of Gary Indiana, the rolling and fabricating operations of large bridge members were seen. At the Wisconsin Steel Works, the high-speed, large-scale production of steel for the many demands of modern industry was the main exhibition. The next stop was on Thursday at the Waukegan Generating Station. Greatly contrasting with the massive machinery in the power station, the Nash Motor Company of Kenosha was a revelation of the possibilities of combination of the skill of man with the might of machines in large-scale, mass production. The visit to the Allis-Chalmers plant impressed embryonic captains of industry with the unlimited extent of the application of technical knowledge to machines. The last, and perhaps most interesting trip was a sight-seeing tour of the bridges on the Chicago river. This completed the three and a half day tour, which most of the fellows topped off with an inspection of a buzz saw operation—the Illini victory over Northwestern.

Going in the opposite direction, the petroleum production option group of the mechanical engineering school cut a path through the newly developed oil fields of Illinois. Besides witnessing the production of oil in the Olney and Patoka sections, the following places of interest were studied: the pipe line booster station of the Texas Empire Pipe Line Company, Mattoon, Illinois; the manufacturing plant of the Imperial Diesel Engine Company, Mattoon, Illinois; the old Illinois stripper fields, Robinson, Illinois; the flooding operations of the Carlysle field; the Bush-Sulzer Diesel Engine plant, St. Louis, Missouri; the oil refinery of the Shell Petroleum Corporation at Woodriver, Illinois; the natural gas compressor station at Glenarm, Illinois; and the Lakeside Municipal Power Station, Springfield, Illinois.

Miners and Metallurgists

Only four students made this trip. They were John L. Brown, O. V. Johnson, Howard Miner, Mathew Retonde, H. P. Nicholson supervised the group.

The first night was spent in La Salle, Ill. The following morning was spent at the Marquette Cement Co. This plant is among the largest cement plants in the country and the opportunity of seeing a great number of conveyors, jaw crushers, bucket elevators and other such equipment used in handling material of this type was greatly appreciated.

Adjoining the cement plant is a large open pit quary where 2,500 tons of limestone is quarried every day. The overburden is removed by shovels and the rock prepared for blasting by drilling holes to the depth of 35 feet. To blast this amount of rock requires

On Inspection Trips

about 250 pounds of 40 per cent ammonia dynamite.

On the afternoon of Nov. 4 the party moved to the Illinois Zinc Co. of La Salle, where they saw the rolling mill and coal mine operated by this company. The rolling mill is one of three such plants which operate in this country. The coal mine owned by the company was originally for a zinc smelter which was run in conjunction with the rolling mill but at present, all smelting is done in Oklahoma and therefore the coal is sold to outsiders. The Longwall method of mining is used in this mine because of the narrow seam of coal which averages about 30 inches. The Longwall method is not used to a great extent in this country but is very common in England and many of the miners employed have come from English coal mines. Another interesting fact about this mine is that most of it is under the Illinois river.

The next move was to Joliet, where a trip was made to the Illinois Coke Co., a subsiderary to Carnegie-Illinois Steel Co. This coking plant operates 140 coking furnaces and makes not only metallurgical coke but also tar, ammonia, ammonia sulphate and many organic products from the hydrocarbons distilled from the raw coal.

Friday afternoon was spent at Wilmington at the Northern Illinois Coal Co. This was an interesting experience since the group had the opportunity to see the large stripping shovel at work directly from the operator's control room. This mammoth shovel can move 32 cubic yards of material in each dipper full.

The trip was terminated in Chicago on Saturday morning with a trip through the Rosenwald Museum of Science and Industry. This place was of interest to all because of a visit through the model coal mine housed in this building. All of the equipment shown was of standard size and operated by men who have mined coal. Besides this coal mine there were many other interesting things which would be of interest to any senior engineering student.

Civil Engineers

Monday, November first, found every civil engineer prepared to disband all school work in preparation for the annual inspection trip, yet two days hence. By Tuesday afternoon every mind was concentrated on the subject of the coming trip, and Tuesday evening found us jolting along toward Chicago in the Illinois Central private student coaches. Our headquarters, as was the headquarters of all Illinois student engineers attending the inspection trip, was the Atlantic hotel.

During our four-day trip, thirteen engineering structures and plants were inspected; the plants and structures that were visited are as listed:

Gary plant of the American Bridge Company, Wisconsin Steel Works in South Chicago, Roundhouse construction at Santa Fe Railway Locomotive Terminal, Chicago South West Sewage Disposal Plant, Lady Esther Plant, International Amphitheatre, Timber construction of A. Brandwein and Company, the New York Central overhead at Cermac Drive, Chicago, North Side Sewage Disposal Plant, Evanston Filter Plant, The Baha'i Temple at Wilmette, Highland Park Sewage Plant, the Shore Erosion Work at Lake Bluff, Waukegan, Illinois Sewage Plant, Waukegan, Illinois Water Plant, optional trip down the Chicago river inspecting the movable bridges crossing the river.

The American Bridge Company furnished guides for the students, as did many of the other organizations, to illustrate the shop work, fabrication, and shipping of the structural steel fabricated at the plant. After inspecting the shops they were permitted to tour the drawing rooms and observe the draftsmen and engineers detailing. Of special interest was the shop erection, fabrication and shipping of the steel dam gates used in the Mississippi river dams.

Perhaps the most spectacular tour of the whole trip was the tour through the Wisconsin Steel Works in South Chicago. Here, many who had never seen steel in the making observed rolling of structural shapes, tapping of blast furnaces and open hearth furnaces, soaking pits where the blooms are kept at a constant temperature, pouring of the ingots, and the mechanical devices used to accomplish these operations. The steel manufacturing did not alone retain the spotlight, for the by-product processes equaled in interest, the making of the steel itself. The charging and discharging of the coke ovens, and the production of ammonium sulphate from the light oils were the highlights in the by-product processes. The class was led over thirty-six separate flights of stairs, up and over coke ovens, rolling mills, furnaces and other obstacles so they were all ready to clean up the meal served to the students and alumni at the Illinois Engineering "get together" that evening.

Thursday, the engineers visited several places for shorter intervals of time. Of interest to everyone was the huge South West Sewage Disposal Plant of Chicago, a result of the criticism levied at Chicago for their contamination of the free water about the city. The vast amount of concrete used in the tanks, and structures about the tanks, can be visualized when we realize that the equivalent of eighty miles of modern concrete highway could have been built with the concrete used in this structure. Several other sewage plants were visited during the remainder of the trip.

After observing Lady Esther Products on the faces of a good many Illini Co-eds for four years we finally inspected the source of these complection defending products by observing the mill construction at the Lady Esther Plant. An outstanding fact here, was the special concrete floor which was processed against dusting, because it

would introduce grit into the face powder.

All members of the department greatly appreciated the delicious turkey dinner given by Mr. A. Epstein, structural engineer of Chicago, and designer of the International Ampitheatre at the Union Stock Yards. After dinner Mr. Epstein showed the class about the Ampitheatre which at that time was being prepared for the auto show.

Mr. Leslie J. Sorenson, City Traffic Engineer of Chicago gave a short lecture, late Thursday afternoon, after which the students were dismissed for the day.

The Baha'i Temple at Wilmette, visited on Friday, was one of the outstanding tours of the whole trip. This structure built of concrete looks as if it were picked up from the heart of India and placed in Chicago. The ornamental work is magnificent, and the arch structural work exceptional.

The Shore erosion work at Lake Bluff, Illinois is unique in this locality. Here, the lake has been eating away very valuable residential property at a rapid rate. Engineers are now busy constructing and experimenting with rock jetties to break up the wave action, undertow, and eddy currents of the lake.

The Highland Park, Ilinois, sewage plant is unusual in that it is located on the shore of Lake Michigan in the heart of a valuable residential section. It is very small, and the waste from the plant is dumped into the lake a few feet from shore.

To the civil engineering faculty goes the credit of protecting the Northwestern bonfire since the Illinois engineers found the wood stack unprotected Friday morning. Only through the united efforts of the faculty, were the enthusiastic civils kept from starting the Northwestern celebration a few hours early.

Ceramists and Ceramic Engineers

The first stop made on the trip was about 30 miles out of Champaign, where the boys inspected a gas station and surrounding buildings. Although nothing of ceramic interest was discovered, the bus company found it necessary to send a new bus to replace one the wrecks in which the party had started the trip.

After finally arriving in Frankfort, Indiana, the fellows visited Ingrano Richardson's fine enameling plant. The most remarkable thing about this plant was its organiation; it seemed as though every detail of operation had been planned in advance and the necessary space allotted to each department. The entire morning was spent in this factory.

After enjoying lunch as guests of the company, the inspectors departed for Elwood, Indiana, the location of the refractory plant of the Pittsburgh Plate Glass Company. This factory made the tank blocks used in the production of glass in other divisions of the company. Here, the problems encountered in manufacturing solid clay blocks which measured as much as 108 x 16 x 18 inches were explained. These blocks are made to withstand over 1,200 degrees centigrade for months at a time since once a furnace is put in operation, it does not shut down until the refractory lining fails.

One more plant, that of the National Tile Company at Anderson, was visited on Wednesday. Here routine production of all shapes and sizes of floor and wall tile was observed. The problems of color matching which the manufacturer must face in order to please his customers were most impressive. This plant had over fifty shades of green!

'Mid songs and cheers, the buses rolled the twenty odd miles from Anderson to Muncie, where everyone caught up on his "rest" overnight. Muncie, on which the spotlight of a nation's interest has been turned by a novel called "Middletown," presented the usual inspection trip entertainments: shows, bars, crap games, bath tubs (if you think one plant is dirty, try visiting three of them), and sleep.

The following morning, they visited the Mason jar center of America, the Ball Brother's plant at Muncie. A book could be written about this plant alone. Not content with the manufacture of all types of bottles, the company now features rubber fittings for all Fisher automobile bodies and a large zinc roling and stamping mill, which now produces shells by the million for small dry cells. Both these latter departments were developed as side lines to the production of rubbers and fittings for Mason jars.

At Kokomo a visit was made to a sanitary-ware manufacturing company, and a trip to Peru took them to an electrical porcelain insulator plant. From there the journey to the "U. of I." convention at the Hotel Atlantic was made.

Friday, the last official day of the trip, was spent in visits to the Chicago Vitreous Enamels Co., the Commonwealth-Edison Co., and the Harbison-Walker Refractories Co. Chicago Vitreous Enamels Co. can boast of one of the best equipped and most beautiful laboratories in the country. This is one place where it would really be a pleasure to work. The Commonwealth Edison layout was another of these immense affairs that would take days to cover thoroughly. As it was, we could only stroll hurriedly along the production lines, with time for only an occasional comment. The refractories plant (engineered, incidentally, by a number of Illinois men) was one which produced silica refractory brick.

Engineer of the "Hiawatha" Prize Inspection Trip Picture
—*Martin J. Goers '38*

Your Opinions

Question: Do you think St. Pat's Ball should be limited to engineers only?

Jim Hoffman: No. I do not see why the dance should be closed. Other school dances on the campus are not closed. Why should we close ours? No more cabaret dances!

S. K. Eisiminger: Don't know, but no more cabaret dances!

Roy Lohmiller: Yes, because the so-called "rough men north of Green Street" might not appear as gracious in the eyes of the women as those south of Green street.

Ed Ebert: Yes. It's our dance. Why let everyone else in?

Llewellyn: Sure. Make it closed – they'll get in anyway.

Ed Holt: No. I do not think there are enough engineers socially minded to make the dance a success.

Pascoe: No. About sixty per cent of the engineers do not date.

Don Dragoo: Yes. It is the only all-engineer social event and there would be too much of a crowd with it open.

Tom Chapman: No. The engineers should have more opportunity to mix with the students south of Green street.

Tom Morrow: Yes. There are enough brawls for the others. Keep our dance exclusive.

Charles Bevans: (Commerce) Open it. I would like to go!

Automobile license plates are clearer to read if dark letters are used on light ground, than if light letters are used on dark ground.

THE STAFF

LEADERS

Krivo, Carr, Robertson, Morrow
Atkinson, Goeke, Berman

HARRY W. ATKINSON 38, Chicago, attended Lakeview high school until February, 1933. There he was a member of the track team, senior chorus, and staff of the Lake Review. He was also awarded a silver honor key for scholarship. He entered Illinois a married man and is now the proud father of a three year old girl. He is a civil engineer, a member of Chi Epsilon, held every office in Mu San, a member of the Engineers advanced corps, T. N. T., is independent, and has a University average of 4.01. He hopes to write books and articles on Sanitary Engineering and particularly wishes to write about sewage treatment in the Illinois state parks.

ALBERT A. KRIVO '37, and a year 1915 started life together on New Year's day. He was graduated from Crane technical high school, where he annexed letters in football and track, and worked on the school newspaper. Lewis Institute claimed him for a year and a half until the World's fair opened. Here he worked from the day it opened until closing time. September, 1935 brought him to Illinois with two and a half years of college work left. Varsity glee club has his attention when he is not working as chairman of the membership committee of A. S. C. E., or on the Technograph. Admiral Byrd is his hero and his Byrd scrapbook is only exceeded by his knowledge of the man and his personal acquaintance with him. He hopes some day to be a contractor and has spent two summers working with the Carnegie Illinois Steel Co. Although he claims no girl friend, a certain girl from Michigan had the laugh on him when the Wolverines defeated Illinois.

JAMES M. ROBERTSON '38 is a native of Urbana. At University high school, track, dramatics, working on the staff of the annual, and presiding over the senior class kept him busy. He is a civil engineer and wears the keys to Phi Eta Sigma, Tau Beta Pi, Chi Epsilon, and Mask and Bauble. Amateur photography has been his chief hobby. He has attended summer school at the University of Colorado, University of Illinois, and the University of Washington at Seattle, Wash. He likes winter sports, mountain climbing, tennis, and swimming. Ten productions of the Theatre Guild have had him on the staff and A. S. C. E. has him as secretary, Tau Beta Pi as corresponding secretary, and Mask and Bauble as treasurer.

HAROLD E. GOEKE '38 was graduated from Dixon high school and entered Illinois in 1934. Here he has been honored by memberships in Phi Eta Sigma, Tau Beta Pi, and Chi Epsilon. Even as vice president of Sigma Pi, treasurer of both Scabbard and Blade and T. N. T., member of A. S. C. E., Skull and Crescent, and Ma-Wan-Da, he still finds time to keep company with a very nice girl. Canoeing, camping, and shooting claim his leisure hours. Summers have found him working for a contractor at various jobs.

SIDNEY BERMAN '38, Chicago, was graduated from John Marshall high school, where he spent some time playing football. He is a member of A. S. C. E. and an independent. He entered here as a sophomore, in 1935, after taking his first year's work at Lewis Institute. Although he claims his ambition is to sleep all day, he hopes to become a successful business man. For the past seven years, the Chicago Tribune has employed him in their maintenance and receiving departments during vacations.

THOMAS M. MORROW '39 comes from Geneseo where in 1935 he was graduated from the township high school after having been one of its "biggest shots." Phi Eta Sigma claims him as a brother and he is the president of Triangle. He is also a member of Pi Tau Sigma and Scabbard and Blade, holds a position with N. Y. A., is on Y. M. C. A. all-University service, is in the Engineers advanced corps, and is active in the Congregational church. He likes to dance and secretly delights in going out with strange women. He hopes some day to take advanced work in aeronautics and specialize in that field. He has worked with a telephone company as a trouble shooter or general repair and installation man.

MAURICE K. CARR '39 was an honor graduate of Avon high school in Avon, Illinois. He won his letter in basketball and participated in dramatics. Here at Illinois Maurice is an E. E. To date he is a member of Phi Eta Sigma, Theta Tau, A. I. E. E., Scabbard and Blade, Pi Tau Pi Sigma, and is on Junior Board of the Student Alumni association, and independent council, and has won college honors. Fishing, swimming, and basketball claim his extra time. He has great hopes of some day working at commercial testing and air conditioning. He has already made a good start by working for the Pittsburgh Testing Laboratories.

STUDENT ORGANIZATIONS

TAU BETA PI

Tau Beta Pi is a national society organized for the purpose of recognizing superior scholarship, coupled with the qualities of leadership, integrity, and character, as undergraduates, or the attainments as alumni; and to promote a spirit of liberal culture in the engineering schools of America. It was organized at Lehigh in 1885, as the result of a long felt need for an organization of this kind. Today there are some seventy chapters in schools all over the country. The pledges of Tau Beta Pi are:

W. G. Chappell, M. E.
C. H. Dunn, M. E.
R. F. Fearn, M. E.
R. E. Jeffries, E. E.
R. P. McGregor, M. E.
J. R. Poyser, M. E.
D. G. Richards, M. E.
P. W. Ryburn, E. E.
C. S. Sandler, E. E.
W. A. Sinks, E. E.
P. R. Gillette, Eng. Phys.
L. R. Marcus, C. E.
J. A. Nachowitz, M. E.
And the honor junior:
R. W. Gaines, M. E.

S. B. A. C. S.

Boasting a membership of close to one hundred, the student branch of the American Ceramic Society is actively engaged in carrying out many projects for this school year. A weekly bulletin entitled "Raw Materials" is soon to make its appearance on the campus, if it has not already done so. It is to contain interesting or entertaining information about students and faculty. Besides this bulletin the society is planning to sponsor a Ceramic year book the "Illini Ceramist." It is also promoting the second annual ceramic "Ruckus" which is a dance, and the annual "Pig Roast" which is a student faculty dinner, in honor of the senior class.

Some of the speakers who are to speak before the student branch are Dr. R. B. Sosman, president of the American Ceramic Society, Mr. Hugo Filippi of the Illinois Brick company, Dr. R. R. Shively of the B. F. Drakenfeld Company, Mr. R. S. Brodley of the A. P. Green Fire Brick Company, Mr. C. H. Henderson of the Alton Brick Company, and Mr. V. W. Boecker of the Richards Brick Comuany.

RAILWAY CLUB

The Railway Club of the University of Illinois is open to anyone interested in railroading, and its membership is made up of students in the University with this common interest.

The programs that the Railway Club sponsors are both interesting and informational. On November 9, Professor H. J. Schrader of the Railway Engineering Department spoke on the subject: "High Speed Braking Problems"

On Saturday, November 13, the Railway club sponsored an inspection trip to Decatur to the shops of both the Illinois Terminal Railway and the Wabash Railway.

A. S. C. E.

Sponsoring a series of talks by leading men in civil engineering and other allied professions, the student chapter of the American Society of Civil Engineers is busy making a success of its fifty-fourth year as a campus organization. Dr. J. A. L. Waddell, internationally known bridge engineer, inaugurated the program with a talk on the future of engineering, at a meeting held October 26. Dr. Waddell, who invented the vertical lift bridge and has constructed bridges in many foreign countries besides this country, envisioned a great need for engineers in all fields from chemical to aeronautical engineering. Besides speaking before the students, Mr. Waddell conducted a discussion on engineering education with some of the faculty and students. Among the things he advocated was a five year engineering curriculum.

On November 10 Professor Harland Bartholomew of St. Louis spoke on "How Shall We Plan Our Future Cities?" Mr. Bartholomew, besides being well known in the field of city planning, is Non-Resident Professor of Civic Design at the University. Mr. A. R. Lord, a well known engineer in the concrete field, gave a talk on the Works Progress Administration on November 17.

CHI EPSILON

V. G. Rathsam, S. A. Olin, D. N. Cortright, H. W. Atkinson, and G. M. Herbert, seniors, and A. J. Logli, E. D. Ebert, G. L. Farnsworth, E. S. Fraser, A. R. Starr, and C. B. Williams, juniors, Organized at Illinois in 1922, Chi Epsilon Civil Engineering honorary fraternity. Organied at Illinois in 1922 Chi Epsilon has since spread to over a dozen other colleges. It is an organization "founded to recognize scholarship, and to develop sociability and practicability among Civil Engineering students."

MINERAL INDUSTRIES SOCIETY

At the first meeting of the semester, held October 6, the Mineral Industries Society had as its speaker, Dr. C. E. Williams, director of the B. M. I. On November 10, the society's councilor representing the Chicago chapter of the A. I. M. E., Dr. Frank H. Reed of the Illinois Geological Survey, spoke on the "Value of the Society." Also at this meeting student members presented talks based upon their summer employment. H. E. Mauck spoke on "Coal Mining in Danville," and G. R. Ingels spoke on "Furnace Design."

In the near future the society hopes to have Mr. Dalson, chief metalurgist of the Illinois Zinc company, Mr. Marsl, in charge of Research at the Inland Steel Company, and Mr. Knowleton, chief metalurgist of the International Harvester Company.

KERAMOS

Keramos, honorary Ceramics Society, was organized to promote professional fellowship among students of Ceramics. The pledges for this semester are P. W. Nelson and G. J. Cahoon.

A. S. M. E.

The student chapter of the A.S.M.E. began this year's activities with their annual smoker and get-together. The membership in this society is over 140; this is the first time in many years that it has exceeded 100. Since the smoker they enjoyed a talk on "Diesel Engines," by a representative of the Busch-Sulzer Co. of St. Louis. A representative of the Elgin Watch Co. gave a lecture on "Watch Making," while a moving picture ca'led "Wire" was presented by the Bethlehem Steel Corp. However, this is only a part of the semester's program, as they have yet to hear Mr. A. K. Nowak of the Baldwin Southwork Co. speak on "Modern Hydraulic Presses" on January 12. The semi-annual banquet of the society will be held on January 19, when Mr. T. S. McEwan, chairman of the Chicago section of the A.S.M.E. and guest speaker, will address the chapter on "Management and the Engineer."

PI TAU SIGMA

Seniors, D. G. Richards, J. M. Keller, and R. P. Molt and juniors, R. W. Gaines, T. M. Morrow, W. T. Pascoe, Jr., F. J. Rasmussen, R. W. Akemann, S. W. Baker, C. D. Evans, and R. J. King were recently pledged to the ranks of Pi Tau Sigma, honorary Mechanical Engineering fraternity.

Pi Tau Sigma was organized to foster the high ideals of the Mechanical Engineering profession, and to develop a congenial friendship among the students and a better acquaintance and mutual understanding between the students and faculty.

A. I. E. E.

On November 23 the student chapter of the American Institute of Electrical Engineers presented a most interesting program entitled "Waves, Words, and Wires," under the direction of Dr. J. O. Perrim, special representative of the American Telephone and Telegraph Company. Besides sporting a sound proof booth from which the speaker talked over a public address system, some of the apparatus used included two fifteen hundred mile long distance telephone lines and two one thousand mile long, high fidelity wires such as are used to carry radio programs. Besides demonstrating the use of a special non-directional microphone and a high fidelity speaker (weighing some six hundred pounds), Mr. Perrim demonstrated the transmission of fifteen different programs at the same time over one line.

Other programs sponsored by the society included a talk on October 21, by Mr. L. A. Hawkins, executive engineer of the General Electric Laboratories. The subject of his address was, "Industrial Research and Research Men." On November 9 the chapter heard Mr. H. B. Gear, vice president in charge of engineering of the Commonwealth Edison Company of Chicago and director of the A. I. E. E. He spoke on "Looking to the Future in Electrical Engineering Through the Mirror of the Past."

M. E.'s Keep Cool

"WHEN the air conditioning engineers learn how to condition the air that hangs over St. Louis, they will really have something there!" How right this fellow is. It is indeed too bad that the air conditioning industry hasn't reached the point where that is possible. However, the rapid growth that air conditioning has had during the past decade has brought the industry to a relatively high state of perfection and this development has had its effect on many phases of engineering, among them being engineering education. This is evidenced by one of the newest pieces of equipment contained in the Mechanical Engineering Laboratory—the experimental and instructional air-conditioning plant completed last spring. This impressive appearing apparatus, occupying the southeast corner of the main floor of the laboratory, is an all-year plant and is used by students in M. E. 21, 61, and 65.

An attempt has been made to incorporate more features in a single assemblage of apparatus than are found in the usual commercial installation. Space has been provided between all of the units for the insertion of instruments for demonstrating and studying the performance of any one part of the plant. These provisions, and the incorporation of special features, such as three separate methods of cooling and de-humidifying air, make the overall length of the plant several times greater than that of the usual installation of the same capacity.

The different untis that compose the plant are types of units used in actual commercial air-conditioning. They are so arranged that all combinations of the various methods of treating the air can be used, furnishing a very practical training to students using the plant.

So far in its use, the conditioned air has been discharged into the large laboratory as no attempts have been made to condition the air of any given space. The plans of the department include a system of supply and return ducts between the plant and the 100 seat lecture room of the building, as well as several smaller adjoining rooms. When this is done, a more satisfactory method of studying the affects of the conditioning will be afforded.

Normal cooling capacity of the equipment is equivalent to 12 tons of refrigeration when handling 3,000 cubic feet per minute of air, which is more than adequate to cool and dehumidify, in hot weather, the air for the lecture room when it is fully occupied. For heating, the extended surface preheater coil has a capacity of 162,000 B.t.u. per hour when the temperature of the entering air is 0 degrees Fahrenheit and the heater is capable of adding 140,000 B.t.u. per hour to the air when it is received at 50 degrees Fahrenheit. All capacities are based on the circulation of 13,500 pounds of dry air per hour and 5 pounds steam pressure in the coils.

One deviation from commercial practice is the presence of restricted sections of the recirculating, the outside air, and the discharge air ducts, the purpose of which is to permit determination of air velocities with smaller percentages of error than is possible where the cross-sectional areas are greater. It has been found that these reduced cross-sectional areas do not add greatly to the total resistance against which the fan must work, and hence do not destroy the value of other data obtained. The larger cross-sectional areas of all ducts are designed for a maximum air velocity of 1,000 f.p.m. based on air at 70 degrees Fahrenheit and a barometric pressure of 29.92 inches of mercury.

All the air dampers in the equipment, controlling the flow of air through the ducts, are operated manually at present. Air temperature and humidity of the air is controlled by means of duct thermostats and hygrostats which operate pneumatic steam and water metal diaphragm valves using 15 pounds compressed air.

One of the most interesting features of the equipment is the method of determining the humidity of the air in the ducts. This is the first time that wet bulb thermocouples have been utilized for this purpose. Throughout the unit there are sets of wet bulb and dry bulb thermocouples at critical points, these thermocouples are connected to the man control board, the difference in wet bulb temperature and dry bulb temperature being determined at any critical point in the system. From this difference the humidity of the air is easily determined. Prior to this installation wet bulb thermocouples have never been acknowledged accurate enough for this type of work. It has been proven, however, that the actual error in temperature readings in this system is less than with the use of mercury thermometers.

This apparatus is suitable for use in the study of many problems including: (1) air cleaning by use of either filters or washers; (2) air humidification; (3) air cooling and dehumidification by three different pieces of apparatus; (4) hot blast heating using either steam or hot water as a heating medium; (5) heat transfer of finned couls using either steam or hot water as a heating medium; (6) heat transfer of finned tube cooling coils, using either chilled water or direct expansion of the refrigerent (Freon), with dry and wet surfaces; (7) problems involving the reheating of cooled and dehumidified air by use of either a steam reheating coil or by bypassing recirculated air; (8) all-year air-conditioning of spaces in which typical load conditions may be maintained either in summer or winter; (9) centrifugal fan performance under different load conditions; (10) precision measurements of both dry and wet bulb air temperatures; (11) air distribution by means of nozzles, grilles, diffusers, etc.; (12) the measurement of air flow and friction losses in ducts of varying section and shape and different units such as filters and coils. —T. M.

—Courtesy Heating, Piping and Air Conditioning

Two Views of M.E. Air Conditioning Equipment

★ WHO'S WHO IN ILL

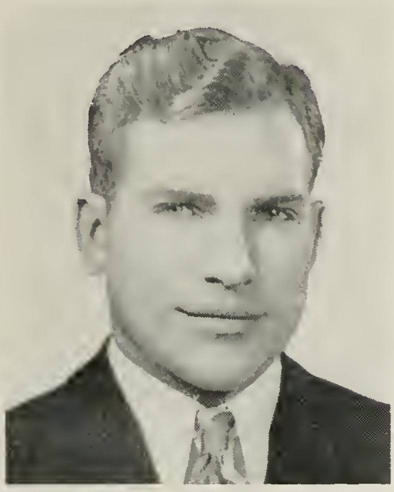
- *H. H. Jordan*
- *J. J. Doland*
- *F. E. Richart*

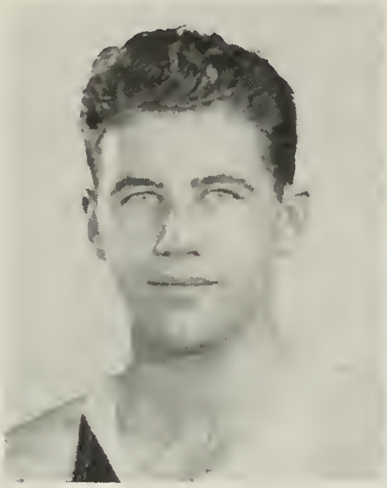
ASSOCIATE DEAN H. H. JORDAN is perhaps one of the engineering students' best friends. From a life spent as an educator, he has learned how many problems confront young engineers and he is doing as much as possible to help them find satisfactory solutions. He admits the vast amount of interesting work in administering the college; but he prefers to teach because it allows him to see students develop as a result of his efforts. Perhaps it is this same desire to see things grow that prompts him to putter around in his flower garden in Urbana, as well as about his cottage in northern Wisconsin. Dean Jordan was born and raised in Maine and was graduated from the University of Maine with his B.S. in C.E. Afterwards he came to the U. of I. as an instructor and a student in the graduate school. He is now a professor in engineering drawing and the head of that department. During the War, his activities were confined to those of a civilian instructor in military aeronautics and the Student Army Training Corps. In addition, he did much towards the publication of the first book of instruction for military aviators. He has many connections with organizations, including: Phi Eta Sigma, Tau Beta Pi, Phi Kappa Phi, Sigma Tau, Triangle, A.S.C.E., S.P.E.E., the Masons, Kiwanis Club, and the University Club.

PROFESSOR JAMES J. DOLAND has had a life filled with many and varied experiences. He started out next door to the Rockies in Denver, Colorado, and stayed there until he had obtained his B.S. degree in C.E. from the University of Colorado. He was later awarded the C.E. degree from his first Alma Mater, but the U. of I. presented him his M.S. degree. From the time of his graduation from Colorado, Professor Doland was employed in actual construction work until he came to the U. of I. in 1926. These experiences, carrying him to ten different states, ranged through all of the many activities of a civil engineer—building construction, grading for levees and railroads, irrigation, canals, bridges, underpinning, and even acting as a coal mine operator for a while. During the War, he was a first lieutenant in the construction division, and was later a captain in the engineer unit of the O.R. until 1935. His chief hobby, he says, is major league baseball. His memberships include Theta Tau, Sigma Xi, Tau Beta Pi, Scabbard and Blade, A.S.C.E., S.P.E.E., and A.W.W.A. He has also been an Associate Water Consultant for the Natural Resources Committee since 1936. That the students are his principle interest is proven by his activities with them here on campus. He is the faculty adviser for A.S.C.E. and Engineering Council, and also counseled the Technograph staff until lack of time forced him to resign last month. He is the president of the Illinois Union, a member of the Student Affairs Committee, and is on the Advisory Council for Tau Beta Pi.

PROFESSOR FRANK E. RICHART holds the title of Reasearch Professor of Engineering Materials, but this work does not seem to have limited his activities to just engineering. His membership on the faculty bowling team has helped them win many a match, while during the summer months he spends much of his time carry out his duties as one of the Board of Governors of the Urbana Country Club or just "shooting" a few holes for enjoyment or in competition. As a Director of the U. of I. Athletic Association, he has much to do in shaping the athletic policies of the University. Professor Richart is an Illini all of the way, for he has obtained his B.S., M.S., and C.E. degrees here at Illinois. After he was graduated, he practiced as an engineer for a time and then came back to teach and to work on research in the T. and A. M. department. He was working with Professor Talbot when they originated the mortar voids theory for plain concrete, and, he and Professor Wilson, worked out the slope deflection method for the analysis of indeterminate structures. Some of his other research has been done with reinforced concrete, building tests, reinforced brickwork, cast iron pipe, and chilled car wheels. In his work he has written ten bulletins published by the Engineering Experiment Station. In attending to his duties of vice president of the American Concrete Institute and as a member of the Executive Committee of the A.S.T.M. he travels about 20,000 miles annually.

IGINEERING WORLD ★





W. D. Orr ●

J. T. Robinson ●

C. E. Wright ●

CHARLES E. WRIGHT was born in Dahlgren, Illinois in 1912. After graduating from the Mt. Vernon township high school, he worked for two years, but resumed his education at Carbondale Teachers college in 1929. After two years there, he reversed the process and taught for a term near Mt. Vernon. Deciding that teaching was not his forte, Chuck enrolled in the University of Illinois as a ceramic engineer. This year, he will collect the dues and call the roll for Keramos and is a member of the Student Branch of the American Ceramics Society. Military seems to be his favorite activity for he is Lt. Colonel of the Engineers, captain of Pershing Rifles, first lieutenant of Scabbard and Blade, and a member of Tau Nu Tau. He won the University gold medal, awarded annually to the best second year cadet in the University. Also, he has been a member of the national guard for the past six years and is now serving as sergeant. Finding it necessary to work while going to school, Charlie spent his first two years assisting in the dean of men's office, but last year he helped do research work with glass. Tinkering with home-made radio sets is his hobby. Charlie is another of those engineers who have already marched down the aisle. Mrs. Wright was Mary Kay Dearth before last June.

JOHN T. ROBINSON had his high school days equally divided between Senn high school in Chicago and Rockford high school. He was a member of the track team of each school and in his senior year set Big Seven conference records in the high and low hurdles while bearing the responsibilities of captain of the team. Jack registered in as a C. E. in 1934 and almost immediately began to make a name for himself as a hurdler. He was captain of his freshman team and set Big Ten freshman records in both the high and low hurdles. During this year he became a member of Beta Theta Pi, after being elected to Tomahawk. As a sophomore he placed third in the high hurdles in the Big Ten indoor meet and anchored the shuttle hurdle team to a new world's record. With these victories he won his "I" and Sachem and the Tribe of Illini both elected him to membership Sachem chose him to be its president. Last year he was Big Ten indoor high hurdles champion and bettered Jesse Owens' 75 yard indoor low hurdles record. At the Chicago relays he ran a tied race in the high hurdles for a record time of 7.4 seconds. Last year Ma-Wan-Da elected him as a member. Jack has worked every year he has been in school, holding down as many as two jobs during the track season, while making better than average grades. His summers have been spent working; in 1936, as a life guard at the Rockford public park pool, and last summer for the state highway department doing surveying and pavement inspection work. Next June he hopes to be employed as a sanitary engineer.

WARREN D. ORR thinks that being born within view of the Keokuk dam may have produced his desire to study electrical engineering. At Carthage high school Bub guided his class through its junior and senior years, captained the football team, and was the leading man for his class plays. From Carthage he went to the University of Missouri to study E. E. There he was a member of the glee club and its quartet, the band, Phi Eta Sigma, and Delta Tau Delta. In February, however, he decided that the University of Illinois was a better place to study his profession. Spending nearly all his time at study during the following three semesters earned him membership in Eta Kappa Nu his junior year. Also, as a junior, Bub was a member of the pistol team, secretary of Eta Kappa Nu, rushing chairman of the Delts, and personnel manager of the E. E. show. In the spring of '36 he was elected as the Illinois Union member of the Engineering council. Last year Orr transferred to law school and was initiated into Phi Delta Phi, legal fraternity. Although no longer an engineer, he served as president of the Engineering council and chairman of Saint Pat's ball. This year Bub is back in E. E. and relaxing, he says. After graduating next June, he plans to study more law at Harvard, and become a patent attorney. His hobbies include hunting and shooting, boating, learning to fly, and discussing economic theories.

Bits About Them . . . .

Rexford Newcomb, Jr., '36 is now working with a Detroit refrigerator firm, and P. T. Talbot '36 is working for the Walker Refractories, Vandalia, Missouri.

Bill Avery '35 was married recently to Miss Isabel Forbes ('35, Iowa). They met while they were working at the 1934 Century of Progress. Bill is plugging away at engineering, he says, just now with Holabird and Root in Chicago.

L. A. Dixon, mechanical engineer '35 is a special apprentice for the Pennsylvania Railroad in Terre Haute. He's anxious to meet the other Illini in Terre Haute.

Newlin D. Morgan, Jr., '35, son of Prof. N. D. Morgan '28, M. S., works for the American Bridge Company in Gary, Indiana.

Leslie Silverman '36 who has a fellowship in Mechanical engineering at Rutgers, is well on his way to his degree. This is Les' first year in graduate school.

Edward Cwiklo '37 is working with the General Electric Company at Schenectady, New York. At the present time he is supervisor of the Industrial Control Test, and is engaged in testing all types of electric refrigeration controls. Ed states that he will try a few jobs in other fields before choosing any one permanent job. J. C. Wheeler '33, E. E., is Ed's foreman at Schenectady.

Leonard Tofft '37 writes that he is engaged to be married to Miss Betty Haddlesay, formerly of the University of Illinois, now at the University of Chicago. Leonard is employed at the Inland Steel Company at Indiana Harbor, Indiana, in the blast furnace department. Leonard states, "During my first vacation I expect to be married—in fact, I will be."

A. Montero '35 is a chemical engineer for an organization in Lima, Peru, making a study of the Peruvian oil lands.

W. S. Debenham '35 is an assistant ceramic engineer at the south works of the Carnegie-Illinois Steel Company. He and Dorothy Wellenreiter, who were married in August, live at 7715 South Shore Drive.

William Crocombe, Jr., '36 is a mill metallurgical observer for the Republic Steel Corporation, Chicago.

Robert T. Crocombe '36 is a metallurgical laboratory assistant at the Youngstown Sheet and Tube Company, Indiana Harbor, Indiana.

Jerry Margrave '37 has been transferred to the Pittsfield, Massachusetts plant of the General Electric Company from their Lynn, Massachusetts plant. Jerry is another engineer employed while taking a training course. Jerry was married to Miss Katherine Whittacker last June.

"A real beauty, with green eyes, and red hair," is the glowing description Leo J. Novak '35 gives of his wife, Elizabeth Steffo. They were married last August 14. He is a chemical engineer for the Peoples Gas, Light, and Coke Company, in Chicago.

Walter Milewski '37 is engaged in a year and a half field work course for the Illinois Bell Telephone Company in Chicago. Walt likes his work well enough to plan on remaining with the Illinois Bell Telephone Company permanently. Maurice Quinn '37, Harold Pearson '37, and Walt sometimes see each other in and about Chicago.

H. A. Holler '35 is another chem engineer engaged in research for Eastman Kodak, making Kodachrome film for the color photographers of the country.

Edward H. Fairbank and Arthur Richard Williams are among the 30 students from 29 universities who have been awarded school medals by the American Institute of Architects "for general Excellence in Architecture." They graduated from school last spring.

Charles Slaymaker '37 arrived in Panama Homecoming morning to work for the United States Government as a junior engineer.

A Preview

1938 E.E. SHOW

•

The Cast

D. K. Chinlund .... General Manager
W. A. Johnson .... Business Manager
C. S. Sandler ... Assistant Bus. Manager
W. A. Sinks .... Treasurer
R. E. Jeffries .... Chief Engineer
L. T. Bleuer .... Exhibits
S. W. Ryden .... Personnel
F. A. Linn .... Electrician
D. W. Russell .... Construction
C. E. Van Slyck .... Programs
F. E. Edwards ..... Rep. Physics Dep't.

The Setting

Exhibits and demonstrations of electrical apparatus of general interest, the latest discoveries from research laboratories, trick stunts, etc.

Synopsis of Scenes

Since it was first held in the spring of 1907, the biennial Electrical Engineering Show has attracted attention from near and far. While still in its youth, the show was so well known and attended that large electrical manufacturing and utility companies were anxious to exhibit their products at the show. A list of some of the products which have been displayed in the past includes an automatic dial telephone system, an electric-clock system, a model hydroelectric plant, bank alarm systems, and many others.

Although plans are only beginning to be made for this year's E. E. show, it already shows promise of living up to the successes of its predecessors.

The class of '36 ceramic engineers is using a novel method of keeping in touch with each other by the use of round-robin letters writes Floyd Hummel '36. Floyd is doing ceramic research at the Onondage Pottery Company.

Robert Schneider '36 is working as an electrical engineer with the Schweitzer and Conrad Company in their production testing and inspection department. Bob is not married yet, but he admits there is a definite relation between his vacation plans, and plans for an engagement or marriage.

Harold Peterson '37 is working in Milwaukee for the Allis-Chalmers Mfg. Co. as a student apprentice studying general operation of power houses. Harold attended the A. I. E. E. convention in June, and there met some Illinois graduates. He says that Allis-Chalmers is in the midst of a large expansion program at the present time, and they should take on a great many new men in the future.

John A. Schaad '31 (also '36 Ph.D.) now instructor in chemistry at Armour Institute, is the author of a paper, "New Measurements in Previously Unknown Large Interplanar Spacings in Natural Materials."

Louis H. Kristof '37 is working as a surveyor with the U. S. Bureau of Reclamation in Gunnison, Colorado.

Roger Benedict '36, engineer for the American Rolling Mills, is now married to Marie A. Bertoni '37. Their home is in Middletown, Ohio.

Karle De Wolf '37, is playing the ambitious role of both student and working man while employed with the Westinghouse Company in Pittsburgh. He spent the first part of last summer at Camp Custer in Battle Creek, Michigan.

E. Lyman Ellis, Jr., '37, is architectural engineer for the E. S. Moore Company of Danville, taking the place of John S. Winbigler '35, now with R. W. Naef '23, in Jackson, Mississippi.

Raymond W. Pope '37, is chief chemist of the Peabody Coal Company laboratories in Duquoin, West Frankfort and Harrisburg.

DEFINITIONS BY THE BASIC ENGINEERS

Snipers shoot only in spasms.

Scouts advance by leaps and bounds.

A scout wears correct clothes.

A scout uses geography for cover.

Concealment—don't stay in one place a long time.

A scout keeps flat with only one eye exposed.

Snipers defend the attack.

A scout is a man who crawls on his belly in front of the army.

Scouts cross open country by day in bounces.

A scout is a person who proceeds the army without making any noise.

TAKEN *at* RANDOM . . . .

Seniors—Remember One September Three Years Ago?

Now and Then

As the Class of '38 is beginning its last lap towards the completion of their college careers, it is interesting to note the great change in the number of men who now comprise the group from the number at the time they were freshmen. The following tabulation shows for each of the various departments under the jurisdiction of the College of Engineering the number of freshmen enrolled on October 1, 1934, and the number of seniors on October 1, 1937.

Department	**1934**	**1937**
Agr. Eng	3	5
Ceramics	34	10
Cer. Eng.	73	24
Civil Eng.	74	62
Elect. Eng.	94	58
Eng. Physics	7	6
Gen. Eng.	39	7
Mech. Eng.	78	75
Met. Eng.	3	2
Mining Eng.	11	4
Rwy. C. E.	1	1
Rwy. E. E.	0	2
Rwy. M. E.	0	0
Total	417	256

Sacramento Water Towers

Beauty as well as utility is evidenced in the new three million gallon balancing reservoirs that the city of Sacramento, Calif., has recently constructed. The tanks, two of which were built, rise seventy-seven feet above the ground, have a wetted wall height of twenty-six feet and an interior diameter of one hundred and forty-four feet. The walls are lined inside with steel plates imbedded in the reinforced concrete floors. The structures are constructed to resist earthquakes.

The steel walls of the tanks were designed to resist the full pressure of the water and the reinforced concrete shell was bonded to them by means of anchors. The specifications for the structures required that the steel walls be tested with a full water load before the surrounding concrete was placed. With the tanks still full of water, the concrete shell was poured. After a twenty-eight day curing period, the water was drained out. The steel necessarily contracted, and by means of the bond from the anchors, drew the sides of the walls inward and placed the concrete under compression. This was, in effect, a method of pre-stressing the concrete.

As a result of this arrangement for placing the concrete when the tanks were full, the concrete will never be in tension and will be at zero stress with a full water load.

Another interesting feature of the construction of the tanks was the fact that all steel connections were made by welding. As a precaution, the city engineer required all welders to take a special examination. Of the fourteen applicants, only seven passed inspection.

These welding examinations, necessary because there are so very few welders capable of doing structural welding, are highly important. The men are examined on their ability to make the common types of welds, all able to withstand the testing loads. In addition to the initial inspection of their work, during the course of the job the men also prepare samples which are tested to see whether they are doing satisfactory work. It has been observed that once trained, a welder always does consistent work.

—Courtesy Engineering News Record

USEFUL BEAUTY

—Courtesy Public Safety

"X" Marks the Spot

Warnings of Sudden Death

To help the careless motorist remember where the worst automobile accidents have occurred, the city of Allentown, Pa., has started to mark the spots with three crosses. They have placed fifteen of these crosses during the past seven months.

•

San Francisco's Treasure Island

In the center of San Francisco Bay, a 400 acre fill has created a "Treasure Island." This is to be the home of the 1939 Golden Gate Exposition and after the fair, it will be used as the permanent airport for the city.

At present, a concrete plant has been erected on the water's edge of the bay and the fill material is being handled from barges. A causeway is to be constructed later to connect the island with the Bay Bridge to San Francisco and with Yerba Buena Island.

A MODERN TREASURE ISLAND —Courtesy Rock Products

Chicago Plans

CHICAGO has approved plans for elevated highways in an endeavor to lower its annual automobile toll of 800 dead and 20,000 injured. These safety structures are regarded as the only available means for reducing the accident percentages. Surveys made of Manhattan's elevated highways have amply demonstrated the safety characteristics of these super-roads.

On the Outer Drive, Chicagoans have been given a taste of the relative convenience and safety of elevated highways. Here, due to favorable land peculiarities, pedesterians, cross-traffic, and parking worries have all been relegated to the ash-heap. However, for the outlying built-up sections, viaducts and some forms of elevated roadways would have to be constructed. On these new roads, motorists will feel much more secure and at ease, since there would be no cross-traffic or jay-walkers to hamper driving.

To keep cross-traffic from this west side superhighway, the roadway would have to be above or below the crosswalks of existing streets and on a different level from the north and south pavements. Parking would be abolished by separation of the express surface from nearby property. The reasons as to why most city planners have favored elevated highways is that depressed boulevards require broad rights of way of prohibitive expense in a built-up area. A low level boulevard would also require a trestle for every north and south street that would not be closed.

Mr. Otto K. Jelinck, traffic engineer for the Chicago Parks, reports that within the busiest one mile stretch

Super Highway

of the Outer Drive, only one death and 26 injuries have been reported in more than 28,871,500 car miles of travel. The National Safety Council reports that on the New York elevated highway, the accident rate is one mishap for every 2,500,000 car miles of travel. It is figured that in Chicago alone, deaths and injuries in traffic accidents totaled 23,629 for one year. This is a rough ratio of about one person killed or hurt in 401,-000 miles of motor travel. The Outer Drive, in spite of having an average speed of traffic about twice as great as the speed on the conventional roads, has therefore proved, by means of its great safety record, the value of elevated roads. A perfected design for elevated highways physically prevents about 98.5 per cent of the accidents which are motor fatalities. A survey made by Dr. Miller McClintock of Harvard for the city traffic committee showed that a system of about 160 miles would be ample to provide the needs of growing Chicago.

The new outer drive from Randolph street across the outer link bridge to Ohio street, opened recently after dedication by President Roosevelt, is almost an elevated highway. However, in a few years buildings will spring up so that it will be as cluttered as Michigan avenue. According to Alderman John A. Massen, Chicago may expect an increase of 12 per cent in the number of vehicles, an increase of 14 per cent in the consumption of gasoline, and an increase of 24 per cent in the number killed and injured.

As things stand now, Chicago needs elevated highways to increase efficiency and lower the ghastly yearly terrific toll of humans. —L. O.

What! No Dedication?

It was a tense moment! The President and the Dean were just finishing a long conversation. "It simply can't be done, that's all! If the Governor were able to be here it would be different, but trying to conduct such a solemn ceremony without his presence is useless. The effect is gone! In my opinion, it will be far better to have no dedication at all."

Shakespeare's words flashed through my mind—"There comes a time in the affairs of men when taken at the flood leads on to fortune; omitted, all the voyage of their lives is bound in shallows and miseries." Yes, Shakespeare was right. To miss an opportunity as golden as that one missed by the College of Engineering is to forever cast a shadow over a portion of the history of the college—a shadow that shall be forever regretted.

You have probably already guessed that I am referring to the artistic triumph in Engineering Hall that would bring joy to the heart of the most downcast artist. Caesar in all his glory was not arrayed like this! Who would suspect that a building as aged as Engineering Hall would house what is without doubt the most modern and up-to-date room on the engineering campus.

So, there it is like an unchristened babe, beside the entrance to the engineering library, silently reminiscent of the glories that might have belonged to it alone, had the officials of the college and university taken the opportunity of setting a cornerstone, a panel, or even a lowly mosiac floor tile, with appropriate dedicatory ceremonies. But man must be served; the unending line of humanity continues to wind its way in and out, scarcely realizing the agony of insult being suffered by their surroundings.

—T. M.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.

Of The Illinois Technograph published six times a year (Sept., Nov., Dec., Feb., March, May) at Urbana, Illinois, for December, 1937.

State of Illinois }
County of Champaign } ss.

Before me, a notary public in and for the State and County aforesaid, personally appeared H. W. Atkinson, who, having been duly sworn according to law, deposes and says that he is the business manager of The Illinois Technograph and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management and the circulation, etc., of the aforesaid publication, for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations.

That the names and addresses of the publisher, editor, and business manager are: Publisher, Illini Publishing Company, University Station, Urbana, Illinois:

Editor, Harold E. Goeke, Urbana, Illinois.
Business Manager, H. W. Atkinson, Urbana, Illinois.

That the owner is The Illini Publishing Company, a non-commercial organization whose directors are W. E. Britton, O. A. Leutwiler, F. H. Turner, F. S. Siebert, Jack Grimm, John C. O'Byrne, J. G. Elzea, Mary H. Moss.

H. W. ATKINSON, Business Manager.

Sworn to and subscribed before me this 1st day of October, 1937.
(SEAL)

ALICE SMITH, Notary Public.

Engineering Experiment Station

(Continued from Page 3)
lines; (b) the routes used; (c) the number of vehicles that make the cities their destination; and (d) the number and duration of other stops made. The efficiency, accuracy, reliability, and cost of the survey method are being studied.

Another study concerns the visibility and efficiency of highway signs of various sies, colors, shapes, symbols, and workings, including plain and reflectorized signs. Consideration is given to the visibility of signs to partially color-blind persons.

The efficiency and economics of city traffic control are also being studied. This covers the free crossing, the boulevard stop and the traffic signal. Tests are being made to determine the amount of fuel used by automobiles while making stops and starts, from which an estimate of the cost of the various types of traffic control to the traveling public may be made. A fourth study covers highway traffic accidents with reference to the hazard-producing features of roads.

Other subjects under investigation include a study of thermal stresses due to welding, the study of stress at sharp corners by the plaster-model method, joint materials for sewer pipe, joint filers for brick pavement, reinforced brick masonry beams, volume changes in burned-clay aggregate concrete, discharge co-efficients for pipe orifices under pulsating flow and for orifices in a pipe wall, and various minor projects in fatigue of metals. In addition, there are many allied research projects in mechanical, electrical, railway, ceramic, and chemical engineering. —A. S. B.

NOTE: The author wishes to acknowledge "Current Investigations at the University of Illinois," Engineering News-Record, by Dean M. L. Enger for the information included in this article.

• TECKNOKRAKS •

Chuck Wright (in library): "Have you a book called 'Man, the World's Ruler?' "

Lady Librarian: "You might find it in the fiction department, sir."

* * *

Magistrate: "So your only defense is that you were drunk when you kissed this lady. How can you prove that?"

Defendant: "Well, just take a look at her yourself, Judge."

* * * *

Prof. Wiley was driving along a country road when he spied a couple of repair-men climbing telephone poles. "Fools!" he exclaimed to his companion, "they must think I never drove a car before."

Bob Walker: Your lipstick is coming off.

Betty: No it isn't.

Bob: It is.

Betty: I'm sure it isn't.

Bob: Listen, any time I get as close as this to a girl, her lipstick IS coming off.

* * * *

Then there's the girl who swears she's never been kissed! (Maybe that's why she swears).

* * *

Cop: "Say, young fellow, there's no parking here; you can't loaf along the road!"

Ed Fraser: "Who's loafing?"

He: "Do you know the secret of popularity?"

She: "Yes, but mother says that I musn't."

* * *

A colored preacher having read to his fleck several verses concerning virgins from the Bible, requested all the virgins in the congregation to come up on the platform. Among the last came a young woman with a baby who was stopped by the parson.

"Hold on dere, sister. How come you come up here wid dat baby? You ain't no virgin."

"Oh, yes, I is, parson. I'se just one of dem foolish virgins."

* * * *

May: "What sort of a chap is Johnny?"

Dot: "Well, when the lights went out last night when he called on me, he spent the rest of the evening repairing the fuse."

* * *

A mother testifying on behalf of her son, swore that he "worked on a farm ever since he was born." Triumphantly the opposing lawyer leaned over toward her and thundered: "You tell this court that your son worked on a farm ever since he was born?"

"I do."

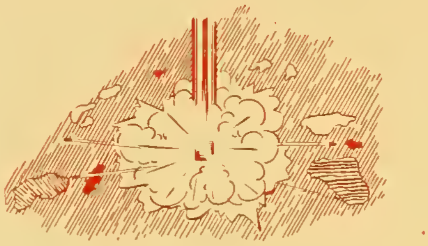
"What did he do the first year?"

"He milked," she answered.

G-E *Campus News*

SHARPSHOOTING TWO MILES UNDERGROUND

SHOOTING HOLES through an oil-well casing at a depth of two miles underground is another problem successfully solved by electricity. The Lane-Wells Company Gun Perforator is an ingenious device used to pierce casings with steel bullets. When an oil pocket has been exhausted, the operators pierce the well casing at a different stratum, thus opening another pocket.



In order to know where to pierce the casing and how deep the gun is, G-E electric locating, weight, and depth instruments are mounted on a panel in a truck from which the shots are fired and the results recorded. Over two and one half miles of steel-sheathed cable is used to lower and fire the gun, the current for the charge being carried in the core of the cable. Accurate measurement of the depth at which the gun strikes or leaves the fluid level in the well is indicated to the operator by a weight indicator which utilizes two General Electric Selsyn motors.

In General Electric Company, numerous groups of engineers devote their entire time to the most efficient use of electricity in all types of industries. These men, former members of the Test Course, have solved many problems such as Sharpshooting Two Miles Underground.

TRAIN-PERFORMANCE DETECTIVE

IN AN EFFORT to determine more accurately the performance of an electric locomotive and to calculate the most efficient motor for the train, T. F. Perkinson, R. P. I., '24, a former Test man now in the Erie Works of General Electric Company, invented a machine which performs these operations mechanically.

Computation by the step-by-step method of these calculations necessitates many hours of tedious slide-rule work; repeated adding and subtracting of time, speed, and distance increments; and reading of charts. The Transportation Calculator eliminates this work and solves the mathematics at least five times as quickly, depending upon the skill of the operator.

The Transportation Department of General Electric Company offers many opportunities to mechanical and electrical engineers in the design, construction, and production of electric locomotives, trolley cars, and trolley buses. The solutions of many interesting problems are found in this department, the Transportation Calculator being but one of them.

BOXING THE ELEMENTS

WIND, RAIN, SLEET, SNOW, arctic and tropical temperatures, six-mile altitudes, and power dives—all are found within the confines of two steel rooms in the radio-transmitter test department in the Schenectady Works of General Electric Company.

To assure perfect performance of aircraft transmitters, the equipment is placed in these two rooms where extremely severe weather conditions are simulated. Portholes of one-inch glass in the rooms permit the test men to observe the effects on the instruments without being subjected to the same strains placed upon the transmitters.

These complicated tests are made by college-trained men now on Test. The field of radio transmission from airplanes is, of course, new and progressive. The "flight rooms" provide radio engineers with a new and clearer conception of designs for radio equipment.

GENERAL ELECTRIC

90-16DH

IN THIS ISSUE

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Who's Who In Illini Engineer World

1938 E. E. Show

The Value of the Scientific Attitude

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February, 1938

The Illinois TECHNOGRAPH

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THE ILLINOIS

TECHNOGRAPH

UNIVERSITY OF ILLINOIS

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"THE TECH" changed its suit—or had you noticed? And to Dudley Pulliam '39 F. A. A. we give our utmost appreciation for his work in styling the new cover, representing the various phases of engineering.

● Senior Special!—Or for anyone who plans to be graduated from the College of Engineering sooner or later, we are having a series of articles which aim to be of particular value to those who are to go out into the wide, wide world. Any suggestions upon this topic which you wish to make for the following editions are welcome. In this issue we hear from one of the most prominent alumnus of Illinois—W. L. Abbott, who gives excellent *Advice to Engineering Graduates.*

● We didn't know an engineer could do it! Just read the Tau Beta Pi prize articles written by the honor junior, R. W. Gaines, on *The Value of a Scientific Attitude*, and you, too, will wonder which side of campus Bob has frequented most.

Wanted:
Your presence at ST. PAT'S BALL on March 25 in the George Huff Gym.
Reward:
A Good Time.

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—Courtesy of Mining and Metallurgy.

QUARRYING MARBLE

THE ILLINOIS TECHNOGRAPH

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A Noted Illinois Alumnus Gives

Advice to Engineering Graduates

FOR years you have planned on having jobs waiting for you at graduation. Some of you now have positions already secured. Others may be wondering where and what kind of a job they will land and if it will be as good as some of those that were reported years ago.

Possibly yes, probably no. Wind blowing across water kicks up waves, crests, and troughs—some times slight, sometimes frightful. For some reasons it were better that the sea always remained smooth as glass. Correspondingly, when the winds of trade blow across the sea of commerce it results in prosperities and depressions. Perhaps it were better to have an even stage of business, say at the height of the boom crest, or that not being possible, at a medium height, but by no means at the bottom of the trough. However, as there are certain natural laws governing the sea and governing commerce which human hands and human laws have been unable to change, we will continue to have ups and downs in the future as we have had in the past.

Ups and Downs Affect Prospects

These ups and downs have a bearing on the prospects of college graduates and, in particular, on those in engineering courses. Here are some examples which have come to my notice:

More than one hundred years ago my father, who had served his time as an apprentice, quit college at the end of the first year for lack of funds. He went to work at his trade for $12 for a 72 hour week. He was glad to get the job as it was during a depression when jobs were scarce. One of his classmates, who held on, graduated three years later as a civil engineer and at once obtained a position from the Russian government locating the railroad that was later built between Moscow and St. Petersburg, salary, $3,000 a year, equivalent to 10 times that sum in these days.

Sixty years ago an older brother of mine graduated as a civil engineer in the class of '77. It was during a severe depression when grangers and greenbackers were rampant. He was an honor student whose reputation for scholarship hung around the University to embarass me years later. As there was no engineering work to be had at that time, he went back to the farm to plow corn and make hay until fall when he obtained a position teaching in a local academy.

Three years later he had quit his students to be instrument man with a Santa Fe railroad locating party, out west, at a fair salary, so it was rumored. In fact the rumor was so extravagant that the story was not believed. One evening when I was a guest at a neighbor's table, he plumped it straight to me—"They say Theodore is getting $200 a month. Is that so?" When I answered that I believed it was, my neighbor gave me a fishy look and said, "Well, he may be getting it, but he can't earn it." No reflections on the young man's ability; it was merely incomprehensible and unjust that one boy raised in that community should be getting five or 10 times as much as any of the others who had not been to college.

In 1884, with some influence, I got a job as machinist at $2.75 for a 10 hour day, $72 a month. I thought it was more than I deserved, but made no complaint. Those who graduated later fared even better. Those who came out still later fared not so well.

This is to show you that regardless of your native and acquired ability, your first job will depend also on what kinds of work are available, but the kind of a start you make will have little to do with your future, except that if one gets too much at first, his taste for jobs that pay less may be ruined for life.

There is a story of a needy man being offered a job, the pay to be fixed later at what he would prove to be worth. The applicant hautily declined the position and pay, saying he would not work for any such money. Fifty dollars a week for a short time nearly ruined me, giving me a superiority complex that made me later decline a position that I would like and which had a great promise for the future. I was offered only a little more than I was worth.

Now You Have a Job

Let us skip a ways and suppose that you have a job. I am not particular about the pay, but I am insistent that in the position you find useful experience. I hope the job will be short-lived and that you will go on to another and another, adding to your practical knowledge as you go. "A rolling stone gathers no moss," but at your age you should not be looking for moss. You need hard bumps and experience which is what the rolling stone gets. Eventually you will fetch up against a tree or in a depression where you will be quite comfortable at a higher salary than you had been getting. Perhaps you should stay there, but most likely not.

I often tell the story of Peter Junkersfeld, from Sadorus, near here, class of '95. He graduated in a depression and was glad to get power house work in a low down capacity at a low down rate of pay. I watched him advance through various positions until he became a switchboard operator, one of the aristocracy of the station, and there he rested content with his white collar job. One day he came to me and said, "Mr. Abbott, I have had excellent treatment here. I have a good job, good pay, and congenial associates. I can stay here as long as I like, I suppose, but I feel that I am getting into a rut and unless I move soon I will never get out of it."

"Pete," I said, "I have been expecting that from you for some time. We all like you and would be sorry to see you go, but for your own good you had better 'git'."

He transferred from operating to the engineering department and began to

W. L. ABBOTT

NOTE—Last spring Mr. Abbott '84 gave the material contained in this article as a talk at a banquet of the combined groups of Chi Epsilon, Pi Tau Sigma, and Eta Kappa Nu. Before retirement, he was chief operating engineer for the Commonwealth Edison Co., and, at one time, was president of the University Board of Trustees.

climb. He advanced as vacancies occurred and in a few years was Chief Electrical Engineer. He was prominent in national engineering societies, President of the Association of Edison Illuminating Companies, Major in the Quarter Master Department and Colonel when the war ended, engineer with Stone and Webster, then partner in MacClellan and Junkersfeld Electrical Contractors, and then, alas, from over work he suffered cerebral hemorrhage and is buried in a cemetery within sight of the University towers. He advanced because he kept moving.

Get Experience While Young

While you are young get experience. Later you will have your money reward.

Let us now assume that you have changed about some and now are in a position where you would like to take root and become an engineer.

Being an engineering graduate your employer unhesitatingly assumes that you are possessed of Integrity, Loyalty, Technical Knowledge, Industry, and Initiative, and that you are a "Company Man," all of which aligns you with the staff rather than with the Rank and File. Such as you are the sprouts from which future executives are grown. Do not betray that trust.

When settled in a position of some permanence don't assume that your education is finished. It may be ended any time, finished, never, or you will be like freshmen who, having passed the trigonometry examination, dance around a bonfire in which a text book is being immolated; then they go home saying, "Trig is past and gone. What's next?"

Fortunate are you when given a problem requiring a review and a refreshening of some phase of your college work. When the problem is finished you will be inclined to say that you never realized before the value and interest of that principle. One of my engineers, on handing in the solution of an assigned problem in entropy, remarked that he had learned more about that subject in the solution of the problem than he had absorbed during his whole course in thermodynamics. He probably overstated the fact, but he did come to realize that entropy was real and had its place in a power house.

Beware of Specialization

You are mechanical, or civil, or electrical, but some of your training involved excursions into other fields. These side-lines were put into your course for a definite and useful purpose. Don't let that knowledge become atrophied for want of use. Around you will be specialists in those lines who usually will have charge of their respective branches of the work; perhaps under you. You should have sufficient acquaintance with the language they speak to know what it is about and perhaps to make the final decision. Hold on to your calculus. You won't need it often if you forget it, but if retained, it will be a magical "passe partout" to many a door.

When assigned to a permanent position, learn all about your job and about what surrounds it. Know what is going on in the department and in the industry generally. Write up your experiences for the technical press and for engineers conventions. Be observing and inventive. Several young men I know are drawing more in patent royalties than in salary, and some have retired rich on their inventions. Make suggestions for improvement in the company's materials and methods. Your suggestions will be accepted or rejected with or without thanks. Either way it is immaterial. You have exercised your originality. Cultivate your superiors. They can do great things for you or to you. Maintain your self-respect and respect the man to whom you report. He is not always kind and he is not always right, but he must be fairly good or he would not be where he is. At any rate he is probably as good as you will be when you reach that position.

It is not good for a soldier to be coddled and it is not good for him to talk back. The same holds for a young engineer in training. He is privileged to walk off the job at any time but as long as he accepts the pay he should take, without grumbling, whatever goes with it.

I recall with satisfaction some exacting and sarcastic foremen who delighted in pointing out my short-comings in their proficient way and later astonished me with preferential kindnesses. I regret that I did not have more of that training.

That is all of the advice I have time to give you on how to become an engineer. I hope that some of that advice may be found helpful and if it is, when you reach your goal, you will join the mighty chorus of others who cry to high heaven that the engineer is not receiving his due honors and emoluments in comparison with the blessings showered on other professions. I am, therefore, moved to take a little time to see if I can help you to something better.

Aim High

The aim of an engineer should be to the title of Superintendent or Chief, although some over-shoot the mark and are called President. But, to obtain any of these titles, the aspirant should have accomplishments that are not usually counted necessary in a mere engineer. This, then, is the last and most important chapter.

Heretofore you had professors to pray for you. From now on you must pray for yourself as your higher success will depend on your ability to sell yourself to your associates. Therefore, be one of them. Enthusiastically participate in their sports and other activities. Follow and support their leaders; you will soon be one yourself. Always be cheerful and a wellspring of joy to your fellows and, high or low, give them greeting for greeting and railery for railery. Don't be a grouch. If I had an enemy and wished to be mean to him I would innoculate him with a grouch over which he would brood, keeping his stomach sour and his mind off pleasant things. It would not hurt me, but it would be eating his heart out. Don't carry a grouch.

Make acquaintances and friends. Remember names and faces, a talent that will be of inestimable value to you. Extend your acquaintanceship beyond the circle of your immediate associates. Cultivate those of influence in other companies who may some day be able to offer you a better position than you have.

Drudgery Apart from Success

Success and advancement are not due to drudgery. Drudgery is plodding and does not spell high speed nor high intellectual activity. Hard work and application are essential, but inspiration and new ideas come when you relax and look up from your work to take a general view of it.

Some one with a taste of sour grapes in his mouth said:

"Whereunto is money good?
Those who have it not have hardihood
Those who have it have much trouble and care
Those who once had it have despair."

Robert Burns, however, with a more popular idea of the value of money, said:

"To win dame fortune's fickle smile
Assiduous wait upon her
And gather gear by every wile
That's justified by honor.
Not for to hide it in a hedge
Nor for a train attendant
But for the glorious privilege
Of being independent."

Vanderbilt said, "A man that has a million dollars is as well off as though he were rich." Paste that in your hat and look at it occasionally as you approach the million mark.

Invest in Yourself

In your permanent position begin to save your money for wise investments and the best investment for some of it is on yourself, good clothes, neatness, smartness, sports, autos, movies, cards, girls, dances, all in moderation and not as a major study. And, while investing your money, put a little of it in the bank as a nest egg, anticipating the time when you will have a home of your own. Some one said of old, "he that marrieth giveth hostages to fortune," meaning that by shirking natural responsibilities, starving his soul, and saving the expense of supporting a family, a man can accumulate more money than he would have done had he married.

Money? Yes, perhaps.
Success? No.

Besides religious celibates, there are occasionally bachelors of probity who have attained high positions and public esteem, but with few exceptions men require a mate and a family not only for their higher and rounder development, but also to satisfy their

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SOCIAL CALENDAR

FEBRUARY

7—Student-Alumni association Registration Dance.
11—MIDA-WGS Mixer.
11-12—Theater Guild Production.
14—Star Course; St. Louis Symphony.
18—YMCA-YWCA Mixer.
25—MIDA-WGS Mixer.
25-26—Woman's League Play.

MARCH

2—Founders' Day Banquet.
4—Women's Glee Club Recital.
11—MIDA-WGS Mixer.
14—Star Course; Nino Martini.
18—YMCA-YWCA Mixer.

Mass Production Ideas Aid Aviation

Large Orders Necessitate Expansion

IN SPITE of their best efforts, the major airplane companies have been unable to fill their orders promptly during the past year. In fact, some of the largest peace time orders in the history of aeronautics were placed last year. Private aviation is having one of its biggest booms in recent years, and the commercial airlines are surveying new routes over the Atlantic, and service across the Pacific has already been inaugurated. With this rapid expansion underway, it is only natural that new planes are needed in quantities that have never been produced before.

These planes which are being manufactured to supply the demand are more specialized than heretofore. Monocoque and semi-monocoque constructions are becoming common, especially in military and commercial planes, while the cantilever wing is becoming almost synonomous with superior performance. These carefully designed structures must be made with exacting precision if a rigidity is to be obtained that will prevent flutter at high speeds. Naturally, increased precision slows down production speed, and the industry, as a whole, found many problems to iron out before a fast and efficient production system could be devised.

Today a monocoque construction almost invariably means all-metal construction. As it is necessary for the different sections of the covering to fit together accurately so that the stress is evenly distributed, the metal sheets from which the skin is made must be cut and moulded accurately. Hand methods of cutting and shaping these metal sheets for the covering were too slow and inaccurate; therefore, the designer turned to machines. The hydraulic press which is used in the automobile industry to shape fenders, steel tops and other body parts, seemed to be the solution. Parts could be cut and shaped rapidly and accurately at a minimum cost. After the Ryan Aeronautical company and a few others had experimented with the press, it was accepted by the industry. The Ryan S-T was one of the first planes in which this construction was used. Today, every company that builds metal airplanes on a large scale has a hydraulic press to form the parts of the wings and fuselage that can be made from stamped metal. One of the most interesting of these presses is the one which was delivered to the Douglas Aircraft company. This press forms several pieces of different sizes and shapes at the same time.

In order to speed up the actual assembly process, efficiency experts came to the conclusion that greater speed and accuracy could be obtained by dividing the plane into smaller units so that more men could be employed in the assembly process. Consequently, assembly jigs were devised for wing sections, fuselages, and other structural parts of the plane so that the individual units would fit together accurately on the assembly line. In building the new Curtiss' P-36, a pursuit plane for which the army has placed an order for 210, the manufacturers have divided the fuselage into two parts by considering the upper and lower halves as two separate units in the fabrication process. When these halves are completed on their jigs, they are essembled.

In manufacturing any article, it is impossible to produce any two which are exactly alike—so it is with airplanes. These very slight inaccuracies, while they do not affect the planes' flying characteristics aerodynamically, do affect the movement of the control surfaces. In planes which use bushing type bearings on the hinged control surfaces, no two planes will have the same "feel"to the pilot. This is caused by the bushing centerlines not coinciding, thus the plane is stiff at first and as the bushings become worn, the controls become sloppy and do not respond promptly because of the excess lost motion in the control transmission system. It is for these reasons that planes using bushing control bearings require more muscular energy to transmit the pilot's actions to the controls. As this saving of energy is becoming more important in the huge planes that are under construction because of the size of the control surfaces, and since positive, instantaneous control is absolutely necessary in high speed formation flying such as the army does, it was necessary to find, or adapt, a bearing that would adjust itself automatically to slight inaccuracies of alignment

—*Courtesy Scientific American.*

NEW DOUGLAS AIRLINER

and yet be simple and dependable.

In 1929, ball bearings were used very little in airplanes. Today the ball bearing is being used extensively in airplane control units where ease of operation is desirable. These ball bearings, which usually have self-contained seal for protection against dirt and are much easier to maintain for they require less attention and servicing. Their ability to take axial load in either direction or misalignment without materially increasing the friction of the unit is important in reducing the energy required to operate the control units. As the wear on a ball bearing is very minute unless the bearing is overloaded, a ball-bearing-equipped control will not become sloppy from wear for hundreds of hours after the bushing type has become excessively worn. Thus the military pilot is able to do a better and safer job of flying because of the instantaneous transmission of his actions to the control surfaces. Another advantage the manufacturers discovered was that every plane of the same type had more nearly the same "feel" since friction is reduced to a minimum. Since rigidity is desired in an airplane, it is a distinct advantage when bearings can be fitted with less clearance tolerance. This is especially true in retractable landing gears and control surface hinges and control cable pulleys. Here the close fits of the ball bearing are especially valuable.

When multi-motored planes first became common, the pilots had trouble in syncronizing their engines. It is necessary that the engines turn within ten r.p.m. of each other if the beats set up by their difference in frequency are not to annoy the crew and passengers. A small, light weight bearing has been developed which is being used on almost all of the engine and propeller controls.

All of these improvements in construction, while they improve the quality of the plane and improve the ease of operation, also make it possible for the factories to increase their output without a tremendous increase in manufacturing costs, and this is very important if the cost of airplanes is to be lowered through mass production. There are many such problems that must be solved before the initial cost of airplanes can be appreciably lowered, and this initial cost must be lowered if private aviation is to thrive. Many of these problems, in fact most of them, can be solved by the engineers outside of the aviation industry. The metallurgist must develop new metals and the chemists have an almost unlimited field for the development of synthetic products.

A very good example of the chemistry in aviation is shown in the construction of sheet metal seams and joints. These joints are used in the construction of the floats for the flying boats and the amphibians. Formerly, oleoresinous materials or bituminous derivatives were impregnated into fabric tape and this tape placed in the joint which was rivited together but these materials were not stable when exposed to gasoline or oil. Since they were also messy to handle, much difficulty was found in cleaning excess material off the joint, and if gasoline was used, great difficulty was encountered in keeping it out of the joint; and when it did get in, it removed the material in the joint. If the excess was scraped off, the protective coating was taken off the metal and it was then unprotected against corrosion. Someone then thought of neoprene, the recently developed synthetic rubber.

Neoprene is comparatively unaffected by gasoline, it has the elastic qualities of rubber, and it is little affected by the common solvents or extremes in temperature. Therefore, gasoline or steam could be used to clean the plane without damaging the joints. A tape of pure neoprene was first experimented with. This tape had to be about .015 inches thick so that it would not dimple when it was under the pressure of the rivets. As it was almost impossible to produce the neoprene in even strips of a fairly constant thickness, it was decided to impregnate it into a cotton tape and apply it much as they had before. In order to prevent corrosion at joints where two different metals were joined, a corrosion inhibitor was added to the neoprene. The compound used is softened, but not harmed, by gasoline, kerosene, or a mixture of light oils.

When it is applied the tape is brushed with one of the solvents and pressed onto one side of the joint. If it is not desired to rivet the joint at that time, the tape may be allowed to dry and can be re-moistened before the riveting begins. It can easily be seen that this method is much simpler and faster Sikorsky, using it on his flying boats, was one of the first manufacturers to use the new method.

WAYNE E. MOORE '41.

E. E. Wonder House of Light . . .

TUCKED away among the tall buildings near the Power House is a building that contains a wonderland of light and color — yet most of the students at the university are unaware of its existence. It is probably one of the most interesting laboratories on the campus; it deals with all the amazing and beautiful effects of light and color, and how they influence us through manufacturing and industry.

Lighting Displays

Here lighting displays for show windows, attractive colored electric signs, and illuminated exhibits of every sort are demonstrated; lighting for shops, factories, and mills is tested and improved; glass bricks are tested for the amount of light that they will transmit, and colored glasses for special uses in unusual signs and exhibits are shown. Behind the footlights of a small stage, an artist's paint rag becomes a brilliantly colored Persian shawl with the magic black light. Throughout the entire laboratory the effects and artistic values of light and color are studied and demonstrated.

As one walks up the stairway to the laboratory, he sees some colored plates of the recent World's Fair that show the effect and arcitectural value of incorporating neon and flood lamps in the various buildings. Those who saw the fair will well remember the striking beauty and power of the Chrysler, General Motors, and Transportation buildings at night. This is a very fine example of one of the most recent uses of colored light—that of outlining buildings to make them more impressive and more beautiful. These plates serve somewhat as an introduction to the lab itself, for as one walks into it, he sees a room that is neat and attractive, yet it is filled with lighting equipment of all sorts.

Hanging from the ceiling, like bunches of grapes from an arbor, are more than fifty different types of the most modern indirect and direct lights for commercial and industrial uses. Over the tables in one corner a powerful five-hundred watt indirect system provides ideal illumination for people working there. It is the most perfect type of light source yet devised, but it is quite expensive, and its large size renders it impractical for home installation. The other lamps that hang from the ceiling are of many different sorts, such as spot lights provided with gelatin slides; long tubular lights that have the filament in one long string, instead of the usual loop; bright flood lights for illuminating large areas in factories or mills; indirect lights that look something like the modern domestic chandeliers; and many others. Each separate light is controlled by an individual switch. This makes conbined effects very easy to produce, and greatly increases the versatility of the system.

Modern Blackboard Illumination

Along the walls the blackboards are lighted by tubular lights, some of which have orange-colored glass. This provides more light without any glare, and rests the eyes of those at the blackboard. Just next to it is a case of glass bricks that are used in constructing modern factories and homes. The use of these special bricks enables much more natural sunlight to enter the building than was possible with the old system of construction, and cuts down the cost of artificial light in addition to improving the appearance of the structure. In conjunction with this is a bank of small, individual panes of colored glass. Some synthetic building stones and natural marbles and granites are also included in this particular section. When the small panes are lighted from behind, one can see which light is easiest on the eyes and that which is best for display windows that contain articles of a certain predominant color. Blue has been found the best colored light for illuminating a room in which some very intricate or precise operation is done, such as fine machine work or disection. These various panels of glass and brick represent part of the work now being done with the effects of light and color in commercial and technical fields.

On another wall, next to the three huge banks of switches which control all the lights, is a bank of about twelve bulbs that form part of the historical exhibits in this room. The bulbs represent the evolution of artificial light from the time of the first carbon filament bulb down to the present day type in which the filament is a doubly coiled spring. This small but interesting panel portrays graphically the progress made in the lighting industry during the past half-century.

Bulb Exhibit

Just beneath this panel is another which shows the various types of bulbs in use today. The modern sixty watt lamp, the special bulb for spot lights, the strong bulbs used in moving picture projectors and lanterns, the lamps that have straight sides and caps of colored glass for special signs; the blue lamps that produce light nearly like the sun; frosted bulbs with special filaments; all these and many more are shown. One hardly realizes the many different types of bulbs that are employed in so many diversified industries and ways until he sees this panel. It makes one see how essential light is in our lives, how extensively we use it to help us in manufacturing, how it amuses us through the theatre, and is of general service to us everywhere. Light follows mankind like a faithful guardian and slave wherever he goes.

There are also two or three exhibits placed by electrical companies. They show different kinds of fuses, switches, connectors, wiring devices, plugs, protectors, and cable in use today. They serve as invaluable informative exhibits that give one who has never experimented with ordinary wiring a definite idea how it should be done and the kinds of equipment that are available.

Lights Effect Colors

Just above these exhibits is a practical demonstration of the difference in light sources that make an object appear of much different shade of color than it would appear in the sunlight. Perhaps some of you have purchased an article of clothing at night that seemed a totally different shade of color when you looked at it the next morning. This exhibit demonstrates the reason for this. In three compartments that are isolated from each other by wooden partitions are three identical pictures of a winter scene at a large steel mill. It is night, and the orange light from the furnaces lights up part of the chimneys and mills, and leaves the rest in a dark shadow. This direct contrast of light and dark, and particularly the blues and oranges that are used in the pictures make it an excellent example for the demonstration. The three compartments are lighted from the top; the first with an ordinary Mazda bulb, the second with a daylight bulb, which is slightly blue, and the third with two lamps that have special filter lenses over them so that they look almost like spot lights.

When all three of these bulbs are turned on, one easily notices the difference in the appearance of these

—Courtesy Architectural Forum.

Indirect Electric Lighting and Glass Brick Illumination in New Bus Station

three identical lithographs. The first picture has the orange colors in it over-emphasized to the detriment of the deep blues. The second appears with a fairly equitable balance between the relative strengths of the two colors, while the blue predominates in the third picture. This study shows that our artificial lamps that are in everyday use contain more orange and not as much blue light as that given off from the sun. The other lamps represent attempts that have been made to compensate this discrepancy.

In the back of the room is a remote controlled slide lantern that was manufactured in the university. It uses weights for a propelling force. A solinoid acts on a plunger which fits into holes that are by each slide. When the solinoid removes the plunger, the weight of the bricks pull the wheel around till the plunger slips into the next hole. This simple device makes an effective slide lantern.

Miniature Stage

Perhaps the most entrancing piece of demonstration equipment in the whole lab is the miniature stage. This stage is mechanically constructed so the effects of black light, flood lamps, spot lights, and many combinations of the four colors of the artificial light, amber, red, green, and blue may be easily demonstrated and studied. The curtains are pulled by a motor that is controlled outside, thus enabling the lecturer to stand at his usual place during the demonstration. The stage is all faced in black cloth, and the drop curtains and board on which pictures and articles are placed is painted black because no light must be reflected from anything but the subject of the demonstration. Footlights, borders, tormentor spots, and two floor lamps comprise the regular lighting sources on the stage, while mercury vapor and ultraviolet sources give many of the special effects.

Demonstrates Lighting Effects

This stage is used to demonstrate the effect of various tenses of artificial light on different colors and combinations of color. Objects that appear dull and uninteresting glow brilliantly with green phosphorescent or deep purple colors when placed under black light. This property of some minerals, known as flourescence enables them to be identified when no other way will succeed, and is also used in the larger display windows to some extent. This type of display is rather expensive but it produces a very striking effect, as the objects seem to glow with an inner light. Some advertising is done by this method.

Other designs are painted with special pigments that react to the influence of ultra--violet light. In ordinary light they appear simply as flow-

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One Man's Idea of

The Value of the Scientific Attitude

IN A discussion on this subject it is necessary that we first define what we mean by the "scientific attitude." The scientific attitude requires first a belief in the fundamental cosmos of the world of nature coupled with an intense desire to comprehend the laws that make up that cosmos; an insatiable curiosity to know, not for the sake of the rewards that knowledge brings, but for the satisfaction that knowing brings. This outlook the scientist has in common with the philosopher.

The philosopher who preceded the scientist gave much towards the birth of the scientific attitude. Socrates introduced the method of hypothesis. Plato reached the conclusion that "the objects of real knowledge are not the ever changing things of the sensible world, but are the immutable, eternal objects which he called 'Ideas.'" Aristotle constructed a great logical system of truth based on "form" and "method." From philosophy came the science of logical thinking within given premises. And from philosophy came the heritage of thinking about the nature of things, the contemplation of phenomena not immediately associated with the problems of existence; a heritage that was essential to the growth of science. All these philosophies were largely speculative or intuitive in the reaching and establishing of their ideas. Deductive methods of reasoning were almost the only means used in getting at truths.

In the sixteenth century there occurred a significant change and development in the method of discovering the nature of phenomena. Roger Bacon probably first wrote on the validity and advisability of experimental research. He originated the philosophy of inductive science which is the basic process of scientific work. Gallileo and Newton made use of this new tool of the reason in verifying their theories. They did not accept as fact that which merely appeared reasonable and logical; they tested their premises by experimental methods. In addition, each possessed that philosophical imagination which is a prerequisite for creative scientific thinking. Michael Faraday gives the following description of the scientist and his attitude:

> "The scientist should be a man willing to listen to every suggestion, but determined to judge for himself. He should not be biased by appearance; should have no favorite hypothesis; be of no school, and in doctrine have no master. He should not be a respecter of persons, but of things. Truth should be his primary object. If to these qualities be added industry, he may indeed hope to walk within the veil of the temple of nature."

Perhaps the reason we have scientists is that the scientific attitude has intrinsic value; it is enjoyable to discover the secrets of nature. Harvey, in discovering the circulation of the blood, must have felt a great surge of pleasure at uncovering the laws which govern the circulatory system. When he was asked why he labored so long at this problem he answered: "It is sweet not merely to toil, but to grow weary, when the plains of discovering are amply compensated by the pleasures of discovery." Likewise, Newton, in formulating the law of gravitation, was almost overcome by emotion when he found his theories checked by experiment. Upon making his calculations concerning the displacement of the moon due to the gravitational forces of the earth, he became so certain that they would agree with his law of inverse squares, that overcome with emotion he was forced to have a friend complete the computations. Kepler, when he had completed his third law of planetary motion, said:

> "What I prophesied two-and-twenty years ago . . . at length I have brought to light and recognized its truth beyond my most sanguine expectations. It is not 18 months since I got the first glimpse of light, 3 months since the dawn, very few days since the unveiled sun burst upon me. Nothing holds me; I will indulge my sacred fury."

From what these men have said it is apparent that one of the greatest values of the scientific attitude to the individual is the aesthetic pleasure he derives from its employment. But this is by no means the only value of the scientific attitude. Its inherent value from an objective standpoint is plainly evident from a consideration of the remarkable development of the world's material civilization that has taken place in the last two centuries. This development has come about through the application of the various sciences to specific problems. The bodies of knowledge that make up the sciences are themselves the product of the scientific attitude.

In the science of medicine the principle of vaccination has been of incalculable value in the prevention of disease. This principle, discovered by Jenner, was further explained by Pasteur, accidentally, in his study of chicken cholera—it was the outcome of scientific curiosity. The telegraph, radio, and telephones; electric motor and generator, and electric light; photography and motion pictures are a few recent scientific achievements. Immense industries have been built around them. Yet each was the result of pure scientific reasearch carried on for the sake of knowing rather than for the sake of utility or profit.

Our modern material civilization is founded on the findings of men of scientific attitude of today and tomorrow to determine how to control this civilization as well as to extend it. The great value of the scientific attitude in this day is in its extension to those problems lying outside the domain of the physical sciences. This is the crying need of the times. The scientific attitude has been of immeasurable value to man in the past; it can be of inconceivably greater value in the future.

By R. W. GAINES '39.

NOTE: *This essay received first place in a competition conducted among the pledges of Tau Beta Pi last month. Gaines is the honor junior member of the organization.*

"Perfectly Shocking" is the

1938 Electrical Engineering Show

THE sixteenth biennial Electrical Engineering Show will present in April its exhibition of the marvels of modern electrical science. The first show of this kind at the University of Illinois was held in 1907. It was produced without great expense and netted $289. A few years later the show was made a biennial function, to alternate with the Engineering Open House. By 1921, the show was so well known that ten large industrial concerns asked for permission to display their exhibits. Soon after, a loan fund for deserving students of Electrical Engineering was established from the proceeds of the show. In succeeding shows, there was a definite growth in number of visitors and exhibits, so that in 1932 the loan fund was increased to almost $3,000. Besides this, a $1,000 guarantee was set aside for the 1934 exhibit. From its small start in 1907, the exhibit has steadily increased in size and popularity, and it is now recognized as one of the leading activities in the College of Engineering.

Perhaps a better idea of the possibilities of the coming show may be obtained by a retrospect of the exhibit made in 1936. The show was sponsored by the Student Chapter of the American Institute of Electrical Engineers, with the co-operation of Eta Kappa Nu, electrical engineering honorary society; the Railway Club; and Synton, national radio fraternity. More than two hundred students and two dozen faculty members took part in the construction of educational and entertaining exhibits in the Electrical Laboratory and the Physics Building.

President Willard closed the switch which officially opened the show. Motion pictures were shown; lectures, scientific demonstrations, and special entertainments were given; and for three days the Physics Building and the Electrical Laboratory were the points of greatest interest on the engineering campus. One day was set aside for high school students, and special arrangements were made for railroad and bus service. The Chicago high schools dismissed from classes those students who wished to attend the show. The General Electric company sent exhibits never before shown to the public. A great many entertaining exhibits were prepared entirely by students, and every one was based upon some fundamental of electrical engineering. Many seeming imposibilities were performed. Eggs were fried over a cake of ice; hot dogs were electrocuted; signatures were transmitted over wires and were presented as souvenirs to their owners; a voice was converted into a flickering light beam, which was directed to a nearby building where the voice was reproduced. The mirrors used in this demonstration were so powerful that care had to be taken to prevent sunlight from being reflected upon objects which might have taken fire. Tests of sex appeal were even made with a machine designed for the purpose, and the results were found to be fairly accurate.

Plans for the 1938 show are already under way. A board of managers headed by Daniel K. Chinlund has been chosen, and enthusiasm has been evinced at a general meeting open to all Electrical Engineering students. Rumors have been circulating that a machine, designed to indicate the co-ed's reaction to a kiss, is to be demonstrated at the show in April. The rumors are probably unfounded, but, even lacking this attraction, the 1938 show is expected to have an increased number of visitors, and to truly live up to the motto, "Ten Years Ahead of the World."

ROBERT TIDEMAN '41.

Social Course for Engineers

Open to engineers—**one** pipe course. Yes, believe it or not, and it isn't a course in hydraulics or one in sewage disposal. It's open to every engineer and really should be on the required list in order to be sure that we all learn the Graces of life (Grace who?). The plan of the course is ideal, since it just meets one night during the entire semester and then for only three hours. All of the previous preparation for the class will be to take a few exercises to limber up a bit so you can really "go to town." There will be no homework assigned for later — purely optional, fellows — and the only material needed is one gal who can really swing it. The date of the class meeting is March 25, and the place is the George Huff gym. Come on, guys, register and see how it seems to take a pipe course. The registration fee is as yet undetermined, but whatever it is it will be money well spent. What do you say, fellows? (By the way, register for St. Pat's Ball).

Efficiency of Stoker to Be Tested by M. E. Department

According to Professor A. P. Kratz of the mechanical engineering department, that department is going to install a commercial make of under-fed coal stoker in the University's experimental warm-air heating residence. At the present time the house is being heated by a hand-fired furnace, and quite extensive data is being gathered on the cost of operation of this furnace, the efficiency with which it heats the various rooms, the different room temperatures, temperatures at various levels in the same room, and other similar data.

During the latter part of January a commercially manufactured under-fed coal stoker will be attached, and during the rest of the winter and during the spring similar data will be taken to that now being compiled for the hand-fired furnace. From this the costs of operation and their efficiencies can be compared, and in general, a thorough comparison of the two methods of firing warm-air furnaces will be possible.

R.O.T.C. Engineers Carry off Honors In Rifle Match

Adding to Engineer victories in military, the engineer rifle teams, both advanced and freshman, walked to an easy victory over the other units. In the advanced bracket, the nearest challenger was the Coast Artillery but still a good ninety-seven points behind. In the freshman matches, both the Engineers and the Signal Corps came out on top taking first and second places respectively.

The members of the teams in order of their scores are as follows:

Advanced Engineers—P. Nilsson, T. Lively, H. E. Goeke, M. Clancy, P. K. Hutton, R. C. Flood, F. Rasmussen, R. L. Miller, C. E. Wright, R. S. Hutton.

Freshman Engineers—M. A. Novy, G. Harbor, H. O. Ireland, T. Inglesby, R. B. Lemmon, J. M. Hess, J. S. Munday, E. R. Picken, T. J. Martens, F. V. Herr.

Freshman Signal Corps—C. A. Eversole, W. R. Clutter, E. W. Berry, T. M. Holman, J. M. Jacobowitz, F. W. Snaith, F. W. Smith, A. D. Cloud, S. H. Yasbee, A. L. Saunders.

Your Opinions

Question: Why is it that engineers take little interest in student activities?

•

Hank Schrader: They have enough trouble staying in school doing engineering work.

Geo. Farnsworth: They think they do not have enough time.

Chester Sosnowski: Engineering problems are enough to wangle about without adding more woe that women etc. will add.

Prof. Vawter: I didn't know that engineers took so little interest in activities. We have had very active engineers in student activities.

Ed Fisher: In proportion to the amount of work they can do, I believe that the engineers spend as much time in student activities as do the students of other schools.

J. Welch: It is my contention that the time for student activities is such that it interferes with the engineering classes.

Bob Zaborowski: A certain amount of inertia and probably the fact that activities aren't interesting and that they haven't enough time.

L. J. McCleish: A lot of them seem to think they haven't the time and further, the other schools haven't the mutual interest that the engineers have.

A. A. Krivo: Because they do not realize how important these outside activities are in the development of their ability to get along with men.

★ WHO'S WHO IN ILL

● *O. A. Leutwiler*

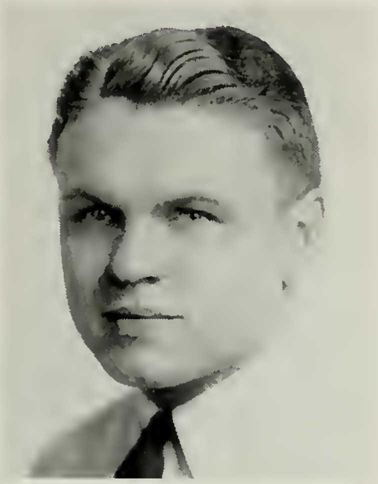
● *C. W. Parmelee*

● *E. B. Paine*

PROFESSOR OSCAR A. LEUTWILER is an "Illini" in every sense of the word. He was born in Highland, Illinois, and received his B.S., M.S., and M.E. degrees from the University of Illinois. He spent two years as an instructor at Lehigh University, after which he returned to Illinois where he now is the head of the department of mechanical engineering. Although his major work has been teaching, he has been a consultant for various concerns and projects during the summers. His vacations have varied from writing some of his books on mechanical engineering subjects to traveling through many of our states. He says about such trips, "why travel so far away when the golfing is just as good here?" It is quite easy to guess that this is his favorite sport, but the excitement of a good basketball game runs golfing a close race. Perhaps his main hobby, that of helping his graduates procure jobs, is one of the finest a person could have. (At least all senior engineers think so.) On the campus he has served on the Illinois Union board and eleven years on the Illini Board of Control. He is, at present, the president of the alumni organization of Sigma Alpha Epsilon. His society memberships include: A.S.M.E., S.P.E.E., Sigma Alpha Epsilon, Tau Beta Pi, Sigma Xi, Theta Tau, Soc. of Auto. Eng., Amer. Gear. Man. Ass'n, Sigma Iota Epsilon, and Pi Tau Sigma.

PROFESSOR CULLEN W. PARMELEE, head of the department of ceramic engineering, has distinguished himself as a ceramist, not only in the United States, but in Europe as well. He was born in Brooklyn, New York and received his college education at Rutgers College in New Brunswick, New Jersey. Here he earned both his B.S. and M.S. degrees, the latter being awarded in 1926. For the first year after his graduation from college, he was employed as a chemist for a company engaged in the dyestuff and tanning business. After this, however, he began his career as an educator by teaching chemistry at Rutgers, where he organized a ceramics department. In 1916 he came to the University of Illinois as a professor of ceramic engineering. In leisure hours, Professor Parmelee's favorite sports are hiking and fishing, and each summer he spends a month or so in northern Michigan for better angling than the Boneyard offers. Last fall he was elected an honorary member of the German Ceramic society. He also belongs to the Deutsche Keramische Gesellschaft, The Ceramic Society (England), A.S.T.M., Beta Theta Pi, Phi Beta Kappa, Sigma Xi, Gamma Pi Upsilon, and Alpha Chi Sigma. He has held the office of vice president, president, and dean of the Fellows of the American Ceramic society.

PROFESSOR ELLERY B. PAINE might well pass for the Connecticut Yankee, if he were given the atmosphere and a good nightmare to help along. Born in Willington, Connecticut, he still keeps in contact with his birthplace through a summer home near there in Woodstock. He received his college education at the Worcester Polytechnic Institute from which he holds the B.S., M.S., and E.E. degrees. After graduation he began work as an electrical engineer, but soon accepted the Professorship of Electrical Engineering at Stetson University. From there he went to the North Carolina College of Agriculture and Engineering, and thence to the University of Illinois. Here he has been the head of the E. E. department since 1913. He spent many of his summers as a consultant—that is before the depression—but since then he has enjoyed himself by visiting his friends and traveling. His travels have carried him through many of the countries of Europe, England, and the East, West, and South of the United States. His favorite sports are swimming and skating. Extensive writing in technical journals and the Bulletins of the Engineering Experiment Station show his active interest in research. His name is included on the rolls of A.I.E.E., S.P.E.E., Sigma Xi, Tau Beta Pi, and Eta Kappa Nu.



R. W. Gaines ●
R. P. Parshall ●
W. D. Rich ●

WILLIAM D. RICH, a tennis playing M.E., says that ever since an important day back in June, 1935, he has called Chicago his home town. Class of '33 of Morgan Park High School claims his membership. He possesses six varsity letters from high school, where he divided his services equally between the basketball and tennis teams. His name was then listed on the pay roll of Armour and Company for a year. In the fall of '34 he was able to satisfy an ambition that had started years before, by enrolling in mechanical engineering at the University of Illinois. His choice of engineering was evidently inherited, as two brothers and his father are already engineers. Also, both brothers are loyal Illini. During his freshman year, Bill won his numerals in tennis. His sophomore year saw him win his "I" and become of member of the Tribe of Illini. Last year he was captain of the tennis team and played No. 1. He is a member of Delta Sigma Phi fraternity and is serving as chapter president this year. Rich has spent the past two summers working for International Harvester and he hopes to make the connection a permanent one next June and to enter their industrial school. Athletics will always occupy his spare time.

RICHARD P. PARSHALL might be called a travelling player. He was born in Pontiac, Illinois, in 1915, and lived in Morris, Oak Park, and Elmhurst, besides the two years he has spent here. In high school he won letters in football, basketball, and baseball, was active in dramatics, went to two State and two National Speech Contests and played the lead in his senior class play. After all this activity, York Community High School in Elmhurst gave him his diploma. Dick spent his first year of collegiate life at Elmhurst College, where he won numerals in football, a letter in baseball, and played the role of "Man" in *The Life of Man*. At the beginning of his sophomore year, Parshall transferred to the University of Illinois, where he is now enrolled as a civil engineer. He played in *Man and the Masses* and during the summer term, besides catching up on the work he missed his freshman year, appeared in four Shakespearean productions. During his junior year, Dick was initiated into Pierrots, men's dramatic society, and Sigma Tau, engineering honorary. This same year he appeared in a number of the Theatre Guild productions. So far during his senior year, Dick has been initiated into Mask and Bauble, honorary dramatic society, and the National Collegiate Players, national honorary dramatic society. He has also appeared in *Boy Meets Girl* and *Spring Dance*. Parshall worked for the State Highway Department last summer, but he hopes to do sales engineering work after next June. Besides his interest in dramatics and sports, he likes to read, and has made a collection of pipes.

ROBERT W. GAINES moved to Urbana from Crete, Illinois, when he was still a toddler. When he receives his B.S. in mechanical engineering a year from next June, he will have completed sixteen years of school in Urbana (except for P.E. at the new gym). Perhaps the word "when" in the above sentence should be changed to "if," for the day before he was graduated from grade school he fell out of a tree, and repeated the feat the day before Urbana High School Commencement Exercises in '35. Between these two events, Bob played football, worked on the staff of the *Echo*, was a member of the student council, and made a 4.99 average which earned him membership in the school honor society. This fall, in his junior year, Gaines received one of the greatest honors that an engineer at the University of Illinois can earn, that of being elected to Tau Beta Pi as the honor junior. He is also a member of A.S.M.E. and Pi Tau Sigma. He did not accept bids to Phi Eta Sigma and Pi Mu Epsilon, math honorary. Outside of engineering, he is a member of the Baha'i Youth Group. During the summer of '36, Bob helped build a house. Last summer he attended school. He says that he is just a plain M.E., not having selected an option.

Bits About Them . . . .

R. C. A. Purl '37, and Winston Black '36, were back on the campus just before the holiday vacation to help certain girl friends do their studying in the library. Black is working in the engineering research department at Lehigh university, and Purl is with the Union Carbide and Carbon company.

The fourth annual edition of the "Pop-Off" of the '33 M. E.'s has been mailed out to the 55 in the group. A picture of Prof. John A. Goff appears on the cover; facsimile letters from Profs. O. A. Leutwiler '99, head of the M. E. department, and H. J. Macintire, of mechanical refrigeration are included.

Gordon (Cork) Peacock (Min. Eng. '29) returned to campus last month from three years work in the copper mines of Chile. The Mineral Industries society were fortunate in persuading him to speak of his experiences at one of their meetings. "Cork" spent his time in South America working seven days a week at an altitude of some 10,000 feet in the mountains. Vacations for the men were provided by giving each engineer his choice of four five day vacations a year, or one fifteen day vacation a year, during which time the men make a bee line for the sea coast to enjoy the company of other American and English citizens. The construction of the mines is quite interesting in that all shafts penetrate the mountains horizontally, then turn vertically upward to the place of actual mining. "Cork" plans to leave for the Philippine islands after the Christmas season.

Edward M. Anderson has a new job on the engineering staff of the city of Champaign. He was formerly city engineer of Urbana and has recently been with the Decatur and Champaign WPA offices. His Illini degrees are plentiful—B. S. '32, M. S. '33, and B. S. in education '34.

E. N. Angell '33 was recently transferred to the Chicago office of the General Chemical company. He and one other man are in charge of six plants west of the Mississippi river.

During the C. I. O. excitement at the South Chicago plant of the Republic Steel corporation, Dick Armitage '33 lived as well as worked within the gates.

Dan Christopher '33 is a sales engineer covering Illinois, Iowa, Nebraska, Missouri, Kansas, Oklahoma, and Texas for Norma-Hoffman Bearings Corp., Chicago. Dan is very anxious for the Illinois Engineering college to install a petroleum engineering department.

Kenneth J. Rabe '33 is working in the piece-rate division, Western Electric, making time studies. He attends evening classes in industrial management at Northwestern university. Sometimes sees John Zikmund and Marshall Wallberg, both at Western Electric, and also Rollo Pollock.

Student Organizations . . .

PHI KAPPA PHI

The national honor society, Phi Kappa Phi, which takes its members from the upper three per cent of the students in the various colleges of the University, recently initiated the following engineering students:

Ralph Frederick Fearn--------M.E.
Philip Roger Gillette---Eng. Phys.
Donald Gilchrist Richards----M.E.
James Mueller Robertson------C.E.
Milton Parker Vore----Eng. Phys.
Robert Zaborowski------------C.E.

RAILWAY CLUB

The Railway club held several parties during the past semester. One of these was a Thanksgiving party at which the members of the railway engineering department were guests. Another of their parties was held shortly before Christmas.

Various members of the club have assisted in making tests with the dynamometer car and two Illinois Central railroad locomotives. These tests were made on runs between Champaign and Chicago. The dynamometer car is owned jointly by the I. C. railroad and the railway engineering department.

S. B. A. C. S.

At a recent meeting of the student branch of the American Ceramic Society, C. F. Hanks and L. J. McCliesh were elected secretary and vice president, respectively. On January 7, the society held its second annual Ceramic Ruckus. The programs for this dance, which, by the way, is the only one which is sponsored by an engineering departmental society, had covers made of glass cloth.

On January 12, the society had as speaker, A. E. Badger, Research Associate in Ceramic Engineering. He spoke on his experiences in Germany during the past year. Also at this meeting, pictures taken by Dr. Andrews on the senior inspection trip were shown. On January 18, Robert B. Sosman, president of the American Ceramic society, was the guest speaker. R. S. Bradely, director of research of the A. P. Green Fire Brick company, spoke on February 10 and movies of plant processes were also shown.

A. S. C. E.

Some of the speakers presented recently by the student chapter of the American Society of Civil Engineers were John C. Page, commissioner of the United States Bureau of Reclamation on December 3, Professor T. C. Shedd on December 8, and Louis C. Hill, president of the A. S. C. E. on December 15.

Commissioner Page, in his talk, outlined the work of the Bureau of Reclamation and showed slides of the various projects constructed by the bureau. These included Boulder and Grand Coulee dams. Professor Shedd presented the commentary for an illustrated lecture on the George Washington bridge. President Hill, in his talk, discussed "Conditions and Variations of Salary in the Past Forty-five Years."

Just before the holidays, the student chapter brought out the first copy of their quarterly, the Illini A. S. C. E. News.

A. I. E. E.

The student chapter of the American Institute of Electrical Engineers held an open meeting for all E. E.'s early in December for the purpose of making plans for the E. E. Show. On December 16 the chapter held a social meeting for the faculty and their wives and the students and their girls. The chief speaker at this meeting was Miss Rita Pinkerton '41, formerly an E. E., who spoke on "A Trip to South America." Cider, doughnuts, and chocolate milk were served as refreshments.

ETA KAPPA NU

Eta Kappa Nu was organized to bring into close union those men in the profession of Electrical Engineering who have manifested a marked ability in their chosen work. Unfortunately its pledges had not been announced at the time this material went to press.

A. S. A. E.

The student branch of the American Society of Agricultural Engineers spent part of last semester discussing the problem of seed corn drying. In one of the early meetings, Professor E. W. Lehmann, head of the agricultural engineering department discussed the problems facing the agricultural engineer. Following this talk Ken Fuller '38 described the construction and operation of a seed corn dryer which he and his father built recently. At another meeting, R. H. Reed of the agricultural research staff described his work on dehydration. After his talk he took those present to his laboratory and showed them his dehydrator.

Shortly before the Christmas vacation the organization held a meeting at which Mr. C. N. Hinkle of the Standard Oil company showed their movie, "Stan," which depicts the operation of tractors. The student branch has also co-operated with the Agricultural council and Engineering council.

Advice to Graduates

(Continued from Page 6)

yearning for intimate companionship and to keep them straight.

Engineering is, or should be preparation for a higher and more useful life which, if you please, may still be called engineering. The engineer is recognized as a useful public servant who gets a pat on the back, or in the head, for what he does while someone else gets the credit for the accomplishment. It is my hope that you may pass the various grades of engineering and on up into that higher sphere where you will be the one looked to for leadership and the one upon whom the honors will be bestowed in proportion to service rendered.

Complaint is even now made that the present sad slump in public morals is because of the recent phenomenal advance in technology. It is true that technology has gone ahead of civic, ethical, and religious development, and the contrast is used as an excuse by the laggards. Let us take them at their word and accept the responsibility not for a moment to slacken our pace, but to gather all human interest under our wings and give them our engineering supervision.

Visionary? Many others are calling themselves engineers, so let us extend the scope of our profession and make it all human engineering. The times are working that way, but the result is waiting for the engineer to overcome his inferiority and boldly step out and be a leader. To do that he must revise his conception of the ideal engineer and make himself an ideal human being.

L'Envoi

A tenderfoot prospecting party in quest of gold invites a way-faring miner to share their supper. As they sit around the camp-fire after eating, the

novices seek helpful information from the old man. The party is well supplied with books, metallurgical knowledge, camp equipment, tools, and such. In fact, all it seems to lack is a gold mine, and when they ask the old timer where there is a good place to dig for gold that gray-haired man, who had prospected for fifty years and now has a pick-axe, frying pan, blanket, and burro, to show for it, arises and with sweeping gesture in the direction of a distant mountain range says:

"In them thar hills way beyond the
range is gold enough for all
And now's the time to take over
the job for I quit that trail
last fall.
Take your pick and go dig in the
hills."
Work hard as an engineer aughter
And when you become a chief engineer you can marry the
president's daughter."

E. E. Wonder House

(Continued from Page 9)

ers or designs that are very common and with nothing unusual about them. When transformed by black light, they glow and shine with an uncanny brilliance.

This stage helps in many ways to demonstrate the work being done with color and light, yet the work of those in the illumination laboratory goes farther than that. They have made studies of student lighting in study rooms and residence halls. There are 25 foot candles on the desks in the lab, while glare is at a minimum. Studies and surveys were made in most fraternity, sorority, and residence houses in which students live. They found some conditions that would produce terrible effects on the eyes, some even conducive to blindness and eye diseases. The goose-neck lamp is the worst offender, while the I. E. S. lamps are probably the best available lights for study rooms.

The work of those who direct the illumination laboratory is varied and diversified, but their work has been toward a definite goal better illumination for factory, home, and classroom.

By ALLEN ADAMS '41.

TAKEN *at* RANDOM . . . . .

—*Courtesy of G. M. Basford and Co.*

METAL IN THE WIND

New Core Drill

To facilitate the inspection of underground rock formations, a drill which will cut a core of 36 inches in diameter has recently been developed.

The drilling is accomplished by rotating a cylinder of the proper diameter, employing shot as a cutting medium or, in soft rock, the teeth are made of high grade alloy steel. The core, after the desired depth has been reached, can be removed in several ways. One method used is to insert small, charges of dynamite at the bottom of the core and break it off by means of the explosion. The core is hoisted by means of a small hole drilled in the center of the core, to which grapples can be attached.

—*Courtesy of Scientific American.*

36 INCHES IN DIAMETER

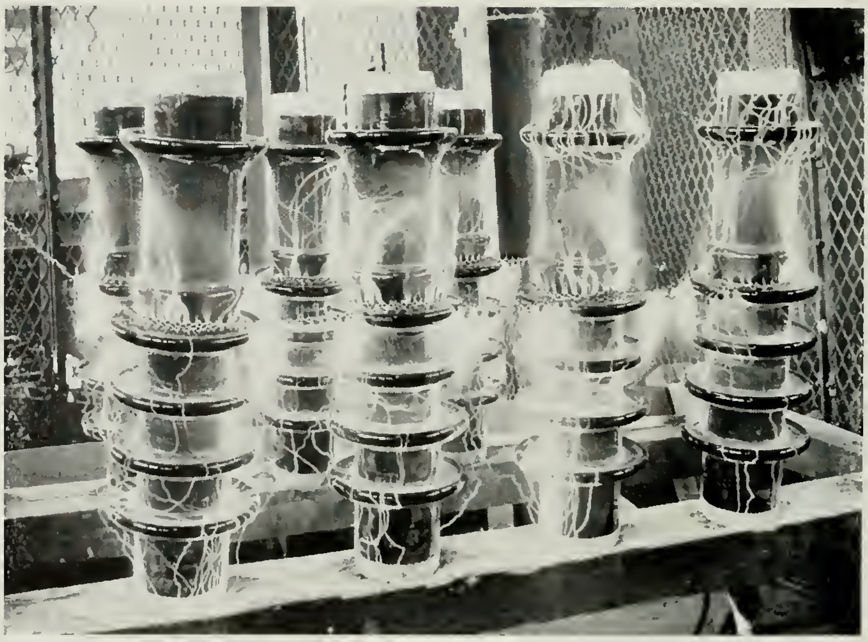
All Metal Yacht

The America's Cup yacht, "Ranger," which won a series of races over the British contender, "Endeavor II," last August and thereby kept the coveted trophy in the United States was designed by Mr. W. S. Burgess who also designed the yachts "Rainbow" and "Enterprise" for former races. It was of steel construction throughout, and measured 135 feet 5¼ inches overall length. It was fitted with a vanadium chromium steel mast 165 feet long which was designed to carry from 6,000 to 7,000 square feet of mainsail. The 110 ton lead keel was the heaviest ever used on an America's Cup yacht, and was held in place by a flat plate of arc-welded steel.

Electrical Insulator

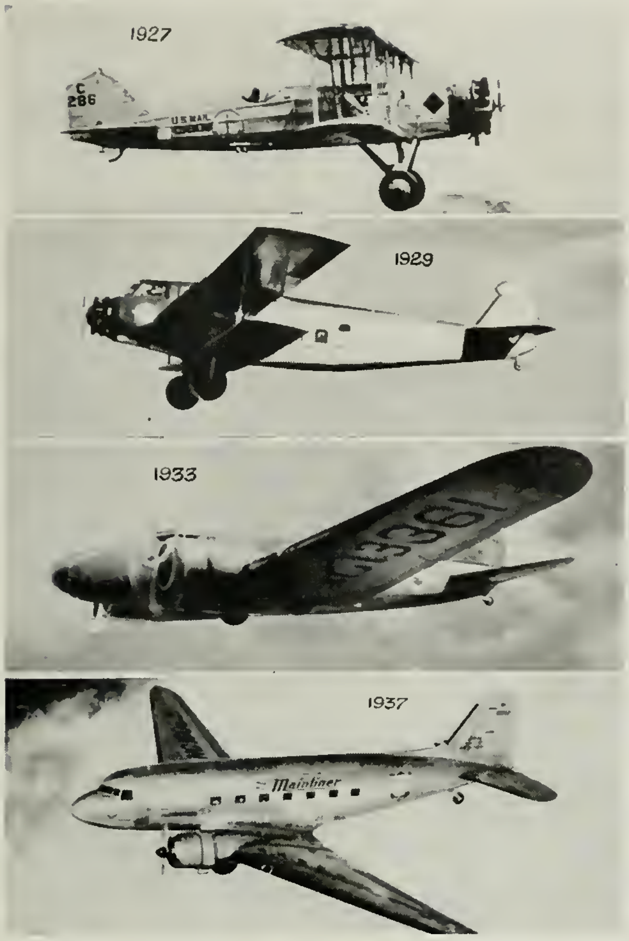
A literial bath of electricity surrounds these porcelain bushings and insulators which are on test. The test is carried out, using flash over, which takes the place of the 200,000 volts of electricity regularly used.

The tests are made to insure the efficient service of bushings and insulators in the transmission of high voltage.



-*Courtesy of Scientific American.*

BATH OF ELECTRIC FIRE



—Courtesy of Scientific American.
PAST—PRESENT—FUTURE?

—Courtesy of Scientific American.
THE MODERN WAY

New Building System

In the construction of any structure, one of the most important items that have to be taken into account is the dead load of the building. In building construction any decrease of the dead load means a lighter structure which may in turn mean a more economical and faster built building.

With the new system, in which the design of the floor and roof deck construction have been perfected, it is claimed that it is possible to save at least 10 per cent of the construction costs.

In reinforced concrete construction, one of the most important costs are those of the forms. In the new system this form work is all relaced by hollow sections of light gage, cold formed steel, in which the beams are cast.

On top of these hollow steel sections are placed the pre-cast slabs of light-weight, reinforced concrete. The strong reinforcing rods protruding from the pre-cast constituting the stirrups of the beam and make the reinforcement continuous throughout the beam and slab. The beams are then cast on the job.

Progress In the Air

Although the beginning of so-called "schedule flying" can be said to have started in the United States before the War, it was not until 1920 that the United States Postal Department completed its first coast-to-coast mail route and not until 1927 that the first passenger service from the Atlantic to the Pacific was started.

In the beginning, the single-engined passenger-mail planes took 33 hours to span the 2,700 miles journey. Today the same route is spanned by giant twin-engined birds of the air in 15 hours and the time is getting shorter every year.

In 1926 there was no cross-country air transportation; in 1927 it took 33 hours fora 2,700 mile trip; in 1938 13 hours are taken for the same trip—breakfast in New York, supper in Los Angeles.

Steamlined Streamlining

Efficiency of a new standard has been incorporated into the new powerful locomotive that has recently been designed for the Baltimore & Ohio Railroad. The new locomotive is of radical design and has 16 cylinders arranged for constant torque which will provide a continuous flow of power. It is believed that the new locomotive will provide approximately 5,000 horsepower and that it will be able to pull 14 standard Pullman cars at a speed of 100 miles per hour on a straight level track.

Each of the four drive-wheels will have a separate steam motor and each motor will have four cylinders directly geared to the axle. No counterbalancing of any kind, will be required on the wheels.

The total weight of the locomotive will be about 400,000 pounds.

—Courtesy of Scientific American.
"STEAMLINED STREAMLINING"

More of Nature's Antics

The photograph shown below was taken on the Connecticut River during a storm. The interesting thing is the fact that the lightning has, or seems to have, multiple paths and streamers.

—Courtesy of Scientific American.
NATURE'S FIREWORKS

The "One and Only"

WHY did you enter engineering? I suppose Florence Gorka, sole girl engineer, has been asked this question numerous times. However, when I questioned her, instead of finding, what I suspected, a girl very peeved from being asked the same question over and over again, Florence surprised me by presenting one of the nicest personalities with which I have come in contact.

Florence did not make up her mind to become an engineer on the spur of the moment; rather, for three years she deliberated over the situation and became firmly convinced that engineering was the only profession for her. Today we find Florence fulfilling her ambitions, enrolled in the University of Illinois as a freshman civil engineer.

An honor graduate of Fenger High School, Chicago, in 1935, Florence left behind her an excellent record. She was editor of the year book, business manager of the school newspaper, president of the math club, vice president of Phorex Honor Society, and a committee chairman of the National Honor Society. With a straight A in high school math, Florence was in the upper ten graduates of her class. After graduation, she worked with her parents until her enrollment here.

Contrary to some peoples' views south of Green Street, Florence finds the engineers very likeable. She thinks the work is very interesting and likes it very much. Further, she states that she is not afraid of anything, and that she can take it. When I told her that Rita Pinkerton had transferred out of the College of Engineering, she said that nothing would stop her from completing such a course. From my short conversation with her, I'm inclined to believe that nothing will stop Florence from fulfilling her ambitions.

Most of all, she wants to be a surveyor and work in South America. The harder the job, the better she will like it. Short life and physical disability hold no horror for her. In fact, she says that as long as she has done something worth while, she does not care what happens to her. An orchid to you, Florence, and I believe that the name of George (middle name) will fit you better than some boys who own it.

By ED FRASER '39.

Fifth From the Top

ONE of the important reasons for the high national rating* given the University of Illinois Library is the engineer's pride and joy—the Engineering Library, a branch of the Main Library.

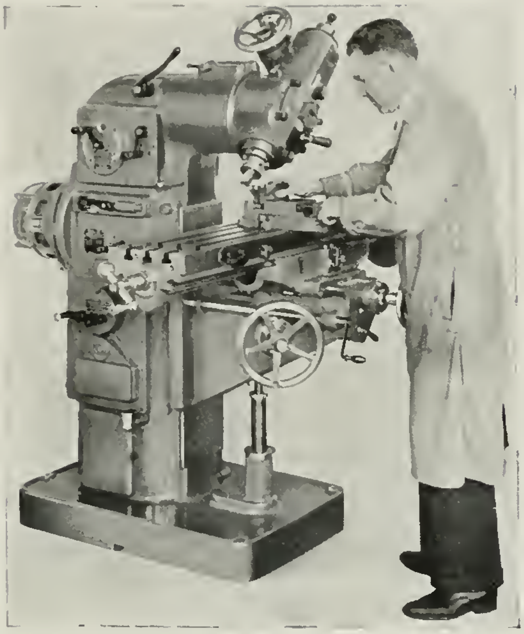
Located on the main floor of Engineering Hall, occupying a large main reading room and an extremely quiet study room on the second floor, the engineering library is a "hefty chip" off the Main Library. For the benefit of those statistically minded engineers, the Engineering Library houses 36,720 volumes, a large majority of which are devoted entirely to different phases of engineering but with a few well-known literary "favorites" to furnish relaxation from technical duties. There are also over 400 engineering periodicals, magazines of general interest, pamphlets, manufacturer's catalogues, books of historical value, and lantern slides used to supplement lectures in various courses. The branch has a seating capacity of 210, including the second floor conference room and tables set aside for graduate students.

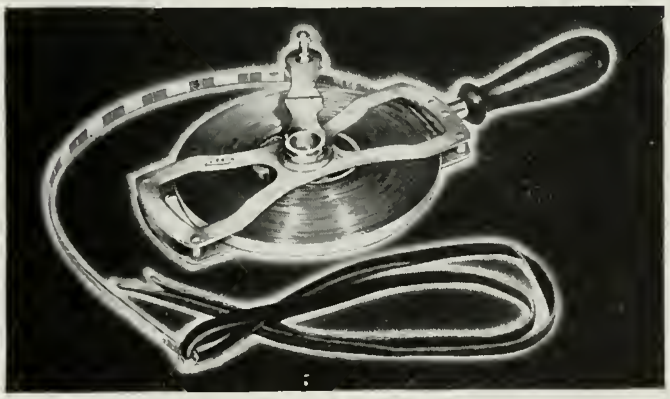
The Engineering Library has become one of the engineers' favorite retreats as is seen by the fact that the seats of the main reading room are almost always completely occupied, with a considerable overflow upstairs. With its solemn and dignified quiet, only occasionally broken by the "swish-swish" of a slide-rule, the Engineering Library is a good place to read and study.

Try it!

By LEONARD OBERMAN '40.

**Ranked fifth among nation's universities and colleges.*





Open for Business!

THE recent failure of the brine pipes at the University of Illinois Ice Rink, maintained and operated by the Athletic Association since 1931, brings before the students a very interesting problem in engineering and presents some actual difficulties that are facing rink operators all over the country today.

In the original floor, a sub-slab of concrete was laid and then a layer of sand was placed in order to permit free movement of the top slab during temperature changes. The top concrete slab, to which steel shavings had been added, was laid on the sand, and the brine pipes were imbedded in this slab. During the construction of the top slab, the sand evidently took water and cementing material from the top slab, and the result was a coarse, porous concrete between the brine pipes and the sand. Brass strips were placed at construction joints in the top slab and held in position by wood wedges driven between the brass strips and the adjacent brine pipes. These wedges were not removed and it was at these points where the first leaks in the brine pipes were discovered; the corrosion which caused these leaks started on the outside of the pipe and progressed inward.

Several factors may have contributed to first breaks or failures in the brine lines, such as electrolytic action between the pipes and the brass strips or the action on the pipe of aerated water contained in the wooden wedges. Of course, as soon as the brine was released, it spread through the porous concrete and the sand layer to all the pipes,

In the new patented monolithic floor, every effort will be made in design and construction to prevent corrosion of the pipe by imbedding it in a slab of good, dense concrete well bonded to the pipe. No sand will be used between the slabs. Instead a layer of heavy asbestos will be placed on the top of the sub-slab so that the top slab which will rest on a layer of zinc plate, will not bond to it and will be able to move freely.

General practice has shown that the most popular ice for pleasure skating always has a wet or "sweaty" surface. This does not mean, however, that good ice is soft or slushy, for it is only at the plane of contact with the atmosphere that the ice should be near the melting point. When a skate passes over ice of this type, the weight of the skater momentarily depresses the freezing point and causes the ice to melt. Of course, an instantaneous re-freezing takes place as soon as the pressure is released, and the surface remains un-marked.

For the operation of this system, many successive coatings of water are sprayed onto the floor, and each is allowed to freeze for about fifteen minutes. This is continued until the desired depth of ice is reached. For ice-hockey, the depth may be three-eighths of an inch, but for ordinary purposes, it is most economical to use ice one and one-fourth inches thick. The temperature at the underside of the ice is determined by the brine pipe and should be from 22 degrees to 24 degrees Fahrenheit. The temperature at the surface of the ice should be about 32 degrees Fahrenheit and is determined by the temperature of the atmosphere, the relative humidity, the air circulation, and, consequently, the number of skaters present. For accurate control of the local rink, there will be ordinary thermometers in contact with the atmosphere, and electric resistance thermometers embedded in the floor at definite places near the surface.

W. O. VOIGT '41.

• TECKNOKRAKS •

"Are you looking at my knee?"
"No, dear, I'm above that."

* * *

"Caught in the act of window peeping, eh?" asked the judge. "That's pretty serious. Are you married?"

"No, Your Honor," explained the defendant serenely, "and that's the trouble. I'm looking for a wife and went window shopping."

Matt Retonde had joined the Nudist Club, and was telling about the first meeting. "They were all sensationally nude," he said, "even the butler who took my hat and stick." Asked how he knew it was the butler Matt snapped, "Dammit, I knew it wasn't the maid!"

* * * *

Inscription on a tombstone: "Here lies an atheist. All dressed up and no place to go."

* * *

A Bishop was considerably upset upon receiving the following note one Friday morning from the Vicar of a village in his diocese.

"My Lord, I regret to inform you of the death of my wife. Can you possibly send me a substitute for the week-end?"

* * * *

The loon is a funny bird, but it takes the stork to kid us along.

* * *

The taxi suddenly came to a halt in the middle of the street.

"What's the matter," called Hartman from the back seat.

"I thought the young lady said stop?" answered the driver.

"Well, she wasn't talking to you."

* * * *

Prof. Severns: "Name a great time saver."

Bob Hilman: "Love at first sight."

* * *

"I wanna come in."

"No, you can't come in."

"Why can't I?"

"'Cause Mamma says boys should not see little girls in their nightgowns."

Short Silence. "You may come in now, I took it off."

Bluenose: "Pardon me, young lady, in the matter of your dress, don't you think you could show a little more discretion?"

Co-ed: "My gosh, some of you guys ain't never satisfied!"

* * *

They were skating on the rink and Liza fell down, flopped over, and came upright in front of Rastus with remarkable agility.

"Did you see how quick ah recovered mah equilibrium, Rastus?"

"Golly—yaas—almfos' befo' ah noticed it was uncovered."

* * *

Harry Atkinson says, "Love is when a man likes to help with the dishes."

* * *

Swede Nelson: "Just between you and me and the lamp post, what do you see in that girl?"

Dick Schwar: "Not a thing. But with the girl between me and the lamp post, well, that's a different story."

* * * *

A man needs $3 and has only two smacks. He pawns the two bucks for $1.50 and sells the ticket to another fella for $1.50. Now he has three bucks, so what?

* * *

She: "Oh, steward, I've got a complaint. A sailor peeked into my cabin last evening."

He: "Well, what do you expect for second class—the captain?"

* * *

Dumb: "We're going to give the bride a shower."

Dumber: "Count me in. I'll bring the soap."

CAREERS OF CARRIER ENGINEERS

BECAUSE A KAFIR COULDN'T STAND THE GAFF...

● Man's quest for gold has led him into strange places . . the frozen lands of the north, the deserts of the south, the bowels of the earth. But from the land of Cecil Rhodes comes an amazing tale of muck and sweat and terrific heat . . . and man's victory over the elements!

The Robinson Deep Mine, Johannesburg, South Africa, is the world's deepest hole—8,500 feet *down!* In those depths is gold, but with temperatures exceeding 100° Fahrenheit and humidities approaching 100%, production reached what seemed to be an impassable barrier Even the natives couldn't stand the intolerable heat!

What could be done to improve conditions, to increase the efficiency of miners, to permit deeper excavations for gold? The answer was Carrier Air Conditioning!

Into those black depths went Carrier engineers and for 365 days tackled the problems of rock temperature and adiabatic compression of air, both of which go higher as shafts go lower. They studied the excessive humidity; heat from oxidation; heat from human bodies; frictional heat from machinery; and heat from explosives. And from their analysis came the installation of a Carrier Air Conditioning system with a cooling effect equal to 4,000,000 pounds of ice every 24 hours.

Thus again had engineering triumphed in a victory affecting not only production, efficiency and comfort, but one which left its impress on world economics.

There is no limit to the scope of Carrier Air Conditioning—nor to Carrier's further expansion and future accomplishments—except as measured by the number and ability of the young engineers Carrier can bring under the training of the pioneers who have been through the 35 years of the development of the art.

In the Carrier organization, *young* men hold responsible positions—their capacity gauged not by age, but by ability. And whether that ability is fostered best by laboratory research or field work in the far corners of the world, Carrier enables engineers to progress. Today in 99 different countries, you will find evidence of Carrier engineers' contribution to the world's progress!

During 1937, Carrier trained 300 recent graduates from leading engineering schools in every section of the country. Carrier needs more men. If you had a good school record, and are interested in the world's most fascinating and fastest-growing industry, write us.

Carrier Air Conditioning

CARRIER CORPORATION, SYRACUSE, N. Y.

AN ORGANIZATION OF ENGINEERS

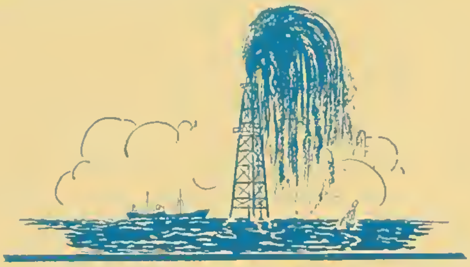
G-E *Campus News*

TEST ALUMNI DAY

TO celebrate the third annual reunion of engineering graduates of General Electric Test, men all over the world gathered in groups to listen to the international radiobroadcast of the reunion at Schenectady, N. Y. Officers and prominent members of P.T.M., or Past Test Men's Association, sent greetings to their fellow Testmen over the General Electric shortwave stations, W2XAD and W2XAF.

More than 15,000 men have graduated from G-E Test—a course which enables them to supplement

their theoretical knowledge with a practical training. Test graduates today hold many responsible positions in the Company. Others have gone into every walk of life—engineers, lawyers, utility executives, farmers, industrial leaders, bankers, and many other professions. There is, however, one tie which binds them all—their experience "on Test," and to many of them that experience is recalled with somewhat the same enthusiasm as days in college.

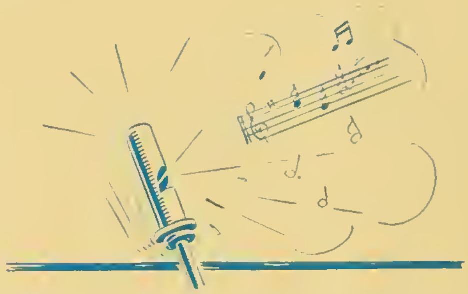


OIL FROM WATER

DOWN on the shores of Lake Maracaibo in the steaming jungles of Venezuela, the Dutch Shell Company owns rights to a fifty-mile frontage. Here it has drilled hundreds of wells to make available the rich oil found in deposits ranging from 1500 to 5000 feet below the lake surface.

The natural gas which accompanies the oil deposits has for years been used to power the wells. In spite of this cheap source of power, General Electric engineers under the supervision of E. E. Thomas, Kansas State '22, were able to convince officials of the Dutch Shell Company that it would be more economical in the long run to use electricity instead of natural gas and gas engines for operating power. As a result, a high-voltage line will be erected along the lake shore, from which step-down transformers will distribute current to the motors in the producing areas.

The Lago Petroleum Company has wells in a section paralleling the Dutch properties and extending ten miles out in the lake, which has already been electrified. The combination of these two companies makes the largest electrified system of its kind in the world, from which 400,000 barrels of oil are shipped daily to refineries in Aruba and Curacao, N.W.I.



WHISTLING GASES

GASES are liquefied to be used as cooling agents and to conserve storage space. Chester W. Rice, Harvard '10, consulting engineer in the Schenectady Works of the General Electric Company, has developed a method of thus processing gases more readily by making them whistle.

To liquefy a gas by this method, it is necessary to compress it to 3,000 pounds per square inch, cool it, and pass it through a series of tubes into a liquefying chamber where the pressure is released through a valve in the form of a whistle, producing a further escape of heat energy. Mr. Rice's whistle is so pitched as to convert the greatest amount of heat energy into sound energy. To be effective, however, the sound energy must be carried away from the liquefying chamber.

Developments such as this are being made by college graduates who were at one time "on Test." Many of them have been off the college campus but a few years and are entering a career in one of the many business and engineering fields in the General Electric Company.

GENERAL ELECTRIC

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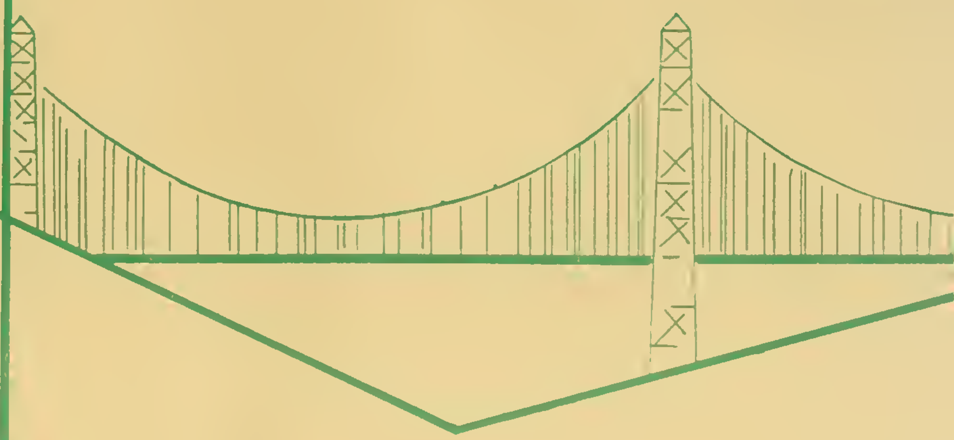

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MARCH, 193[illegible]

The Illinois
TECHNOGRAPH

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THE ILLINOIS

TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

MARCH, 1938

Volume 52 Number 5

DO YOU know the first important step in landing the job you want? In the second of a series of articles containing advice for the graduating senior, Bob Tideman tells how a good application letter should be written.

● We hear all about St. Pat's Ball from a man who had the good fortune to meet and converse with the engineers' patron saint himself. Tom Morrow wishes to correct a few of the ideas about St. Pat and to talk all engineers into attending the Ball.

● The E.E.'s promise a better show than ever before. In this issue, Maurice Carr's conducted tour through the exhibits serves as a preview for the real performance to be presented April 21 to 23.

● When Henry Ford finally makes a car entirely from soybeans, the newspapers will shout that it is something entirely new, but in this issue the Technograph scoops them several years by presenting a few of the little known facts about that farm product that is becoming increasingly important to all industry.

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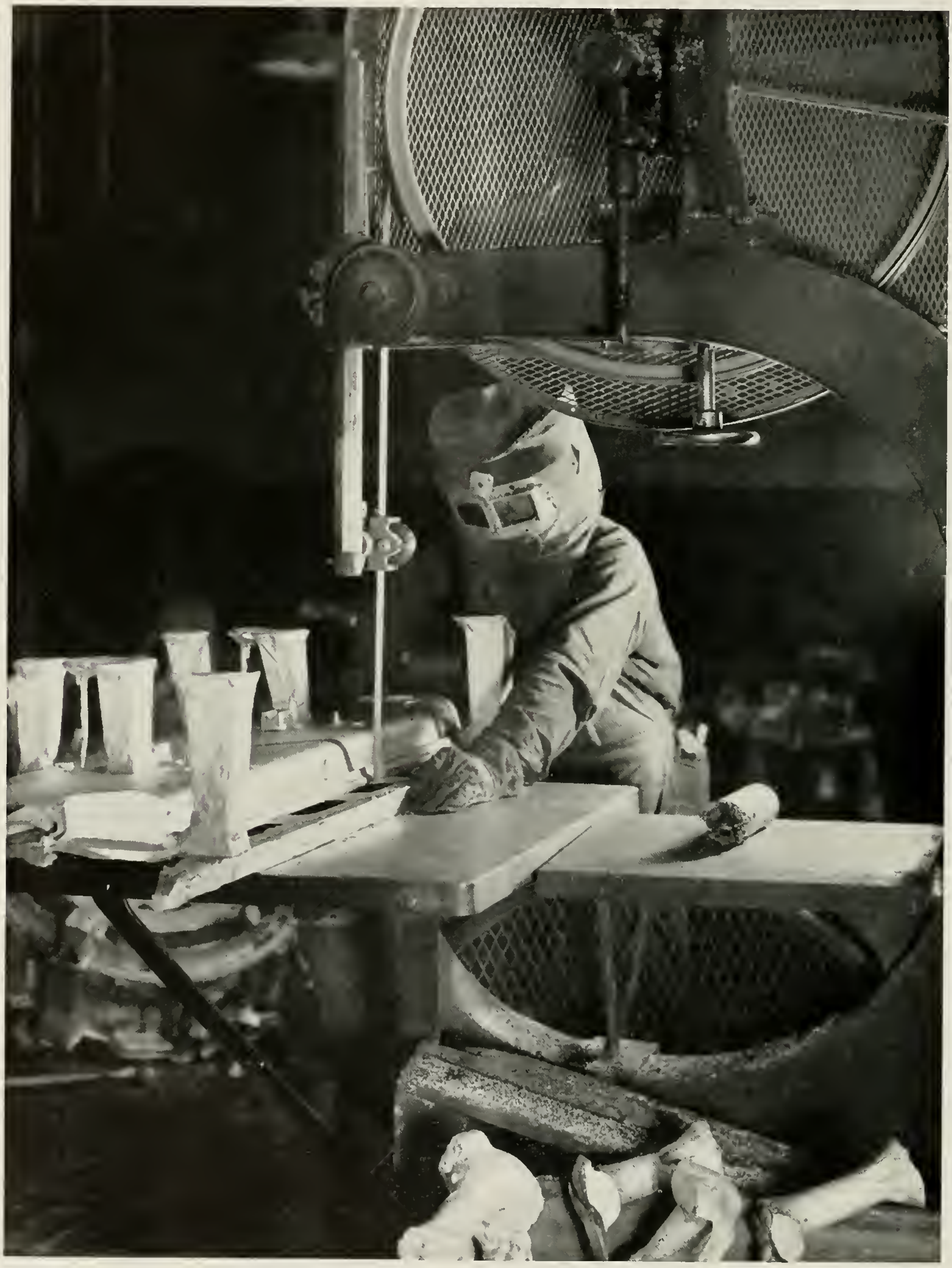


—Courtesy of Aluminum Company of America

TRIMMING ALUMINUM CASTINGS

THE ILLINOIS TECHNOGRAPH

Published Six Times Yearly by the Students of the College of Engineering, University of Illinois

Volume LII MARCH, 1938 Number 5

ST. PAT'S BALL

Engineers Celebrate Birthday of Patron Saint

THE FUNNIEST thing happened to me one day as I was crossing Green street to get to my class. A man about 70 years of age, sitting in a make of car I had never seen before, stopped me, apparently seeking information. I noticed that he was wearing a green tie, that there was a green feather sticking in his cockily-worn, soft-felt hat, and that protruding from between his well-kept white mustache and goatee was a browned clay pipe. In his eyes there was a gay mischievous look, which, together with his appearance, gave me the idea that he was quite a dude despite his age.

"Say, buddy, what's all this here excitement goin' on around these parts? Some sort of a celebrashun or somethin'?" I noticed that he spoke with a decided Irish brogue.

"The engineers are celebrating St. Patrick's Day today, sir. Didn't you notice all of the green ties and socks the fellows are wearing? Why, you even have on a green tie yourself, sir."

"I'm always awearin' one, son. But tell me, who is this St. Patrick guy?"

I was a little ashamed to try to answer him, for at that time, I really knew very little about St. Pat. But I took a stab. "St. Pat was an Irish civil engineer, who the engineers call their patron saint."

St. Pat a Scotchman

He flinched when I said that. "Them's almost fightin' words, buddy. I guess I'll have to put you straight. In the first place St. Pat was a Scotchman by birth, and not an Irishman." Whereupon he went on to illuminate my flickering torch of knowledge with a neater biography of our patron saint and all that he stood for than I later found in any encyclopedia. "And in the last place," he concluded, "don't get mixed up on this point; he was a mechanical engineer, and not a civil. And you had better give him a rousing good celebrashun, too. None of this cheap stuff. If it's a ball you're givin', make it a good one, for if there was anything that St. Pat enjoyed, it was dancing the jig. Well, Erin Go Bragh, son."

And after this amazing discourse, the queer automobile started off, and after a run of a few hundred feet I saw some stubby wings shoot out from the sides of the car, and the whole contraption took off into the air like a bullet and disappeared over Hanley's. It was just as I realized that all the information I had just received was first hand from old St. Pat himself that my alarm clock went off.

WARREN JOHNSON
Chairman, St. Pat's Ball

You all know a little of the story of St. Pat, the patron saint of the engineers, and how he invented calculus and handed it down for us to cuss. There is, however, a little dissention in the ranks as to just how he became our patron saint. Historians themselves can't swear to anything definite about St. Pat, as most evidence points to him as a Scotchman instead of an Irishman, and as having driven snakes out of Ireland, when according to Hoyle there never were any snakes on the isle. But it makes mighty interesting material for argument, and gives us the liberty of celebrating the fifteen hundred and forty-second anniversary of his birth in any manner we choose. And, by cracky, we choose to do it by throwing one of the best waxed-wood shindigs that ever caused a Boneyard Benny to throw a connecting rod or burn out a bearing.

So let it be proclaimed to all, and especially you northsiders, that tickets are now on sale for the annual St. Patrick's Informal Ball, which will take place in the George Huff gymnasium on Friday evening, March 25th. The particularly joyful notes of Jimmie Joy and his orchestra will do their part to give every one of the dancers a very joyous night of fun.

One of the features of the evening will be the crowning of St. Pat, the most popular student engineer on the Illinois campus. The balloting for St. Pat will take place at the door on the night of the dance, the back of the tickets being stamped with a ballot. And so the man to receive the traditional halo on his head will be kept a secret right up to the time of the ceremony. And here are the candidates for St. Patrick, men chosen from their respective departments by the students themselves: C. E. (Red) Carter, C.E.; Dan Chinlund, E.E.; Bob Phillips, M.andM.; Al Nelson, M.E.; and Chuck Wright, Cer.E. And if you see any fellows going around the campus wearing a little green cap, it will either be one of these candidates, or else a member of the St. Pat's Ball committee.

Warren Johnson, president of the Engineering Council, has announced all of the committees and heads, who, with "The best St. Pat's Ball" as their motto are certain to give all who attend more than they money's worth. Walker Stone, the man faced with the big job of finding a good orchestra, is a curious fellow—he refused to be satisfied with anything but the best. And Matt Retonde can be depended on to get something unique in the way of programs.

Decorating the gym is no easy task, but with Jim Robertson as chairman of the decoration committee, the place will be no less than a palace, so help me. Harry Atkinson, as publicity chairman, will see that you don't forget the occasion, while Dan Chinlund and his finance committee will see that ends meet.

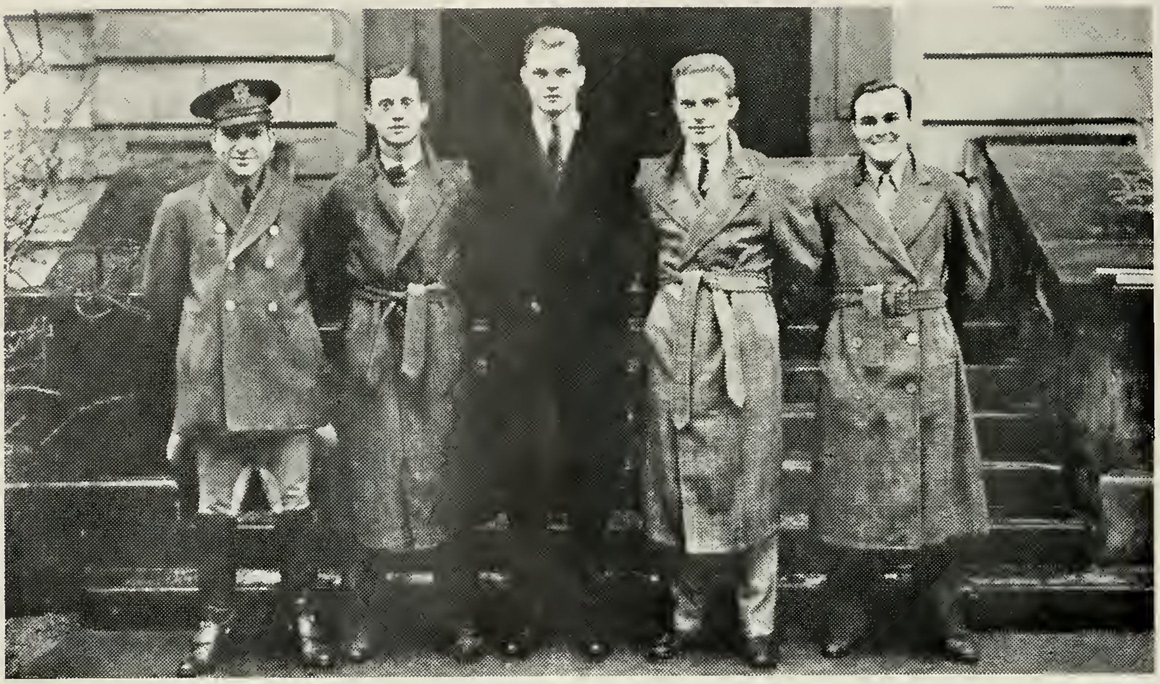
Get Your Ticket Now

And now that it has been decided that the engineers are going to sponsor a dance that will probably bring a flock of transfers to the engineering college, how about the tickets. Remember that, although ticket sales will be limited to engineers for a few days, the tickets will then be available to some 8,000 other fellows. So while you are still in the running, Maurice Carr, and his gang of salesmen, will give as many as possible a break. But don't get caught coming around late and asking for a ticket, because, engineer or no engineer, no ticky—no selly. And before they get into the hands of the scalpers, the price will be one dollar and sixty-five cents, including tax.

This month's formula for a good time is mighty easy to derive. With a little oil on your bearings, with a little steam in your cylinders, and with a little queen on your arm, it can be easily seen (or it follows, if you prefer that choice phrase) that the 1938 St. Patrick's Informal Ball will be the solution to any man's entertainment problem.

By TOM MORROW '39

CANDIDATES FOR ST PAT



Chuck Wright, "Red" Carter, Dan Chinlund, Al Nelson, Bob Phillips

Get the Job You Want

● *Some Timely Advice About Application Letters*

When you are graduated as an engineer by the University, you will have completed a major step in your life. You will be starting a new mode of living. Your key to this new mode of living is a letter of application for a job. Care taken in its writing will effect a saving in time, effort, and money.

Imagine a personnel director reading as many as fifty letters of application for one position. An ordinary letter, poorly written and lacking originality, may fail to impress him, even though the writer's qualifications may be very good. An application letter should be thought of as a sales letter in which the writer is trying to sell his services and is competing with others who are trying to sell theirs. It is a vitally important step in securing a job.

In spite of the importance of letters of application, the average engineer knows very little about the technique of writing one. He is more concerned with training for his profession than with learning how to give a good impression of himself on paper. This is not as it should be. Engineering standards of today are higher than ever before, and an engineer who knows only his profession—who cannot express himself interestingly and convincingly—is seriously handicapped.

Most important of all in writing an application letter is the attitude assumed by the writer. Once the correct attitude has been assumed, the rest will follow comparatively easily. The writer should keep in mind that the employer is not personally interested in him. To the employer, it does not matter whether or not the applicant secures a job. He is seeking the best man for the position.

According to Mrs. Alta Gwinn Saunders, head of the University of Illinois division of business English, the correct attitude to assume is the so-called "you attitude." That is, one should temporarily disregard the fact that he has preferences and dislikes and should consider, above all, what he has to offer his prospective employer.

A letter is its writer's representative. It is the means by which the personnel director can judge whether or not to grant an interview. If it is neat, he is justified in supposing that the writer is neat. Hence, the letter should be typewritten on a good quality of bond paper, 8½ by 11 inches, and should be free from typing mistakes and erasures. Since the letter is also considered an index to the quality of the writer's mind, it is essential that the material be selected so that the most important facts about the writer's experience, education, and activities are included, while long personal histories and unnecessary facts are omitted.

To aid in abbreviating the letter, a data sheet is usually added. On this sheet the writer tabulates the details of his education, his experience, his life, and his references. It is invaluable in producing a compact, well-organized letter.

The word "I" is a constant offender in application letters and should be avoided. This is sometimes accomplished by writing the letter in the third person, with such an introduction as: "Portrait of a Man Who in June Received His Bachelor's Degree in Engineering and Is Now Looking for a Job." In this way, statements which would otherwise seem boastful can safely be included in the letter. Modesty is a virtue which one should not forsake when writing a letter of application. The ingenious writer can find more ways than one to recite his merits without showing boastfulness.

An effective letter of application also shows originality. When a personnel director reads many application letters for a position, he will find time to consider carefully only those letters which impress him most—the original ones. A stereotyped letter is most often a waste of time, while a letter which shows originality is likely to bring results.

The mechanics of the application letter should be perfect. This is not a difficult requirement to meet; yet it is of great importance. A personnel director can easily classify letters into two groups: those which are mechanically correct and those which are not. Those which are correct will undoubtedly receive greater consideration.

Further, the application letter shows the writer's character and personality. By his letter he will be judged for accuracy, confidence, sincerity, thoroughness, and all the human qualities which can make the essential differences between men. All of this the reader will judge from a letter, besides the writer's training and ability in engineering.

—By ROBERT TIDEMAN '41.

This excellent, unsolicited letter and an accompanying data sheet were written by an undergraduate student in an eastern college. The letter is here reproduced by permission of Mrs. Alta Gwinn Saunders, from whom it was obtained.

July 6, 1937
226 North Winston Ave.
New York, N. Y.

John Smith Manufacturing Corp.
246 South Wabash Ave.
Chicago, Illinois

Dear Sir:

I would like to submit my application for engineering work in your air conditioning department.

I have completed my college training at the University of -------. This training has included five years of mechanical engineering, giving me B.S. and M.S. degrees, and one half year in the commerce school.

During the past two years I have become deeply interested in air conditioning as a vocation. You will note on the attached sheet that during this time I have taken a number of engineering courses dealing with air conditioning and allied subjects. More recently, the particular division of sales engineering has strongly attracted me. To improve this interest, I re-entered the University last fall to study marketing and advertising. In two of my courses I have had the opportunity while preparing term papers to study the marketing and advertising problems of the air conditioning industry.

While preparing these reports, I became familiar with the great service many of the larger Public Utility Companies are performing in fostering the proper introduction of air conditioning to the public.

Because of your strategic position, I have felt that you may be able to put me in contact with dealers or manufacturers in air conditioning who might be looking for college graduates who are interested in making this field their permanent vocation. If you can use no new men in your department, I shall greatly appreciate any contacts you may be able to make for me.

On the attached sheet I have listed as references the names of four men and one woman who have known me as a student and employee.

I am free to go to work at any time and am willing to begin at the bottom. If you wish, I shall be happy to come to Chicago for an interview at any time which is convenient to you.

Sincerely yours,

JOHN DOE (Signed)

Eli Electron Entertains

At 1938 Electrical Show

"And on your left, LADIES AND GENTLEMEN, are the electrical engineering buildings, where we shall see the preview of the Biennial Electrical Show, that greatest of all college exhibitions, where "Eli Electron," that mighty multitudinous mite who makes the world go round—all Fascist dictators to the contrary—is putting on a nightly performance. Just think of it folks, here you can see that sage saying, "In union there is strength," proved before your very eyes, for when you view the work that millions of these electrons, working together, can perform, you cannot help but believe.

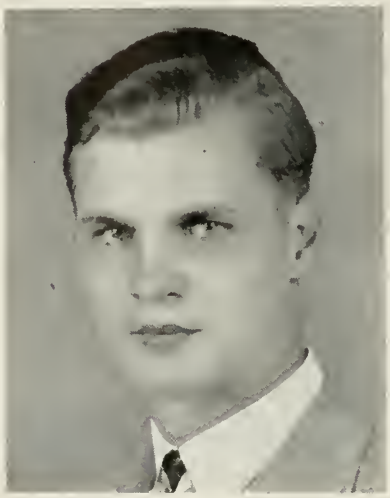
"Our tour stops here for two hours, folks, so make the most of your time. If any of you want to go with me, I will show you the exhibits of major interest.

"Before we go in, let me explain the significance of all of this display. It has been a biennial event since 1907, when the electrical engineers put on an exhibit to raise a contribution for the John Fritts Memorial in New York and were so successful that their contribution was one of the largest. Since that time, the profits of the show have gone into a loan fund to be used to help deserving electrical engineering upperclassmen. The show, like any healthy child, has grown much since its birth in 1907. The first show occupied only a few rooms of the laboratory. This year, the two electrical engineering buildings and the physics building will be so full from top to bottom with student exhibits that most of the electrical manufacturers have been denied displays for lack of room. The show is now recognized by electrical engineers to be the greatest student engineering exhibit. As the show has grown, so has the loan fund, until now it has reached the sum of about five thousand dollars.

"Just a few more words before we go in. This show is entirely a student affair, being backed financially by pledges of money made by the students, and being entirely planned and executed by the students, with the faculty acting only in an advisory capacity.

"Folks, the street we just drove along is Burrill Avenue. Years ago, this was the central street of the campus, just as it still is for nearly two thousand engineers, of whom some two hundred electricals are presenting this grand, stupendous pageant of the modern workings of "Eli Electron." Let us go in by this door. The floodlighted building reminds one of the Century of Progress. If you will look on your left, you will see a tablet, dedicated to the ten electrical engineers who here founded Eta Kappa Nu, electrical engineering honorary which has spread its chapters from this campus to 28 other colleges since 1904.

"Turn to the right after you enter the door. If anyone wants a drink of water, bend over the fountain. An electric eye will turn the handle for you. I'm telling you people, if these engineers keep on, they will be having machinery to breathe for us.



DAN CHINLUND
General Manager, E.E. Show

"Turn into the laboratory on the right when you come to the end of the hall. These motors are the equipment that the students use in their laboratory work. That big cup-shaped mirror by the window is being used to send sound to the physics laboratory. You can speak into a microphone here. The sound waves are transformed into light waves by electrical apparatus. Another mirror in the physics laboratory intercepts the light waves and the light is changed back to sound. On the other side of the room is the ever-flowing wine bottle, which has been a part of every show. A strong magnetic and electric field is used to bring the water molecules back into the bottle so that it never gets empty. Of course, for the first show, they were able to get only enough water so that the water just dripped out of the bottle. The large stream of water flowing now is a good measure of the advancement of the science of electricity since that time.

"Downstairs are some lighting and stroboscopic exhibits. A stroboscope is a machine by which a moving body can be made to appear to stand still. In this room we see some of the U. S. Army Signal Corps equipment. There along that wall are some of the field radios and on the other side of the room are some of the telephones they use. In the next room are exhibits explaining the operation of meters. Over here on our left are some of the commercial displays.

"Let's go back upstairs and on up to the second floor. This is the radio laboratory. Inside that wire cage is the short wave radio station of the University. If you know any amateur back home, they will send a message to him for you. Here are some other short wave sets. In that corner is the television apparatus. It really works, and if one of you will step into the booth, the rest of us will get to see a picture of him transmitted by television. In that little room over there is a modern telephone central system. If you watch a few moments you will see what happens when you dial a number.

"Come on downstairs again and we will see what they are showing in the north laboratory. Did you ever see a man sent to the electric chair? Well, watch over by the north wall. See, they are leading the condemned man to the chair. Watch his hair stand on end when they turn on the juice. Right behind us are some electric toys that you can operate yourself. When you get done playing, come over to this booth where they will test your degree of sex appeal with a kiss-o-meter. This device is being used by the psychology department in an effort to find some of the Romeos that the Tribune tells about.

"Out in the hall is the talking skull. It will answer any question you ask. You don't need to look for the person answering you, for there isn't anyone but a ghost who comes back to haunt every Electrical Show.

"We will now go out the back door of the building to the illumination laboratory. That big fountain on the right is simply the aerator for the water supply of the University. Perhaps you have noticed a sleepy look on the faces of a few of the boys. They haven't been getting much sleep lately, for they had to carry their work as well as get ready for the show. Also, some of them were out pretty late, last night, at the Military Ball

"Here in the illumination laboratory is nearly every type of light manufactured. We are just in time for the show, so let's sit down. If you are all ready to go on, we will go down to the high voltage laboratory. That big spark machine will probably handle more Eli Electrons than any other machinery you have seen tonight.

"From here we go to the physics laboratory. Here are some more commercial exhibits. In this laboratory a large number of electrical measuring instruments are on display. However, the most interesting exhibit in this building is the cyclotron. This apparatus is used to break up atoms. Here they are able to do what alchemists have been striving for for centuries turn one element into another.

"Well, folks, I guess we have seen the 1938 Electrical Show, and we will have to admit that it was one of the most educational, interesting, and entertaining shows we have ever seen. We hope you have enjoyed this short preview and that you will be on hand for the grand opening at 7 p. m. on April 21."

By MAURICE CARR '39.

The Fatigue of Metals . . .

U. of I. Laboratory Prominent In Investigation

AMONG the most interesting of the phenomena of materials is their failure under repeated stress, commonly known as fatigue. Failure by fatigue did not become apparent until the development of relatively high speed machines, after which it was noticed members such as rotating car axles often failed suddenly without distortion by bending. Because of the jagged, crystalline appearance of a fatigue break, this type of failure was first attributed to "crystallization" of the metal. The advent of the metallurgical miscroscope proved this to be wrong, as the metal was shown to be crystalline before stress was applied. The failure of metals under repeated stress is now attributed to the development of minute, probably sub-microscopic cracks within the crystalline grains. These cracks act to intensify stress at their ends far above its normal value and consequently spread through other grains until not enough soild metal is left to withstand the applied stress, when failure occurs suddenly.

First Investigation by Wohler

The first investigation of fatigue of metals on a large scale was conducted in Germany by Wohler from 1859 to 1870. Later other investigators began to study this phenomena. Directly after the World war extensive investigations were conducted by McAdam at the United States Naval Academy, R. R. Moore of the United States Air Service, Gillett and Mack at Cornell university, Gough in England, and Professor H. F. Moore at the University of Illinois.

Professor Moore, upon coming to Illinois in 1907, ordered the first fatigue machine for the University. As a result of the World war, an intensive study of fatigue was begun at the University of Illinois in 1919. A testing floor originally intended for airplane engines was provided in the old boiler house, and the investigations were conducted there until the fatigue of metals laboratory was established on the third floor of the present Materials Testing Laboratory.

Best College Laboratory

The present laboratory is one of the most completely equipped to be found in any college. There are over forty machines; varying from small rotating-beam machines which take a three-sixteenths inch specimen and run at ten thousand revolutions per minute to rotating-beam machines turnig a two-inch diameter specimen at one thousand revolutions per minute. Professor W. M. Wilson's large fatigue machines, located in the basement, are among the most powerful fatigue machines in the world and will apply a 200,000 pound load 185 times a minute.

The most numerous of the many types of machines in the laboratory are the rotating-beam machines, the simple-beam machines with constant bending moment, and the smaller, faster cantilever-beam machines. There are special machines for repeated torsion, repeated tension-compression, as well as special machines for conducting tests at temperatures up to twelve hundred degrees Fahrenheit. Some of the fatigue machines have attachments for investigating the simultaneous effect of corrosion and fatigue. Tests have been conducted by the University of Illinois at the United States Air Service in Dayton, Ohio, at temperatures as low as forty-five degrees below zero. Under the Hydraulics laboratory are rolling-load machines for subjecting full size rails and rail joints to stresses equivalent to or exceeding those encountered in actual track. The design for three of these types of machines originated at the University of Illinois, and several of the machines in the laboratory were built here. About the only form of fatigue testing machine not represented is the electro-magnetic type.

Operate Twenty-four Hours a Day

Fatigue machines operate twenty-four hours a day every day in the year. Fatigue specimens usually have to run ten-million cycles and often as much as one-hundred-million cycles. Specimens have been run continuously for over a year in the laboratory as many as one billion cycles. The staff has, in common with most other investigators, unsuccessfully tried to find a quick test for the endurance limit of metals.

Many of the principal studies of the fatigue phenomena have been or are being conducted at the University of Illinois. It was here that for most metals the existence of an "endurance limit" below which specimens would run indefinitely was demonstrated conclusively. In these tests specimens of twenty or thirty metals were run from one-hundred-million to one-billion cycles. Some aluminum alloys and some copper-nickel alloys seem to be exceptions in that they apparently have no endurance limit. A study of the stresses on car axles is another important contribution made by the fatigue of metals laboratory. Corrosion-fatigue in both tension-compression and torsion are now being studied by Professor Dolan as well as the effect of heat treatment, grain size, and the size of specimens. The first photo-micrographic motion picture of an opaque object was made by the Photographic Department to show the progressive failure in fatigue. An extensive investigation of the development of transverse fissures in rails, a fatigue phenomena, is in progress. As a result of these tests, ninety per cent of the rails rolled in the United States last year were rolled by a process which nearly eliminates the minute "shatter cracks" which are the starting points for fatigue failure.

The failure of metals under repeated stress emphasizes the necessity for scientific investigation of the assumptions underlying our present formulas of mechanics. These formulas, while statistically correct, do not hold strictly in some cases of which fatigue, starting at a point of localized stress, is a notable example. The designer of high speed machinery is finding it more and more important to study fatigue phenomena and their application on design to supplement the older principles of mechanics. By JOHN SHAPLAND '40

University Fatigue of Metals Laboratory

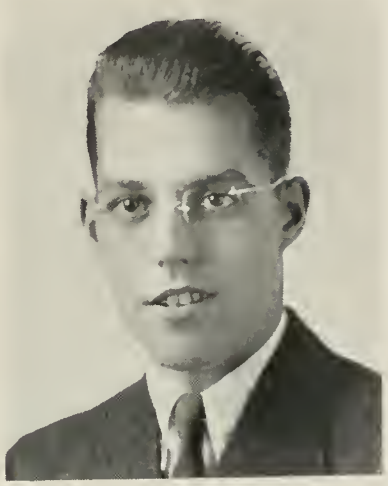
★ WHO'S WHO IN ILLI

- *E. E. King*
- *D. B. Keyes*
- *E. H. Waldo*

PROFESSOR E. E. KING has a hobby very different from those of most engineers. It is that of growing peonies on his lot here in Urbana and also on an acre plot out in the country. During his twenty years of endeavor he has exhibited his flowers in many shows and has won numerous prizes for their quality. During the long winter evenings, he spends many hours browsing through nursery catalogues trying to decide which varieties to grow the following season. Professor King obtained his B.S., M.S., and C.E. degrees from Rose Polytechnic Institute, his A.B. degree from Indiana University, and his M.C.E. degree from Cornell University. His first job after graduation from school was in Mexico as a resident engineer for the Mexican Central Railroad. Later he went with the C. H. & D. R. R. (now the B. & O. R. R.), after which he began his teaching career. He has taught at Oklahoma A. & M. College, Cornell University, Iowa State, and is now professor of railroad engineering here at Illinois. Traveling is his favorite way of spending the summer, for each year he drives East for a month or so. He has also been West and has spent one summer in Europe. The organizations of which he is a member inclue Alpha Sigma Phi, Tau Beta Pi, Sigma Xi, Theta Tau, and Phi Kappa Phi, A.R.E.A., A.S.C.E., S.P.E.E., and A.A.R.

PROFESSOR D. B. KEYES seems to have spent the greater share of his life traveling over the country. He was born in Rhode Island, received his B.S. degree from the University of New Hampshire, his A.M. degree from Columbia University in New York, and his Ph.D. degree from the University of California. At present he is professor of chemical engineering and head of the department here at Illinois, as well as a member of the executive staff of the Engineering Expriment Station. Recently he spent two summers in Europe; the first was in England for promotional purposes, and the second was on the continent to attend chemical society meetings and for an inspection trip through their chemical plants. On the continent he and his family traveled by automobile and thoroughly enjoyed meeting "just people." On one occasion with his Packard he raced a Ford V-8 over the highest pass in the Alps, between Austria and Italy, where the road was on a twenty per cent grade. He won—his speed was ten miles per hour! Here at the University his work is centered around the development of the distillation processes. Professor Keyes has contributed many articles for various chemical magazines and is a fellow in the A.A.A.S. and the A.I.C.

PROFESSOR E. H. WALDO certainly is an engineer with varied interests. Having taught here on the Illinois campus for twenty-seven years, he was made an associate professor of electrical engineering, emeritus, in 1934. This more or less inactive status now gives him more time to pursue his avocations. One of his principal hobbies is building a Christmas display window each year. This is accurate in all details for the period which he is reconstructing and entails a large amount of research for the proper treatment of his subject. Listening to good music is on his list of favorite indoor sports as well as attending lectures upon the topics of economics and international relations. Athletics of all kinds have always fascinated him, and he has actively taken part in many. He particularly enjoys figure skating and goes to see hockey, football, and lacrosse games whenever he has a chance. His travels have all been confined to North America; but he has visited Canada, Mexico, and all of the states in the Union except the Gulf states. Out West he delights in mountain climbing but says that at the Grand Canyon he encountered the most difficult climb. Professor Waldo received his A.B. degree from Amherst college and hopes to go back there for his fiftieth class reunion this next summer. His M.E. degree was obtained at Cornell university, while his M.S. and E.E. degrees are from the University of Illinois.



W. B. Katz ●
D. G. Richards ●
R. E. Jeffries ●

ROBERT E. JEFFRIES began life in Dwight, Ill., in the year that the United States entered the Great War. He was graduated four years ago from Lyons Township High School where he was an athlete and activity leader. Before he left high school, Bob picked his hobby by licensing station W9OQY and his CQ is still heard when he can find time to operate. As an electrical engineer at the University of Illinois, Jeff has been initiated into Phi Eta Sigma, freshman scholastic honorary; Eta Kappa Nu, electrical engineering honorary; Tau Beta Pi, all-engineer honorary; and Synton, amateur radio fraternity. During his freshman year he found time to win numerals in wrestling. Right now, every minute that he can spare is required by his duties as Chief Engineer of the Electrical Show, to be presented April 21 to 23. Bob is earning most of his education as he gets it by working for his meals and NYA. During the summer after his freshman year, he designed and built radio equipment for the National Guard at Pontiac, Ill. The summer of '36 he was an inspector for Stewart Warner. Last summer he did some very interesting work in the General Motors research laboratories in Detroit.

DONALD G. RICHARDS came to the University of Illinois in 1936 after being born, reared, and educated through the junior college period in Lincoln, Ill. In high school, he was in several plays and he played basketball for Lincoln Junior College. While still in grade school, he began to pursue the hobby of model-airplane building, but now he hopes that his will be another case of avocation becoming a paying vocation, when he begins to build his planes on a larger scale. While in high school, he helped to build and to fly a glider. Don is now a senior in mechanical engineering. He is a member of the Student Chapter of the A.S.M.E. That his scholastic standing is very high is indicated by his membership in Phi Kappa Phi, all-University scholastic honorary; Tau Beta Pi, all-engineering honorary; and Pi Tau Sigma, mechanical engineering honorary. Work as a painter earned Richards the money to attend Lincoln Junior college. The past two summers have found him working on a line gang for the Central Illinois Electric Light and Gas Company. This semester he is spending much of his time at the Arthur Newell Talbot Laboratory doing research on photo-elastic analysis. When graduated next February, Richards hopes to return to school to obtain his master's degree in aeronautical engineering.

WILLIAM B. KATZ'S present home is in Wilmette, Ill., but he first put in his appearance in Spokane, Wash., in 1917. He was graduated from New Trier High School in Wilmette in 1934 with a record which included a 4.75 scholastic average, activity in dramatics, and membership of the glee club, rifle club, lightweight basketball team, chemistry club, radio club and student usher's corps. The fall of that same year, Bill came to the University of Illinois to study chemical engineering. He is a member of Synton, Phi Eta Sigma, Phi Kappa Phi, Phi Lambda Upsilon, and the Tribe of Illini. He earned his "I" in fencing. He was treasurer of his house, Zeta Beta Tau, last year. His scholastic average, which is one of the highest in the University, has won him the Thomas Arkle Clark Phi Eta Sigma prize, awarded annually to the sophomore man having the highest average for his first three semesters; the Phi Lambda Upsilon prize cup; and Class and College honors. Katz states that his hobbies, in order of enjoyment received, are: fishing, fencing, amateur radio (W9PPH), photography, golf, stamp collecting, and chess. That he is an ardent fisherman is evidenced by the fact that for the past three summers he has gone on extended fishing trips. This summer he plans to see Europe from a bicycle. After graduation in June, Katz hopes to earn his master's degree at Massachusetts Institute of Technology.

STUDENT ORGANIZATIONS

TAU BETA PI

President A. C. Willard will present the speech at the spring initiation banquet of Tau Beta Pi, to be held on April 24.

Officers for the second semester are as follows:

President__Carroll H. Dunn, M. E.
Vice-president________________
____Warren R. Johnson, Cer. E.
Recording secretary___________
______Donald G. Richards, M. E.
Corresponding secretary_______
______Robert W. Gaines, M. E.
Treasurer_____________________
____ William A. Sinks, Jr., E. E.
Cataloger__Howard W. Miner, Min.
Master of Initiation__________
____William G. Chappell, M. E.

A. S. C. E.

The student chapter of the American Society of Civil Engineers began the second semester of its 54th year as a campus organization by selecting the following officers:

President_________James Robertson
Vice-president______Donald Bassett
Treasurer____________Andrew Reed
Secretary________Thomas Chapman

In the near future the society expects to present a series of talks by prominent engineers such as Mr. Kalinka, vice-president of Roberts and Schaefer Company of Chicago; Major William Bowie, Geodetic Engineer, Washington, D. C.; and Mr. E. B. Black of Black and Veatch, Kansas City, Mo.; and also to present a series of motion pictures illustrating various civil engineering enterprises.

A. S. M. E.

The student branch of the American Society of Mechanical Engineers announces the following second semester officers:

President_____________B. Y. Kutner
Vice-president________S. J. Wenthe
Treasurer_____________W. Chappell
Secretary_______________H. R. Lett
Publicity man______N. V. Needham
Asst. Pub. man______J. R. Poyser

TAU NU TAU

At a meeting held Tuesday, Feb. 22, Jim Llewellyn was elected treasurer for the coming year. As a part of the plans to make the local chapter better and stronger, it was decided to get in touch with the other chapters and to have national officers elected. Also as a part of these plans, the office of historian was created. His duties will include keeping a permanent record of the activities of every man and alumnus of the local chapter and making a scrap book of the doings of the organization. Elected to this office for the coming semester was Ed Fraser.

Professor Springer of the G. E. D. department gave the members an excellent idea of what to expect in case of war by recounting his experiences while a captain in the Engineers Corps of the United States Army during the World War.

Pledged to TNT at this meeting were A. R. Starr, C. H. Coyne, and I. H. Alexander.

CHI EPSILON

Chi Epsilon announces the election of the following new officers:

President______________J. O. Potter
Vice-president___________S. A. Olin
Secretary______________ L. E. Salch
Treasurer___________C. B. Williams
Assistant Editor of Transit________
__________________E. F. Wilson

S. B. A. C. S.

The Ceramic Year-book will be out sometime in the latter part of March. This is the only publication of its kind on the engineering campus. The book is to be used to send to prospective employers of the graduating seniors, to advertise them and the department.

The speakers for the remainder of the semester are:

March 8—Dr. Kautz of the Republic Steel Corporation.

April 5—F. E. Hodek, Jr., of the General Porcelain Enameling Company.

April 27—Charles Henderson of the Alton Brick Company.

May 3—J. L. Essex of the Illinois Clay Products Company.

The national convention of the American Ceramics Society is to be held at New Orleans from March 27 to April 2. Some of the seniors are planning to attend but regret that they will be just too late for the Mardi Gras.

Enameled ash-trays, symbolic of membership in the student branch, will be given for the first time this semester.

The student branch basketball team, "The Hot-Bricks" is now playing in the intramural competition. A hand-ball tournament will be sponsored in the near future. These athletic ventures are sponsored to keep up the society spirit and to promote friendship among the members. Paul Buckles is chairman of the athletic committee.

Plans for the annual Pig Roast are well under way. George Zinc is chairman of the committee. The roast will be held during the second week of May. Small enameled favors will be given as souvenirs. If the Ceramic boys want the low down on the faculty, they should be present, for the faculty will be roasted as crisp as the pig.

A. I. M. E.

The American Institute of Metallurgical Engineers announces the following meetings and speakers: March 9, Mr. Vaughen, assistant chief metallurgist for the Caterpillar Tractor Company, will speak. Mr. Parsons, of the Haliburton Oil Company of Duncan, Oklahoma, will speak at a joint meeting of A.I.M.E. and A.S.M.E. to be held the latter part of March. On April 11, D. F. Forbes, president of the Gunite Foundries in Rockford, Ill., will talk. About the middle of May, the society will hear M. L. S. Maash, Manager of Inspection of Metallurgy of the Inland Steel Company, will speak. During Easter vacation the A.I.M.E. will make an inspection of the Krupy Drop Forge Company.

Last October 7, Dr. Clyde E. Williams of Bartelle Memorial Institute of Columbus, Ohio, spoke on "The Place of Industrial Research." November 18, Mr. C. D. Peacock '28, spoke about copper mining in Chile. He has been employed by the Breden Copper Company at Sael, Chile, for the past three years. On December 1, Mr. H. F. Hebley of the Commercial Testing and Engineering Company gave an interesting talk, "Around the World as a Mining Engineer." Mr. Hebley was born in New Zealand and has travelled widely. A group of 25 members made an inspection trip through the South Works of Carnegie Illinois Steel Company during Christmas vacation. One entire day was spent at the plant. Mr. Berchurstein, chairman of the Chicago sector of A.I.M.E., spoke at dinner. Mr. Larson of A. O. Smith Corporation of Milwaukee, Wis., gave a talk on "Welding of Pressure Vessels" on Jan. 12. Between semesters, nine members of A.I.M.E. and Dr. Welder, faculty sponsor, attended a dinner of the Chicago Section at the Chicago Engineers Club. They also made an inspection trip through the Couveth plant of the Crane Company. On Feb. 10, a dinner was held at which Mr. W. Sykes of Inland Steel, and director of A.I.M.E., spoke. Mr. J. R. Daeson, chief metallurgist of the Illinois Zinc Company spoke on "The Metallurgy of Zinc and Modern Applications.

ETA KAPPA NU

Eta Kappa Nu wishes to announce the initiation of the following men: E. Buehler, R. Wetzel, H. Wetzel, P. Zuercher, R. Zierjack, E. McCown, M. Carr, W. Lyon, R. Andermann, C. Poarch, and F. DeWolf.

The following officers have been elected for the second semester:

President_____________E. E. Fisher
Vice-president_________C. K. Poarch
Treasurer_____________W. A. Sinks
Secretary______________P. Zuercher

SIGMA TAU

Sigma Tau, all-engineering scholastic honorary fraternity, held its formal initiation on Sunday, Feb. 20, 1938. Initiates were: W. S. Bonnell, R. W. Benoliel, E. E. Nelson, J. M. Trummel, J. Spengler, H. E. Phillips, A. Wolf, R. K. Ericson, J. O. Potter, R. E. Loeck, E. D. Ebert, A. B. Horn. These men were selected for scholastic merit out of all the students enrolled in the various branches of engineering. At this meeting, John Shapland was awarded a medal by the organization as the outstanding Freshman in the College of Engineering last year. This medal is awarded annually.

MU SAN

Mu San, sanitary engineering honorary, announces the election of the following new officers:

President _____________Leo LeBron
Vice-president-Treasurer __________
_______________Eugene Shields
Secretary ___________H. J. Spaeder
Historian ___________G. A. Perkins

The Soybean . . . .

WILL IT REPLACE STEEL?

While Henry Ford miraculously turns the soybean into horn buttons and steering wheels, a United States government laboratory, under our very noses in the old Agriculture building, is also making great strides in the discovery of new industrial outlets for soybean products. Only a few days before the beginning of this year, a news release was sent to Washington, D. C., which announced that a new soybean-oil varnish, after seven month's exposure to the weather, was still in good condition, but a high-grade spar varnish, exposed on the same panel, failed completely in five months!

The work of the Regional Soybean Industrial Products laboratory at the University of Illinois is done in connection with other stations in the United States and under the supervision of the Secretary of Agriculture. Soybeans of different varieties are grown in the middle-Western states and sent to Urbana. We note with pride that Illinois produces more of the legume than all the other states put together, that Champaign county has a greater output than any other county in Illinois, and that Illinois men have published a great deal of the written material on the soybean.

Although the soybean is already used industrially in making soap, linoleum, glue, lard, paper, lubricants, and foundry sand-cores, this investigation may prove to have a large commercial value because the unsettled conditions in the Far East have lessened the Chinese exportations of tung oil (the best drying oil known for varnishes), and "producers of varnishes are seeking substitutes for the tung oil normally employed in their formulas." *The limited use of soybean oil in paints has been due to its drying rate. Now, new paints, varnishes, and enamels are possible since "properly treated soybean oil can be substituted up to 100 per cent of the oil vehicle in a considerable number of varnishes, not only without impairment, but in certain cases with actual improvement of the properties of the resulting films."

You Eat Soybeans

Although we now consume many edible soya products in certain types of breakfast cereal, cheese, macaroni, bread, salad oil, oleo-margarin, sausage, tinned beans, and ice cream, the Chinese have been thriving on this simple food for three thousand years! Mr. A. de C. Sowerly, editor of "The China Journal," said;

"The soya bean is unquestionably the most important individual food plant, and it is not too much to say that if the Chinese had it and nothing else, their wants would be amply supplied. Fermented, it yields all their different sauces which supply the basic flavouring of their food; pressed, it gives out oil which can be used for cooking; sprouted, it gives a fresh vegetable rich in vitamins; plucked in the pod while still green, it makes a delicious table dish; ground dry, it forms flour from which bread can be made; ground wet and curdled, it provides the famous bean curd—a substitute for meat. Bean curd itself is treated in many ways to yield a variety of dishes. The soya bean also provides food for horses and cattle, while bean cake from which the oil has been pressed is an excellent fertilizer."

George Douglas Gray tells us "All about the Soya Bean" in his excellent book by that name, from which much of the following information is taken. Gray writes that "the yield of protein from the bean, weight for weight, is approximately twice that of meat; four times that of eggs; and 12 times that of milk." Moreover, the bean gives us this valuable food cheaper than any vegetable or meat. Soya vegetable milk is much higher in protein than human milk, and children can be fed on it from birth; the roasted bean makes a "coffee without caffein" with a nutritive value twice as high as that of ordinary coffee; the pulverized bean is the chief constituent of popular brands of milk chocolate; in the United States, soya centers into the composition of many widely advertised cereals and is obtainable unmixed with other cereal; the bean can be boiled and put in tins; the starch-free and sugar-free flour is especially valuable in the diet of diabetic people; the soya, planted in alternate rows with corn, makes a fine pasturage for sheep and pigs; and as a hay, it is equal to red clover and alfalfa for milk and butter production. Gray relates that one of the most important by-products of the soybean is a good casein which has heretofore been manufactured from animal milk. Casein is the material from which bakelite is made. Not only are the bean oil and meal used industrially, but the shredded stalks can be made into pressed board and wall materials.

Although Manchuria, "the Land of the Soybean," is the chief producer of the soya, its methods of farming are primitive and go back to pre-Biblical times. The farmer uses a heavy hoe for cultivating and a hand sickle for reaping. On the threshing floor, a donkey pulls a roller over the dried plants. Then, as described in the Old Testament, Book of Ruth, the beans are "winnowed" by being thrown into the air so that the wind will carry away the chaff.

In Europe and America, modern machines are used for soybean cultivation. The threshing can be done with an ordinary grain separator, and there are mechanical bean hullers and cleaners. Three processes can be used in extracting the oil: hydraulic pressure, the expeller machine, and solvent extraction. The expeller process is most popular in the United States. After being crushed and dried, the soybean mass is passed through a machine similar to the domestic meat grinder. This leaves two of the basic commercial products, oil and meal. For the shipment of soybean oil, Japanese research workers have developed a method of hydrogenation which hardens the oil into a fat and prevents leakage loss and changes in color and taste.

The soya will grow in soil that is unfit for wheat, corn, and many other farm products. It is a sturdy plant with flexible uses and has been used for generations in the Orient. With private research and government investigation earnestly under way, we cannot forecast how closely the future of the human race will be tied to "the great soybean."

By BILL VOIGT '40.

*O. E. May, director of the Regional Soybean Industrial Products laboratory at Urbana.

U. of I. Soybean Laboratory

• KATCHY KWIZ

Forget Your Slide-Rule

1. What are the dimensions of a cube with a surface of 24 square inches?

2. A machine-and-a-half builds a car-and-ahalf in a day-and-a-half, how long does one machine take to build one car?

3. Draw the figure of this problem before proceeding. If line AB, one half inch long, is perpendicular to line BC as a base, three inches long, and CD is drawn equal to AB such that angle BCD is just very slightly less than 90 degrees. Points A and D are connected. To lines AD and BC, the perpendicular bisectors are erected and meet above the figure in some common point O. Lines OA, OD, OB, OC, are drawn. Now triangles OBA and OCD are congruent since AB equals CD, OA equals OD (o is point on perpendicular bisector), and OB equals OC (for the same reason); hence, the triangles are congruent as they have three sides equal. Now angles OCD and OBA are equal, from congruent triangles, and angles OBC and OCB are equal, base angles of isosceles triangle. Therefore angle ABC is equal to angle DCB, but angle DCB was drawn slightly less than a right angle while angle ABC is a right angle. What is the fallacy of this proof?

4. What distances must parallel planes to the base of a hemisphere be above the base in order to divide the surface of the hemisphere into three equal areas? Use 24 feet as the radius of the hemisphere.

5. A man carrying two twenty foot planks comes to a moat around a square castle. The moat measures twenty-five feet across. By use of the planks only, how can the man cross the moat?

6. There are two books standing on end on a shelf, similar as in a library. Book one is to the left. If the leaves are two inches thick in each book and the bindings are one-quarter inch thick, how far is it from page one of the first book to the last page of the second book?

7. A man in building a barn has a window, four feet by four feet, square. The top of the window just touches the roof and the bottom of the window just touches the top of the door. How can the man double the area of the window and still keep the window square?

8. Two water jets, A and B, running together fill a tank in twenty minutes. If A runs alone for ten minutes and then B takes 28 minutes to finish filling the tank running alone, how long would it take A and B to fill the tank by itself?

Korrect Konclusions

1. Two inches.

2. A day and a half.

3. Submit your answers to this problem to the Technograph by putting them in the basket in the Tech office. The best answer, correctly proven so that there is no doubt will receive a subscription to the Technograph for the remainder of the year. Contest closes two weeks after this issue was printed.

4 Eight feet, 16 feet, and 24 feet from the base.

5. Puts one diagonally across a corner and lays the other on it and the far side of the moat.

6. One-half inch.

7. Revolve the window so that it lies on the flat side instead of a corner as it must have been in the problem. Then the sides are now four by four feet instead of the diagonals and the area of the window is doubled.

8. A—45 min., B—36 min.

EDITOR'S NOTE: If you are in favor of continuing this column in the Tech, please show your intention by submitting an answer to problem three, or by handing in a piece of paper with a comment on it to the Tech office.

Bits About Them . . . .

Richard Franklin states that he is "one of several Assistant County Superintendents of Highways." Dick received this job with the Iroquois County Highway Department through Professor C. C. Wiley, while spending his vacation at Yellow Stone National Park and at Grand Coulee Dam. Says Richard, "it's hard to get used to the small town after living in Chicago."

Bob Hieronymus '36, while working for the Carbide and Carbon Chemicals Corporation of South Charleston, was sent into the heart of the "hill-billy" region, Cattletshung, Ky., to help start a new raw materials plant. Of the 300 men on construction near the plant, some 75 carried guns to work. We are sure Bob enjoyed working among such friendly people.

Robert Baker is working for the Frigidaire Company in Dayton, Ohio. He was married last summer to Katherine Nicely, a graduate of St. Elizabeth Hospital.

Tom Scholes '36, C. E., is working with the Pennsylvania Railroad at Paoli, Pa. Tom has been working in Philadelphia, but he was recently transferred to take charge of maintenance-of-way on the Lincoln Highway and the main line of the Pennsylvania Railroad east and west.

G. L. Jeppensen '36, C. E., does research at the Materials Testing Laboratory. Gordon spent his time last summer working on a track stress investigation under Professor Talbot. He is now doing thesis work.

Tom F. Pope '37 C. E., resigned from the highway department to do engineering work at the Ingalls Iron Works in Birmingham, Ala. Tom worked on the 11,500 ton approach of the bridge at Baton Rouge, La. Recently, he visited Web Benedict '35, C. E., in the materials laboratory of the highway office in Springfield.

Lowell Anderson '35, M. E., finished his apprenticeship with the Carnegie-Illinois Steel Company last June.

Ed Simons '36, is working with the Pullman Standard Car Manufactures in Chicago as a draftsman. At the present time Ed seems to be having a lot of fun working on the new streamlined trains.

"Duch" Mader '35, E. E., is working as Assistant County Superintendent of Schools of Morgan County. "Duch" sometimes spends a week-end on campus with Bob Lindgren '35, M. E.

Hal Kibbey '36, is working with the Carnegie-Illinois Steel Corporation in their sales correspondence department. Hal does not have to wonder what to do with his spare time for he attends Northwestern Night School classes.

W. C. Burdick '36, and his wife, now reside in Yuma, Ariz., where he is a concrete foreman for the Morrison-Utah-Winston Company at Imperial Dam.

Casagrande to Give Lectures on Soils

The department of civil engineering has secured Dr. Arthur Casagrande, assistant professor of civil engineering in the Graduate school of Engineering at Harvard University, to give three lectures on soil mechanics on the regular University Lectureship to be held in the Electrical Engineering Lecture room at 4 p.m., April 6th, 7th, and 8th. Subjects of Dr. Casagrande's lectures include: "The Principles of Soil Mechanics," "Recent Developments in Earth Dam Design," and "Recent Developments in Settlement Analysis." He will also give a lecture on "New German Highways" illustrated with slides and movies for the Student Chapter of the American Society of Civil Engineers.

Dr. Casagrande is the outstanding authority in the field of soil mechanics in the United States. As a young man in the field, he has much to his credit which is reflected by his accomplishments. Besides his work in research at the Technische Hochschule in Vienna, Austria, he has worked with the Department of Public Works in Holland and as an engineer in tunnel construction in the Austrian Alps. In this country he has worked as a research assistant in the U. S. Bureau of Public Roads and as a co-worker with Prof. Terzaghi at the Massachusetts Institute of Technology in 1926. Dr. Casagrande has been in charge of soil mechanics in the Graduate School of Engineering at Harvard University since 1934.

DR. ARTHUR CASAGRANDE

• TECKNOKRAKS •

Highway department stenographer: "Now, before we start this ride, I want to tell you that I don't smoke, drink or flirt; I visit no wayside inns; and I expect to be back home by 10 o'clock."
LeBron: "You're mistaken."
H. d. s.: "You mean that I do any of those things?"
LeBron: "No, I mean about starting for this ride."

* * *

Bill Todd spent the night with a farmer. The next morning he appeared downstairs with a black eye.
"How did you get that?" asked the farmer in surprise.
"Oh, I just happened to fall in the guest chamber, that's all," answered Bill.
"Gee, you didn't break it, did you?" anxiously inquired the farmer.

* * *

Tom Scott: "Do you pet?"
New Girl: "Sure—animals."
T. S.: "Go right ahead then, I'll be the goat."

* * *

Wright: "Since I met you I can't sleep, I can't eat, I can't drink."
Skipper (shyly): "Why not?"
Wright: "I'm broke."

* * *

There's the wonderful love of a beautiful maid,
And the love of a staunch, true man.
And the love of a baby that's unafraid,
All have existed since time began.
But the most wonderful love—the love of loves,
Even greater than that of a mother,
Is the tenderest, infinite, passionate love
Of one dead drunk for another.

Shrewd Customer (to young coal salesman): "How high is the sulphur content of your coal?"
Salesman: "Very low."
Customer: "And the ash?"
Salesman: "Practically none."
Customer: "How about B.T.U.'s?"
Salesman: "There's where we've got them. Not a one."

* * *

"Walpole once wrote," said Bob Jeffries dreamily, as he parked the car, "that the world is a comedy to him who thinks, and a tragedy to him who feels."
"Well?" said the girl.
"Well," continued Bob shutting off the lights, "I think I'm about to get tragic!"

* * *

A pretty school marm who prided herself on knowing the parents of all her pupils, on the street car one day said: "How are you, Mr. Smith?"
Then perceiving he was a total stranger, she apologized: "I beg your pardon; I thought you were the father of one of my children."

* * *

Overheard on a Campus Route bus before registration:
First Berry-eyed Engineer: "What time ish it, fellowsh?"
Second More-so: "It'sh Wednesday."
Third Still More: "Me too, letsh get off."

* * *

Best Girl: "This beer has a neat little wallop to it. I wonder how much of it we'll be able to drink?"
McCleish (promptly): "A dollar and fifteen cents' worth."

"Mother, I advertised under an assumed name that I would like to make the acquaintance of a refined young gentleman with an eye for romance."
"Marjorie! How awful! Did you get any answer?"
"Only one, from father."

* * *

Maurie Adams (showing wife around ISEE): "Dear, this is the very latest type of milking machine."
Kay: "But, Maurie, do you think any of these machines make as good milk as cows do?"

* * *

Orator at Convocation: "And where, I ask you, is Julius Caesar? Where is Attila, the Hun? Where are Moses, Oliver Cromwell, Charlemagne, and Hannibal?
Mike Herod (a little the worse for wear): "Stand up, boys, so the man can see you."

* * *

A honeymoon couple were making a tour of eastern Europe. In some of the cities they found hotel accommodations were terrible. There were seldom any bath tubs, and frequently not even water pitchers in their rooms.
One night the bride, looking around the room in disguest, suddenly screamed:
"I hate Istanbul."
"Me too," agreed the groom." It ain't got no handle on it."

* * *

Lohmiller: "Do you object to petting?"
She: "That's one thing I've never done."
Lohmiller: "Petted?"
She: "No, objected."

* * *

Mandy: What's de matter, Sam? Don't you love me no mo'?"
Sam: "Sho' ah does, honey. Ah's just restin'."

* * *

Uncle and niece stood watching the young people dancing around them.
"I bet you never saw any dancing like that back in the nineties, eh Uncle?"
"Once, but the place was raided."

* * *

St. Peter was interviewing the fair damsel at the pearly gate. "Did you, while on earth," he asked, "indulge in necking, petting, smoking, drinking, or dancing?"
"Never," she replied, emphatically.
"Then why haven't you reported here sooner?" said Peter. "You've been dead a long time."

* * *

An old retired contractor had taken a room in a hotel and was preparing for bed. Just as he was about to slip under the covers the door opened unexpectedly and a young flapper bounced into the room.
"Oh, excuse me," she cried, "I—I must have gotten into the wrong room."
The old man looked at her sadly.
"Not only the wrong room, young lady," he said reproachfully. "You got here about forty years too late."

CAREERS OF CARRIER ENGINEERS

Carrier Centrifugal Refrigeration—

the development that revolutionized an industry!

IT'S a simple matter to provide refrigeration for air conditioning small stores or buildings. A good conventional compressor will do the work in a satisfactory manner, and at reasonable cost. But it's a different matter entirely to supply the thousands of tons of refrigeration required for cooling skyscrapers—or for industrial processing. Space is costly. Power costs must be controlled. Paralleling the trend toward rotating, high speed, smooth-action machinery, Carrier engineers developed Carrier Centrifugal Refrigeration—a development that literally revolutionized the industry!

Think of a compressor capable of supplying cooling equivalent to melting 1000 tons of ice each day—yet so compact that it can be installed in a fraction of the space required for conventional compressors. So economical that power costs are reduced as much as 25%—yet so simple that no skilled attendants are required. So efficient, the first machine constructed is operating today, as effectively as when installed, 15 years ago.

Above: Carrier Centrifugal Refrigeration machine providing refrigeration for air conditioning of skyscraper. *Below:* Diagram of construction

Centrifugal Refrigeration . . . Evaporative Condensing . . . safe refrigerants . . . in fact every Carrier contribution to the comfort and efficiency of the world has been brought about through engineering. And the opportunities for young engineers to gain recognition at Carrier are greater now than ever before. At Carrier, young men hold responsible positions—their capacity gauged, not by age, but by ability. Whether that ability is fostered best by laboratory research or field work in the far corners of the world, Carrier enables engineers to progress

☆ ☆ ☆

During 1937, Carrier trained 300 recent graduates from leading engineering schools in every section of the country. Carrier needs more men. If you had a good school record, and are interested in the world's most fascinating and fastest-growing industry, write us.

Carrier
Air Conditioning

CARRIER CORPORATION, SYRACUSE, N. Y.

AN ORGANIZATION OF ENGINEERS

G-E *Campus News*

"SOUPED" ENGINES FOR SIX-MILE HEIGHTS

AS THE bellows is to the forge, so is the supercharger to the airplane engine. Because of the rarefied atmosphere at high elevations, airplane engines require superchargers which operate like fan blowers, maintaining air pressure in the engines and permitting the motor to operate at normal efficiency.

Today, twelve-hour flights from coast to coast at an average height of six miles are the objective of transport airlines. Experiments in this field have been successfully conducted by Transcontinental and Western Air, Inc., and the U.S. Army Air Corps with very encouraging results, using G-E turbine-driven superchargers.

Military, transport, racing, and transoceanic planes are equipped with G-E superchargers which increase motor efficiency, speed, and flying distance. The superchargers were developed by Dr. S. A. Moss, of General Electric and are built in the River Works in Lynn, Mass. Student engineers on Test at Lynn have an opportunity to inspect and test these devices as a part of their training course.

BEATING SWORDS INTO PLOWSHARES

WELL, not exactly swords into plowshares, but rather discarded rails, superheaters, and boiler tubes into steel for the overhead system of an electrified railroad line. In this manner the old steam railroad of the Witwatersrand Gold Mining Area was replaced by a completely electrified line.

Because of the rise in gold prices during the last few years, an increased suburban passenger traffic in that section of South Africa necessitated an enlargement of the railroad.

Mercury-arc rectifiers made by the British Thomson-Houston Company, an affiliate of General Electric, supply the power for the "Reef Scheme," as it is called, while 115 four-motor, multiple-unit car equipments were furnished by G.E. through the International General Electric Company.

The engineering and sales work on this project was done by several former G-E Test men. Many such opportunities are open to graduates of college engineering schools who have successfully completed the G-E Test Course.

AMERICA'S OUTSTANDING YOUNG ELECTRICAL ENGINEER

DR. CHAUNCEY GUY SUITS, research physicist of the General Electric Research Laboratory, in Schenectady, has been named by Eta Kappa Nu, honorary electrical engineering fraternity, as the outstanding young electrical engineer for 1937.

Born in Oshkosh, Wisconsin in 1905, Dr. Suits graduated from the University of Wisconsin in 1927 and from the Technische Hochschule in Zurich, Switzerland (Sc.D. '29). An ardent skier, he spends most of his spare time on the snowy slopes around upper New York State.

As a member of the Research Laboratory staff, his work has been on the fundamentals of electric arcs, showing how arc temperature can be measured by sound, and it was for this work that the Eta Kappa Nu award was given him. Other activities for which Dr. Suits is noted include the investigation of non-linear circuits, high-pressure arcs, and the development of automatic tuning for radio receivers.

Last year the award was given to Frank M. Starr, U. of Colorado '28, G-E Test '29, who is employed in the Central Station Engineering Department of General Electric. The Test Course, of which Starr is an alumnus, provides a practical education supplementary to the theoretical knowledge obtained in college.

GENERAL ELECTRIC

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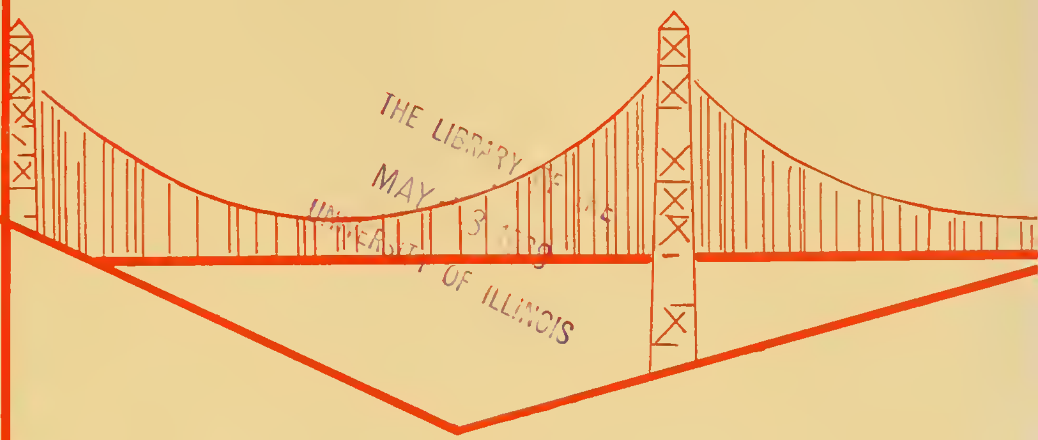

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MAY, 1938

The Illinois TECHNOGRAPH

Member of ECMA 20 Cents

THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

MAY, 1938

Volume 52 — Number 6

WITH the University and the College of Engineering, the Technograph feels privileged, for the second time this year, to honor Dr. Arthur Newell Talbot upon the occasion of the renaming of M. T. L. to the Arthur Newell Talbot Laboratory.

● President Arthur Cutts Willard heads Who's Who in this issue. Although the responsibilities of being the President of the University of Illinois at present overshadow his work in engineering, he is a recognized authority in the field of ventilation engineering.

● Seniors—are you going to be "graduate apple-polishers?" For those men who soon will be employed by the various industries, there is an article with excellent suggestions for developing the ability to get along with the boss.

● Au Revoir, auf Wiedersehen, or plain old American "so long"—which ever you choose! In this, the last 1937-38 Technograph, the staff wishes to say that we have enjoyed our work; that we appreciate the cooperation we have received; and that we wish a very successful year of the 1938-39 Staff.

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MEMBERS OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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—Courtesy of Illinois Alumni News.

ARTHUR NEWELL TALBOT LABORATORY

THE ILLINOIS TECHNOGRAPH

Published Six Times Yearly by the Students of the College of Engineering, University of Illinois

Volume LII | MAY, 1938 | Number 6

M. T. L. Becomes the

Arthur Newell Talbot Laboratory

ONCE again it becomes the privilege of the Technograph to dedicate another issue to Doctor Arthur Newell Talbot. It was forty-eight years ago that this man, whose name is now carved in stone above the doors of Illinois' great materials testing laboratory, gave the name "Technograph" to what was then the new student publication of the college of engineering. During this half century, Doctor Talbot has kept his vital interest in students and their problems. And during the sixty years that have passed since he first came to this campus, Doctor Talbot has lived a life of work and service to humanity, of educational inspiration to all students who have come in contact with him, and of friendliness and good-will to all who know him. So today it is we who are honored by being able to rededicate this magazine to him.

On April twenty-first the University of Illinois bestowed on Doctor Talbot one of the highest honors possible, when the materials testing laboratory was officially renamed the Arthur Newell Talbot laboratory. This renaming took place at a convocation held in the university auditorium.

Professor Robert E. Doherty, president of the Carnegie Institute of Technology, was the principal speaker at the convocation. Others who spoke during the occasion were Dean M. L. Enger, chairman of the convocation, President A. C. Willard, and Mr. Orville M. Karraker, member of the university board of trustees.

Following the convocation a banquet was held in Doctor Talbot's honor. Four hundred people, mainly close friends of his, representatives of professional engineering societies, colleges of engineering, and other institutions, attended the banquet in the Women's building. H. F. Moore, research professor of engineering materials, presided as toastmaster.

In connection with the occasion, a 64-page booklet, "A Tribute to Arthur Newell Talbot," stating in brief form some of the outstanding features of his professional career and tracing the growth of the college of engineering, was published. Its purpose is to "express the regard and esteem in which he is held and to epitomize the principal facts and events in his life as an engineering teacher and investigator."

Thirteen thousand copies of the publication were printed and are being sent out to alumni of the college of engineering in the years 1923-37, members of professional societies, deans and presidents of all engineering colleges,

DR. ARTHUR NEWELL TALBOT

•

engineering libraries in the United States and foreign countries, and to students who have applied for them.

President Willard states in a forward to the booklet:

"The University of Illinois takes this occasion to recognize and acclaim a distinguished son, Arthur Newell Talbot, of the class of 1881. Honors and awards, degrees and memberships, tablets and medals attest to the lifetime achievement in many scientific fields by Dr. Talbot.

"Over a period of nearly 60 years his contributions to engineering education, research, and practice, have grown more and more notable until today he is an acknowledged leader among engineering teachers, research organizers, scientific investigators, and writers, and above all, among men.

"Many generations of college students have gone forth from this institution inspired by his high standards character, and devotion to his ideals.

"It now remains for his alma mater to signalize for future generations of students the enduring contributions of this man to the engineering profession by placing his name on a great materials testing laboratory at the University of Illinois."

To tell the story of Doctor Talbot's life is a task beyond the scope of this article, and to do true justice to all of his life and work, a complete story would be necessary. As a longer account of his life and work was published in the September, 1937 issue of the Technograph, we shall suffice to give only an outline here.

He was born in Cortland, Illinois, October 21, 1857, of English parentage. He majored in civil engineering at the university, returning here to join its engineering faculty after four years on railroad location, construction, and maintenance in the West. He was active in the planning and development of the college of engineering and its experiment station, retiring in 1926 when he reached the retirement age.

One of Doctor Talbot's most important contributions to engineering education is the development of laboratories dealing with the testing of materials and structural elements. Starting with a small testing machine in 1888, the facilities have grown to the present large laboratory, one of the best equipped of any engineering school.

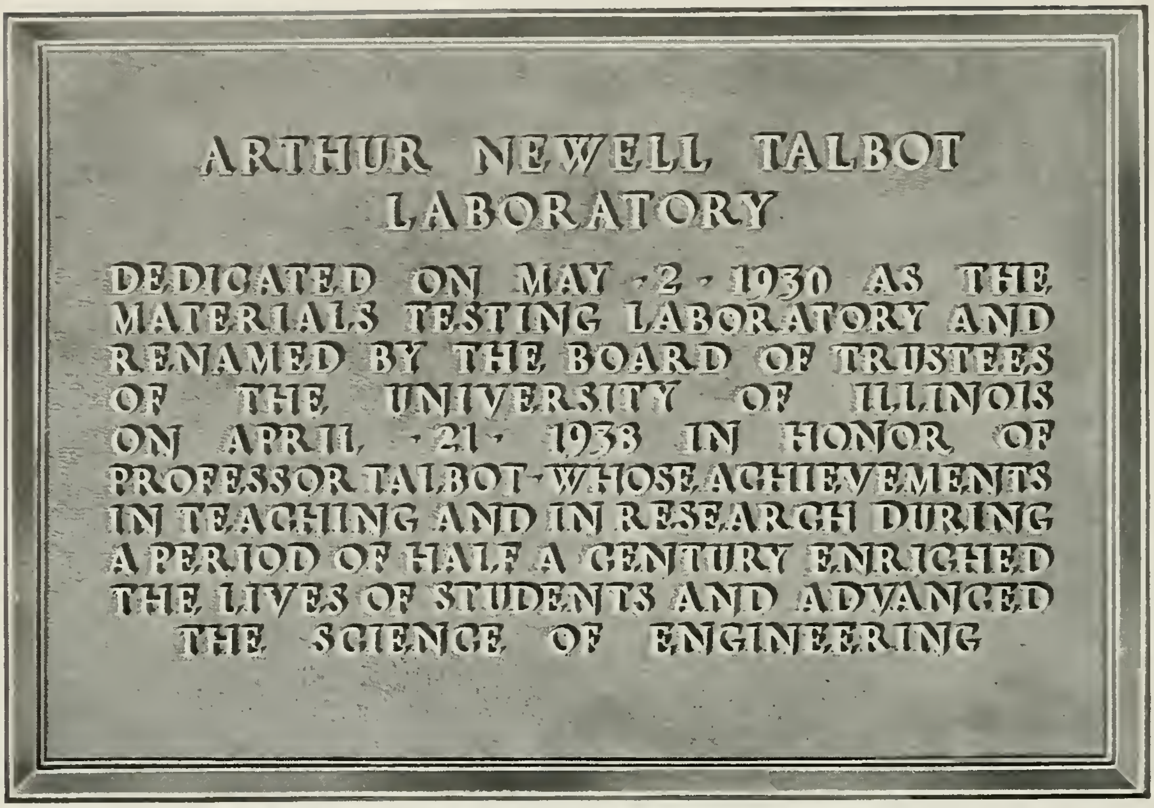
His research is believed to have accomplished more than any other one investigator to establish laws of the strength of concrete. A list of his published writings on his studies alone fills 14 pages in the tribute booklet.

To list the honors that he has received would, in itself, take many pages. To give only an idea, he has received honorary degrees from the Universities of Pennsylvania, Michigan, and Illinois, and he has been given honorary membership to nine state, national, and international professional organizations. All of these he has served at some time or other as president, committee worker, director, or by written contributions.

The awards he has received include the award of the Western Society of Engineers, the George R. Henderson Medal of the Franklin Institute, the Turner Medal of the American Concrete Institute, the Lamme Medal of the Society for the Promotion of Engineering Education, medal of the American Railway Engineering Association, and the most recent, the John Fritz Gold Medal given by the combined organizations of the A. S. C. E., A. S. M. E., A. I. E. E., and the I. M. M. E.

On April 21, the day of the convocation, Doctor Talbot was eighty and one-half years old. And should you desire to find him any one of these days, you can be reasonably sure that he will be in the materials testing laboratory, probably in his office. For, carrying on his great work, he still drives down to the laboratory every morning and afternoon. And if he should not be there, the next best bet is that

(Continued on Page 12)



Bronze Tablet in Arthur Newell Talbot Laboratory

(Placed in duplicate inside building near East and West entrances)

Physicists Break Down Matter with

The Illinois Atom Smasher

At one time, scientists claimed that there were but two basic forms of matter, fire and water. Since that time, man has progressed through stages where it was claimed that the molecule and then the atom was the basic particle of matter. Now experiments show such things as protons, electrons, and neutrons are the fundamental units of mass. Not content with present beliefs and wishing to determine what holds the atom together and keeps it from collapsing, scientists are investigating the nucleus of the atom by bombarding it with high speed particles.

Such high speed particles are obtained with an instrument which has popularly become known as the cyclotron, invented and developed at the University of California. The original instrument has since been improved but its principles of operation are identically the same. Instrumental in the development of this instrument are two of our own physicists, Prof. Kruger and Dr. Green. These men have set up in our own laboratory an instrument capable of producing energies of two million electron volts which give the particles a velocity of twelve thousand miles per second.

Principles are Simple

The operation of the machine is basically simple and uses only the fundamental mechanical and electrical principles. An electron stream is shot into the cyclotron by means of a tungsten filament and a grid with a high potential differential existing between them. The cyclotron itself is essentially two parallel plates about one inch apart, completely encased, split along the diameters and separated about a half-inch. These plates are filled with some substance like hydrogen or deuterium which is to be used for the high speed particles. As the electron stream passes through the cyclotron, at the center of curvature of the plates, it ionizes the gas. These ionized gas particles are then picked up by an electric field, caused by electrodes, and accelerated between the plates. These ionized particles can be a proton, deuteron, helium nucleus, etc., depending on the gas used. As the particle passes between the plates it is acted upon by a strong magnetic field of approximately 15,000 Gauss. This field bends the particle around in a circular path. When it covers one half of a circle, it is back into the electric field—which is now reversed by the oscillating electric potential and it is given an additional velocity. Again it is bent around by the magnetic field but the circle is greater than the first because the inertia force mv^2/r must be a constant as the field producing the curvature, the permanent magnet, is constant. That is, since v is increased to keep the system in balance. Each time the electron passes through the electric field, it is given an additional velocity by the oscillating potential until the path has become so great that it can leave the cyclotron through a slot in the outer edge of the plates. It is then bent away from the cyclotron by another electric field and directed down a tube to where-ever the particles are to be used. The particles now have a kinetic energy of from one to two million electron volts, depending on the square of the diameter of the plates and on the square of the intensity of the magnetic field. However, there is a limit to the size of plates usable as the increase in the radius of each succeeding circle is less than the one before. Thus there is a point where the increase in the radius of the path is so small that the edge of the plate used in removing the particles totally obstructs the passage of the particles. Difficulties are also encountered in increasing the intensity of the magnetic field.

Nuclear Physics

These particles, after they have left the cyclotron, are used in the study of nuclear physics. That is, they are used to try to determine the laws regarding nuclear structure.

It is commonly known that there is a repulsive force between two charged particles of like charge called Coulomb repulsive force, equal to the product of the charges divided by the square of the distance between them.

(Continued on Page 12)

Timely Suggestions for

A College Graduate In Industry

William Allen White, Kansas journalist and philosopher, pictures an excavation made near Luxor, Egypt:

"The foreman, turbaned and draped in long dark skirts, stood over the youths, yelling at them, cursing them, urging them to their task. They, watching the tail of his eye with snake-like cunning, did as little clawing in the earth as possible, filled as few leaky baskets as possible, under which their comrades groaned as they carried them out of the excavation. Occasionally, and when a white man came along, to emphasize the abysmal difference yawning between the foreman and the workers, the turbaned man cracked his whip and let the lash fall upon the naked back of some boy who jumped and winced and began to claw eagerly in the earth. Another foreman, or superintendent, much more gorgeously turbaned, much more splendidly robed, sat aloof, as far from the slave driver as the slave driver was from his prey . . . "

Not in America

Praise Allah! This description cannot be applied to American industry. Egypt can have her silk-garbed despots, but America prefers to move sensibly on to a different mode of industrial endeavor where fairness and equality exists. We see before us an industrial organization that is growing humanely, scientifically, and economically. And a challenge that forces us to a new and different realization of "the survival of the fittest" for the future. Not only will the "counterfeit" engineer fall behind, but many brilliant and practical men will be squashed because they lack the cultural and social background so important to the scheme of modern American industry. Since a great number of engineering students hold summer jobs in industrial plants, it is good to review a few helpful rules that will apply directly to the summer job as well as to the higher positions of tomorrow. It is our purpose, therefore, to serve the future by serving the present. We shall try to give some concrete suggestions that can be used by the student in the plant. We shall first discuss usefulness, or service, in industry, and secondly, we shall show the necessity of cordial relations with men in the plant and how to bring these relations about.

Service is First

Henry Ford said, "The way is clear for any one who thinks first of service —of doing the work in the best possible way." And, as Theodore Roosevelt put it, "The men who will loom large in our history are the men of real achievement of the kind that counts." That statement is very true, for the person who does not give service above all, leaves only tracks in the mud that will wash away in the first rain. The value of true service, however, is not always measured in history; most people feel the results of their energies all through life. They can get out of life only what they put in it through honest labor.

Edwin Markham told the story of a wealthy man who took an interest in a poor carpenter who could not make a success at his trade. He asked the carpenter to build a house and gave him a sum of money to do it with. The carpenter saw that he was on a free lance; so he decided to use inferior materials and to do only the kind of work that would "get by." When the house was completed, it had a good appearance but was really a poor piece of workmanship. He knew, however, that the wealthy friend could stand the loss, but imagine his horror when the good man whom he had cheated said innocently, "Here is the deed. Take it and move your family into the house and enjoy the fruits of your own hard labor at last." The carpenter had done no service in the construction of the house and was justly rewarded for his neglect.

Learn to Work

The first thing the student learns when he begins work in a plant is that usefulness is all that is wanted of him; that industry is no respector of persons, of education, or of social status; that personal identity is unimportant in the plant; and that he is merely a part of a large scheme. In short, he is impressed by the actuality of work (or service) above all else. Here, glorified titles are really Sunday names for actual human energy. The terms efficiency, production, wages, and capital lose their previous meaning. Labor is no longer an institution—it is work. This does not mean that it may not be pleasant work. Work may be very agreeable, but it is hard for the student to realize that it is not a dream, and when the boss tells him to move some material, he must roll up his sleeves and actually move that material, just as his foreman has to get up and do the thing he is required to do. Usefulness is the by-word; service is the purpose.

Co-operation Necessary

Service can only be rendered, however, through honest co-operation. The Egyptian whip-method of bossing men, described by Mr. White, is no longer popular. Modern management has gradually turned to the cultural for a means of effectively handling men, and, versatile as ever, the engineer—the "practical applier of knowledge"—is executing a new duty. He is giving a useful and larger meaning to the popular idea of etiquette prevalent in the butterfly society of our "upper-class" brethren. He is developing a code of ethics in the plant community. He is learning to coordinate men as well as machinery. He calls this new duty Human Engineering.

Charles M. Schwab was so conscious of the importance of Human Engineering that he attributed his success in the steel industry to it.

"I never was a great engineer," wrote Mr. Schwab. "I never was a conspicuously able chemist or metallurgist. I have never flattered myself that I was a super-salesman.

"But when it comes to handling men, when it comes to winning men's loyalty, when it comes to getting men to give their best, including workmen, I think I can say, in all humility, that I don't have to regard myself as a second-rater."

Stress Human Relationships

The success of any plan depends upon the human relationships connected with the plan, and an industrial plant that does not stress this element usually fails. Let us emphasize this point. In Scribner's magazine, February, 1938, Whiting Williams, an adviser to large employers on personnel and public relations, cites an interesting incident in which the plant relationship between the management and the workers was neglected. The result was a strike, and here is what the employee's committee said:

"Forty-five of our most skilled men asked us to find out if it was true that men doing the same work in a nearby plant had received a three-cent-per-hour increase. If so, our men wanted the same. We found our manager was out of town. The 'Super,' next in line, told us he'd give us his answer in 24 hours. But three days later he was still stalling. So one shift of these skilled workers—only 15 men, y'understand—walked out. These 15 told everybody else, 'The place is on strike'—and it was!"

Friendliness Pays

The reader can probably cite many examples in his own experience which show how individual negligence, insult, and jealousy affect any plant, no matter how large it is. There are many logical ways to prevent such situations and to maintain cordial human relations in the plant, but only a few will be given here.

"A very good beginning on a new job," writes Mary P. Barker, the author of the popular booklet, "The Technique of Good Manners," "is to cultivate a friendly morning greeting. Whether it be 'Hi, Bob,' to the time-keeper, 'Hello there,' to your office mates, or 'Good morning, Sir,' to the boss, say it with a smile, and mean it. Get acquainted with your associates just as fast as they will let you. You will find many of them with a stiff reserve which they will not let you break through, but watch carefully and you can tell when your friendly interest is acceptable and when not." Friendliness and cheerfulness is the basis of most businesses today. Cheerfulness in service brings customers to gasoline stations all over the country. Charles Schwab believes in cheerfulness and good-will in service:

Cheerfulness an Asset

"Yes, I'll admit that I studied from the start how I could earn the good-will of my superiors, not by toadying obsequiously to them — no he-man wants that sort of thing. My method was to make myself useful to those above me. . . . Even at that early age, I had the thought that people liked to have cheerful individuals around them. I was always cheerful.

(Continued on Page 12)

★ WHO'S WHO IN IL

• *A. C. Willard*

• *T. C. Shedd*

• *A. C. Callen*

ARTHUR CUTTS WILLARD, to most students, is the president of the University of Illinois, a figurehead whom they hear speak a few times while in school. But President Willard would rather be known to the students as a friend. He is best described by the term so often used by those who have had the pleasure of meeting him,"A swell fellow!" Although he is always busy, he generally has a few moments to chat with those who come to see him. Dr. Willard was born and educated in our national capital. His first degree was in chemical engineering. After teaching that subject for two years, he entered the field of mechanical engineering. In 1917 he came to the University of Illinois as a professor of heating and ventilating engineering. In 1920 he became head of the department of mechanical engineering; in 1933, the acting dean of the College of Engineering; and in 1934, the president of the University. Although he was an engineer and little known as an educator when he became president, Dr. Willard soon made a place for himself in educational circles. He would like to impress this fact upon the minds of engineering students: There are many other things to be learned besides the technical, and of these things the English language is one of the most important.

THOMAS CLARK SHEDD was born in Worcester, Massachusetts, and received parts of his education in Rhode Island, North Carolina, and Virginia before graduating from Brown University. He decided to desert the vocation of his father, uncles, and grandfather (civil engineering) and studied mechanical engineering. After teaching at Brown for two years, however, he took a civil engineering position. Against his will, he again became a teacher during the war when his employers loaned his services to Lehigh University. In 1922 he came to the University of Illinois and is now professor of structural engineering. Professor Shedd keeps in touch with the building industry by working for different companies during the summer. Last summer he helped design the New York World Fair Theme Building, a 200-foot sphere. He is co-author of one book on structural design, author of another, and is in the throes of authorship again. He says that writing takes so much time that he has little time for hobbies, but that when he gets a chance he likes to play tennis. However, because he is so interested in the economics of structural design, he does not feel badly about being so busy. Other interests include two boys, one a sophomore in electrical engineering—evidently also trying to break away from civil engineering—the other in University High, and a little daughter, the apple of his eye.

ALFRED COPELAND CALLEN, head of the department of mining and metallurgical engineering, was born in Pen Argyle, Pennsylvania, in the heart of the famous slate-quarrying region where he was afforded, during his boyhood, an opportunity to study mining and metallurgy as practiced. His education consisted of high school at Reading, an Engineering Mining degree from Lehigh in 1909, an M.S. in 1911, and graduate work here from 1914 to 1917. Professor Callen has done a variety of engineering work besides teaching, and has not stayed in the mining and metallurgical fields to do this work. His teaching experience was gained at Lehigh and at West Virginia. A mining extension course in West Virgina gave hm some of his most interesting work—the unique experience of teaching really interested pupils. Organizations that claim Professor Callen's membership are too numerous to list here. He is very active in various Twin city clubs and has served as the Illini representative in the Big Ten for seven years. As for his recreation, in his own words: "An infrequent, indifferent, but consistent golfer; my card usually totals 134-7."

The Production of . . .

STAINLESS STEEL

Editor's Note: *The following eight-page supplement illustrates the processes in the manufacture of stainless steel in the subsidiaries of the United States Steel Corporation. This was made possible through the courtesy of U. S. Steel News.*

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STAINLESS steels are made in electric arc furnaces, which often have a capacity of thirty tons. The molten steel is tapped from the furnace into a huge ladle from which it is poured into molds, where it solidifies into ingots. After being stripped from its mold, each ingot is placed in a pit to soak up heat until it reaches the correct, uniform temperature for rolling. The ingot is then rolled on a blooming mill into slabs, from which flat plates, strips, or sheet bars will later be rolled, or into blooms, from which bars and tubes will be rolled.

Stainless steel plates are rolled on a 96-inch continuous mill consisting of a slabbing mill, slab furnaces, three stands of roughing mills, six stands of finishing rolls, and an immense cooling table, all in one straight line.

Sheets, which comprise a large portion of the stainless steel made, must be rolled with great care for much of the tonnage must be polished. The sheets are first hot-rolled. Then because the rolling hardens the metal, the sheets are softened by heat treatment before they are processed further. This process, generally done in a continuous furnace must be completed correctly for insufficient treatment produces sheets of low ductility and overtreatment makes the metal so coarse grained that polishing is difficult. The scale formed by the heat treatment is removed by pickling the sheets in an acid solution. The pickling process also requires good judgment as overpickling results in excessive loss of metal and roughens the surface, making polishing difficult.

The pickled sheets may be cold-rolled or polished to finish them. The cold rolling consist of passing the sheets through the highly polished rolls of a special mill. Some types of sheet are given a second annealing and pickling. If high tensile strength is desired, the sheets are rolled under much greater pressure, which also gives the metal greater hardness. The sheets to be polished are first rough ground on a revolving belt machine. The final polishing operation uses powdered lime as the abrasive. The steel may be polished to mirror finish. The degrees of finish have been standardized and the finish desired may be specified by number. When the polished sheets are crated for shipment, they are interleaved with special paper to protect the surface from marring or scratching.

Stainless steel strip is made by hot-rolling, annealing, pickling, and cold-rolling. By proper cold-rolling, steel having a tensile strength of 150,000 to 180,000 pounds per square inch may be produced.

Stainless steel bars of all shapes may be finished by cold-drawing. Round bars may also be finished in a "Medart" machine or in a centerless grinder, which produces the highest finish.

Stainless steel wire is drawn from bars. Some is drawn to a diameter finer than that of human hair. Such wire is so fine that twenty miles of it weighs one pound. Such wire must be annealed in hydrogen to prevent the formation of scale.

Stainless steel tubing is manufactured by four processes, namely, seamless, rotary-rolled seamless, lap-weld, and butt-weld. In the seamless process, a hot round bar of steel is pierced by a conical shaped mandrel, then rolled and finished. In the rotary-rolled seamless, tubing made by the seamless process receives a further rolling which enlarges the diameter and which can be made to increase or decrease the wall thickness. By this process pipe with a diameter of 24 inches can be produced. In the lap-weld process, a sheet of strip steel is bent longitudinally until the outside edges overlap and is then passed through rolls which weld the edges. In the butt-weld process, a similar piece of strip steel is pulled through a funnel-shaped opening in a die called the welding bell, bringing the two edges together to form a weld.

Polishing the outside surface of stainless steel tubing in National Tube Company, Ellwood City, Pennsylvania. Outside polishing is done by rotating the tube over a traveling belt which produces either a rough ground finish or a smooth buff finish, depending upon the different grits employed. Polishing is done either to impart a more brilliant finish or to develop a surface which is readily kept bacterially clean.

Illustrations and captions by courtesy of U.S. Steel News

THIS HOT METAL IS STAINLESS STEEL

Fig. 1. Tapping a heat of USS 18-8 stainless steel from a 30-ton Heroult electric furnace at South Works, Carnegie-Illinois Steel Corpn., Chicago. Note the observer checking the pouring temperature of the metal with an optical pyrometer.

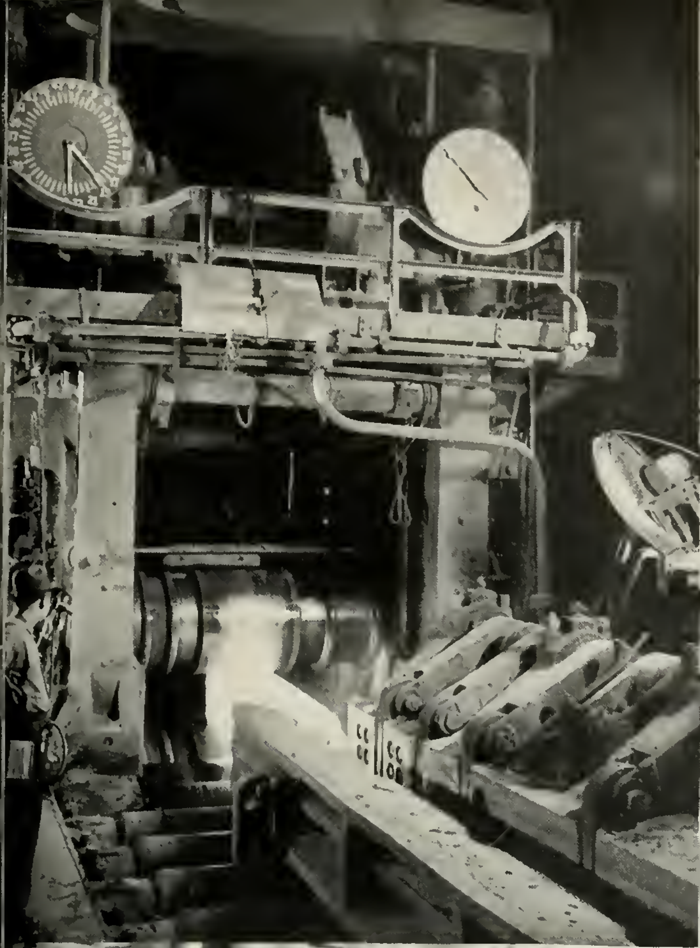


Fig. 2. (At left). Blooming mill at South Works, Carnegie-Illinois Steel Corpn. Here stainless steel ingots are rolled into blooms, billets or slabs for further processing. Notice another "brain truster" checking temperature with an optical pyrometer.

Fig. 3. (Below). Cooling bed of 96-in. continuous plate mill, South Works, Carnegie-Illinois, where stainless steel plates are rolled.

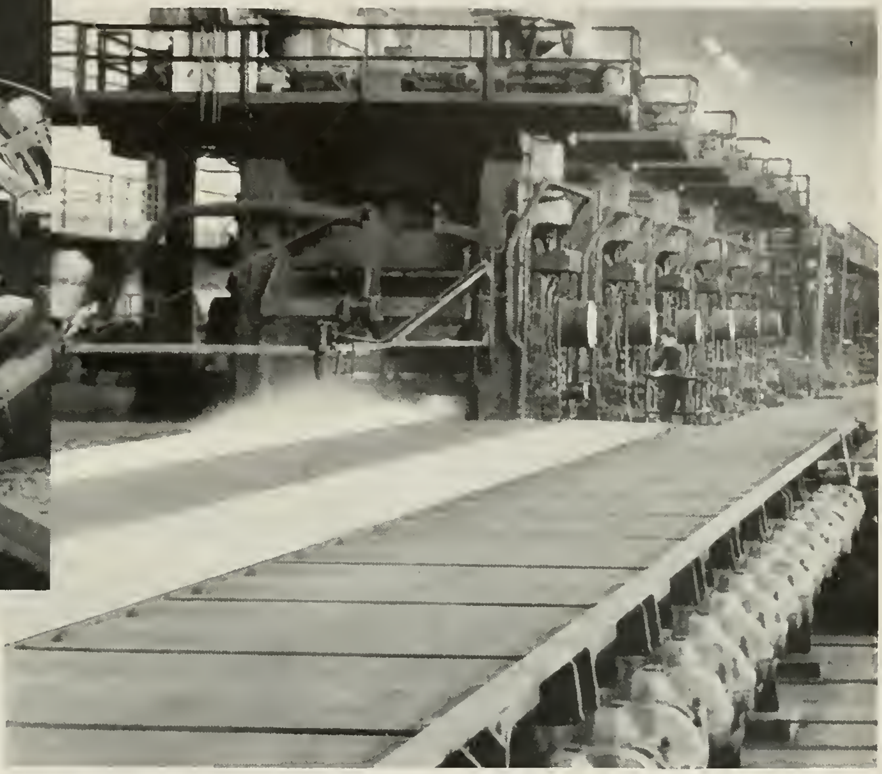


Fig. 4. (At left). Coils of hot-rolled stainless strip which will be further processed into cold-rolled strip or will be cut into breakdowns for rolling into sheets. The employee is putting a micrometer on the edges to see whether they are of the right thickness. This is called "inspecting for accuracy of gage." Gary Works, Carnegie-Illinois Steel Corpn., Gary, Ind.

Fig. 5. (At right). Rolling stainless steel eets at Wood Works, Carnegie-Illinois Steel orpn., McKeesport, Pa. The man at the right blowing compressed air on the sheet to move any loose scale which may be present. It is important to keep the sheet free om such scale during rolling to prevent arking.

Fig. 6. (Above). Rolling stainless steel sheet at Wood Works, Carnegie-Illinois.

Fig. 8. (Below). These stainless steel sheets have just been pickled and are about to be immersed in a water tank to be washed and rinsed. Wood Works, Carnegie-Illinois Steel Carpn.

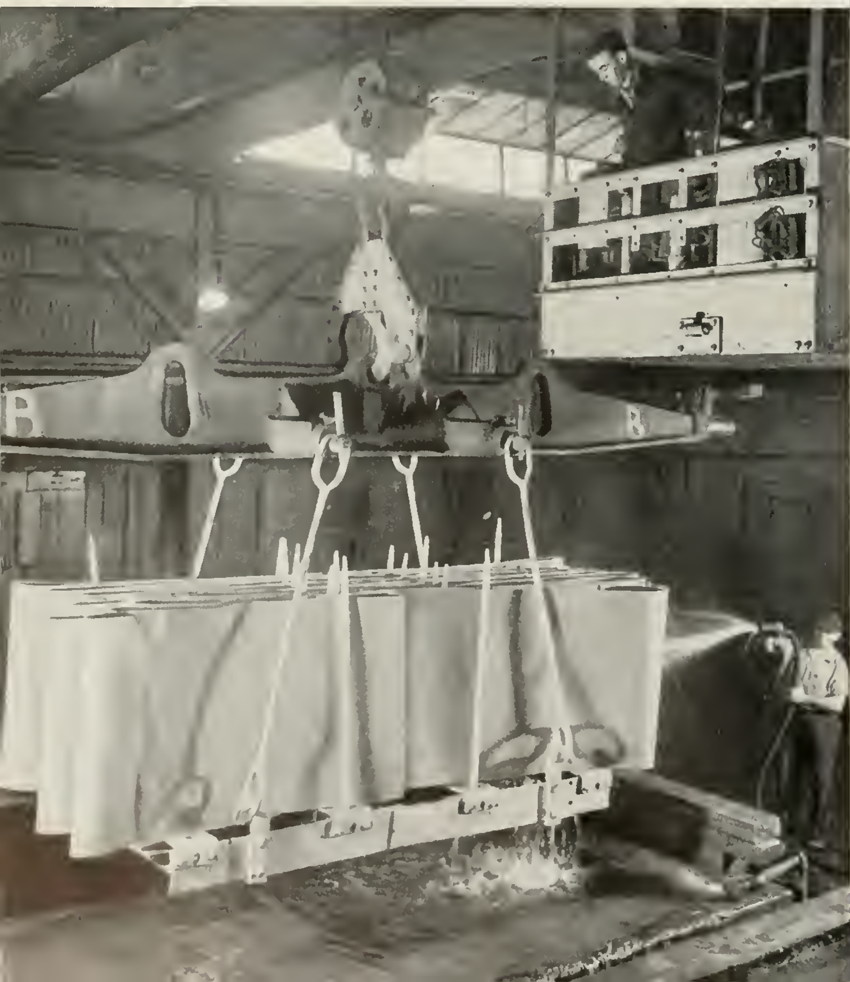


Fig. 7. (Below). Continuous annealing furnace, Wood Works, Carnegie-Illinois, in which stainless steel sheets are heat treated. The stainless sheet is laid on a "rider" or "waster" sheet for its ride through the furnace. The conveying mechanism is below the furnace except for the dogs (supports projecting from a continuous chain belt) which hold the sheets. The dogs project through slots in the furnace bottom. Note the two ventilating fans which help to keep the operator comfortable.

Fig. 9. (Below). Four-high mill where stainless steel is cold-rolled to produce a smooth surface finish or high tensile properties. Wood Works, Carnegie-Illinois Steel Corpn.

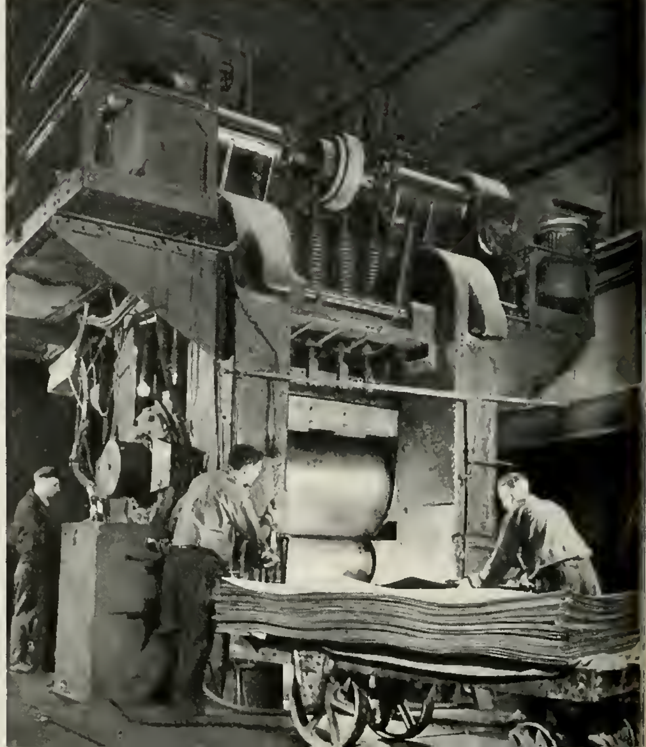


Fig. 10. (Upper left). Rough-grinding stainless steel, Wood Works. The operator is slushing grease on the sheet.

Fig. 11. (Above). Finish-grinding stainless steel sheets, Wood Works. The operator is applying a suitable grease.

Fig. 12. (Left). Hydraulic stretcher leveling machine, Wood Works. In this machine the stainless steel sheet is stretched just enough to produce a smooth and even surface.

Fig. 13. (Right). Packing and crating stainless steel sheets, Wood Works. The polished sheets are interleaved with specially selected paper to prevent marring and scratching. The employee at the left is marking the sheet with a rubber stamp. Packing, inspecting and weighing are simultaneous operations here. The empty box and the paper are weighed first and the scale is set to tare. Hence when the box is packed the scale shows the net weight of the contents.

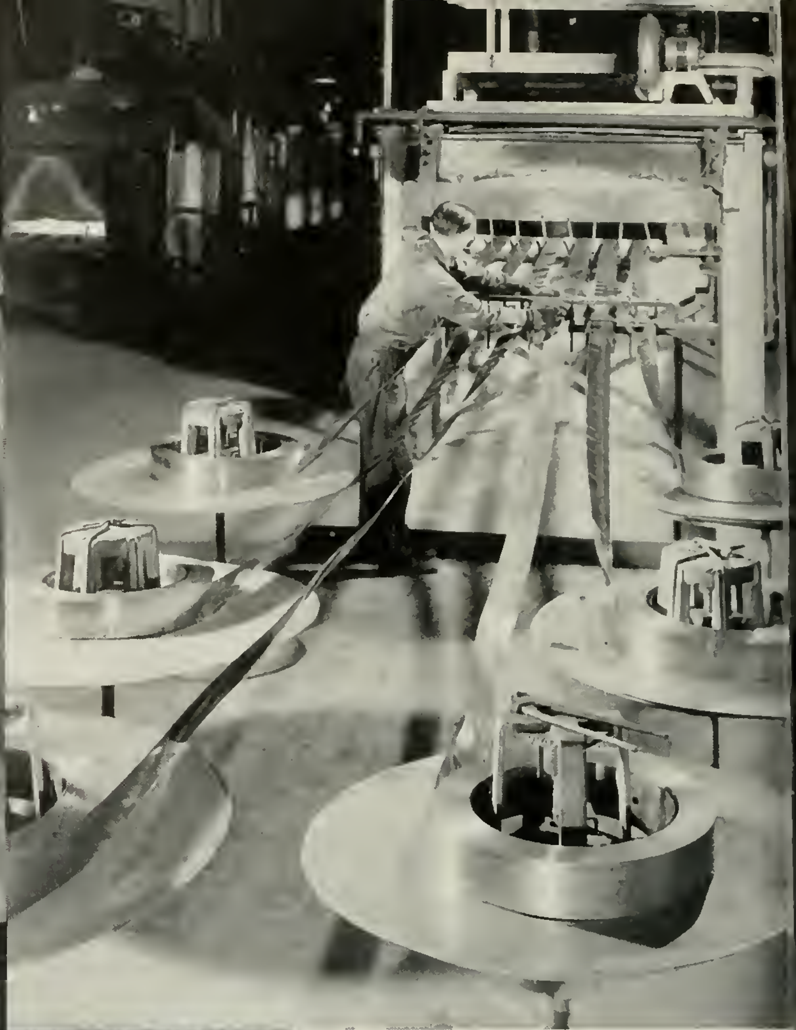


Fig. 14. (Upper left). Cold-rolled stainless str leaving a 12-in. four-high cold-rolling mill Cuyahoga Works, American Steel & Wire Co Cleveland, Ohio.

Fig. 15. (Above). Cold-rolled stainless ste strip entering a continuous annealing furnac Cuyahoga Works, American Steel & Wire Co Cleveland.

Fig. 16. (Left). Continuous pickling of cold rolled stainless strip after annealing, Cuyahog Works.

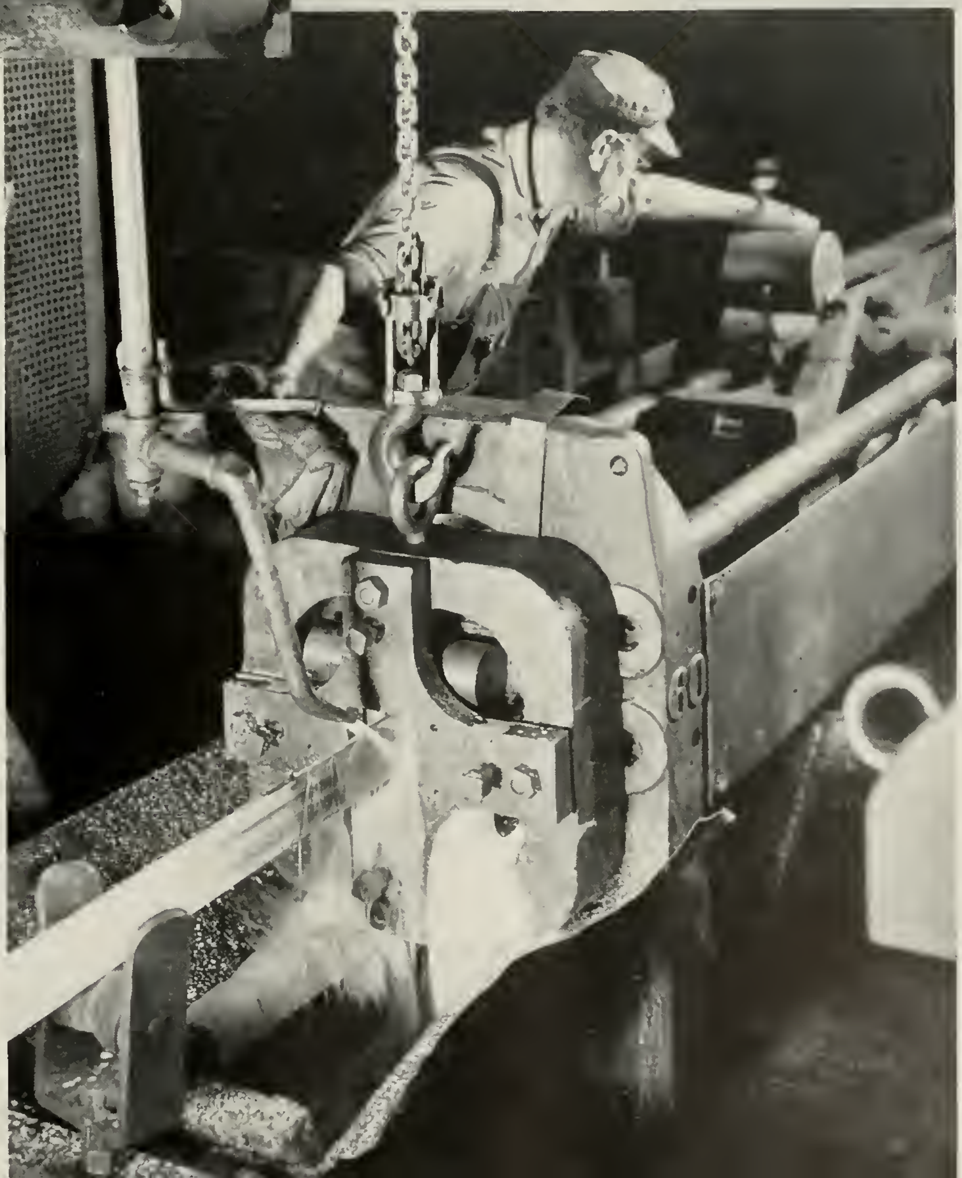


Fig. 17. (Above). Recoiling finished ;old-rolled stainless steel strip pre- ιaratory to shipment. Cuyahoga Vorks. To protect the cold-rolled sur- ιce the strip is carefully interleaved vith specially prepared paper. The ιaper, it will be noted, runs up from eels located near the floor.

Fig. 18. (Upper right). Extra-width old-rolled stainless steel strip leav- ιg continuous annealing furnace, uyahoga Works.

Fig. 19. (Right). Cold-drawing stain- ess steel flats, Newburgh Works, merican Steel & Wire Co., Cleve- ιnd.

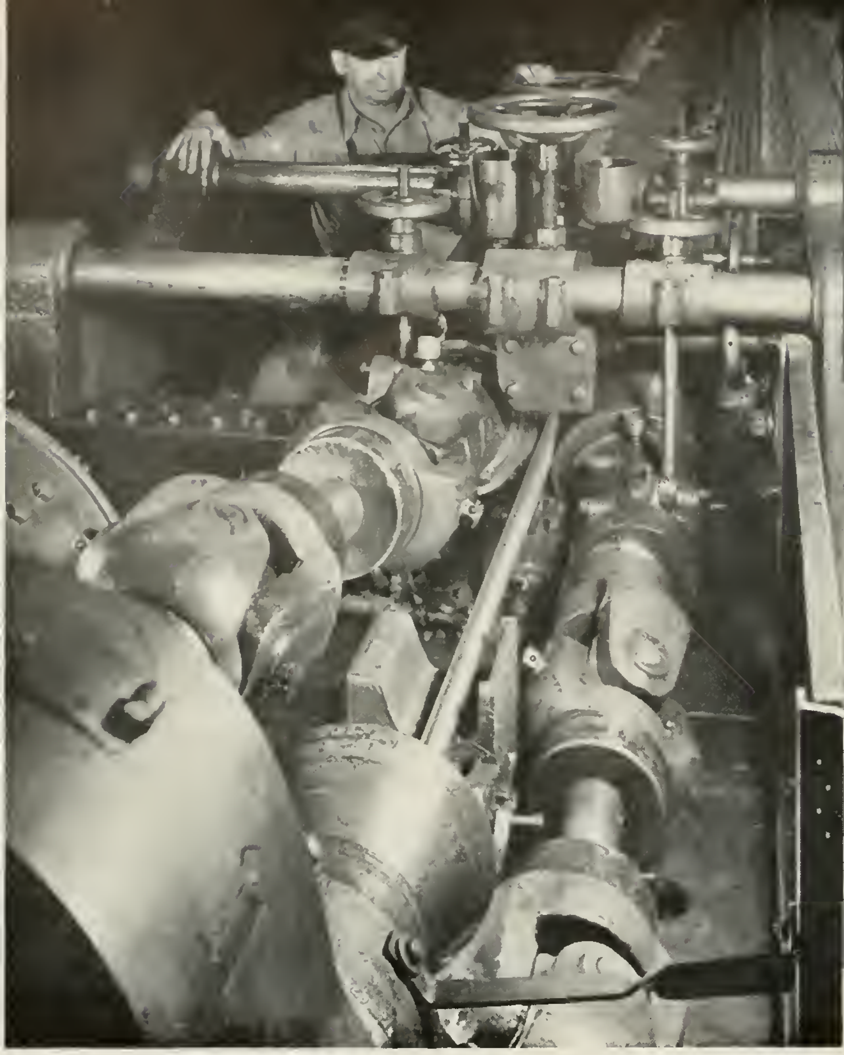
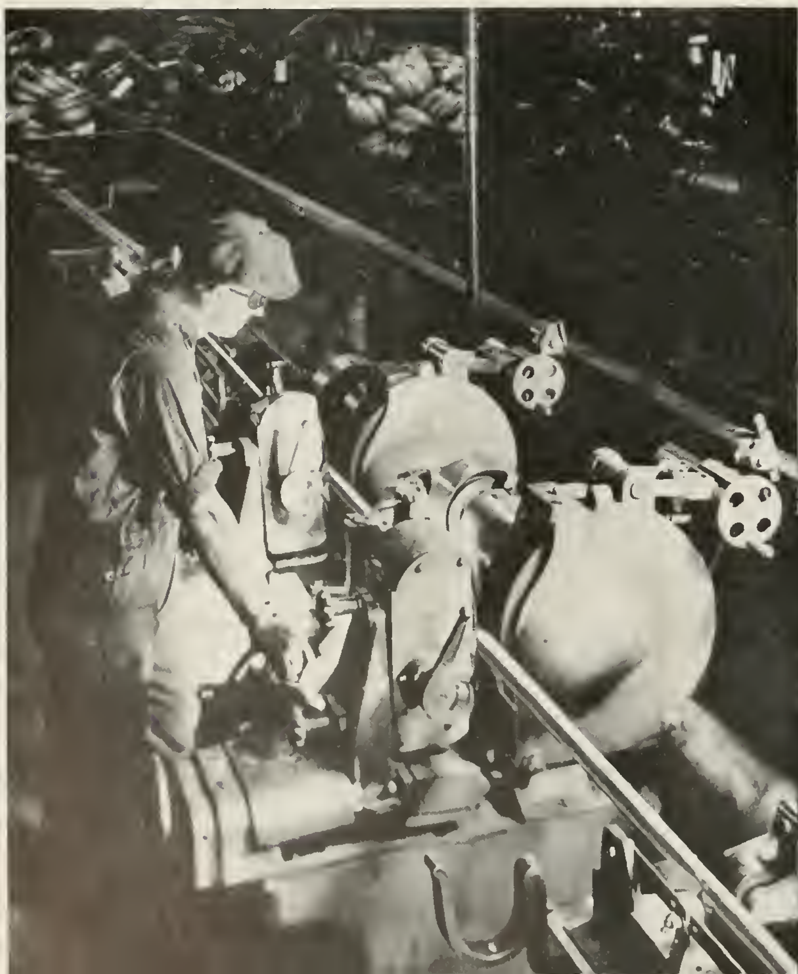


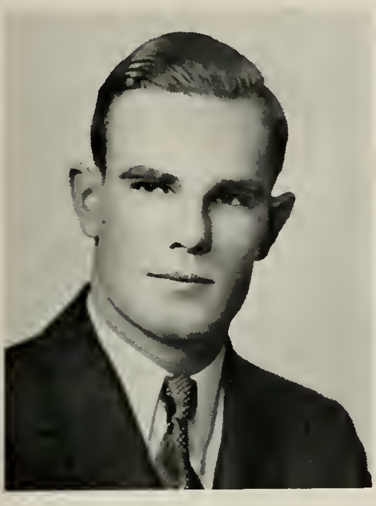
Fig. 20. (Above). Straightening and polishing stainless steel bars, Newburgh Works, American Steel & Wire Co.

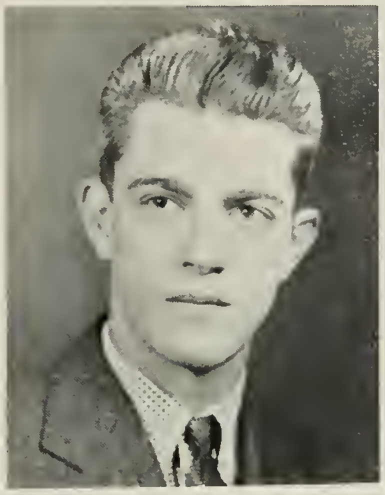
Fig. 21. (Below). Polishing stainless steel bars in a centerless grinder. Newburgh Works.

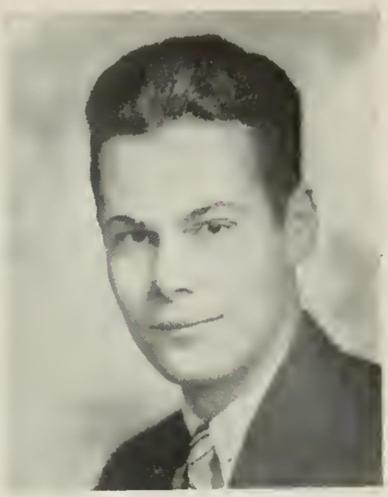
Fig. 22 (Above). Drawing extremely fine stainless steel wire American Works, American Steel & Wire Co., Cleveland.

Fig. 23. (Below). Annealing fine stainless steel wire, America Works.









J. M. Robertson ●

R. F. Fearn ●

W. A. Sinks ●

WILLIAM A. SINKS, E. E. '38, has quite diversified interests; as Bill puts it, he has "diddled around with a number of things." At Cairo High School, 10 miles from his home in Cache, Ill., he showed versatility by earning two baseball letters and an honor pin. His college career began at the Southern Illinois Teachers College in Carbondale, where he majored in P. E. and mathematics. Feeling a need for a general education before he decided upon his life's work, he registered in physics, advanced mechanics, and commercial subjects. After three years at the Teachers College, he decided definitely that engineering offered him the greatest opportunities, and, accordingly, he took a summer correspondence course in G. E. D. from the University of Illinois. In September, 1936, he entered the University with a junior standing and soon became known as an earnest scholar. Last semester he was elected treasurer of Eta Kappa Nu and A. I. E. E., and this semester he is treasurer of Tau Beta Pi and the Electrical Show. He declined a bid to Sigma Tau because of a lack of funds. In spite of his activities, Bill still finds time to work in the E. E. Laboratory on an N. Y. A. job. After graduation he hopes to work in the field of power generation and transmission or in the manufacturing of power equipment.

RALPH F. FEARN, M. E. '38, came to the University of Illinois with a junior standing after having studied engineering for two years at Bradley Tech in Peoria. He attended Peoria Central High School, where he made an exceptional record by earning school honors and a membership in the National Honor Society. Besides his excellent scholastic work, he played in the school band and earned a letter in track, running the "440" and the half-mile relay. At the University of Illinois, he has earned a 4.85 average for three semesters and has been initiated into Tau Beta Pi, Phi Kappa Phi, and Pi Tau Sigma, of which he was secretary last semester. He has spent a great deal of his summer time in traveling through the United States and Canada, and has visited every state east of the Mississippi river except Delaware and Florida. Last summer, in his basement workshop, he constructed a circular saw which, according to his roommate, really runs! The greater portion of his summer vacations has been spent playing the saxaphone and trumpet with a professional orchestra. After being graduated from the University, he hopes to take a training course in physics which will lead to a research position.

JAMES M. ROBERTSON, C. E. '38, a native of Urbana, is undoubtedly one of the most active students in the entire University. He is a member of the Engineering Council, president of A. S. C. E., and was for more than two years a staff member of the *Technograph*. He has been initiated into four honoraries: Phi Eta Sigma, Chi Epsilon, Phi Kappa Phi, and Tau Beta Pi. He is also a member of Mask and Bauble and Arepo, and has worked backstage on 16 Theatre Guild productions. He has spent his summers in extensive travel through nine European countries and in study at the Washington and Colorado state universities as well as in Switzerland. Jim graduated from University High School where he was active as a member of the track team, as president of the Senior Class, and as a member of the annual staff. At present he is collecting data for his bachelor's thesis entitled "A Study of the Flow of Water Around Bends in Pipes." Tennis, golf, and winter sports are his favorite forms of athletics. His outside interests include reading and playing the piano. If it is possible, he will travel during his spare time. Jim hopes some day to learn well the German, French, and Spanish languages.

Summer to Bring

New Problems for Experiment Station

ONE of the most valuable and useful divisions of the University is the Engineering Experiment Station, which puts the theories of engineering into actual practice, and gives the benefits of its work to the public. In this cooperative enterprise, money and men from industry and research technicians from the staff meet in an effort to solve the problems that are steadily coming from the many industries of America. Many different types of experiments are being conducted, such as research on stresses in railroad tracks, warm air heating systems, hardness of boiler water, vitreous enamels, and reinforced concrete. These investigations that are conducted in widely varied fields may affect the lives of each of us materially sometime during our life. The general public doesn't know or hear much about the station or its work, yet many of the investigations have a far more profound effect upon the people than the sweet nothings that they are so concerned with every day.

At present there are nearly twenty different projects being carried on at the station, about ten of which will be continued through the summer. An investigation of rigid frame structures, in co-operation with the Portland Cement Company, that has just been completed has brought out several new facts that are of great interest to contractors. Another investigation, in co-operation with the State of California, on reverse stresses in riveted connections, has also been recently completed. The public is not interested in the technical features of these reports, yet it will appreciate and commend the improvements in buildings and large structures that will be the direct result of these studies.

This summer the Ceramics department is to do some work on vitreous enamels in co-operation with the Canton Stamping and Enameling Company and the Chicago Vitreous Enamel Products company on vitreous enamels and enamel frits, respectively. In the smaller things, such as china, crockery, and enamelware, the experiment station moves silently and effectively behind the scenes to provide us with better products to use on our tables and in our kitchens.

Some of the most important work to be done this summer will be the work on stresses in railroad track, continuous welded rails, and a general rails investigation. These studies will be conducted by different members of the staff in co-operation with the American Society of Civil Engineers, the American Railway Engineering Association, the Rail Manufacturers' Technical Association, and the Association of American Railroads. These tests will probably aid in making travel by train much smoother and safer than before.

One of the newest developments in the field of railway engineering is the continuous welded rail. Formerly the rails were cut into given lengths at the mill, and then fastened to the roadbed with a small space between them for expansion. Now, however, on some experimental tracks, a special car that is equipped to weld the rails together is employed to produce a continuous rail of several miles in length. A unit about eight miles long has been successfully completed by one road. In the field tests that have been given, these rails have proved very satisfactory. However, some problems have arisen with the advent of these exceedingly long rails and Professor H. F. Moore is in charge of their investigation at the experiment station. If these rails are found to be entirely practical, the roadbeds will be made much smoother than was ever dreamed of by the passengers of Stephenson's first train. Another result of the extensive adoption of these rails will be the disappearance of the familiar clickety-click of the wheels as they swiftly run over the rails.

At the present time a study of some of the problems of air-conditioning is being conducted by some of the research professors in heating and ventilating in cooperation with the American Society of Heating and Ventilating Engineers and the National Warm Air Heating and Air-conditioning Association. This study is not yet completed, but when it is, cool air may circulate in more homes in the hot summer months than ever before.

An important section of the ventilating field is that of providing for mines clean, cool air which is free from dust and poisonous gases. A report of an investigation of "Ventilation Characteristics of Some Illinois Mines," by Professor C. M. Smith, has just been published by the station. Fourteen mines were studied, ventilation characteristics and savings were considered, and in some places yearly savings amounting to as much as $1,400 were pointed out.

About two-thirds of the power generated in this country comes from the plants where water is heated to provide steam for the turbines. Two of the most important problems of the steam generating stations are the menace to health and property from stack gases, and the breakdown of the boilers due to impure water. This summer the chemical staff of the station will study these two problems in co-operation with the Utilities Research Commission Incorporated.

During the summer, the highway engineers will work with the U. S. Bureau of Public Roads and the State of Illinois Division of Highways on the problems encountered in the use of reinforced concrete slabs. Automobile traffice has increased so much in the last decade that highways that were thought to be eternal are fast wearing out. Ways of reinforcing the concrete slabs with steel and other metals are being investigated at the present time. This country still needs many more miles of good roads; perhaps the results of this investigation may be broad stretches of concrete that will be smoother and safer than even Germany's Reichsautobahn.

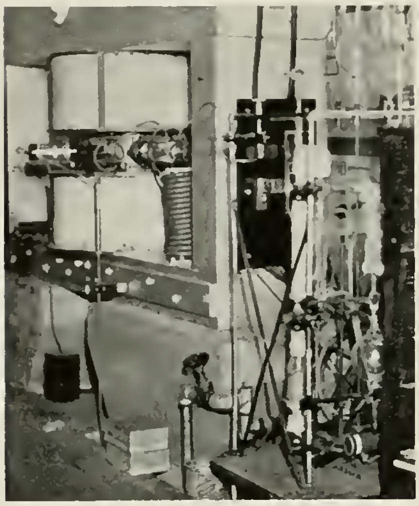
By ALLEN ADAMS '41.

Former Laboratory of Applied Mechanics. Built in 1902

ILLINOIS ATOM SMASHER

(Continued from Page 6)

As the distance between the particles becomes smaller, the repulsive force becomes more and more intense. However, it is found that as the particles approach a distance of one times ten



Illinois Cyclotron

to the minus twelve or thirteenth power centimeters, this force changes to an attractive force. Thus it is the purpose of the cyclotron to produce particles of such energies that they can overcome the repulsive force and get into the distances where this attractive force becomes effective, and thus get the particles to combine with each other. This has actually been accomplished and heavy hydrogen has been changed to helium by its bombardment with deuterons, and beryllium has been made into boron with a similar bombardment right here in our own laboratories. Of course, many other interesting phenomena occur during and after the bombardment, such as the emission of gamma rays, but the discussion of this is lengthy and very technical. For further information regarding this subject, the reader is referred to a textbook on modern physics or to the articles written by Prof. Kruger, Dr. Green, and others in the **Physical Review** during the past two years.

At the University of California, a cyclotron capable of producing energies up to eleven million electron volts has been in operation for some time. With this instrument, every known element has been bombarded and other elements formed. Gold, for instance, has been made by bombarding platinum. At the present time, Lawrence, the inventor of the cyclotron at the University of California, is building one to produce energies up to twenty-million electron volts. This machine is to be used in the study of biological physics. As yet, the highest energy that can be produced with the instrument in our laboratory is two million electron volts, but this has been sufficient for our uses.

By ED FRASER '39.

Talbot Laboratory

(Continued from Page 5)

he is out of town, examining some of the research projects in which he is interested or taking part in, or that he is attending a convention of some engineering organization. For all these years, the love that Doctor Talbot has had for his profession has never waned.

And we students in the university, who, with his family and his work, share his great loyalty, add our tribute to that which he has recently received.

—By Tom Morrow.

College Grad In Industry

(Continued from Page 7)

Maybe my superiors recognized that nothing was any trouble to me so long as I could render them even the smallest service."

The first rule for influencing men in industry is: be cheerful, render a service with a smile!

The second rule is: don't let your own routine affect your relation to the men around you. Remember that your employer has a dull routine too. Even the work of the President of the United States is tiresome and, in many ways, homely. Although doing the same specific thing over and over is terrifying to a certain kind of mind, the general type of repetition is not an unfair hinderance. "When you come right down to it," says Henry Ford, "most jobs are repetitive. A business man has a routine that he follows with great exactness; the work of a bank president is nearly all routine . . . Indeed, for most purposes and most people it is necessary to establish something in the way of a routine and to make most motions purely repetitive—otherwise the individual will not get enough done to be able to live off his own exertions."

The third rule for getting along with men in industry is: don't tread on the other fellow's ground. It is very important in the plant to have jobs specifically defined. Great pains are taken to prevent ambiguous duties. Consequently, the ambitious, over-stepping worker is generally a source of trouble to his employer, and he is hated by his fellow workers. In dealing with workers, remember that a machinist, for instance, has a "job pride" that is almost sacred. His trade is his soul; it is the most important thing to him, and he will defend it as a dog guards a bone. He will snarl at intruders. Keep in mind that the tradesman doesn't like to be improved upon. You may observe that he resents an infringement upon his duties even by his foreman, and he is silently reverent for the boss who keeps "hands off," who leaves him to the execution of an instruction. But he will always give his best to workers and employers who deal with him earnestly and fairly.

The fourth rule is: stay out of the rut; use your education. "At an executive meeting of the General Electric Company," declares Mrs. Barker, "this comment was made: 'One of the first things a young engineer should acquire is a dinner coat, and he should see to it that he wears it to some function or other at least once a week.' That advice is good, figuratively speaking. If you take it literally, it is even better . . . " Join your professional societies; go to as many of the conventions as you can afford in time and money. Get yourself known. When a vacancy occurs, the man who has to fill it runs over in his own mind the men he knows who might be suitable. If he doesn't know you, how can you expect to be considered?

Human Engineering

Since college education has become so popular, or should we say so easily obtained, a college man is no longer upheld by a traditional prestige, and sometimes he is even shadowed by the very fact that he is a student. Some industrial organizations, through experience, have built up a resentment toward the student in the plant. They have found many students to be "social misfits," poor workers, and even shirkers of responsibility (in its realistic form). Many plants hire the college man merely for his technical knowledge, and that kind of knowledge is very cheap today. It takes a clever student to overcome such barriers as these. Sometimes he has to resort to some practical psychology to do it. At any rate, it wouldn't hurt the engineering student to look ahead of his assigned duties for a philosophical formula that would help him in this great movement called Human Engineering.

—By BILL VOIGT '40.

Bits About Them . . .

From Baltimore, Maryland, comes word that Julius Horelick, Cer. E. '37, is working with the Standard Gas Equipment Corporation as the control engineer. Julius seems to be quite active professionally as he has joined both the American Ceramic Society and the Eastern Enamelers Club.

Wayne Fay, Cer. E. '37, is working for the General Refractories Company as a research engineer in Philadelphia. Wayne likes to associate with graduates of Illinois; his "boss" is A. E. Fitzgerald '27, an Illinois graduate, and his two roommates are Bradley Gardner and Harold Schwartz, both 1937 graduates in ceramic engineering.

Ernest Berninger, E. E. '37, is one of the few '37's that have undertaken trips to the altar. Ernest was married to Marion Skelton of LaSalle on February 18, 1938. At the present time he is working in the Engineering Department of the Westclox Company in LaSalle. His last trip to the campus was to attend the E. E. Show.

James Miller, M. E. '37, and Woodrow Walsh, M. E. '37, are doing design and engineering work for the Ideal Commutator Dresser Company in Sycamore, Illinois. James says, "nice people, nice work",—and that's all.

Stan Arthur, architecture '37, became engaged to Jean Wilson, Kappa, last New Year's Eve.

Dick Little and Karle De Wolfe, both E. E.'s '37, are working for Westinghouse Electric Company in Williamsburg, Pennsylvania.

Bernt Larson, who graduated in C. E. this February, is now teaching in the University G. E. D. and Surveying Departments.

Gregory Hebert is working with the Carter Oil Company at Tulsa, Oklahoma.

Arthur Brown, E. E. '37, was in the communication game working for Leich Electric Company in Genoa, Illinois, but started working for the Illinois-Iowa Power Company last February. Now, Arthur is at their division office in Mt. Vernon, Illinois, doing distribution mapping and sub-station design. He was married to Miss Norma Gold of Chicago, on June 26, 1937.

Walter Black, G. E. '37, who has been working with the Goodyear Tire and Rubber Company, has been transferred to Jackson, Michigan.

Harry Skinner, C. E. '37, is working through the Rock Island office of the U. S. Government Engineers in Quincy, Illinois. At the present time he is working on topographic surveys. Harry seems to be doing all right, having brought his own girl with him when he came down for the Mil Ball a couple of weeks ago.

Robert V. Shepherd, E. E. '34, is living with W. R. Knight '34, H. S. Shott '34, and C. G. Talbot '36 while doing design work in the motor and generator engineering department of General Electric, Schenectady. Bob writes that he enjoys the winter's fine skiing, and occasionally sees a play or two in New York City.

Bart Williams is working with the Chicago Bridge and Iron Company in Chicago.

Bob Lindgren, M. E. '34, is an engineer for the Dauly Machine Specialty Company in Chicago.

Among the '38 C. E.'s, doing graduate work are LeRoy Brink, working on track stress investigation under Prof. Talbot, Albert Krivo, working on road expansion joints under Prof. Crandell, and Bob Zaborowski and Carl Rohde, who have received research appointments.

Walter Glover, Arch. '37, is now in the Canal Zone doing estimating and surveying work for the Panama Railroad and Steamship Lines, as is Charlies Slaymaker Jr., C. E. '37.

F. Pope Thomas, C. E. '36, is working as an engineer in the structural department of the Ingalls Iron Works in Birmingham, Alabama.

STUDENT ORGANIZATIONS

TAU BETA PI

On April 24, Tau Beta Pi held its annual spring initiation and banquet, the address being given by President A. C. Willard. At this meeting the following men were initiated:

M. K. Carr
I. T. Chapman
F. T. DeWolf
W. G. Dugan
G. L. Farnsworth
E. S. Fraser
C. G. Haessler,
M. P. Hall
H. F. Kleckner
C. K. Poarch
T. J. Putz
J. M. Trummel
C. P. Wampler
C. B. Williams
P. J. Zuercher

CHI EPSILON

A group of civil engineering students including Tom Chapman, James Llewellyn, Phillip Sadtler, Jack Gee, Andrew Burgher, and Ralph Johnson were invited to meet the members of Chi Epsilon at its regular semester symposium, Tuesday evening, April 12. The meeting was held at Phi Gamma Delta. Professor C. C. Wiley addressed the group.

The A.S.C.E. and Chi Epsilon are breaking a precedent this year. For a number of years it has been the custom for each organization to hold a spring banquet, but this year one banquet will be sponsored jointly by the two societies. All civil engineering students are invited to attend the banquet which was held at McKinley foundation on May 12.

A. S. C. E.

On Wednesday, April 6, the Student Branch of the A.S.C.E. sponsored a talk by Professor Arthur Casagrande on the New German Highways. Professor Casagrande, of Harvard, an eminent authority on the subject of soil mechanics, was visiting the University for a series of lectures on that subject, his visit being sponsored by the department of Civil Engineering.

TAU NU TAU

Tau Nu Tau, military honorary engineering fraternity, held a radio dance at the Sigma Nu fraternity house on April 13. This climaxed the initiation of the new men at the Alpha Rho Chi house on March 22. At that time pledges Coyne, Alexander, and Starr became active members of the organization. During the year, Tau Nu Tau sponsored a talk by Capt. McNutt of the Engineer Corps on the subject of Mexican Highways, and a moving picture of the United States Military Academy at West Point.

PI TAU SIGMA

In the last meeting of the fall semester, Pi Tau Sigma, national honorary mechanical engineering fraternity, elected the following student officers:

J. R. Poyser '38, president
N. V. Needham '38, vice president
R. P. Molt '39, secretary
T. J. Putz '38, treasurer

On March 9, a rushing smoker was held at Triangle Fraternity. At this meeting, Professor O. A. Leutwiler was the speaker of the evening, his subject being "The Engineer's Success Formula." Refreshments concluded the evening.

On March 17, a dinner meeting for active and faculty members was held at Chi Psi Lodge. Following the dinner, Dr. James J. Carney, of the Commerce School, spoke on "Foreign Relationships," followed by a very interesting informal discussion.

On April 1, Pi Tau Sigma pledged the following juniors:

R. P. Campbell, R. S. Darke, S. Jacobs, J. W. Morrison, and V. M. Zwicker.

The activities yet to come this semester include a formal initiation banquet, which will be held in conjunction with Chi Epsilon and Eta Kappa Nu, a picnic, and at least one more evening dinner meeting with a speaker.

Auditorium Reincarnated

YOU HAVE been passing the Auditorium every day, watching the old seats and ventilating pipes pile up outside the east door, and undoubtedly were curious to see what changes were taking place inside. Once you almost stepped inside to look around, but instead hurried home to cram for that exam.

Suppose, through some unavoidable accident, you have been dropped through the skylight of the Auditorium. Being a typical tidy engineer, you first brush yourself off, straighten your tie, and then have a look around to see what's doing.

In the first place, you are rather surprised to find that you have not fallen into the main room of the Auditorium. The skylight, which all but tore the shirt off your back, is not the same one that you have been used to seeing from below. After talking this over with the two workmen who are working between the upper and lower skylights while installing the 18,500 watt chandelier, you discover that the building has a false roof—that the ceiling you see from the inside is, in some places, fully thirty feet below the roof you see from the outside. You proceed down the rickety wooden staircase over the inner dome and down a steep and narrow spiral staircase which explains to you why the shortest and thinnest men are sent to work up above.

After your somewhat exhilarating trip through the skylight and down the spiral staircase, you feel relieved to stand once more on a solid footing. Seeing no one to whom you can speak, you descend to the first floor and, by talking with a workman, discover a number of interesting facts.

The Auditorium was closed in April, 1937, when one of the cast iron pillars supporting the balcony was found to be bent due to an eccentric load. Since then, almost forty thousand dollars have been spent repairing and refurnishing the building. Green linoleum and new upholstered seats as well as entirely new accoustic and lighting systems have been installed. The walls have been repainted, and the floors have been cleaned and waxed. The building has taken on an atmosphere of newness and proudly displays the results of its reincarnation.

BY ROBERT TIDEMAN '41.

• TECKNOKRAKS •

Judge (after giving jury instructions): "Is there any question anyone would like to ask before considering the evidence?"

Juror: "A couple of us would like to know if the defendant boiled the malt one or two hours, and how he kept the yeast out."

* * *

Young Lady (Just operated on for appendicitis): "Oh, doctor, will the scar show?"

Doctor: "Not if you are careful."

* * *

The buxom woman was standing in the street car, holding to a strap. The cantankerous looking man was seated reading. The car swung and she stepped on his foot.

"Madam," he barked, "will you please get off my foot?"

"Put your foot where it belongs," she replied sharply.

"Don't tempt me, madam, don't tempt me," he countered.

* * *

A farmer was passing the insane asylum with a load of fertilizer. An inmate stopped the farmer and inquired:

"What are you hauling?"

"Fertilizer," replied the farmer.

"What are you going to do with it?" asked the inmate.

"Put it on my rhubarb," replied the farmer.

The inmate quickly answered, "We put sugar on ours and they call us crazy."

Little Boy: "Mother, do they have skyscrapers in Heaven?"

His Mother: "No dear; it takes engineers to build skyscrapers."

* * *

Krein: "Did you travel in Europe to satisfy your thirst for knowledge?"

Geiser: "No, just my thirst."

* * *

In Montana a railway bridge had been destroyed by fire and it was necessary to replace it. Two days later came the superintendent of the division. Alighting from his private car, he encountered the old master bridge builder.

"Bill," said the superintendent—and the words quivered with anxiety—"I want this job rushed. Every hour's delay costs the company money. Have you the engineer's plans for the new bridge?"

"I don't know," said the bridge builder, "whether the engineer has his picture drawed yet, but the bridge is up and the trains is goin' over it."

* * *

Professor: "Here you see the skull of a chimpanzee, a very rare specimen. There are only two in the country—one in the national museum, and I have the other."

* * *

"Whaffo' you sharpenin' 'at razor?"

"Woman, they's a paih o' gemmun's shoes undeh you bed. If they ain't no niggah IN them shoes—Ah's gonna shave!"

A young lady recently visited the locomotive works and then later told some of her friends how a locomotive is made.

"You pour a lot of sand into a lot of boxes," she exclaimed, "and you throw old stove lids and things into a furnace, and then you empty the molten stream into a hole in the sand, and everybody yells and swears. Then you pour it out and let it cool and pound it, and then you put it in a thing that bores holes in it, and they take it to the drafting-room and make a blue print of it. But I forgot one thing—they have to make a boiler. One man gets inside and one man gets outside, and they pound frightfully; and they tie it to the other thing, and you ought to see it go!"

* * *

"John, dear, I'm to be in an amateur theatrical. What will the people say when I wear tights?"

"They'll probably say that I married you for money."

* * *

Goers: "I've been in a terrible state of consternation for the past three days."

Doherty: "Did you ever try bran?"

* * *

Porter: "Did you miss the train, suh?"

Puffing Passenger: "No! I didn't like the looks of it, so I chased it out of the station."

* * *

A girlie whose name doesn't matter,
Found that she got fatter and fatter,
But she dieted so well
That she now looks like hell,
And there isn't any place you can
pat her.

* * *

This sign appears on a building in Escanaba, Michigan, which is being remodeled and occupied by a barber shop:

"During alterations all patrons will be shaved in the rear."

* * *

An elderly lady, afraid of passing her destination, poked the street car conductor with her umbrella. "Is that the First National Bank?" she asked.

"No mum," replied the conductor, "them's my ribs."

G-E *Campus News*

DEW-POINT POTENTIOMETER

DEW on the grass may be fine for the farmers and an indication of fair weather, but it has no place in metal heat-treating furnaces. Moisture in the atmosphere in furnaces causes corrosion on the metal, thus decreasing the size of the part. Because it is impossible to tell the amount of moisture in such a furnace by sticking your hand into it, General Electric engineers have developed a dew-point potentiometer to do this job, and do it accurately.

The potentiometer consists of a metallic mirror located in a small chamber into which gas from the furnace is passed and condensed on the mirror. By means of a thermocouple, a balancing circuit, and a direct-reading meter, the weight of water vapor per cubic foot of gas may be derived. Thus the furnace operator can tell if the furnace atmosphere is suitable for the treatment of the metal.

Many of the G-E developmental engineers working on this and similar apparatus are former Test men. The General Electric Test Course augments the theoretical training received by engineering graduates, giving them a practical training in industry.

SPEEDY FLIES

THERE are many legends of nature which have remained for many years, eventually being refuted by naturalists, but one which has persisted up until a few weeks ago is that of the phenomenal speed of the deer botfly. While man plods along at a speed of 400 miles per hour in his airplane, one entomologist calculated the speed of the deer botfly to be 800 miles per hour. Digressing from his usual type of experiments, Dr. Irving Langmuir, Nobel Prize winner in the General Electric Research Laboratory, exploded this entomological myth by means of a series of tests.

Using a piece of solder the size and shape of a deer botfly, Dr. Langmuir showed that if this insect traveled at 800 miles per hour it would encounter a wind pressure of 8 pounds per square inch—enough to crush it, and that maintaining such a velocity would require a power consumption of one-half horsepower—a good deal for a fly. He also demonstrated that the insect would be invisible at speeds in excess of 60 miles per hour, yet the entomologist estimated the speed of the fly at 400 yards per second because he saw a brown blur pass by his eyes. Finally the calculations showed that if the fly, while traveling at this speed, struck a human being, it would penetrate the skin with a force of four tons per square inch and bury itself deep in the flesh.

BOMBARDING ATOMS

The modern miracles of aviation, television, and World's Fairs are taken quite calmly in this twentieth century of progress. But it is a different matter when scientists start snapping the whip with ions to smash ultramicroscopic particles called atoms into even more minute portions. And that's just what scientists are doing over at Harvard University.

Using a machine called a cyclotron, devised by Prof. Lawrence of the University of California, the Harvard physicists are bombarding atoms by accelerating ions to a tremendous speed and shooting them out through a hole in the side of the machine. But people are talking about this barrage of ionic ammunition because the results have proven successful in the treatment of cancer.

This is the third of such atom-smashing machines for which the General Electric Company has furnished parts. Even in such academic and highly specialized fields, Test men are called upon to make their contributions.

GENERAL ELECTRIC

90-58DH

THE

TECHNOGRAPH

UNIVERSITY of ILLINOIS

H V CHESCOE Arch 1934

SEPTEMBER 1938

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

THE ILLINOIS

TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

SEPTEMBER, 1938

Volume 53 Number 1

THE TECHNOGRAPH takes this opportunity to extend a greeting to Engineering students. Freshmen, we are glad to have you with us and wish you success. Upperclassmen, we know you are glad to get back to your friends and to your work. The best of luck to all of you!

● The Tecnograph is to publish news of the Engineering world and articles about engineering subjects, news of the College of Engineering and the Engineerings news notes, practical engineering tips students of Engineering. Who's Who, Boneyard Philosophy, North of Green, Our Societies, The Illini Trail, and Tecknokraks, all features of this issue, will be continued. There will be added such features as an Alumni Who's Who, Engineering news notes. practical engineering tips and shortcuts by professors of our faculty, faculty news, and college news. Follow the pages of The Technograph for enjoyment and to learn of phases of Engineering that are not taught in the classroom.

● Did you know that you spend $2.18 a year needlessly for soap just because of the hardness of our city water. Bill Voigt tells of the great losses that hard water cause the people of our country and explains the zeolite method of water softening.

● Although a complete list of staff members has not been made, we sincerely thank the following men who helped to make this issue possible: Bill Voigt, Harold Kleckner, Tom Morrow, Al Starr, Al Logli, Maynard Hufschmidt, Art Brown, Bob Tideman, F. E. Butterfield, Ted Jakim, Ed Geiser, and all those others who helped us with Registration Day sales. We wish to extend an invitation to join our staff to all those students interested in publication work.

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NEW SPILLWAY FOR MORMON FLAT DAM

THE ILLINOIS TECHNOGRAPH

Published Six Times Yearly by the Students of the College of Engineering, University of Illinois

Volume LIII SEPTEMBER, 1938 Number 1

Soft Water

An Explanation of the Zeolite Process

by
W. G. VOIGT

WATER! WATER! Man, his wars, his tents, his cities, his progress, have ever followed the water. The Arabians utilized extinct volcanic craters as basins for the accumulation of water. Greece had its rivers, springs, and infiltration galleries. Rome had its lakes, aqueducts, and reservoirs. China had its deeply driven wells which supplied its best water. The American Indians fought for the possession of good water; early settlers died from the lack of it.

Besides clouding the skies, water covers three-fourths of the earth's surface, and, through a network of streams comparable to the arteries of the human body, feeds the remainder. It serves as a home for fish, oysters, lobsters, and other aquatic animals; affords us kelp, sponges, salt, bromine, iodine, and sand; provides commercial and pleasure transportation; and is a boundless source of natural beauty. Frozen, it serves as a refrigerant; heated, it furnishes enormous power; distilled, it aids in chemical research and processing; and, in combination or solution with other compounds, makes up most of the world.

One can readily see why so much scientific attention has been given to the purity of this substance. Although it must also be chlorinated to remove bacteria; settled to remove mud and sand; and filtered to remove vegetable matter, tastes, and odors; treating water for hardness is alone so important a process that men devote their lives to it and companies exist merely for that purpose. In fact, libraries of books have been written on the one subject of the hardness of boiler feed water.

Almost all natural waters contain a considerable quantity of salts that dissolve in it as it passes through the soil. These salts are calcium carbonate, or limestone; magnesium carbonate, or dolomite; calcium sulphate, or gypsum; magnesium sulphate, or epsom salts; silica, or sand; sodium chloride, or common salt; sodium sulphate, or Glaubers salts; and minute traces of iron and aluminum. Ocean water contains as high as 2,100 grains or about three-tenths pound of these minerals per gallon.

The calcium and magnesium salts found in water are known as scale-forming or "hardness" minerals. In nature they are occasionally deposited in the solid form as stalactites and stalagmites, but in the commercial world they are noticed everywhere because water hardness affects everything it touches, from food, faces, fabrics, and dyes, to fuel bills, plumbing, and machinery. The amount of work, worry, and expense it causes is almost unbelievable. It scales boilers, radiators, and pipe lines. It may even affect the human body, for many physicians hold theories that hard water is the source of indigestion, dyspepsia, rheumatism, and other ailments.

The next time you take a bath, remember that soap has two distinct properties; emulsifying power by which it converts grease into droplets surrounded by soap, and adsorptive power by which collodial particles carry off dust and dirt. But, remember, too, that in hard water the minerals in solution grab the soap and change it to an insoluble curd so that these cleansing actions cannot take place until all the hardness has been removed from the water in this way:

Na Soap + Ca Hardness > Ca Curd + Na Salt.

This curd, not dirt, forms the "ring around the bath-tub." More than $200,000,000 are spent annually to form this ring in the bath-tubs of the United States.

There are many ways of treating water for hardness, but according to recent authorities, "the most recent and apparently the most successful of all water softening processes is the use of Zeolites, natural or artificial." The low cost of installation and the simplicity of operation of this type of water softener is responsible for its popularity. The zeolite, a silicate mineral, is merely placed in tanks similar to filter tanks and as the water passes through it, the hardness salts are changed to soft sodium salts:

Ca Hardness + Na Zeolite > Na Softness + Ca Zeolite.

After the softening properties of the zeolite are used up, the zeolite is renewed by passing a strong solution of common salt through the softener and draining the calcium chloride thus formed into the sewer.

Ca Zeolite + Na Cl > Na Zeolite + Ca Drainage.

About two and a half pounds of salt are used per pound of hardness. After the zeolite has been regenerated, it is exactly the same as it was before using. "From all indications," say J. T. Campbell and D. E. Davis, Pittsburgh engineers, "zeolite can be used indefinitely, since the reversible reaction between sodium and calcium-magnesium does not tend to break down the zeolite grain or to decrease its base-exchange capacity.

The zeolite softeners may be operated in open or

(*Continued on Page* 18)

New Society Proposed

Plans for All-Engineering Organization Now Before the Engineering Council

During the last weeks of the past semester, the new Engineering Council was called together to discuss the proposal of some of its members that an all-engineering society be founded. The success with which such organizations function on other campi, plus the rather marked inactivity of our present Engineering Council, decided these students to take this step. Because of the lack of time and because some of the leaders of the student branches felt that they did not have sufficient power to act, all plans to start the organization this fall were dropped.

The object of the new society would be, "to unite the engineering students, faculty, and alumni of the University of Illinois and, through this union, to promote interest in the welfare and traditions of the College of Engineering."

Students of the College of Engineering, and students in chemical, agricultural, and architectural engineering could become active members. Alumni and faculty members could become honorary members. It would be possible to purchase life honorary-membership.

The dues of the organization were to be $1.75 to active and $1.00 to honorary members for one year. In return for his dues the active member would receive membership in the society, membership in his branch society, and a year's subscription to The Technograph. Society membership, which would be graded according to a point system, would entitle one to wear the badge of the society, to attend the Slide-Rule Shuffle, to participate in the activities of the society, and to otherwise benefit from the varied activities of the society program.

The government of the society would be vested in a council made up of the presidents of all the student branches, the editor and business manager of The Technograph, and the presidents of all the professional and honorary engineering fraternities. The council would, from its own number, elect a society president, vice president, secretary, and treasurer. The Dean of the College and five faculty members appointed by him would serve as an advisory council.

The society would hold six meetings during the year, the first to be a smoker for which the council would furnish the program. The programs for the other meetings would be presented by the different student branches, expenses to be paid by the society.

The council would function as a senate, having committees to do its work and make reports back to the council. It would have the following standing committees, the chairmen to be from the council, but the members to be from the society: Membership, active and honorary; Program and attendance; Publicity; Technical; Atheletic; Literary, writing, speech, and debate; Hobbies, photography, model building, radio, etc.; Illinois Student Engineering Exhibit (Open House); Employment survey, permanent, summer, and local; Calendar publication; Social committee, St. Pat's Ball, Slide-Rule Shuffle, and departmental functions; Guide service; and Scholarship. Many of these names are self explanatory, but some warrant to few words. The technical committee would have as its function the encouragement of student independent technical activity as independent reasearch and the writing of theses. The athletic committee would attempt to set up an intermural league in which teams from the different student branches would play. (The Ceramists already have a basketball team.) The literary committee would try to revive interest in technical writing by the students, the presentaion of papers at the student branch meetings, and debates on technical subjects. The hobbies committee, working with Synton and other clubs of that nature, would bring together all the students interested in any hobby. The Open House committee would, of course, have its busiest time in the spring of alternate years, but through year around planning and effort would relieve the council of much of the last minute rush of presenting the exhibit and would provide for a better-planned show. There has been, in the past, the complaint that students do not seem interested in employment but allow the faculty to do all the work of getting them jobs. Our employment committee would attempt to change all this. The calendar committee would produce a weekly calendar of engineering events for bulletin-board publication. The Slide-Rule Shuffle would be a free, closed, society dance during the first semester. It would be similar to the Ag Club Mixer. The departmental function subcommittee would encourage functions similar to the Ceramics Ruckus and the Ceramics Pig Roast. Capable guides who could give interesting explanations of the laboratories would be provided by the guide service committee. The function of the scholarship committee would be to promote more student interest in scholarship, student aid or tutoring to freshmen, a working honor system, and thus more student control of scholastic activity.

These are the plans as they were submitted to the Engineering Council last spring. The formation of such an organization would, undoubtedly, curtail the budgets of some of the student branches, but its six big meetings could be substituted for some of those now held by the departmental societies. It would not decrease the importance of the departmental societies but would seek to make them a larger factor in the life of the engineering student and to give him an interest besides his school work. It would greatly increase the prestige of the College of Engineering, both on this campus and in the engineering world.

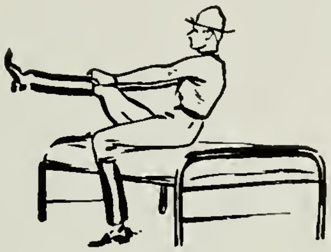
The Engineering Council hopes to perfect these plans so that next fall, when students return to the campus, they will find a functioning society. The members of the Council solicit the comment of students, faculty, and alumni upon both the general idea and upon these plans. First of all, a name is needed for the organization. The Technograph offers one year's active dues or two years' honorary dues to the person who presents the name finally selected. Keep in mind that, in increasing the prestige of the College of Engineering, you are helping yourself, in that "Illinois '09, or '39, or '42" will mean more. Please send in your opinions and comments. Just address them to The Engineering Council, 213 Engineering Hall.

The Life of A Private

Two Seniors Give Their Impressions of Camp Custer

Signal Corps

The train was already packed when Lyon and I got on at 63rd Street, but we found Hino and Weston holding down four seats. Everyone on the train got off at Battle Creek, and there found a lone corporal with one truck. He sent for more trucks and, with typical army efficiency, they arrived in two hours. We learned in those seven miles why GI trucks last only six months. At camp we found Captain Stice, who was in charge of the Signal Corps O. R.'s, and Captain Sturies, still



wearing his Lieutenant's bars, who was our supply officer. We signed into Company E, drew part of our equipment, but were too late to be processed. At tent 8 we found that Summerfield, Schrieber, and Coggins had gotten there before us so Hino and I took the beds that were left. At six o'clock the whistle blew for mess. I'll never forget my first army meal. I don't believe that not eating any lunch had anything to do with the taste, either. I wish I could say as much for all the meals.

We stood in line nearly all day Saturday, first to take our physical exams and then to draw uniforms. But when it was over we had nothing to do till Monday morning. Of course, Cip drew K. P. on Sunday. We got one suit of fatigues to wear six weeks. I should have made two suits from mine; they were big enough. Still, they didn't go over the hill any night, but stood quietly in the corner.

Instruction began Monday. Up early enough to fall in at six. Mess at six-thirty, calisthenics at seven and drill at seven-thirty. Leave for instruction at eight, with tents in order for inspection. Captain Sturies, with the assistance of Sergeant Whitfield and the men of the 4th Signal Company, gave us instruction in wire communication. For the next few weeks the daily routine was lug a couple of wire carts, a BD-14, a couple of BD-11's, some phones, and a trunk of other equipment about a half mile from camp, set up a wire system, operate it a time, then tear it down and cart the stuff back to camp. Everyone had his chance at making splices and tie-ins, connecting a switchboard, hooking up locals, operating a board, laying wire, and patrolling a line. Some of the boys still brag about the road overhead they put up on the third day in the field. Fit for A. T. & T., they claim.

Then there was radio instruction under Captain Mathews. At first this was only code practice with most of the boys starting from scratch and working their speed up to ten words a minute. Then, after wire instruction was done, that time was put into radio practice.

(*Continued on Page* 19)

Engineers

Dear Ed:

It seems as if every time I write to you, there is so much to tell but such a short time in which to tell it. So, as usual, I'll dash off what I can and try to give you an abbreviated idea of what the Engineers did at Camp Custer.

Not long after we landed in camp we were busy trying to find our rifles which we knew were someplace in all that cosmoline. But find them we did, and for the rest of the six weeks the engineers came out on top in the use of said weapons, both on the drill field and on the range. Even on the pistol range things were popping. Butch Eisiminger demonstrated his right to the captaincy of the University pistol team by shooting high score in the company, despite a few difficulties encountered by the use of a poor pistol. And believe it or not, Ed, on the rifle range all but two of the approximately 40 Illini engineers qualified; Beneliel, Carlson, Clementz, Fraser, Gatewood, and Hicks, all qualified as experts. Remember Tony Janosik and Nick Pokrajac? They both landed berths on the Camp Perry rifle team.

You should have seen Phil Clementz wield a shovel, Ed! Someone accused him of using TNT, the way the dirt flew out of that super-ultra trench the engineers constructed. That's not all that Phil could throw, either!

I didn't tell you, did I, that the Illinois Platoon was the best in the company? It must have been that I didn't want to boast; but it was plain to see, after watching the Illini erect French high wire in nearly record time. Ray Hicks and Butch Eisiminger both did some nice work in directing the entire company in the erection of the heavy pontoon bridge out into Eagle Lake. You would have enjoyed seeing Ray being tossed off the end of the bridge. "Colonel" Green and Bill Simmons were two other soldiers who didn't seem to be able to resist the cool lake water, encouraged by the others, of course.

You've heard the one about running into a door, haven't you? That story didn't go so well when Ted Jakim came home from the T.N.T. beer-bust with as pretty a black eye and sore face as one will ever see. That came, not from a door, but from a friendly little

(*Continued on Page* 20)

WELCOME

President A. C. Willard

FELLOW ENGINEERS, *I wish to take this opportunity to extend a word of welcome. We are facing a busy and important year and may I wish you success in all your efforts.*

The Technograph is an important supplement to the educational program of the College of Engineering and indirectly of the University as a whole. Such student enterprises are not only worthwhile in themselves as extra-curricular activities, but are valuable, educationally, to those who participate in them.

The Technograph has always been a publication of fine standards and has been a credit to the University. It deserves the support of the students in the College of Engineering for it affords them a means of expressing their professional interest and is well worth reading by all engineers.

—A. C. WILLARD.

THE BEGINNING *of a new year is usually a time for making good resolutions. Resolutions of the day-dream type, weakly made with no real expectation of fulfillment, are worse than useless. Repeated failures of a feeble will produces a growing sense of inferiority. Budget your time to do your school work promptly and well and also allow for a reasonable amount of extra-curricular activity. Studies come first, but worth-while activities outside of the class room have an exceedingly important place in a well-rounded education. Men who have made good scholastic records and who have, at the same time, engaged in activities are in demand upon graduation. Time wasters are usually failures in college and in life.*

Best wishes for a busy and profitable year.

—M. L. ENGER.

Dean M. L. Enger

Associate Dean H. H. Jordan

IT IS ALWAYS *a pleasure to see students of the College of Engineering returning to their tasks in September each year. They are eager to pick up the threads of their courses where they left off in June. New students in the College seem to catch this spirit of enterprise quickly and they become established members of the family of engineering students and faculty at the University of Illinois in a very short time. The College greets all its students with the expressed wish that they may realize to the fullest their fondest dreams of high achievement.*

We extend a personal welcome to each student who registers this fall and wish for him the joy and satisfaction that comes from the exercise of one's abilities to the utmost on worth while tasks.

—H. H. JORDAN.

★ WHO'S WHO IN ILL

• *F. B. Seely*

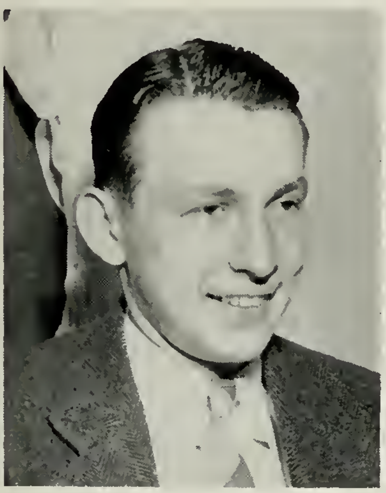
• *C. H. Casberg*

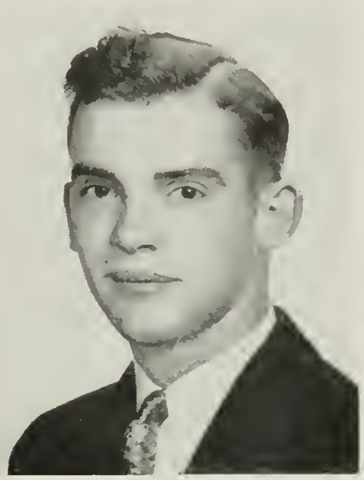
• *W. C. Huntington*

PROF. FRED B. SEELY states, "Many students have more ability and capacity for extra-curricular activities than they realize." Having devoted his spare time through many years to activities foreign to his work, he is able to speak with authority. While procuring his degree at Worcester Polytechnic Institute, he captained the baseball team, called signals for the football team, and served the athletic council as its vice president. He also found time to hold active membership in Tau Beta Pi, honorary engineering fraternity; Sigma Xi, honorary scientific fraternity; and Phi Gamma Delta, social fraternity. Between his graduation and 1909, when he became a member of our faculty, Prof. Seely gained that practical engineering experience, so necessary to a good teacher, by working for the Carpenter Steel Company as draftsman and test engineer, for the duPont Powder Company in their engineering department, and for Consolidated Expanded Metals Company as a research engineer. He also was an instructor at Villa Neva College. Now head of the department of theoretical and applied mechanics, Prof. Seely is still busily engaged in extra-curricular activities. He is a member of the American Society for Testing Materials, American Society of Mechanical Engineers, Society for the Promotion of Engineering Education, Chicago Engineers Club, Kiwanis and University Club. He is one of those men one likes immediately. He has written several Engineering Experiment Station bulletins and is the author of the texts: "Analytical Mechanics for Engineers," "Resistance of Materials," and "Advanced Mechanics of Materials."

PROF. C. H. CASBERG is another member of our faculty who boasts a college athletic record. He earned his "W" at the stroke oar of the University of Wisconsin shell. Before entering Wisconsin, he worked for nine years for the C. B. & Q. Railroad. While studying for his bachelor's degree in mechanical engineering, he became a member of Acacia and of the "W" Club. After graduation, Prof. Casberg was a foreman and later assistant superintendent in the plant of the Rockford Drilling Machine Company. He taught for a time at the Rockford High School and in 1923 became a member of the faculty of the University of Illinois. Three years later he took a position in the engineering department of the Western Electric Company but returned to Illinois as a professor of mechanical engineering in 1928. He is in charge of the shop laboratories, and there the mechanicals and electricals make his acquaintance as sophomores. He is co-author of a number of Engineering Experiment Station bulletins on foundry practice. At present, Prof. Casberg belongs to Sigma Xi, scientific honorary; the American Foundrymen's Association; the American Society of Mechanical Engineers, and holds a professional degree in mechanical engineering.

PROF. W. C. HUNTINGTON advises, "Intelligence in dress, manner, and personal life, as well as in business, is a requisite of the successful engineer." After being graduated from the University of Colorado as valedictorian of his class, he continued his study there to obtain his M.S. and C.E. degrees. As a faculty member at his alma mater he rose from an assistantship in civil engineering to become assistant professor, professor, head of the department of civil engineering, assistant dean of the engineering school and head of the construction department. In 1926 he left Colorado to become head of the civil engineering department of the University of Illinois. By stopping at the departmental office almost any day, one can have a friendly chat with this calm, self-assured man who always has a business-like air about him. In addition to his duties as a pedagogue, Prof. Huntington has served as adviser to the Civil Works Administration of Illinois, and as adviser to Work Rehabilitation in Illinois. He is chairman of the Illinois committee in charge of the study of expansion joints in concrete pavements. As an author, he has written the text "Building Construction." Organizations of which Prof. Huntington is a member include Tau Beta Pi, engineering honorary; Sigma Xi, scientific honorary; Chi Epsilon, civil engineering honorary; Beta Theta Pi, social fraternity; the University Club; and Kiwanis.





J. R. Poyser ●

G. L. Farnsworth ●

R. J. Diefenthaler ●

ROBERT J. DIEFENTHALER became a native son of Oconee, Ill., in May of 1917. Neighboring Pana benefitted by his athletic prowess when he played football and basketball and high jumped for the Township High School there. He also found time to participate in the dramatic efforts of the student body. His active high school career was brought to a natural close in the spring of '35 when Bob was graduated. The following fall found him at the University, studying electrical engineering. Working his way has not prevented Bob from earning numerals and letters in track. His high jumping has also earned him membership in the Tribe of Illini and Sachem. Last spring his teammates elected him track captain for this year. But Bob has not spent all his spare time at the jumping pits, for he has taken an active part in the affairs of the Student Branch of the American Institute of Electrical Engineers and will serve as chairman this fall. Phi Gamma Delta, social fraternity, lists Bob as a member. His special interest has been in illumination and he is working with Prof. J. H. Kraehenbuehl on the construction of the world's second ocosahedrn photometer. This instrument will be used to measure the light from large fixtures, taking the place of the expensive spherical photometer. His summers have been spent with the Big Ten track team and working as a carpenter for his father.

GEORGE FARNSWORTH'S claim that he isn't interested in much of anything is very ably disputed by his record. By Oct. 10, he will have been calling Ottawa, Ill., his home, for 21 years. Point number one on his record sheet is that he graduated from high school with an "A" average. Initiation into Phi Eta Sigma, freshman scholastic honorary, is point two. He is a member of Tau Beta Pi, honorary engineering fraternity; Sachem, junior activity honorary, and Blue Pencil, senior activity honorary. He lives at the Delta Tau Delta house. The Student Branch of the American Society of Civil Engineers lists his name on its rolls. While hitting the books hard enough to make the Honors Day program three years, George has served in the copy department of the business staff of The Daily Illini. Last year he was copy manager. This year he is circulation manager of the Siren. Instead of taking military, George played a clarinet in the first regimental band. In spite of such varied interests, he remains true to his first love, civil engineering, and spends his summers peering through a transit, making preliminary surveys of reconstruction roads for his father who is superintendent of LaSalle county highways. Next June he hopes to be an employee of some sanitary or highway engineering firm.

JOHN R. POYSER was born in Canton, O., just 21 years ago next Oct. 16. He calls Milwaukee, Wis., home, however, and has since he was five. To keep busy while attending Riverside High School, he was a member of the news staff of the school magazine and a member of the Shovel Club, a student charity organization. Any spare time was devoted to debating, and, from one who knows, don't try to argue with him. Jack couldn't decide where to go to college so tried first Lyons Township Junior College and then the University of Wisconsin. The reputation of the College of Engineering of the University of Illinois brought him to our campus, which he will leave next February with a very enviable record. He is a member of Tau Beta Pi, honorary engineering fraternity, and Pi Tau Sigma, honorary mechanical engineering fraternity, whose affairs he managed last semester. A student member of the American Society of Mechanical Engineers, he will wield the gavel at the local student branch meetings this fall. It is his hope that he can strengthen the bonds between the student branch and the senior branch at Peoria, thus bringing the students and practicing engineers into closer touch. Jack's sports interests are centered in tennis, swimming, and baseball—he plays with the Chi Psi team. Professionally he is interested in steam power plants and sales engineering.

• BONEYARD PHILOSOPHY •

Policy

I realize that some members of the faculty will feel that I am not in a position to write what is to follow. However, it is my firm belief that, as the student publication of the College of Engineering, it is the duty of The Technograph to attempt to help improve the College. I believe that the students, on the whole, are an earnest, clear-thinking group of young men and that they can do much to help the faculty to better the education received while attending the College of Engineering. Therefore, I invite letters of criticism and of defense of the College, The Technograph, the faculty, and the student body. I will not promise to print every one of these, but all will be appreciated. So the next time something makes you angry, do not explode on your associates. Sit down and write a letter to 213 Engineering Hall. —*The Editor.*

Are You Certain?

Each fall nearly 800 freshmen enter the College of Engineering. An aggressive, ambitious group of young men, they come from village, farm, and city, unafraid of the work and problems that face them. Most have given considerable thought to the choice of a career. But there are those who are not sure. There are those who have chosen engineering because it is the one professional career that requires only four years of college, or because of the romance of the outdoor lives some civils lead, or because their elders have advised them that there will be money in the field of radio or air-conditioning. Some of these 800 boys are better fitted for other things. Too, some have chosen the wrong branch of engineering. It is important that every student find himself, so that his four years of college, and perhaps his whole life, will not be wasted.

But by what rules is the young man going to make his all-important decision? He should be able to answer two questions in the affirmative. First, "Is the work one in which I will always be able to take an honest pride?" The word pride in this question does not refer to the kind of pride one feels when he points out something that he has accomplished. It is a feeling that lies wholly within one. It is the kind that a man feels when he looks back at his life and is able to say that it has been one of service to others. Many men build enormous fortunes, but one finds most of them busily at work giving away their wealth in the later years of their lives. They feel more honest pride in the bestowal of their wealth upon others than they do in its accumulation. They want to be able to say that they have lived a life of service. A man can receive very little aid in answering this first question about any profession. The answer is as personal as a man's religion.

The second question is, "Will the work always be intensely and absorbingly interesting to me?" The man who can truthfully say, "I love my work," is the happy one. It is to help the student make his answer to this question that the freshman is required to attend engineering lectures. In these lectures the attempt is made to point out to the freshman just what the work of each branch of engineering really is. The senior very probably lamented loudly to his fellows when he had to attend the lectures. But that was four years ago. Ask him today. He will probably advise the freshman to keep his eyes and ears open during that hour each Wednesday morning, as it might make the difference between a lifetime of happiness and one of struggling along in the wrong pigeonhole.

Besides this help offered by the College of Engineering, the Y. M. C. A. has a program through which the student may have personal interviews with men who have spent their lives actually working in engineering fields. These men can tell the young man much that will help him to decide whether he will be happy in his chosen profession.

So engineers, seniors as well as freshmen, make sure! After all, happiness is what makes life worth living and most necessary to happiness is an interesting, satisfying, life's work.

Ethics

Like all other great professions, engineering has its Code of Ethics which governs the conduct of all those engaged in its pursuit. It was because of the great obligation of engineering to humanity that this code was formulated. We should bear in mind, as we go about our task of learning to be engineers, that we owe it to our profession to be true at all times to this code:

1—The engineer will carry on his professional work in a spirit of fairness to employees and contractors, fidelity to clients and employers, loyalty to his country and devotion to high ideals of courtesy and personal honor.

2—He will refrain from associating himself with or allowing the use of his name by an enterprise of questionable character.

3—He will advertise only in a dignified manner, being careful to avoid misleading statements.

4—He will regard as confidential any information obtained by him as to the business affairs and technical methods or processes of a client or employer.

5—He will inform a client or employer of any business connections, interests or affiliations which might influence his judgment or impair the disinterested quality of his services.

6—He will refrain from using any improper or questionable methods of soliciting professional work and will decline to pay or to accept commissions for securing such work.

7—He will accept compensation, financial or otherwise, for a particular service, from one source only, except with the full knowledge and consent of all interested parties.

8—He will not use unfair means to win professional advancement or to injure the chances of another engineer to secure and hold employment.

9—He will cooperate in upbuilding the engineering profession by exchanging general information and experience with his fellow engineers and students of engineering and also by contributing to work of engineering societies, schools of applied science and the technical press.

10—He will interest himself in the public welfare in behalf of which he will be ready to apply his special knowledge, skill and training for the use and benefit of mankind.

• NORTH OF GREEN STREET •

Forrest Nelson managed to "go out nights" this summer even though he worked 70 hours a week in an automobile supply store and played softball in the Decatur city league.

Jim Tracy indulged in his hobby of making the parts for and assembling small electric motors and gasoline engines this summer. Some of the motors are so small that he does not touch them but starts them by blowing on a miniature propellor attached to the end of the shaft. The gasoline engine made too much noise to suit the neighbors.

Bill Tracy, a radio hobbyist, worked for a short time as an inspector for the Galvin Manufacturing Company.

Bill McMahon spent his vacation away from home at summer school and says that he enjoyed it.

Bob Diefenthaler, knowing from experience that summer E.E. jobs are not so good, spent the first part of the summer travelling to track meets. The rest of the summer he spent doing carpentry work for his father.

Jack Poyser whipped his tennis game into shape and did a lot of swimming.

A. H. Reid kept cool working for an ice company.

Steve Wenthe spent his summer at Crystal Lake, Ill.

Going to business college was Roger Bush's summer's work.

Bob Phillips took a trip West on his motorcycle.

Another summer cyclist was Dick Molt.

Jack Hanson got some real engineering experience working in the engineering department of the world's largest coal mine at West Frankfort, Ill. Most of his work was surveying, underground, but one day the foreman surprised him by handing him a blueprint and telling him that he was responsible for some work on the air shaft.

Ranny Odum, also from West Frankfort, stayed above ground to work with his father on road construction.

Ralph Herzler spent the first part of the summer helping his father convert the Herzler and Henninger Machine Works into a portable farm-building factory. Later he went to work for the Alton Boxboard and Paper Company.

Paul Zuercher says that his father, in order to minimize an increase of vice, set him to working painting the house.

Ed Geiser spent the summer returning to the shop for tools as he tried his hand as a plumber.

Johnny Grubb was steadily employed entertaining a Miss W. who was visiting in Chicago.

Don Cortright was at Sandwich with Cortright and Oswald, builders, until the first of September when he returned to the campus to resume his duties as mailing room assistant in the Engineering Experiment Station.

Clarence Bush, John Trummel, and Lynn Huffman were employed by the Soil Conservation Service and received training in the various phases of the work done by that service.

After Camp Custer, Nick Pokrajac spent the time painting the house until the day he left for Camp Perry and the National Rifle Matches.

Chester Kwast took a 10-week course in differential equations at Lewis Institute and played tennis in his spare time.

Walter Kalisz spent the summer swimming and loafing.

Walter Jollie worked for R. H. Clements Company of Chicago.

Robert Wirth served as a truck driver for his father's company.

Bob Tideman spent a week as a carpenter's helper and spent the rest of the summer doing the least possible.

Bob "Pure" Zierjack spent what was left of the summer, after he waited for his pay at Custer, clerking in his father's grocery store.

Bob Steinfort quit camp in its first week to take a job with a power company in Dayton, O.

H. Bunte worked with Bob in Dayton. He was in the meter department most of the summer.

* * *

Students, this page is yours! Boxes are being placed in different engineering buildings for your contributions. We want to print personal items, so tell us of your friends' activities, in and out of the classroom. Let us print that classroom joke, that incident that set everyone to roaring with laughter. Try your hand at rhyme. Give us the dirt, the lowdown. To each of the three students sending in the largest number of printable items for each issue we will award a free ticket to the Virginia theater. This page will be what you make it, so put your contributions in the boxes or send them to 213 Engineering Hall!

St. Pat's Ball

Engineers, perhaps you are not aware of it, but unless St. Pat's Ball is a success next spring, it will pass out of existence. Two years ago the Cabaret dance made many dollars but lost the dance many of its regular patrons. Last year, the Ball was a fairly successful dance, socially, but barely broke even. So the Engineering Council is now asking you for ideas and suggestions. It is desired to create some theme for the dance that will become traditional, just as the Ag Dance, Fine Arts Ball, and Military Ball have. So if you don't want our one engineering social function taken away from us, put on your thinking caps and produce a central idea or theme upon which to build the evening's entertainment.

Award

To aid in the revival of student interest in writing, Kappa chapter of Theta Tau, national professional fraternity, has purchased a bronze tablet to be placed in the Engineering Library during the Illinois Student Engineering Exhibit next spring. Each year the name of the freshman submitting the best article to The Technograph will be placed on this plaque. The essays, to be one thousand words in length and about any subject of engineering interest, will be judged by a committee of five. Three of these members will be from the faculty and two from the student body. This year, its first, the contest will close on March 1, 1939. The award will be announced during the I-SEE. Freshmen, do not pass up your chance at this award! Begin your essay now and have it finished before the teachers really begin to crack down! For any further particulars see the Editor.—(Articles by upperclassmen as well as freshmen, although not eligible for the contest, will be greatly appreciated.—*Editor.*)

OUR SOCIETIES

ENGINEERING COUNCIL

The Engineering Council is a student board composed of the presidents of the eight departmental societies, a representative from the Illinois Union, and the editor and business manager of The Technograph. Its purpose, as stated in the constitution, is, "to encourage and advocate the participation of engineering students in extra-curricular activities on the campus; and to sponsor such student engineering activities as the All-Engineering Smoker, St. Pat's Ball, Illinois Student Engineering Exhibit (Engineering Open-House) and to assist in the production of the Electrical Show.

This year St. Pat's Day is on Friday and the Council hopes to make it a day of celebration for the engineers. They hope to sponsor a parade and convocation in the afternoon and to hold St. Pat's Ball in the evening. This is also the year for I-SEE and the Council has already begun to lay the plans for the best exhibit yet.

ASME

Jack Poyser .... *Chairman*
Hudson Reid .... *Vice-Chairman*
Joe Morrison .... *Secretary-Treasurer*
Tom Morrow, Norm Ferm ....
.... Publicity Committee

The purpose of the Student Branch of the American Society of Mechanical Engineers is three-fold: It serves to unite the mechanical engineering students with the practicing engineers of the professional society; it brings to the campus speakers who talk about the practical side of engineering; it helps the student get acquainted with the faculty members.

Plans for this year are still in the making. The first meeting, with an outside speaker, will be held Wednesday, Sept. 28. On Wednesday, Oct. 5, the membership drive will close with an informal smoker—no speaker, just a student-faculty round-up. The regular meetings will start Wednesday, Oct. 12, and will be held every second week thereafter. The speakers will generally be engineers in the employment of some large company. Occasionally they will be regular ASME speakers or men sent down from the Peoria Branch. They will always have interesting and valuable information to tell the students.

RAILWAY CLUB

Bill McMahon .... *President*
Don Lyons .... *Vice-president*
Tom Shedd .... *Secretary-treasurer*
Malcolm Harvey .... *Publicity*

The Railway Club is going to break away from the usual program and try to take its place as one of the most active of the engineering clubs. First of all, meetings will be held at fraternity houses instead of at the Transportation Building. This will help to implant in the minds of other students that the club is not an organization only for railway engineering students, but is open to all. Plans have been made for three inspection trips this year. The club will visit the Illinois Central Roundhouse and the Big Four Shops, both in the Twin Cities, and the Wabash Railroad Shops in Decatur. It is hoped to devise a way by which the society can begin the construction of a model railroad. At present there is plenty of talent but no space.

AIEE

Bob Diefenthaler .... *Chairman*
Steve Bushman .... *Vice-Chairman*
Bill Lyon .... *Secretary*
Goodwin Peterson .... *Treasurer*
Ralph Andermann .... *Publicity Manager*

The Student Branch of the American Institute of Electrical Engineers is interested in aiding and developing the abilities of the students by affording them opportunities to carry out activities similar to those of the professional society; such as, holding meetings and presenting and discussing papers, reports, and abstracts. The Student Branch brings prominent engineers to the campus to discuss engineering problems with the students.

AG ENGINEERING CLUB

Clarence Bush .... *President*
Milan Watson .... *Vice-president*
John Trummel .... *Secretary*
Lynn Huffman .... *Treasurer*

The Agricultural Engineering Club is interested in better acquainting the students in ag engineering with each other and with the practical side of their profession. It presents speakers and motion pictures at meetings held throughout the year. The club will have an exhibit at the Little International and another at I-SEE, thus co-operating with both the ag students and the engineers. It will also operate a stand during Annual Farm and Home Week to earn the money to send delegates to the national convention next summer.

SBACS

Forrest Nelson .... *President*
J. R. Zeller .... *Vice-President*
J. W. Briscoe .... *Secretary*
R. S. Irely .... *Treasurer*

The Student Branch of the American Ceramic Society carries out a very active program during the school year. A dance, the Ruckus, is given annually, and the Pig Roast, a traditional banquet, is enjoyed at the close of each year. The club also publishes a year book, "The Illinois Ceramist." The club meets twice a month and prominent men from the ceramic companies are invited to speak.

This spring, the Illinois Branch will be host to the delegates from the other schools when the annual convention of the American Ceramic Society is held in Chicago.

A. I. Ch. E.

Jerry Arkis........ *President*
Victor Munnecke........ *Vice President*
John Cox........ *Secretary-Treasurer*

The Student Branch of the American Institute of Chemical Engineers plans to open the year with a smoker. In October they will hold a banquet meeting with a nationally known speaker. Two meetings a month will be held during the year, with young practicing engineers for speakers.

MU SAN

Mu San was founded on this campus in 1911. Its purpose is to more closely unite graduates and undergraduates and to promote interest in municipal and sanitary engineering. Plans for this year have not been completed and officers will not be elected until sometime this fall.

TAU BETA PI

Tau Beta Pi is a national society organized at Lehigh University in 1885 for the purpose of recognizing superior scholarship coupled with the qualities of leadership, integrity, and character as undergraduates, or attainments as alumni; and to promote a spirit of liberal culture in the engineering schools of America. This year Alpha of Illinois plans to hold monthly dinner meetings, with both student and faculty speakers. Plans are also being laid for the starting of a chain letter among the members of each pledge class.

ETA KAPPA NU

Paul Zuercher .... *President*
Frank DeWolf .... *Vice-President*
H. Bunte........ *Recording Secretary*
Bill Lyon .... *Corresponding Secretary*
Dick Wetzel .... *Treasurer*
Kenny Poarch .... *Bridge Correspondent*
J. S. Wenger .... *Pledgemaster*
Lewis McCown .... *Sergeant-at-arms*

Eta Kappa Nu was founded in 1904 by 10 students on this campus that those men in the profession of electrical engineering, who, by their attainments in college or in practice, have manifested a deep interest and marked ability in their chosen life work, may be brought into closer union whereby mutual benefit may be derived.

Alpha Chapter plans to hold a faculty-actives picnic early in the fall and pledging and initiation will follow soon. It is planned to start pledge letters between the members of the different pledge classes so that the alumni of each class can learn what their old friends are doing and so that the active chapter and faculty can keep in touch with the alumni. An employment survey of the different electrical companies will be made during the school year.

THETA TAU

Maurice Carr........ *Regent*
Bob Spellbrink........ *Vice Regent*
E. C. Heubach........ *Scribe*
Al Starr........ *Treasurer*
Ken Leutwiler........ *Corresponding Secretary*

Theta Tau, national professional fraternity, exists for the purpose of bringing together men from all the branches of engineering, that by their association both the profession and the men themselves will be benefitted.

Kappa chapter plans to begin the year with rushing and pledging meetings. During the year it hopes to begin a chain letter for each of its pledge classes. Sunday evening dinner-meetings, with student and faculty speakers, will be held once a month. It is also sponsoring the freshman essay contest described elsewhere in this issue.

PI TAU SIGMA

Dick Molt........ *President*
Tom Morrow........ *Vice President*
Bob Darke........ *Treasurer*

Pi Tau Sigma is a national mechanical engineering fraternity honoring high scholastic standing. One of its important functions is that is serves as a meeting ground for students and faculty members. Plans for this year are still indefinite. A rushing smoker will be held early in the fall, followed soon by formal pledging. Formal initiation will be in December and will be followed by a banquet held in conjunction with Eta Kappa Nu and Chi Epsilon. During the semester, monthly dinner meetings will be held, followed by talks by faculty members and professional engineers.

SIGMA TAU

Howard Phillips .... *President*
John Trummel .... *Vice-president*
Roger Ericson .... *Secretary*
Alfred Horn .... *Treasurer*

Sigma Tau was organized for the purpose of recognizing scholarship among student engineers, and to encourage any move which will advance the interests of engineering education. The local chapter plans to hold its annual smoker during the second week of school and to hold meetings every two weeks during the rest of the year.

KERAMOS

Paul Corbett .... *President*
Gilbert Cahoon .... *Vice-president*
Morris Hall .... *Secretary-treasurer*
Howard Swift .... *Herald*

Keramos was organized to promote professional fellowship and to reward high scholastic standing among students of ceramics.

I-SEE

This is the year for the Illinois Student Engineering Exhibit (Open House). That means that in April, all students in engineering are going to be very busy. But let's not wait until April and then get caught in that last minute rush. Begin to plan now just what you want to do for the I-SEE. The Engineering Council is going to lay its plans early and may call for the plans of the different exhibits as early as the end of the first semester. So don't put it off! Begin your plans now that this may be the biggest and best I-SEE!

• THE ILLINI TRAIL •

Engineering Alumni, this is your page! We hope you will help to make it bigger and better. We really appreciate a letter telling us what you are doing and what you think about things in general and the College of Engineering and The Technograph in particular. And your old friends like to hear about you, too. Tell us what other Illini-Engineers are doing. In our attempt to build up an alumni section and an alumni circulation, any assistance is deeply appreciated.

As a supplement to both this page and to Who's Who, we are beginning, with the December issue, an alumni Who's Who page. So alumni, faculty members, and students, send in your nominations for this honor! The address is 213 Engineering Hall.

* * *

John R. Fraser '35 is an engineer trainee with the Union Oil Company of California.

E. F. Stahl '26 is the Chicago district sales manager of Lyons Metal Products, Inc. He married Anna Moore in September of 1927 and their only son, James, is 4 years old.

E. G. Staley manages the Chicago office of the Henry Vogt Machine Company. Mrs. Staley was Hazel Linton '20, from his home town of Leroy. Their 14 year old son attends Oak Park High.

The Chicago Board of Education employs Carl O. Anderson '24 as heating and ventilating engineer.

As plant engineer and master mechanic, P. A. Faust '12 works for the International Smelting and Refining Company in Miami, Ariz. He married Mary L. Holcomb the fall after he was graduated.

Edward C. Barkstrom '17 is the chief engineer of the Los Angeles plant of the Stephens-Adams Manufacturing Company. He married Helen LeKander of West Chicago in 1930 and they have a six year-old daughter, Carol. He says that Los Angeles is so distant from Urbana that it is difficult to keep in touch. Get after him, Illini!

D. B. Allabough '33 writes from Collinsville that he is an engineering draftsman for the Union Electric Company of East St. Louis. He married Barbara Boneau in 1934. Stamp collecting is his hobby and he is looking for other collectors to trade with. He also likes to travel and to take pictures.

Leonard G. Abraham lives in Madison, N. J., and works for the Bell Laboratories as a toll transmission engineer. He married Ruth Thrasher '23 and they have three children.

N. R. Feldman '18 is a partner in the Feldman Petroleum Company. Mr. and Mrs. Feldman, she was Isabel Goldblatt '20, have a daughter, Geraldine, on the campus this fall. Son Elliot is in Junior High at Tucson, Ariz.

The secretary-treasurer and chief engineer of the Underwood Construction Company of Chicago is Reuben L. Sandberg '12. He married Henrietta Elofson. Their daughter is working as a stenographer and their son, Bob, enters the University this fall.

R. B. Stampfle '37 is a junior metallurgist with the Bethlehem Steel Company in Johnstown, Pa. His work at present is on wrought steel wheels.

Harold E. "Hek" Barden '15 filled out the best questionnaire yet. He works for the Los Angeles City School District as classification technician for the Personnel Commission. He now has his M.S. in education but does not regret graduating as an E.E. He married Myrtle Mason, a native daughter of the Golden West. Regrets that they have no children, but has taken part in Boy Scout work for years. His hobbies are yachting, fishing, and collecting ship stamps. Invites visits from old Illini (i. e. around '12-'18). (He'll have to make his own apologies for that word "old."—Ed.)

Earl H. Beling '22½ is the owner of the Beling Engineering Company in Moline. He married Marian

Armstrong '24 in 1927. They have three children ranging in age from 10 to three years. His firm designed the air conditioning for Lincoln Hall Theatre and several other buildings on the campus.

Walter Aikman '28 works for the Beling Company. He is married to Lois Armstrong '29.

Russell C. Smith '29 is an engineer with the American Telephone and Telegraph Company in Chicago. His work is with pole line maintenance. Mrs. Smith was Margaret Pedersen. They have a 7 year-old daughter, Beverly Jean.

The American District Telegraph Company employs Paul M. Farmer as chief engineer. He lives across the river from his work, in Maplewood, N. J. Edna Miller was his wife's maiden name. Their one son just missed being a Christmas baby by four days back in 1930.

Fred Meyer '37 is employed in Bluefield, W. Va., by General Explosives.

"Doc" Kring has travelled three times around the world since he was graduated. He worked on both of San Francisco's big bridges. Now he is employed by the Ben Hur Construction Company in St. Louis.

W. J. Brown '00 is an architect in Cedar Rapids, Ia. M. R. Bechstrom '29 practices in the same profession in Moline; Benjamin A. Horn, in Rock Island.

Ivan Anderson '23 is assistant superintendent of the meter repair department for the Peoples Gas, Light, and Coke Company in Chicago, so Illini, if your meter runs too fast, you now know where to go.

Carrol O. Beeson '23 works for himself and family as an architect in Crawfordsville, Ind. The family includes the former Elizabeth Deer, Beechwood College, Jenkintown, Pa., class of '24, and a son and daughter.

The secretary-treasurer of the American Foundrymen's Association is Dan M. Avey '10, former Tech editor. His wife was Jessie R. Newcomb of Champaign until he changed her name in 1911. Their daughter, Mary, is a graduate student in journalism here.

E. D. Bell '03 is employed in managing the affairs of the Kansas Power and Light Company. Mr. and Mrs. Bell, she was Amelia J. Seifferman, have one daughter, Mary Bell Muench, who has given up the profession of landscape architecture that she learned here to become a wife.

Guy T. Avery '17 is assistant works manager of the Riversdale plant of the Acme Steel Company. Mrs. Avery was Ada M. Berger. Their son, George R., is an engineering junior here.

The Marathon Electric Manufacturing Company of Wausau, Wis., employes W. R. Appleman '28 as chief electrical engineer. Alberta Kohlenbach Appleman graduated from here in education in '28. They have a daughter, age six, and a son, age one.

Horace M. Adams '31 works for the Midland Electric Coal Corporation, who operates the huge strip mines near Farmington, Ill. Mrs. Adams was Florence Beidelman '33. Richard L. was born last Jan. 10.

R. J. Anen '32 is employed by the Ceco Steel Products Corporation of Berwyn as assistant works manager. He married Ruth Granstrom two years ago.

Vice-president and eastern district manager of the Marley Company is J. C. Albright '20. He and Mrs. Albright, the former Hazel Wartman, have a 13 year old son.

Of the class of '92, William Snodgrass writes from his citrus grove in Clermont, Fla. He married Antoinette Dewey of Urbana in '97 and their daughter, now Mary S. Priebe of Norris, Tenn., graduated from here in landscape architecture in 1925.

SOFT WATER

(*Continued from Page 5*)

closed water systems and on either the up-flow or down-flow principals. Because the softening action is instantaneous and all the water is completely softened, seasonal variations in the hardness of incoming water produces only the problem of varying the salt regenerations. Water of any degree of hardness may be obtained by means of a by-pass around the softener. The handiness, the low cost of construction and operation, and the facts that the softener does not require much space, nor involve special sedimentation or filtration facilities, are of great concern to buyers of commercial water softeners. People are glad to know that there is no sludge to dispose of, that there are no moving parts such as feeders and pumps, and that there is no need whatever for a chemist.

Zeolite softeners are made in sizes from portable units to units large enough for entire cities. They are being used by canneries, hotels, beauty parlors, restaurants, schools, homes, laundries, industrial processing plants, boiler plants, diesel power plants, and chemical laboratories. One system has been constructed, that, using ocean water for regeneration, will soften 10,000,000 gallons of water per day.

The zeolite softener has proved indispensable to the laundry industry. In the past, it was the practice to soften laundry water with chemicals or soap, but this caused a grimy precipitation which stuck to the fabrics and not only made them a dull gray, but, baked into them during the ironing, soon caused splits in the cloth. Besides that, the cost of soap and washing powders was high, so that almost universal adoption of zeolite softeners has resulted.

Every engineer knows the danger of boiler scale, because it acts as an insulator and increases fuel bills about 15 per cent for every one-tenth inch scale. Also the higher temperature made necessary by this scale produces overheating, burnouts, and even explosions.

Kent's Engineers Handbook says, "Many substances have been added with the idea of causing chemical action which will prevent boiler-scale. As a general rule, these do more harm than good, for a boiler is one of the worst possible places in which to carry on chemical reaction, where it nearly always causes more or less corrosion of the metal and is liable to cause dangerous explosions.

"When the water used for steam-boilers contains a large amount of scale-forming material, it is usually advisable to purify it before allowing it to enter the boiler rather than to attempt the prevention of scale by the introduction of chemicals into the boilers."

On the average, 1,000 gallons of hard water will produce about 50 cents damage in boiler repairs and increase in fuel bill; the same 1,000 gallons of water could be softened for 3 cents. Several years ago, it was estimated that the railroads in this country were spending $15,000,000 a year in boiler repairs and increased fuel bills due to hard and muddy water. Today, water treating is saving the railroads money, time, and labor. Loco-boilers, for instance, are washed once a month instead of once a day.

The practice of softening the entire water supply of a municipality by the zeolite method has grown steadily and in not a few manufacturing cities the municipal softening plant is saving citizens hundreds of thousands of tons of coal per annum and adding years of life to the communities' boilers. This is not the only large saving, for there is a tremendous saving in the soap consumption of such a municipality. Our own State Water Survey Division published a bulletin by Dr. Hersel W. Hudson of the University of Illinois entitled "Soap Usage and Water Hardness." Through an exhaustive research, Dr. Hudson found the soap usage per capita in four cities to be as follows:

City	Total Hardness Grains	Per Capita Annual Soap Usage—Lbs.	Annual Cost of Soap Per Capita
Superior, Wis.	2.5	29.23	$3.75
Bloomington, Ill.	4.1	32.13	4.48
Champaign-Urbana, Ill.	17.4	39.89	5.93
Chicago Heights, Ill.	32.4	45.78	7.50

Using Superior, which consumes $3.75 worth of soap per capita annually, as a basis for comparison, it will be seen that the excess cost of soap per person per year using hard water is: Bloomington, 73 cents; Champaign-Urbana, $2.18; and Chicago Heights, $3.75. In other words, Champaign-Urbana, with 17.4 grain water and 40,636 population (including students) wastes about $88,713 per year on soap. This waste is of soap alone. Just think how much the extra enjoyment, comfort, and convenience adds to the savings of the people of Superior.

It is true that science has brought man a long way. Today we have artificial wool made from cheese; vinegar made from coke and limestone; soap from corn; and gasoline from sand; but with all our modern culture, we are primitive in many ways. Sanitary engineering is still in its infancy. Only recently have methods of treating and handling food been improved. Due to the smoke of our civilization, housewives find it increasingly hard to keep things clean. Soap manufacturers are capitalizing on the embarrassment of "tattle-tale gray" and on personal untidyness which is hard to prevent in many sections of the country. The answer to this question of cleanliness will undoubtedly be found in that universal solvent and cleansing agent, soft water.

SIGNAL CORPS

(*Continued from Page 7*)

Most of us learned that the procedure had been changed and that ZWA instead of ZZX now meant "close your station." After a few lessons in procedure with the TG-5's, we went out with the 131's, setting up, getting swell sunburns, cranking generators—the Engineers called us G-men—pounding brass, sending IMI, and always waiting for the ZWA. Then we were introduced to the 171's and set up our nets from points farther apart.

After radio came message-center work, with Corporal Widener doing the instructing. The long hours we put in under Captain Sturies last semester made this easy.

At last we put all these into one complete communication system. Our first day of this was the day we helped the regulars demonstrate for the O. R.'s. The next two days the O. R.'s were in command and we sat in the trees for a couple of hours, waiting for them. We put the time to use, teaching Doherty and Coggins who not to fool with. After that were days of reduced distance exercises with student officers in charge of the work. One of these was a demonstration for the Infantry. Finally came the three big field exercises, supplying the communication for a meeting engagement, an attack, and a withdrawal—the United States Army never retreats.

The overnight hike was the last week. We left camp at seven in the morning and marched seven miles to the bivouac area at Stony Lake. All the R. O.'s but the cavalry and a few Signal Corps gold-brickers who rode in a truck, were in the column. Our tents were all pitched by ten-thirty and we ate at eleven. The food was hot and good—brought out from camp. Talking and sleeping took up the time till five when we fed again. After supper the maneuver began. The infantry, with the engineers to build a bridge and provide boats and the signal corps to provide communication, was to make a river crossing. The cavalry was to be the enemy. About ten it began to rain. It let up about midnight when we messed, but started again soon after. The infantry pulled a fast one on the cavalry and had just about won the war when the authorities called the problem off because of the rain; everyone was wet by then. Company E piled men and equipment into trucks and headed for camp. That cot felt good at four-thirty.

But the sergeants wouldn't let us sleep the next morning. We had to turn in equipment. Then came fatigue details with everyone staying hidden so that he would not do more than the rest. Turning in clothes, folding pants, tying socks—phew, stacking bedding, counting clothes, checking equipment. Finally it was all but done. We spent the last night on a bare cot with one blanket for cover. Up early the last day to turn in our cot and blanket before mess. We folded tents as soon as they were dry and everything was turned in by seven-thirty. Then we began to wait. We knew the paymaster and money had come out the day before, so we ought to be out of there soon. Two false alarms and the line fin-

(*Continued on Page 20*)

• TECKNOKRAKS •

He had married a widow and all went well for a week, when they had their first quarrel. The next day he came down to breakfast with a mourning band on his arm.

"Oh, I'm sorry," said his wife. "What is it for?"

"For your first husband," he replied, "I'm sorry he died."

* * *

Immigration Officer—"What do you expect to do in this country?"

Pat—"Take up land."

I. O.—"And how much, Pat?"

Pat—"Not more than a shovelful at a time."

* * *

IN A FRESHMAN'S EYES

A Senior stood on the railroad track,
The train was coming fast.
The train got off the railroad track,
And let the Senior past.

* * *

"What have you been doing all summer?"

"I had a position in my father's office. And you?"

"I wasn't working either."

SIGNAL CORPS

(*Continued from Page* 19)

ally began to move just before noon. At last! Civilians again!

Memories we will always carry—ask any of the boys: Monty's explanation that the mosquitoes didn't bite him because they would die of acute alcoholism; "Rest? Doney?"; serving K. P.—six till eight; changing uniform; B. B. Schreiber and his flat boats; Larry "Casanova" Summerfield; the 2nd Infantry band at 5:40 a. m. and at 4:30 p. m.; Gull Lake; "Command? Weston?"; walking guard; S. A. S. Doherty and the vice-squad; The Rendezvous; Whit's good nature; Doney playing football on the drill field; Gogoac Lake; Mundt leading calisthenics; "Little Corporal, Napoleon" Rugg; Pierce's ticklishness; the tent 6 and tent 7 cars; the totem pole and its three disappearances—nobody thought to blame Company E when it was stolen from their company street nor to suspect the Illinois boys for its disappearance from its hiding place the last night; tents 4 and 9 with their back door entrances; the cot folding the last night; Max Coggins' thrill at having two weeks more of military at Camp Grant; "hurry, hurry, hurry—wait, wait, wait"; Moore's three weeks' confinement sentence; our contempt for the C. M.'s; Holz going to sleep standing up; climbing poles; "roll 'em up—roll 'em down"; S. O. S.; Kenny Hino—in on most the pranks, but never blamed; the Wetzel's, bickering; cold showers; the many S. L.'s; "Ready on the left? Ready on the right? Ready on the firing line?"; circus water; "Yeah! Dat's right!"; the trip to Jackson, the GI picnic lunch, and the bomb in Captain Sturie's car; Frank Conner's speed; rolling packs; foldin' money; our verbal warfare with Company D; singing as we went through Augusta on the long hike; and a host of other brief moments that will always cling in our minds. As time passes, the disagreeable times will be forgotten and we will remember our camp days as six weeks of fun.

Two old Scotsmen sat by the roadside puffing solemnly at their pipes. "There's no much pleasure in smoking, Donald," said Sandy.

"Hoo dae ye mak' that oot?" questioned Donald.

"Weel, if ye're smoking ye ain bacca ye're thinkin' o' the awful expense and if ye're smoking some ither body's y'r pipe's rammed sae tight it winna draw."

* * *

Ed.: "Who spilled the mustard on this waffle, dearest?"

Elsie: "Oh, Ed, how could you? This is lemon pie!"

* * *

"I vish I vas as religious as Semmy."

"For vy?"

"He clasps his hands so tight in prayer, he can't get them open ven the collection box comes aroundt."

* * *

War does not determine who is right—only who is left.

* * *

Inquisitive visitor (visiting the Keokuk dam): "And did they put that dam to the bottom of the river?"

Altruistic engineer: "No, madam; they left two inches so that the fish could swim through."

* * *

"Stop, I never heard such profanity since the day I was born."

"What were you, a twin or a triplet?"

* * *

A pretty young nurse was selling poppies. A salesman told her that he would give her a $5 bill for a poppy provided she would promise to nurse him if he ever went to her hospital. She agreed.

"By the way," he asked, "where is your hospital?"

"I am at Queen Charlotte's Maternity Hospital," meekly replied the pretty nurse, putting the five-spot into the box.

ENGINEERS

(*Continued from Page* 7)

tussle between Clementz and Jakim, which ended with Jake doing a power dive into the gravel.

There isn't time, Ed, to tell you much more—about how Bill Pascoe took fifty-seven minutes to walk his 400 yard guard post, how Sadik kept the boys roaring, how Hernlund, Langille, and Lind drove Snorky, their $25 Pontiac, all over the countryside, about the first time the totem pole was removed from the Signal Corps, only to be returned by those noblemen, Dalrymple and Jakim. Nor have I mentioned the night maneuvers, the erection of the footbridge, the lessons in horsemanship, the gas-mask drill and the exposure to tear gas, the athletics, or the dozens of other interesting activities we engaged in.

Perhaps the biggest problem that some of us were confronted with was that of keeping Tom Meisenzahl away from the Wee Nippy and the women. He's certainly a devil when he gets away from home.

All I can say, Ed, is that I'm glad I was in that army rather than the army of the unemployed, as were many of my friends. Yours truly,

—Tom Morrow.

THE TECHNOGRAPH

UNIVERSITY of ILLINOIS

NOVEMBER 1938

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

THE ILLINOIS

TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

NOVEMBER, 1938

Volume 53 Number 2

EVERYONE has been watching the papers for pictures of the new cars. *The Technograph* goes behind the scenes to discover the engineering features of the 1939 automobiles. Before buying a car, make certain about the many small points that have made the new cars the best engineered automobiles ever produced.

● In an interesting article, Maynard Hufschmidt tells of a unique power development on the Wisconsin river. To enlarge the output of the station, the river was diverted into a pond alongside the old river bed.

● For the grads there is more news of classmates. It has been suggested that we compile a directory of the graduates from the College of Engineering. *The Technograph* is willing to do this if enough alums indicate that they think it worth while.

● According to Bob Tideman, the people of Chicago will be able to rest more easily in about two months, for their sewage disposal problems will again be solved, and they hope that this time it will be for good.

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A PARADE OF BEAUTY

THE ILLINOIS TECHNOGRAPH

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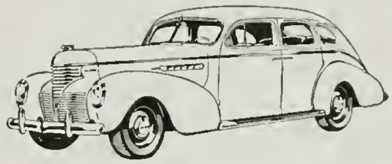
Presenting —



Beauty and Performance

An Engineer Looks Behind this Typical Advertising Slogan to Find Why the New Cars are Better than Ever Before

by
HAROLD KLECKNER

Strike up the band! Clear the way! The parade of new motor cars is passing! The time is here for the annual auto shows. Let us, as engineers, pause and dig beneath the avalanche of advertising of "new beauty and greater performance" to discover the really important features of the car of 1939. The new cars are the best engineered cars ever offered. So let us compare the important engineering features of the new cars against those of other years.

Start with the engine. The best motor has the block made of cast iron alloyed with molybdenum and chromium. This alloy gives greater wear resistance, smoother wearing surfaces, and greater resistance to fatigue. Pick a car with tin-plated, aluminum alloy pistons; they weigh less but cost more than cast iron pistons. Four compression rings are no better than three if the fourth is near the top of the piston. Tests have shown that this top ring causes the greater portion of cylinder wear. See that the cylinder head is aluminum also. Be certain that the valve seats have inserts. Valves should be of alloy steel, with different alloys for the intake and exhaust valves. Full length water-jacketing is a necessity on the better motor. So are steel-backed bearings for the crankshaft and camshaft. Require that both the crankshaft and camshaft be one-piece forged steel. A non-metallic helical gear should have replaced the steel chain drive to the camshaft. The fabric gear reduces noise and wear, and the stretch of the chain is eliminated. See that the water pump is sealed and lubricated for life.

Check on the springing. The wish-bone type, individual, front-springing has definitely proven its superiority as the last of the knee-action sponsors swings over to the wish-bone type for 1939. However, this type has as many variations as a strip-tease dancer. Simplicity is an excellent criterion of the efficiency. A front-wheel springing with innumerable links, knuckles, and grease joints is subject to much more wear than a springing of simpler construction. Look for construction utilizing either roller bearings or rubber mountings. Do not be misled by the number of fifth shock-absorbers, ride stabalizers, and anti-roll bars; these are a necessity with coil springing, not an added attraction. Coil springing on the rear is a new feature and has not thoroughly proven itself yet.

The brakes on your new car will be hydraulic, of course; but they should have some of the minor refinements that increase their performance: a shorter rear lining that stops squeaking; a stepped cylinder for each brake that gives the front shoe greater pressure, the one that does sixty per cent of the braking; and cast iron brake drums for less wear and faster cooling. These things give perfect brakes their perfection.

Then there are many minor features to make certain about. See that the generator is shunt wound. Check that X-type frame. An X-frame that does not cross is like a bent nail; it encourages rather than resists bending. Has the crankshaft a torsional vibration damper? The motor without one is like a vibrating violin string. Check the automatic controls on the carburetor. An automatic choke that is not integral with the carburetor body will cause trouble in bad weather. The single-spring conical clutch proved itself in 1938 and should be a part of that '39 car. This clutch is one of the greatest engineering refinements of the new car.

Perfection is no trifle, but trifles make for perfection. Watch for valve-spring vibration dampers, rotary door latches, needle-point universal joints, anti-vapor locks in the fuel line, a hypoid rear axle, airplane-type hydraulic shock-absorbers, solonoid-controlled overdrive, and the steering post gear-shift bar. Look for the most ingenious engineering feature of the new cars, the utilization of the valve push rods as pumps to force the oil to the skirts of the pistons.

Engineers, let's allow concrete engineering advancements to rule our choice of the best 1939 automobile. Let's look under, not at, that bright, gleaming hood; for beauty is only paint deep.

Chicago's Sewage Troubles

Natives of the Windy City Hope to See the End of a Seventy-five Year Old Problem by New Years

by BOB TIDEMAN

On Jan. 1, 1939, Chicagoans can smile through their hangovers and think that at last it's all over—no more "litigations," no more bonds—nothing to do now but pay for it—$177,000,000.

Pay for what? Well, for those who haven't heard, it is on Jan. 1, 1939, that Chicago's sewage-disposal problem will be solved once and for all. That is what Chicagoans must pay for—the solution. On that date, the Sanitary District can go to sleep in its swivel chair and need awake only occasionally to figure out its tax bill.

Chicago's sewage-disposal problem has had a stormy history. Eleven states and Canada have been involved and the city of St. Louis claimed to have an interest in the matter. All over the United States, sanitary engineers and lawyers have discussed the questions which have arisen, and the controversy which developed was finally settled only by the Supreme Court of the United States.

From 1833 until about the middle of the century, disposing of Chicago's sewage was not a problem. Pipes were laid under the streets, and sewage flowed either directly into the lake or into the Chicago river, which flowed into the lake. The amount of sewage was so small that the lake was not contaminated and could be used also as a source of drinking water.

This situation might have continued until now, had not Chicago been so ideally located that it soon became one of the world's fastest-growing cities. In amazingly short intervals, it doubled its population, and while the size of Lake Michigan naturally remained constant, more and more sewage was emptied into it, and more and more water was taken from it. The natural thing happened—the water supply was polluted.

Nowadays, we talk carelessly of a polluted water supply, for we do not visualize the panic which threatened the very existence of the city, when epidemics of typhoid fever and cholera broke out. Rich and poor were affected alike, and Chicago's death-rate from water-borne diseases became one of the world's highest. The situation was critical, and it was obvious (to Chicagoans) that something had to be done.

The time of the Chicago epidemics, however, was the time of the Civil War, and when engineers advised that a new crib be built, farther out in the lake, the suggestion was criticized severely on the grounds of expense. Much discussion followed, but in the end, the new intake was begun, and relief was in sight. The tunnel to the intake was dug by hand through clay, 50 feet below the lake bottom, and due to the war, wages were high. Backers of the new intake encountered difficulties on every side, but the need was acute, and their determination was strong. A few years later, the intake was put into use, and Chicago's sewage-disposal problem was "solved."

The acute situation was indeed relieved for a time; Chicago was satisfied. The lake was still very foul, but the death-rate had gone down. Not once, however, did the city cease growing, and even during the construction of the new intake, it became apparent to persons with foresight that what had happened once would happen again. With the increase in population, typhoid and cholera broke out once more, and Chicago's death-rate rose again. For a time, it appeared as though Chicago had a naturally-determined population limit, beyond which it was unsafe to go. Optimistic Chicagoans, however, hoped for a solution to the problem and, in 1889, formed the Sanitary District of Chicago, whose first duty was to discover a method to dispose of sewage without contaminating the water supply.

The Sanitary District immediately set to work on the problem and considered four suggestions: (1) Construction of a new intake crib, farther out than before, (2) Disposal of sewage at one end of the city and construction of an intake at the other, (3) Construction of sewage-treatment plants, (4) Reversal of the Chicago river and construction of a canal to the Desplaines. The first two suggestions were eliminated on the grounds that, as population increased, the same difficulty of pollution would be encountered. The third was eliminated because of the great expense of the crude methods of sewage treatment which were available at that time. The fourth suggestion—that of constructing a canal—appeared to be the only feasible one, and in 1892, construction on the project began.

Eight years later, on Jan. 17, 1900, the canal was first put into use. The Chicago river, instead of flowing into the lake, now flowed out of it and carried sewage into the drainage canal. From there the sewage flowed into the Desplaines and Illinois rivers and eventually reached the Mississippi, entirely purified by the action of bacteria, sunlight, and air. A power dam at Lockport controlled the flow of the water from the lake. When heavy rains caused a local rise in the river, and it threatened to back up into the lake, the gates in the dam at Lockport could be opened to allow a greater flow of water. Chicago's sewerage problem at last was "solved."

For almost 30 years, Chicago swelled with pride, and children in grade school read in their hygiene books how the kind and fatherly Sanitary District had saved the lives of Chicago taxpayers. The engineers who planned the canal, however, did not plan against international treaties, and in 1926, Canada, supported by five states bordering the Great lakes, was complaining bitterly that Chicago's diversion of 10,000 cubic feet per second kept the level of the Great Lakes six inches below the average before 1900. The Sanitary District, supported by Illinois and five other states in the Mississippi valley, "hotly contested" the case which arose and carried it even to the Supreme Court. In the final decree in 1930, however, the Sanitary District was ordered to reduce its diversion to 1,500 cubic feet per second by Jan. 1, 1939.

About the time of the Supreme Court's final decree, Chicagoans began to lose faith in the Sanitary District. The depression had begun, and the public was "money conscious." Investigations indicated that the Sanitary

(*Continued on Page* 15)

Grandfather Falls Hydro Plant

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The Enlargement of a Wisconsin Power Station Requires Interesting Engineering Methods

by

MAYNARD HUFSCHMIDT

The Wisconsin river has long been known for the swiftness of its rapids and for its many power sites. Most famous of these have been the "Grandmother" and "Grandfather" Falls between Merrill and Tomahawk in north-central Wisconsin. Although dams have been located at both these falls for many years, the total water-head has not been utilized for power because of the great length of the rapids. In the summer of 1936, the Wisconsin Public Service Corporation purchased the site of the Grandfather dam and their engineers began the plans for the hydro-electric-power project that is now under construction.

These plans make use of the fact that there is a 94-foot drop in the river level from the site of the old dam to a point one mile downstream. They include a canal to divert the water from the river bed just above the dam into a pond alongside the river. From this reservoir the water will be piped to the turbines of the power plant, situated on the river bank, one mile below the dam. By these plans, 17,000 kilowatts of electricity will be produced by the same amount of water used before to produce 3,000 kilowatts. The cost of the entire project will be $1,700,000. Actual work was begun last March and it is expected to start using the new power-house this winter.

The construction of the canal and pond requires the excavation of 170,000 cubic yards of earth and 14,400 cubic yards of rock. First the top soil is stripped off and then the rock loosened with dynamite. Two steam shovels are used to remove the rock. When completed, the canal will be 210 feet wide, 12 feet deep, and 2,000 feet long. The pond will be 1,700 feet long, will average 800 feet wide and will vary in depth from 12 feet at the canal mouth to 39 feet at the intake gates. The topography favors the installation of such a pond because a high ridge forms a natural dike along one side, making it necessary to build only one dike, separating the pond from the river. The highway to be submerged by the canal and pond has already been re-located along the top of the ridge.

One is impressed by the elaborate precautions taken to prevent seepage through the dike and thus to prevent its weakening. As bed rock is close to the surface, it has been possible to build the dike directly on rock foundation. To insure a good bond between the clay and gravel of the dike and the rock beneath it, a concrete wall has been poured three feet into the rock and extends three feet into the dike material. The heart of the dike is constructed of fine clay which is rolled into place. The clay is built to the normal level of the pond and has a one-to-one slope on both sides. Over this clay, sand and gravel are placed with a three-to-one slope on the reservoir side and a two-to-one slope on the river side. The top of the dike will be 12 feet wide and will be continuous except for a spillway at the lower end of the pond. This spillway will handle any excess water caused by sudden flood and will also afford an exit for debris. A gravel drain is being built along the dike on the river side just below the normal ground level. This drain is connected to gravel cross drains at 100-foot intervals to carry any seepage to the river.

The intake structure closes the lower end of the pond and houses the two gates through which the water flows into the pipes to the power-house. It is a massive,

(*Continued on Page* 15)

Power House and Surge Tanks

• OUR SOCIETIES •

RAILWAY CLUB

Fifteen railroad fans turned out to hear Professor H. J. Schrader describe the history and achievements of the Railway Engineering Department at the first meeting of the Railway Club for the 1938-39 school year, which was held in the Locomotive Laboratory back of the Transportation Building. Professor Schrader expressed the belief that railway engineering will become an increasingly important field of study since the railroads, which formerly employed few college-trained men, are hiring them in steadily increasing numbers.

The Railway Department had its inception in 1898 when technical options in Railway Engineering were offered in the Mechanical Engineering Department, and the separate Railway Engineering Department was established in 1906. Research work of outstanding value to the railroad industry has been an important feature of the work of the department since its founding. The train resistance and brake shoe tests are examples of investigations which the department has conducted with the aid of its excellent testing equipment.

The Club plans to hold meetings every two weeks this semester, and it welcomes any railroad fan, railway student or not.

MU SAN

F. E. Wisely.......................................*President*
H. J. Spader....*Vice President and Treasurer*
G. A. Perkins.......................................*Secretary*
R. J. Johnson *Historian, Editor Mu San News*

Mu San held its first fall meeting on October 6. Officers for the first semester were elected and plans were made for the fall meetings.

ASCE

Sidney Berman ....*President*
I. Thomas Chapman ....*Vice President*
H. E. Phillips ....*Secretary*
Edward S. Fraser ....*Treasurer*

The annual smoker of the student branch of the American Society of Civil Engineers was held at the Social Center on Wednesday, September 28. Toastmaster H. E. Babbitt introduced, with special remarks in each case, Sidney Berman, president of the student branch; C. B. Williams, president of Chi Epsilon; Maurice K. Carr, editor of the *Technograph*, and Professor Wilbur M. Wilson, acting head of the Civil Engineering Department. Professor Wilson gave an interesting talk upon the inspirational value of A. S. C. E. Mr. Berman closed the meeting with an invitation to all civil, general, and architectural engineers to join the student branch. Doughnuts, cider, and cigarettes were furnished to all who wished to indulge.

The second meeting was held Wednesday, October 5. A sound motion picture about diesel tractors was shown. On October 20, Thomas Wolfe, a research engineer from Chicago, presented a talk and a movie. The color film, "Steel-Man's Servant" was shown to a large audience on November 9.

A talk, "Scientific Crime Detection," will be delivered by B. F. Fitzsimons, Special Agent of the Federal Bureau of Investigation in charge of this district. Another movie, "The Plow that Broke the Plains," will be shown later in the semester.

PI TAU SIGMA

Pi Tau Sigma was formed in 1915 when a group of upperclassmen in the mechanical engineering school at the University of Illinois executed a plan for an honorary fraternity for their department, "to foster the high ideals of the engineering profession, to stimulate interest in departmental activities, and to promote the welfare of its members." The fraternity is now national in scope having fifteen active chapters in prominent engineering schools throughout the country.

The local unit has greatly assisted the Mechanical Engineering Department by rewarding high scholastic averages and by cooperating with the faculty in all A.S.M.E. activities. A "Marks M. E. Handbook" is presented each year to the sophomore with the highest scholastic average.

The bi-annual initiation and banquet is held in conjunction with Eta Kappa Nu and Chi Epsilon. Active student and faculty members congregate informally several times each semester to enjoy themselves at dinner meetings, promoting mutual understanding and friendship between faculty and students.

KERAMOS

Due to the large number of members graduated last June, the membership in the Illinois chapter of Keramos has fallen to the lowest level since the society's inception. At present there are only seven actives, but it is expected that eight or ten will be pledged during the semester. The great decrease in the size of the organization has kept group activities at a minimum.

Last year, at the biennial Convocation held in New Orleans, the Illinois chapter representative proposed the "weighted average" method of determining the scholastic eligibility of prospective members. The local campus unit intends to carry on a campaign among other school chapters for the adoption of the plan.

The senior Keramos members are engaged in making keepsake plaques that offer the same problems in Ceramics that might be met by the graduate after he has started work in a commercial organization. After being cast in porcelain, the plaques are protected with the proper glazing and colored black and gold.

SBACS

The student branch of the American Ceramic Society held its initial meeting on Wednesday, September 28. Professors C. W. Parmelee, R. K. Hursh, A. I. Andrews gave short talks. Plans were made for the Enamels Forum and a tentative date for the Ruckus was set as December 3. The meeting closed with the serving of refreshments.

Approximately 300 visitors representing the United States, Canada, Poland, England, and Argentina, including superintendents, foremen, and engineers of ceramic products companies gathered here for "one of the most important technical conclaves in the country for the enameler." It was organized and held to assist in the training of factory men in methods which will contribute to the general advancement of the enamel industry.

The key speech, "New Frontiers," was delivered by Bennett Chapple, president of the American Rolling Mill Company. Entertainment was furnished by Bruce Foote and Sherman Schoonmaker of the Music School.

ETA KAPPA NU

Eta Kappa Nu members are looking backward at first seasonal activity, a weiner roast, held on October 15, to which all members of the Electrical Engineering Department were invited. Plans for the outing were made by brothers Wetzel, Zierjack, and Horn.

The Chicago Alumni Chapter has informed the local unit that it hopes this semester to duplicate the Employment Conference held with such success last March. Seniors who made the trip last year urge the present membership to attend.

Headed by Recording Secretary Bill Lyon, a committee, made up of Milburn Pehl, John Wenger, R. O. Gray, and Bernard Epstein, has already begun work on the H. K. N. alumni chain letter plan. Approximately fifty per cent of the two graduating classes written have responded.

President Paul Zeurcher said the search for pledges will probably begin early in November.

SYNTON

One of the most unusual organizations on the campus is the local chapter of Synton, professional radio fraternity. While many of its activities are common to other fraternities, both professional and social, its central theme is unique.

Radio communication forms the principal activity of this fraternity. Since 1925, when the first chapter of Synton was founded at the University of Illinois, its members have maintained a short wave station in the University Armory. Most of its members are licensed operators who own and operate their own amateur stations at home. Since very few of them bring their radio equipment to school with them, the Synton station is used considerably for keeping schedules with home stations and for keeping in touch with other friends over the air.

W9ZOL, as the station is officially designated, is licensed to Synton through Professor H. A. Brown, of the Electrical Engineering Department, who acts as trustee. The room in which it is located, 236 Armory, is furnished as a club room. The receiving equipment usually consists of three receivers covering the broadcast, short-wave, and ultra-short-wave bands. There are two main transmitters, one used for phone communication over distances up to two hundred miles, and the other for code work with stations all over the world!

The power input to the one-hundredth tube in the final stage of the latter transmitter is 300 watts. Besides this, the station is also equipped with an oscillator for code practice and with small transmitters and receivers for experimentation.

Several of the members of Synton are also members of the Signal Corps of the R. O. T. C. Thrugh their operation of W9ZOL they obtain very valuable experience in operating under actual conditions involving atmospherics, static, "skip distance," and other factors; experience which will mean much in safeguarding our country in case of war. Valuable experience is also gained by those members who are pursuing electrical and radio courses in the University, since practically all of the equipment has been built by the members themselves.

Synton always plays a large part in staging the biennial Electric Show. It conducts a message service to all parts of the country, and holds code classes annually, both services being free to those interested. The station is open to visitors nearly every afternoon and particularly on Saturdays.

ASME

At the opening meeting of the student branch of the American Society of Mechanical Engineers, on September 28, Mr. Yeager, of the Owens Illinois Glass Company gave a talk and showed motion pictures of the manufacture of "Fiberglass." On October 5, the annual round-up was held in the laboratory with Professor A. R. Knight acting as master of ceremonies. After the mechanical engineering faculty had been introduced, cider and doughnuts were served.

SIGMA TAU

Sigma Tau, national honorary engineering fraternity, held its thirty-fourth anniversary conclave the week beginning September 30, at the University of Colorado at Boulder, which was attended by H. E. Phillips, president of the Illinois chapter, as delegate.

In addition to the technical committee reports and business sessions, the program was made up of trips into Boulder Canyon, banquets, and a real western steak fry, which was especially enjoyable to the eastern delegates. The conclave was attended by ninety delegates from various chapters throughout the United States. Prominent Illinois alumni who were present included Professor Sutherland, now of the University of Colorado, and M. H. Cook of the Western Electric Company. Mr. Cook is National Councilor for Sigma Tau.

The annual smoker was held in October. Various speakers on engineering and related subjects will follow, and, as a change from technical speakers, B. F. Fitzsimmons, special agent in charge of this district for the Federal Bureau of Investigation will speak.

Theta chapter held its fall rushing in October and had National Councilors Cook and Lehigh, from Chicago, for one of the regular meetings.

A.I.Ch.E.

The first meeting of the student branch of the American Institute of Chemical Engineers was held October 5. On October 19, Dr. L. F. Audrieth lectured on "The Effectiveness of Chemical Warfare Today." He showed slides and motion pictures.

AGRICULTURE CLUB

In its first meeting of the new school year, the Ag Club, presided over by Clarence Bush, had as guest speaker Professor E. W. Lane, who related experiences and observations from traveling through the farm districts of Europe and the United States during the summer. Professor Lane placed special emphasis upon the almost complete shift from human labor to machine power on farms large and small throughout the country. He gave as the principle reasons for the change the extra efficiency of machinery and the labor disputes so prevalent between farm employes and employer. Another interesting observation made by Professor Lane was the noticeable decrease in the size of individual farms as he went farther south.

At the meeting of October 20, the addresses were given by John Trummel and Herman Finkel, the two students selected by the faculty to make a two weeks tour of the better known farm implement manufacturing companies.

Reid Bishop, former University of Illinois student, and for two years employed by the Soil Conservation Branch of the Federal Department of Agriculture, was the guest speaker October 3.

The December meeting will be devoted to moving pictures showing the Ag clubs from coast to coast at their various activities.

★ WHO'S WHO IN ILLI

● *R. K. Hursh*

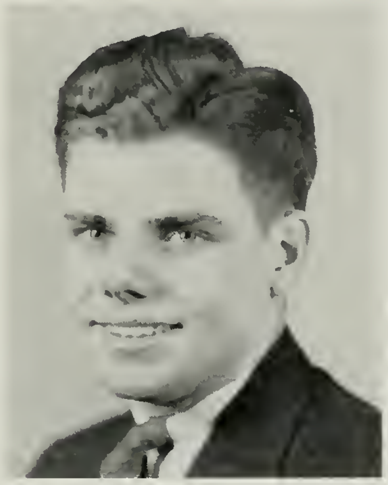
● *R. F. Larson*

● *E. A. Reid*

PROFESSOR RALPH K. HURSH was born in Woodstock, Illinois in '85. After one year at Western Illinois State Teachers College, he transferred to Illinois where he received the degree of bachlor of science in mechanical engineering in '08. A year followed in which he worked in an Ohio brickyard and he spent two years with the Ceramic Technology division of the United States Bureau of Standards. In 1911, he began as a faculty member of the Ceramics department as a half-time assistant. He has stayed at his post ever since and now ranks as a professor. When an undergraduate Illini, Professor Hursh was a member of Acacia, A. S. M. E., and the Ceramics Club. Today, a nationally known figure in the field of Ceramic Technology, he is national treasurer of the American Ceramic Society, national secretary of the fellows of the American Ceramic Society, secretary of the Illinois Clay Manufacturing Association, a member of the refractories committee of the A. S. T. M., and a member of the University's entrance committee. He is advisor of the Student Branch of the American Ceramic Society. His son, graduated from the U. of I. last spring, is now a research fellow in mechanical engineering at Ohio State.

PROFESSOR LARSON, in charge of petroleum engineering courses offered in the Petroleum Production Option of Mechanical Engineering, is a man of wide practical experience. Born Reinhold Fridtjof Larson in Geneva, Illinois in 1899, he came to our campus in '19 and secured his bachelor of science degree in mechanical engineering in 1923. During his undergraduate days he was elected to Tau Beta Pi, engineering honorary fraternity. Four years were spent in industry as lubrication engineer for Standard Oil of Indiana, conveying-machinery designer for the Stevens-Adamson Manufacturing Company, and as a salesman for the Dearborn Chemical Company, and later, for the Newport Boiler Company. In 1927, Professor Larson returned to the University of Illinois as full time assistant in the mechanical engineering laboratory. During summer vacation periods he has worked for the Babcock and Wilcox Boiler Company, the Western United Gas and Electric Company, and the Humble Oil and Refining Company. He took over the supervision of the petroleum production courses in 1934. A. S. M. E. and Sigma Xi claim his membership. Professor Larson has completed two-thirds of the work towards the degree of Doctor of Philosophy in mechanical engineering. He and Professor Straub of the chemical engineering department have done research on the subject of boiler water. Their papers have appeared in the A. S. M. E. Transactions, American Chemical Society Transactions, Power Plant Engineering, and The Petroleum Engineer. He knows the problems met by many engineering students for he earned all of his educational expenses. Professor Larson recommends that engineering students investigate the possibilities of employment in the petroleum industry and that they get field experience as soon as possible if they plan to take the petroleum option.

PROFESSOR ERNEST A. REID, well known to students for his interest in student affairs, is a native son of the Hoosier state. His first two years of college were spent in the South at Mississippi A. & M. The University of Illinois conferred the B. S. degree upon him in 1914. In 1915 he received his M. S. and in '30 his E. E. degree. His formal education has been supplemented by a year with the General Electric Company and summer vacations with the Illinois Commerce Commission Committee on Electrical Inspection of Utilities, the engineering department of Public Service Company of Northern Illinois, the Bell Telephone Laboratories in New York City, and the combined laboratories of General Electric and Westinghouse in Pittsburgh, Pennsylvania. Professor Reid gained his first experience at teaching at the University of Minnesota. He has been a faculty member of our college since 1917 and now has charge of the electrical laboratories. His name appears upon the rolls of Tau Beta Pi, Eta Kappa Nu, Society for the Promotion of Engineering Education, and American Institute of Electrical Engineers. He has held the chairmanship of the local professional branch of A. I. E. E. and is the advisor of the student branch. He also helps the Alpha Chapter of Eta Kappa Nu make its decisions. Because of his friendliness and understanding he has always been popular with students, faculty, and alumni.



S. Berman ●

F. W. Nelson ●

R. R. Phillips ●

BOB PHILLIPS is the adventurer of the month. Mining must have gotten into his blood during the fifteen years he lived in Jerome, Idaho. After the Phillips family moved east to Chicago, Bob spent three years at Lindblom High School and ended up at the head of his class. Sports were his major activity in high school; he upheld the honor of Lindblom on the gridiron and worked on the school paper as a member of the sports staff. Nineteen hundred and thirty-four found him on the cast of the senior play.

A former graduate of the University helped him to decide to enroll in mining and metallurgy here. His name appears on the membership rolls of Alpha Chi Rho, the Engineering Council, of which he is secretary, and the Student Branch of the Mineral Industries Society. He will wield the branch's gavel this year. Bob's sports interests are in football and wrestling; he once groaned and beat the mat for the University on the frosh squad. For four years he worked as shoe salesman and gas station attendant; now he's selling candy.

Since two summers ago when he worked in a motorcycle repair shop, straddling an engine has been his main spare time occupation. Last June he started out on a motorcycle tour of the mining sections of the West. For two months he mined, shoveled rock, and acted as mill foreman for a living. In Omaha his bike had six flat tires; in Ketchum, Idaho, he prospected the city lock-up. He wrecked his motorcycle on a mine grade, wrecked a car a week later, and hurried back to Illinois on a bus.

To Decatur, FORREST NELSON is a home town boy making good. He is accomplishing the rare feat of working his way through school, engaging in activities, and maintaining a high scholastic average to-boot. Decatur has been Forrest's home since May 30, 1917. In high school he was on the staff of the paper for three years, besides spending much of his time with the Boy Scouts. Graduated in 1935 with a 4.5 average, he was seventh in his class.

He had friends in ceramics at the University and he wanted to come here. To realize that ambition, he applied for, and won on his high school record, one of the last Illinois Clay manufacturers scholarships. Since that time it has been necessary for him to earn his entire way. He is now head of the N. Y. A. workers in the psychology department. In addition to the work needed to maintain his 4.4 average, he will this year keep order at the meetings of the Student Branch of the American Ceramics Society. Keramos, ceramic honorary, claims his membership, and he is treasurer of the Engineering Council. This year he plans to write articles on ceramics for the *Technograph.* Tennis and baseball are his favorite sports, and he looks forward to the time when he will have enough time to catch up on his reading.

His summers have been spent as clerk in grocery and motor supply stores. Not satisfied with working all day, he played softball under flood lights.

The fact that SIDNEY BERMAN was born in Chicago at the beginning of the World War may account for his perpetual activity. While attending John Marshall High School, he played football and served as vice president of the school's society of lettermen. His next step was to Lewis Institute where he put in his first year of college work. Finally deciding, however, that the University was the place to get an education in civil engineering, he transferred here in 1935 as a sophomore.

At one time Sid's greatest ambition was to sleep all day. Now he doesn't even sleep at night, with piloting the student branch of the A.S.C.E., being a member of the Engineering Council, and laboring far into the night at amateur photography. Not long ago Sid traded his girl for a camera as an economy measure; now that he finds his pockets empty more often than before, he is considering bids on the camera. Hunting articles and illustrations for *The Technograph* consumed much of his time last year. Just to keep his hand in, he threatened to proofread this before publication. He is a student and an activity man, but imbibing the amber brew is his most amazing ability. It has been said that he can drink three design classes under the table in one afternoon.

For seven summers the *Chicago Tribune* has employed him in its maintainance and receiving department. Last summer he did cost estimating and surveying for the W.P.A. His professional ambition is to succeed in whatever business he can find a good opening.

• THE ILLINI TRAIL •

— Class of 1886—

George S. Bannister, who graduated fifty-two years ago from the School of Architecture, passed away June 3.

—'95—

Emery Stanford Hall '95, married Clara Louise Adams '94. Their four children are of the classes of '27, '28, '35, and '36. Mr. Hall does architectural work and is Secretary-Treasurer of the National Council of Architectural Registration Boards.

Their daughter Josephine married Armando Lejada '35, and the two are now in Bolivia, South America.

Their son Halbert '28, works in Boone, Ia., for the Chicago and Northwestern R. R.

G. R. Radley, former editor-in-chief of the *Technograph*, married Della Converse, a graduate of Wisconsin State Teacher's College. Their only child, Jane, took her B. A. from the University of Wisconsin in 1933. Mr. Radley owns a sign company in Milwaukee.

—'05—

The subway for the City of Chicago concerns F. A. Randall, who is Consulting Structural Engineer. Two of his four children are students here at the University. His wife was Mabel Morris.

—'07—

J. D. Ball, Professor of Physics and Business Administration at Mount Mary College, Milwaukee, is the father of two children, John D. Jr., who has a B. A. from Carroll College, and Ester Catherine, who is a senior at Mt. Mary. He received his Ph. D. at Marquette in 1928.

—'09—

Charles E. Ramser whose mother and brother reside in Urbana, is doing Soil Conservation Work in Washington, D. C. He has two children, a son Charles Ernest, Jr., and daughter Ann Ernestine, whose mother is the former Ann Lillian Larkin of Marshall, Missouri.

—'11—

Frank S. Bauer is one M. E. graduate that made good in his own field. Frank is now head of the Mechanical Engineering Department at the University of Colorado, in addition to being a Professor of Engineering Drawing and Machine Design. His two children have both attended the University of Colorado, Frances Evelyn graduating in '38 and William Charles now completing his last year of Chem. Engineering.

—'12—

Paul Simonini, M. E., owner of the Industrial Products Co., insulation and roofing concern, has two prospective musicians in the persons of his two sons, Paul, Jr., and Alfred. Paul, who is eighteen, intends to enroll at Armour Institute for two years before finishing at the U. of I. Alfred, 15, is still at high school. The Illinois Band, according to Paul, Sr., can count his two sons among its future members.

—'14—

Back in the smoky city of Pittsburgh, John M. Fetherston is District Sales Manager for the Photostat Corporation. He married Katherine Born '17, and their oldest of three children, John M., Jr., is of the Class of '42. His father is of the class of '90 and his brother James '17.

—'17—

Seeing that the New York Telephone Company's circuits are okay is the job of H. H. Schroeppel. His three children live in Urbana, two attending the University and the other at Urbana High.

—'19—

Many heat transfer problems in Bloomington, Ill., are handled by C. J. Scanlan. He married the former Nelle Curley and they have two sons and a daughter.

Head of the Department of Electrical Engineering at the Montana State College, Bozeman, is E. W. Schilling. In 1927 a "Western gal" of Sioux Falls, S. D., lassoed him. They have two boys.

C. B. Schmeltzer is now in Vicksburg, Miss. He was married to Pauline Kennedy of Springfield, a year after graduation. He does Flood Control Work for the Department of Agriculture.

A graduate in Civil Engineering, Harry G. Hoake, is at this time vice president of the Ceco Steel Products Corporation at San Marino, California. He was married to Mildred Moore of St. Louis in 1928, four years after her graduation from Washington University. Their children are John and Harriet Jane.

—'20—

J. M. Aubuchon is a district engineer for the A. T. and T. Company in Omaha. He and his wife, Hazel Martin, have a boy and a girl.

At work in the Law Department of the Union Pacific Railroad, as a Contract Engineer, is Earl J. Smiley. His present address is Omaha, Nebraska. He has been married twelve years and has one child Dorothy Ellen, age 8.

—'22—

Lester Seelig is Chief of the Engineering Department at the Museum of Science and Industry in Chicago. Two children have been presented him by the former Leora Allswang.

Kenneth Cotton Brown, M. E., is employed by the Electronic Control Corporation as General Manager. He was married in Evanston, Ill., in 1917. The union of Mr. and Mrs. has produced four children: Dorothy, 20; Malcolm, 15; Barbara, 13; and Kenneth, 6.

—'23—

Frank S. Brueckman, after his graduation in civil engineering, returned in '24 to complete the required graduate work for his M. S. degree. Now employed as design engineer by the Standard Oil company of Indiana, he is married to Ambie Carroll Mosley Brooks and is the father of two boys, Frank Robert and John Edward, aged nine and three and one-half years respectively.

Fred P. Schrader is the husband of Ruth Lawton, same class. He does city paving engineering for Kinsey Engineering Company, Pekin, Illinois.

P. N. Ferguson is protecting the employees of the St. Joseph Lead Co., in Rivermines, acting as Safety Engineer of the Federal Division of Safety and Welfare. He married Winnifred Brown '23 two years after leaving school. They have two children.

L. Clifford Goad, M. E., whose appointment as general manager of the AC Spark Plug division of General Motors has been announced, is one of the youngest general managers in the ranks of General Motors, being only 37. Mr. Goad succeeds Fred S. Kimmerling, who has been on leave of absence since last September because of ill health. Mr. Goad has been acting general manager during Mr. Kimmerling's absence. Mrs. Goad was Frances Creek '26.

Cities Service company employs T. P. Hamilton as engineer in Kansas City, Mo. His wife, of Parsons, Kansas, was Jewell Harris.

—'25—

Working for the Corn Products Refining Company, R. B. Hall, now in Englewood, N. J., serves as a superintendent. Evelyn Manchester of Berwyn, Illinois became his wife in 1933, and since then two boys have doubled the household membership.

—'26—

Walter G. Hagemeyer, his wife, the former Lois Newburn, son Robert, and daughter Donna Jean reside in Springfield. Hagemeyer is an assistant engineer for the Illinois Division of Highways.

—'27—

Hugh Alexander is located in Indianapolis, where he is employed by the Johnson Service Co., as Branch Manager in charge of automatic temperature and humidity control. He married Marion Wright of Buffalo, N. Y. Their child Sharon is three years old.

—'28—

Robert C. Hadley is doing contract sales work in Denver, Colorado for the Stearns-Roger manufacturing Company. He married Helen Schroeder of Kansas City; the couple now have a boy and a girl. Hadley states that the U. of I. has a hearty reputation in those parts.

For details on Wm. L. Sawyer see "Young Men of America." Sawyer is in the department of Civil Engineering at the University of Florida, but has done other than teach. Mrs. Sawyer, whose maiden name was Friend, and he have two children.

—'29—

Graduated from the Electrical Engineering department, Gordon Whipple Brown of Evanston, Illinois now holds the position of Plant Repair Supervisor with the Illinois Bell Telephone Company. He married Alice Fern Wallace of St. Louis in August, 1929. They are the proud parents of twin eight year old girls, Dorothy Alice and Helen Donna.

—'30—

J. J. Floreth is a manager for the Westerlin and Campbell Co., in the air-conditioning division. The former Alice V. Landly is of the same class. Since their marriage in 1931 they have been blessed with a boy and a girl.

Carl J. Scheve is with the U. S. Navy in Pearl Harbor, Hawaii, doing channel and harbor dredging.

—'31—

Flood control work for the TVA is being done by D. Joseph Brumley, a C. E. now residing in Knoxville, Tenn.

At work as a Junior Engineer in the U. S. Engineering office at Memphis, Tenn., is L. H. Shifley, C. E. In 1932 he married Estelle Smith at Waterloo, Illinois. They now have two children, L. H. Junior, and Joyce.

"Uncle Sam" is the employer of G. W. Barry, now a C. O in a C. C. C. Camp. Barry, located in Dubois, Idaho, married Margaret Clark '30. They have no children. He states that Lt. T. L. Woltauski '36, also serves at Dubois.

—'34—

One of our graduates has really headed South. Ralph Bevis, according to Fred Armstrong, is working in Buenos Aires. He has his wife along with him.

Fred Armstrong is a superintendent for Johns-Manville Corporation at Manville, New Jersey. He is connected with the manufacture of home insulation products. His wife, the former Marybeth MacKenzie, is the daughter of a Champaign grocer.

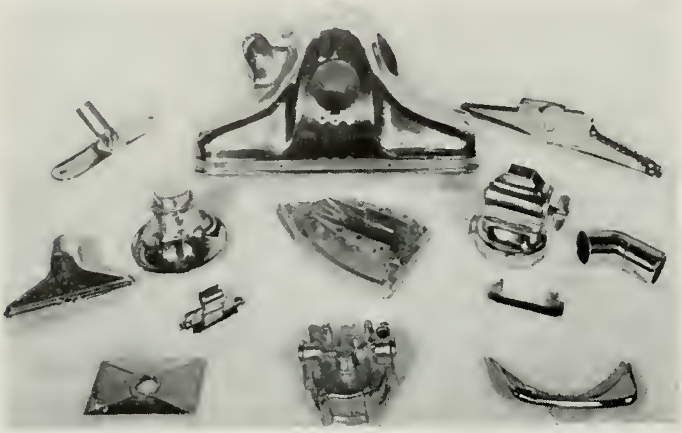
Perry Hafer married Ethel Hurley (Dennison U. '31) two years ago and is doing Industrial Management Training for the International Harvester Co., of Chicago.

John Shelford is designing up-to-date railway cars to be used for inspection purposes. Fairbanks Morse & Co. employs him at Three Rivers, Michigan.

—'35—

Ralph E. Bailey seems to be permanently connected with education. He receivd his M. S. degree in E. E. from Ohio State University. He is now Assistant Professor of Electrical Engineering at Virginia Polytechnic Institute, where he teaches communication work. His wife was Neva M. Mathis.

• THE PROFESSIONAL WORLD •



Some Plated Aluminum Articles

Aluminum Can Now Be Plated

Aluminum, by first coating with anodic-oxide film, can be plated, it has recently been discovered. The trouble before has been that aluminum's affinity for oxygen not only presented a chemically sensitive surface to the air, but also a surface that would resist plating. Aluminum is more abundant in the earth than iron and its usefulness may sometime exceed that of the ferrous metals, especially now that it has been discovered that it can be plated. Already the airplane manufacturers are using the new plated aluminum in many ways.

Smothering a Gasoline Fire

A New Fire Extinguisher

A fine water spray, which surpasses many other types of fire-extinguishers, has recently been adopted in California. The "water-fog" as it is called, presents an enormous heat-absorbing area to the otherwise destructive fire. An ordinary stream of water not only fails to absorb the maximum heat, but also to smother leaping flames. Water-fog, however, displaces such a large volume of air that it will put out a gasoline flame, despite the low temperature of gasoline's flash point.

World's Largest Bearing

Declared to be the largest journal bearing ever made, the 317,000-pound "horseshoe" bearing shown in the accompanying illustration will carry the million-pound load of the world's largest telescope. This giant instrument, one of the most important scientific projects in all history, is expected to enable astronomers to peer a billion light-years into space.

The bearing resembles a giant steel washer, forty-six feet across and fifty-three inches thick, from which a large "U" has been cut. Because of its unusual size, the bearing had to be made in three sections for shipping from the East, where it was made, to its final resting place atop Mt. Palomar, California. During machining, the "horseshoe" was bent out of shape so that it will be squeezed back into a perfect circle under the great weight of the telescope mounting. The warping of the bearing was done by placing a large compression member near the bottom of the U and pulling in at the top of the bearing with steel bolts and turn-buckles. Originally the boring mill on which the bearing started its long "grind" was built with a fourteen-foot table. For the machining of the valves for the Boulder Dam turbines it was enlarged to thirty feet. But these valves are dwarfed by the telescope bearing and the mill table is now more than forty-three feet in diameter. When finished, the bearing will have a glass-smooth surface, and so precise will the final machining be that the bearing will be within five-thousandths of an inch of a perfect circle when it is sprung back to its normal position. The specifications state that the telescope must be sighted with an error not larger than the angle formed by two lines drawn from a point three miles away to two points the thickness of a twenty-five cent piece apart.

When hoisted into position on its steel base, the bearing will rest on two steel oil pads through which oil at a pressure of 250 pounds per square inch will be pumped. Despite the fact that the telescope and its supporting structure will have the proportions of a six-story building, the friction between the bearing and the oil pads will be so slight that an electric motor of only one hundred sixty-five one thousandths of a horse power can turn it.

The sixty-foot telescope tube, housing the two-hundred-inch mirror, will swing between two sixty-foot, tubular-steel arms forming a yoke. The upper end of this yoke will be welded to the horseshoe, and a flat swivel at the lower end will turn in a ball and socket bearing floating on oil. The yoke will be hung parallel to the earth's axis, or at an angle of thirty-three degrees with the earth's surface.

The construction of this giant telescope, conceived by Dr. George E. Hale, was made possible by a six-million dollar grant by the Rockefeller Foundation. Work was begun in 1936 and although the steel frame-work is nearing completion, the instrument will not be ready for use until 1940.

• NORTH OF GREEN •

Seen on blackboard in 319 E.H., "Dear Doc, we have went home. Sec. A-2."

What freshman asked if the boneyard was part of an engineering experiment? *Harold Kleckner* has the answer and he states that he thinks they used to use it for testing battleships. That was before the flood. Let us also advise *Ben Janda* (a sophomore!) that armatures are not the guys that sing for Major Bowes.

When *Bob Williamson* asked Professor Macintire if the University steam line extended east to the Residence Halls, Mac said yes, he'd remembered going through the tunnel to them . . . properly escorted by the power plant engineer.

Announcements: *Johnny Grubb* and *Bob Krein*, both M.E. '39, are doing extensive research in Human Engineering. The results shape up pretty good but one of them failed to keep a "coke" date last week . . . Winchell doesn't have it, but Technograph does, that *Harold Bunte*, senior E.E., hasn't been a bachelor since September 9. Now let Winchell look up the details. Congratulations Harold.

By the way, *Dick Thompson* is seldom seen about nowadays without two or more pulchritudinous bodyguards . . . and speaking of cupid, *Tommy Spires* spent most of his summer vacation making bows and arrows for his friends . . . and speaking of vacations, how's this?

Don McCreight worked in a tomato cannery for two months while in New Jersey. *Don Rader* worked on his Grandmother's farm. *Paul Todd* spent his time showing prize livestock at various county fairs. *Eldon Arbuthnot* put in eight hours a day at the Western Cartridge Company in Alton, Illinois. *George Eyerly* spent part of his summer in Colorado shooting woodchucks and jackrabbits. *R. L. Williams*, also an outdoor lad, occupied himself working at camp.

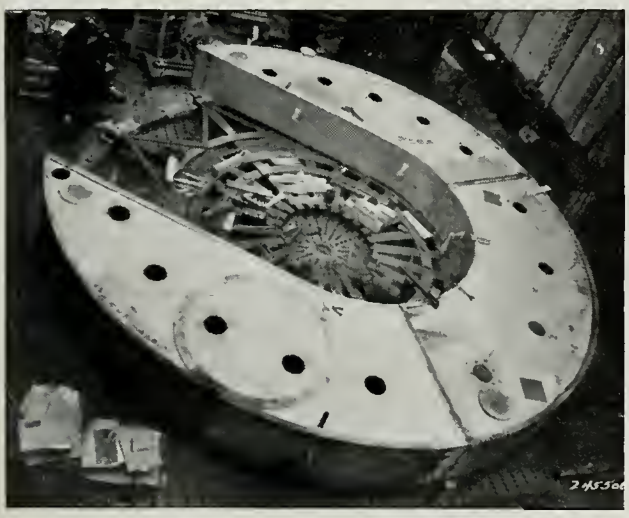
Warren Harestad spent the whole summer in Chicago engaged in unproductive effort, while *Bill Thieman* worked for the school board in Peoria and then took a trip West. *Leonard Fieman* '39 worked with the Acme Sheet Metal Company of Kansas City, and *Charles Apple*, Chem. Eng. '41, worked with the Child Recreation Department of the St. Louis Public Schools . . . sounds like *Paul Spellbrink's* line two summers ago.

Warren Gratian spent most of his summer helping with the construction of pipe organs in his father's factory at Bunker Hill, Illinois. *Edwin McCown* learned the ups and downs of a toll lineman. *Kenneth Smith* gave his mind a rest and his feet a work-out on his father's farm near Rockford, Illinois.

Jamestown, N. Y., sent *Fred Moore*, Gen. '40, back to us this year; but Jamestown'll get him back if he designs any more buildings (guaranteed not to fall over) with 28 inch by 28 inch wood planks. Have your instructors all made the "roll call pun," Ed? (His last name is *Wanderer*, poor boy). Granite City, the Pittsburgh of Southern Illinois, claims six engineers this year: *Art Karrer*, Cer. '40, *Glenn Voigt*, M.E. '40, *Chris Papadinoff*, Met. '42, *Gene Sternberg*, M.E. '42, *Leo Jercinovic*, '42, and *Roger Braden*, Cer. '42.

Instructing the boys on flux mapping in design class, Mr. Archer, at the board, said, "I'm not bragging about my map." Don't feel bad, Mr. Archer, looks aren't everything.

Among the ninety-five freshmen who are not taking Rhetoric I because they passed the proficiency are engineers: *Robert Debs*, *Paul Freeland*, *Donald Hayes*, *Phil Kessler*, *Elwyn King*, *Donald Melohn*, *Howard Mendenhall*, *Robert Nelms*, *George Nibbe*, *Pryor Randall*, *Donald Stevens*, and *James Thale*.



Horseshoe

• FACULTY NEWS •

Promotions

Ceramic Engineering: J. A. Pask, from Assistant to Instructor.

Civil Engineering: G. L. Jeppeson, from Research Graduate Assistant to Instructor.

Electrical Engineering: L. B. Archer, from Associate to Assistant Professor. C. E. Skroder, from Associate to Assistant Professor.

General Engineering Drawing: Albert Jorgensen, from Associate to Assistant Professor.

Mechanical Engineering: R. B. Engdahl, from Research Graduate Assistant to Special Research Assistant.

Mining and Metallurgical Engineering: H. P. Nicholson, from Associate to Assistant Professor of Mining Engineering.

Physics: E. B. Jordan, Jr., from Instructor to Associate.

Theoretical and Applied Mechanics: R. E. Cramer, from Special Research Assistant to Special Research Assistant Professor. N. J. Alleman, from Special Research Assistant to Special Research Associate in Engineering Materials. J. L. Bisesi, from Special Research Assistant to Special Research Associate.

Appointments

Ceramic Engineering: H. A. Van Derck Frechette, as Research Graduate Assistant. George Herbert Zink, Assistant.

Civil Engineering: Robert Marvin Mains, as Research Graduate Assistant. Lawrence Rogers Marcus, as Research Graduate Assistant. Arnold M. Judd, as Research Graduate Assistant. David Hume Caldwell, as Research Graduate Assistant. Fred William Oevirk, as Special Research Graduate Assistant. Warren Alwin Grasso, as Special Research Graduate Assistant.

Electrical Engineering: William Joseph Warren, as Associate. Marion Stanley Helm, as Instructor.

Mechanical Engineering: Kenneth James Trigger, as Associate. Jay Arthur Bolt, as Instructor. Edwin Devere Luke, as Instructor. Francis Seyfarth, as Instructor. Daniel William Thomson, as Research Graduate Assistant. Mario Joseph Goglia.

Mining and Metallurgical Engineering: Harold Leroy Walker, as Assistant Professor of Metallurgical Engineering. Richard Arnold Wilde, as Special Research Graduate Assistant.

Physics: Moritz Goldhaber, as Assistant Professor. John Reginald Richardson, as Assistant Professor. Robert Serber, as Assistant Professor. Leland John Haworth, as Associate. Ernest McIntosh Lyman, as Associate. Donald William Kerst, as Instructor. Francis Barnet Berger, as Assistant on half time. Louis John Cutrona, as Assistant on half time. Milton Parker Vore, as Assistant on half time.

Theoretical and Applied Mechanics: Winston Edward Black, as Instructor. Francis Lewis Ehasz, as Instructor. Harvey Rogers Puckett, as Research Graduate Assistant. Robert Roy Penman, as Special Research Graduate Assistant.

General Engineering Drawing: Richard Roy Little.

Withdrawals

Ceramic Engineering: W. R. Morgan, Associate.

Civil Engineering: M. E. Fiore, Special Research Graduate Assistant. F. J. Morales, Jr., Research Graduate Assistant. A. A. Thomas, Research Graduate Assistant.

Mechanical Engineering: J. A. Goff, Professor of Thermodynamics. J. C. Reed, Associate.

Mining and Metallurgical Engineering: D. R. Mitchell, Associate Professor.

Physics: H. Q. Fuller, Instructor. G. K. Green, Instructor. R. N. Griesheimer, Assistant on half time. H. A. Leedy, Assistant on half time. W. E. Shoupp, Instructor. R. E. Watson, Assistant on half time.

Theoretical and Applied Mechanics: R. H. Heitman, Research Graduate Assistant. H. A. Lepper, Jr., Special Research Graduate Assistant.

General Engineering Drawing: G. R. Fink, Instructor.

Deceased

Proctor Edwin Henwood, Associate in Machine Design. Died May 29, 1938.

Dr. Jakob Kunz, Professor of Mathematical Physics. Died July, 1938.

Chicago's Sewage Troubles

(*Continued from Page 4*)

District's payroll was padded, and on April 21, 1930, one week after the Supreme Court's decree, the *Chicago Daily News* launched forth its campaign against corruption in the board of trustees of the District. A public scandal followed, and some claimed that the Sanitary District had deliberately lost the "diversion case" so that it might reap graft from the construction of sewage-disposal plants. The evidence supporting this opinion was only circumstantial, however, and shortly the scandal was forgotten.

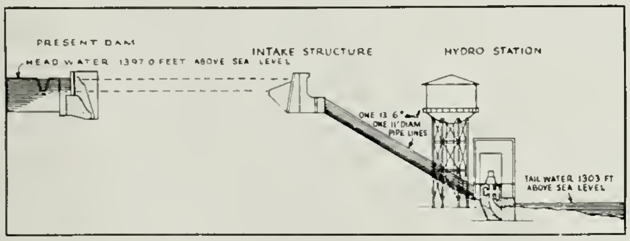
In 1930, after the decree, the Sanitary District faced a new problem. Fifteen hundred cubic feet per second obviously was not enough to dilute Chicago's 17,000 cubic feet per second of sewage, and even if it were, the river might back up during rainstorms and pollute the lake. Within less than nine years, the Sanitary District would have to build not only locks at the river's mouth to prevent back-flow, but also treatment plants to handle about five-sixths of its sewage. The Supreme Court had said that the District should finance its construction with bond issues, but the District's credit was at an all-time low, and the outlook was dark. Just as the Sanitary District was about to fold its hands on its tummy and give up, along came the P. W. A. with a long-period loan for sewage-treatment projects.

At once, the Sanitary District swung into action, and at the date of this publication, it is still going strong. By Jan. 1, it expects to have finished $177,000,000 worth of treatment plants and sewers. Of course, Chicago taxpayers will be paying the bill for years to come, but they can smile with pride and console themselves by pointing out the "biggest," "best," and "most expensive" solution.

Grandfather Falls

(*Continued from Page 5*)

reinforced-concrete structure with two wings connecting the main body with the high ridge on one side and with the dike on the other. Steel piling has been driven into the ridge to guard against seepage. The intake structure will be backed with an earth embankment to strengthen it. The water level at the gates will be the same as that at the dam, 3,700 feet upstream, so that all of the 94-foot fall is between this point and the turbines.



The water is led from the pond to the turbines by two huge pipes. These pipes are constructed of redwood staves bound together by metal hoops which are spaced only two inches apart at the lower end of the pipes. One pipe is 11 feet in diameter and the other is 13½ feet. Together they will handle a flow of 1,165,000 gallons-per-minute, which will exert a pressure of 6,500 pounds-per-square-foot at the lower end. The pipes rest

(*Continued on Page 16*)

• TECKNOKRAKS •

"How long you in jail fo', Mose?"
"Two weeks."
"What am de cha'ge?"
"No cha'ge, eberyting am free."
"Ah mean, what has you done did?"
"Don shot mah wife."
"Yo all done killed yo wife and only in jail fo two weeks?"
"Dat's all—den Ah gets hung."

* * *

A certain railway engineer who had made a complete study of the oil losses on his particular run, made it his first duty to instruct new firemen in the care of oil so as to eliminate these losses. On one occasion he was quizzing a new fireman on the duties of his post.

"What would be the most important thing to do in case of an unavoidable head-on collision?" he queried.

Without a moment's thought he shouted, "I'd shut off the lubricator, grab the oil can, and jump."

* * *

"Have you ever driven a car?" asked the clerk of the lady applicant for a driver's license.

"One hundred and twenty thousand miles," put in her husband, "and never had a hand on the wheel."

Modern Youngster: "What are prayers, Mother?"
Mother: "Prayers, darling, are little messages to God."
Youngster: "Oh, and we send them at night to get a cheaper rate?"

* * *

A young man with a pretty but flirtatious fiancee wrote to a supposed rival: "I've been told that you have been kissing my girl. Come to my office at 11 o'clock Saturday. I want to have this matter out."

The rival answered: "I've received a copy of your circular letter and will be present at the meeting."

* * *

Missus: "Has the Professor had his breakfast?"
Maid: "I don't know, mum."
Missus: "Well, ask him!"
Maid: "I did, mum, and he didn't know either."

* * *

A salesman bringing his bride South on their honeymoon, visited a hotel where he boasted of the fine honey.

"Sambo," he asked the colored waiter, "Where's my honey?"

"Ah don't know, Boss," replied Sambo, eyeing the lady cautiously. "She don't wuk here no mo'."

Grandfather Falls

(*Continued from Page* 15)

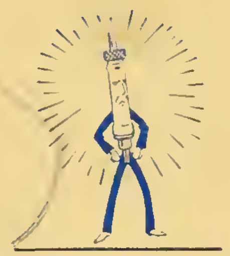
in concrete cradles spaced eight feet apart. They describe both a horizontal and a vertical curve in their descent to the power-house. About 60 feet from the power-house the redwood pipes are replaced by riveted steel penstocks to carry the water into the turbines.

Alongside the power-house are the surge tanks. They tower 100 feet into the air, being on the level with the top of the dam, one mile upstream. The tanks are protective devices to prevent the bursting of the pipes when the flow of water through the turbines is decreased or the collapse of the pipes when the flow is increased. The inner diameters of the tanks are 39 and 51 feet, respectively. All joints are riveted. A 180 foot steel crane is being used to lift the steelwork into place.

The power-house was the first unit to be completed, but will be the last to be touched by the water. It is on the edge of the river, built upon the solid rock, which is everywhere so conveniently close to the surface. It is of structural steel and brick and will be equipped with devices to permit the operation of the turbines by remote control. These turbines are of the vertical axis type with ratings of 11,000 and 6,240 kilowatts and are located deep in the heart of the power-house. From the turbines the water will flow through the tailrace back into the Wisconsin river, which it left a mile upstream.

Adjacent to the power-house and of similar construction will be the sub-station from which electricity at 44,000 volts will be supplied to the northern Wisconsin valley and at 66,000 volts to the central Wisconsin valley.

G-E Campus News

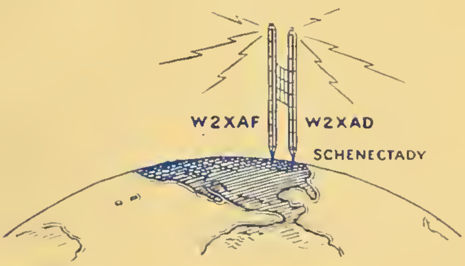


"MIDGET SUN"

FOR years Old Sol has had things pretty much his own way—causing sunburn, having sunspots, and wandering periodically north and south of the equator.

Now a young upstart about the size of a cigarette has been announced by General Electric. It is the new 1000-watt mercury lamp, which, even though many million times smaller than the sun, has one fifth the brilliancy of Old Sol's surface.

Source of the brilliant light is the lamp's highly concentrated arc—12 times more brilliant than the incandescent filament of a 1000-watt standard projection lamp. Laboratory tests show that the "upstart" will be of great value in searchlights, photoengraving, blueprinting, photo-enlarging, and as an aid to medical science.



"AMERICA CALLING . . . ."

NEWS reports broadcast via short-wave radio from America told of troop movements in Spain; picked up in Barcelona, they aided forty refugees in escaping a war-torn area. An appeal for emergency contributions to a Red Cross flood-relief fund was heard in South America; Venezuelan oil-field workers answered with a donation.

Behind these events and others of front-page news were the two powerful short-wave stations of General Electric—W2XAD, and W2XAF, in Schenectady, New York. Since they first took the air, 12 years ago, the stations have figured in events of all kinds, have broadcast their programs to all parts of the earth. One of their weekly variety programs is an institution in South America. World Series baseball games have been heard in India and Arabia. The news reports of these stations are heard everywhere.

The steady stream of cards and letters from all over the world asking for information on the programs and congratulating the stations on their service is indicative of the good will that the stations are helping to promote.

The 152-hour-a-week operating schedule, headed by Eugene Darlington, Oregon State '28, ex-Test man, now features broadcasts of all types, on four different frequencies, in six languages—English, Spanish, Portuguese, French, Italian, German.

"FROM AMERICA, FROM INDIA, FROM ENGLAND . . ."

SCANNING the recent rolls of young men on Test with General Electric gives the impression of reading membership lists in an "International House" at some large university. For, intermingled with graduates of engineering schools all over the United States are, for example, Cariapa from Kashmir, in India; Bambery, from " 'way down under" in New Zealand; Gurewitsch, of Roumania; and Chia-Hsu Hou, of China.

But predominating in the picture are picked men from American colleges and universities. Selecting names at random from the various Tests inevitably shows student engineers from widely separated parts of the country working side by side. Miller of Arizona U. and Olsen of Brooklyn Tech. worked together on motor and generator tests. Schmid of Wisconsin ran turbine tests with Norris of Texas Tech. Testing induction motors were Loew of Washington and Owens of Union College.

General Electric's executives look upon this Test training as more than a graduate course in engineering—it is a carefully formulated plan of training young engineers for leadership in industry.

GENERAL ELECTRIC

THE TECHNOGRAPH

UNIVERSITY *of* ILLINOIS

DECEMBER 1938

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED


Tireless Talker!

THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

DECEMBER, 1938

Volume 53 Number 3

WITH the February issue The Technograph will initiate a new method of distribution. Instead of mailing the magazine to the student subscribers, the distribution will be made at The Technograph office in 213 Engineering hall. When the magazine is published, notices will be placed on the bulletin boards and in The Daily Illini. The subscriber will then be expected to call for his magazine. This plan has been used successfully at other schools and there it was found that more interest in the magazines was created, making it possible for the staff to produce a better magazine. So when you see the notice that the new Technograph is out, come to 213 Engineering hall and get your copy.

● In this issue, Wayne Moore relates the history of anti-knock gasoline and describes the octane system of rating the anti-knock qualities of a motor fuel.

● Read how the engineer deals with such commonplace things as the leakage of cold air around windows and doors. In "Window Testing" an apparatus used to determine the heat loss through windows is described in detail.

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OLD UNIVERSITY HALL

is Replaced by

THE NEW UNION BUILDING

THE ILLINOIS TECHNOGRAPH

Published Six Times Yearly by the Students of the College of Engineering, University of Illinois

Volume LIII DECEMBER, 1938 Number 3

FILL 'ER UP

A Story of the Development of Anti-Knock Fluids and of the Octane System of Rating Motor Fuels

by
WAYNE MOORE

Shortly after the war the manufacturers of gasoline engines began to be troubled about the knocking of their engines. But as the public did not object, nothing was done about it until General Motors began the development of the Delco lighting system for rural homes. Then the insurance companies objected to the use of gasoline because of the fire hazard. When an attempt was made to use kerosene, the knock became so objectionable that it was apparent that either the compression ratio had to be lowered or some other method adopted to prevent knock. It was discovered that by adding tetra-ethyl of lead to the fuel knock could be prevented. Since that time no more efficient method has been discovered.

At first the sound of engine knock was attributed to looseness of the parts of the engine. When this was proved wrong, the idea was advanced that it was caused by a detonation wave set up by the explosion of oxygen and hydrogen. This was not widely accepted because many doubted whether cylinders could withstand such an explosion. A third erroneous idea that has been implanted in the mind of the public is that knock and pre-ignition are the same thing. Pre-ignition is caused by overheating of the spark plugs or by incandescent carbon particles in the cylinder and occurs before the end of the compression stroke, whereas knocking occurs after the spark has ignited the fuel mixture. Knocking, if continued, will produce overheating to such an extent that it may cause pre-ignition, but the two are not the same.

To determine the cause of knocking it was necessary to find out what happened inside the cylinder when an engine was knocking. So engineers made an explosion chamber with a small quartz window in the side. Through this window they took motion pictures which showed the sweep of the explosion down the cylinder like a wall of flame. If the flame was followed by an afterglow until it reached the end of the chamber and the flame did not particularly increase in brightness at the end of the cylinder, no knocking was heard. However, when the flame was not followed by an after-glow during its entire travel, just before it reached the end of the chamber it accelerated and a bright after-glow was suddenly set up behind the flame. The last flame seemed to vibrate and a pinging noise was heard at the time the after-glow spread through the chamber behind the flame. When tetra-ethyl of lead was added to fuels that produced the ping, it was found that the flame did not accelerate and vibrate at the end of the explosion, that it was followed by after-glow during its entire travel and that no knocking was heard. This after-glow is a completion of the combustion of the end products; and in knocking fuels some extra impetus, such as that furnished by the shock of the flame reaching the end of the explosion chamber, seems to be needed to finish the combustion. The sudden secondary explosion results in a sudden increase in pressure, the knock. Tetra-ethyl of lead seems to prevent the sudden explosion of the end products, but does not affect the speed of the flame prior to the time knock would ordinarily have occurred.

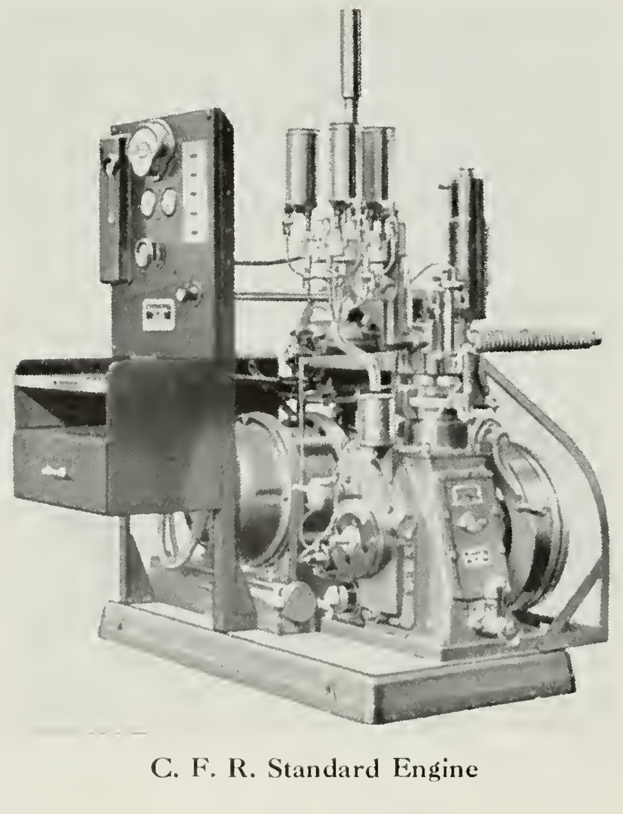
Engine design has an important effect upon knocking. Compactness of the combustion chamber and a central location of the spark plug tend to reduce knock. Since it is usually impossible to place the spark plug in the center of the combustion chamber, it is best to place the plug on the hotter side of the cylinder so that the gases will be compressed by the explosion against the cooler side of the engine and thus will lose their heat more rapidly. Turbulence in the chamber tends to lessen the chance for gases to become trapped in a certain part of the chamber and also tends to spread the flame through the charge more rapidly and evenly, thus decreasing the tendency to knock. One manufacturer uses this theory to gain greater power by using a piston with an irregularly shaped top. The higher the compression ratio, the lower the anti-knock qualities of the engine will be; so those features which permit the increase of the compression ratio without an increase in knock are of greatest importance as the higher the compression ratio, the greater the efficiency of the engine.

The chemical composition of the fuel also has a great deal to do with the knocking of an engine. It was found by experiment that the paraffin hydrocarbons are the worst offenders, while the aromatic hydrocarbons cannot be made to knock even at extremely high compression ratios. Cracked fuels are more resistant to knocking than straight run gasolines and those cracked fuels that are produced under high temperature-pressure conditions are even more resistant to knocking than ordinary cracked gasoline. The spontaneous ignition temperature (S.I.T.) of the fuel seems to have an effect on the knock properties of a fuel for, in general, the higher the S.I.T., the greater the anti-knock rating. Adding anti-knock fluid raises the S.I.T. of a fuel. These S.I.T. values may be used to determine between a good and a bad fuel, but they are not accurate enough to be used to determine the anti-knock rating of a fuel. As the molecular weight of the paraffin hydrocarbons increases, the S.I.T. of the fuel decreases, along with the anti-knock rating. The S.I.T.'s of the paraffins are much lower than those of the aromatics and the alcohols, as are the anti-knock ratings.

All of these facts about the composition of fuels have led to a number of hypotheses about knocking. One that is fairly widely accepted is the peroxide theory. This theory is that the first products of oxidation are organic peroxides and that these break down upon further oxidation to form other oxygen compounds until finally carbon dioxide and carbon monoxide, along with water, are the final products. The knock is produced by the decomposition of the peroxides. By experiment it was found that the higher the temperature of initial oxidation, the greater the anti-knock rating. Also, when organic peroxides were added to fuels, the anti-knock rating was decreased; the more stable the peroxide, the smaller the decrease.

Ricardo, of the Asiatic Petroleum company, was one of the pioneers in the investigation of knocking. He developed two engines, both with adjustable cylinder, so that the compression ratio could be changed. Since turbulence decreases the tendency to knock, the engines were low speed engines, a feature that has been incorporated in other test engines. Ricardo found that as the cylinder diameter increased, the highest useful compression ratio decreased. His engines had no provisions for testing knock except by ear so are of little importance today except for historical interest.

The Ethyl Gasoline company developed a test engine from the Delco light plant engine. This engine was fitted with two V-belts through which it drove an electric motor, which served as a governor. Compression ratio could be changed by removing shims at the point where the cylinder joined the crankcase. The cooling system was of the evaporating type and used water for jacket temperatures up to 100° Centigrade and ethylene glycol for temperatures above this. A neon tube was fitted to the crankshaft so that the ignition timing could be checked and accurately adjusted. The carburetor was fitted with two bowls so that different fuels might be used and adjustments were provided so that any fuel-air ratio could be used. The knock was measured by a knock-meter. This consisted of a small, steel diaphragm fitted into the top of the head. A slender steel pin fitted on top of this; and as the engine knocked, the sudden explosion bent the diaphragm upward and thus moved the pin upward. When the pin moved, it completed the circuit of a resistance coil. A very sensitive thermocouple placed close to the coil measured the temperature rise on a millivoltmeter. There was a slight time lag in the instrument, but it caused no trouble.



C. F. R. Standard Engine

Armstrong-Whitworth also developed a test engine which was much the same as the Ethyl company engine except for minor mechanical details.

In 1928 an attempt to standardize the method of testing fuels for their anti-knock qualities was begun. As a result the Co-operative Fuel Research committee was formed. They developed an engine known as the C.F.R. engine. It is very similar to the one described above. But when road tests were made in 1932, it was found that the anti-knock rating given by the C.F.R. engine did not agree with those obtained in practice, but neither did the results from one road test agree with those from another. It was decided, however, to develop a new engine that would give ratings more nearly agreeable with those obtained on the road. Ratings obtained with the new engine are obtained by what is called the C.F.R. Motor Method, whereas the old method is called the C.F.R. Research Method. Both engines are in use today as standards. The Army and Navy use a different method from either of these, as do the British.

Knocking has been hard to standardize because it is dependent upon so many factors to which no two engines will react alike. Also there are variables in the operation of a single engine. Temperature of the engine affects the knock rating, but not in the same manner for each fuel. Timing is another controlling factor. It was because of these many factors that the C.F.R. decided that a standard fuel was the proper way to set an anti-knock rating. Because they would not deteriorate upon storage and would always have the same properties whenever manufactured, a standard fuel of a mixture of pure hydrocarbons was decided upon. They devised the octane number system of rating which is defined as being: "the percentage of iso-octane and normal heptane required to match the anti-knock value of any given fuel." Heptane has a very low anti-knock value while iso-octane is theoretically perfect—number 100. Until a few years ago the cost of iso-octane was about $20 a gallon so that it was not used in actual testing. Three or four secondary fuels were made for running the test and tetra-ethyl of lead was added to these secondary fuels until they matched the rating of the fuel under test. These secondary fuels were mixed to different octane numbers, matched against iso-octane and heptane mixtures, and kept on hand. Iso-octane is now produced at low cost for use in high octane aviation gasolines.

Tetra-ethyl of lead is still the best anti-knock agent. A few of the other anti-knock fluids are iron acetyl acetonates, organic ferro-and ferri-cyanides, ferric compounds of oxymethylene camphor, and ferric compounds of beta diketones. Some compounds of copper and the alkali metals have been patented for use as anti-knock agents, but their use is still in the experimental stage.

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GLASS FABRICS

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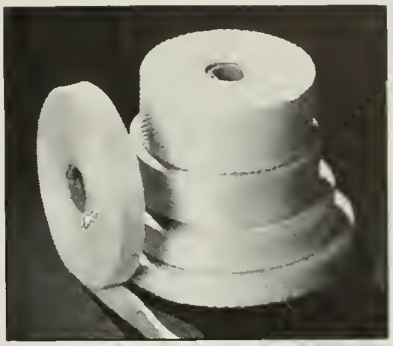
by

HAROLD KLECKNER



Glass marbles, melted and drawn through tiny holes into filaments almost invisible to the human eye and then combined into one strand the size of a human hair bid fair to make the world safe from fire, as these strands are today furnishing "Fiberglas" for a multitude of purposes such as tape, braided sleeving, insulation, cloth and paper.

The story of the discovery and development of this new product reads like a page from the tales of the Arabian Nights, or might we say, like a story of modern science. "The Fiberglas process was discovered," states one of the research men who had much to do with its development, "when we were trying to find a method to fuse color to the side of milk bottles, so that dairy firms, for instance, could have their names and slogans, or even cartoons and other characters, imprinted permanently in any desired color upon the container as a merchandising aid.

"We tried different methods. One of them involved the use of a blow-torch, that is, melting finely-powdered, colored glass and forcing it, simultaneously, under pressure against the milk bottle. The glass did not adhere as we desired, but it was noted that the glass was being 'blown' into tiny filaments that piled up in a fluffy mass alongside the bottle.

"We had not been thinking in terms of fibrous glass, but realized, naturally, that we had bumped into something. An examination revealed that the fluffy mass of glass weighed only about one pound per cubic foot.

"It had been known that a crude form of insulation glass was being produced in Europe, but the thing that aroused our interest was the fact that European insulation glass weighed about one pound per cubic foot. Weight is, of course, a highly important factor in insulation.

"We invented machinery to produce fibrous glass for insulation, made such glass commercially practical early in 1934, and then began experiments with Fiberglas for textile purposes.

"The new continuous Fiberglas yarn is composed of 102 filaments and has a length of 100,000 yards per pound. It is of such extreme fineness that a single filament is only one-twentieth of the diameter of a human hair, with a tensile strength greater (fiber for fiber) than steel."

Fibreglas today is made by two methods, known as the "continuous filament" process, and the "staple fiber" method. The manner of melting the glass is identical in both processes. Glass marbles are fed into electrically-heated furnaces. Each furnace has a trough, of V-shaped bushing, made of costly metals of a higher melting point than glass. In the continuous process, the molten glass entering the open or upper end of the bushing is drawn downward by gravity, the glass emerging from 102 tiny holes in the bottom of the bushing. These filaments average 0.00025 of an inch in diameter, and can be made as small as 0.00005 of an inch in diameter. Human hair has an average diameter of 0.0010 of an inch, cotton fiber averages 0.004, and silk between 0.00002 and 0.00004 of an inch. These filaments are combined into one strand measuring 0.024 of an inch in diameter and wound upon spools. These spools are transferred to other machines where the fabric is made. In the staple process, the molten glass is forced through the bushing by steam under high pressure, instead of being drawn through by gravity. After passing through a flame to remove all moisture, the fibers gather upon a revolving drum and then are drawn past groved wheels to be wound on a spool. Then it is taken to an ordinary spinning machine for reduction to thread.

A complete range of electrical insulating materials is available. For example, a motor can be constructed in which the wires are first insulated with glass, then wound into coils and the coils wrapped with impregnated glass tape. These coils will be installed in the slots which have previously been insulated with Fibreglas sheets, and the commutator segments will have been separated with glass insulation sheets. Electrical equipment will be improved because of the completely inorganic composition of glass fabric. But before the maximum improvement can be obtained it will be necessary to develop inorganic impregnating varnishes.

Fibreglas cloth is unaffected by most industrial temperatures and by common acids. In addition, it can be furnished in more tightly woven, stronger cloth than asbestos or any of the other acid and heat resisting cloths. It can be treated readily by any of the coating materials now used in industry and is perfectly flexible. Industry has found that it is better than the older products for such things as filtering hot gases in process work as ore smelting because it resists both the heat and acidity of these gases better. Also, because it can stand much higher temperature, its use eliminates the necessity of passing the gases through coolers.

Glass fabric has been used very successfully as the base material in the construction of oil-field gaskets and cylinder head gaskets.

Today's housewife can have her share of Fibreglas in her kitchen. Her oven can have glass insulation, the refrigerator can be insulated with this fire, vermin, and moisture-proof material. In the basement the hot-water heater can have a glass insulation covering—just like the great industrial concerns are using. The walls of all her rooms can be covered with the new fire-proof, water-proof glass wallpaper. And in a short time she will be able to hang glass draperies, lay a beautiful glass, lace table-cloth upon her table, and even sleep between glass sheets.

• NORTH OF GREEN •

As far as the M. E. instructors are concerned, Al Horn may be in one of the power plant boilers. Some time ago Al took the inspection trip through the boilers and forgot to punch out that day.

Frank Hanlon is the freshman whose roommate spent twenty minutes showing him that the square root of x^2 is x.

To disprove the fact that machines save time, Bill Clark, who scoots about in a snappy? model A Ford, has posted a new tardiness record for his eight o'clock calculus class. Professor Doob doesn't mind, so long as he gets there before class is over. After all, what's the difference where a fellow sleeps?

We're hoping that Bob Johnson will give varsity basketball a try. He played two years at Wilson Junior college in Chicago. We're not sure, but he might be almost as tall as Joe Frank.

We wish to add Donald Kuhn's name to the list of freshmen who passed rhetoric by the proficiency route. He makes thirteen for the engineers. Twenty-one passed the hygiene proficiency: Robert Ballard, John Boyd, John Buyers, Joseph Collins, Robert Epstein, Charles Filstead, Edwin Firese, Edward Hammerstein, George Jerdan, Max Kelley, Elwyn King, James Lund, Robert McDonald, Clement Miller, Robert Nelms, James Nelson, William Nolte, Theodore Parker, Robert Schadt, Arnold Smith, and Arthur Weber.

Elwyn King and Robert Nelms passed both exams. Nice going, all of you! Let's see you make your extra time count for something.

Bits about the inspection trips . . . It didn't take the seniors long to find the way to the coach with the bar on the way to Chicago. The prices kept them from getting out of hand. Tau Nu Tau actives got their entertainment on the train from pledge George McCracken—he did so well that they expect to back him in his vaudeville debut. A great many decks of cards but very little cash were seen—there was no cash seen on the return trip. The electricals saw Bill Sinks at Bell Telephone and L. A. terVeen at Stewart-Warner. At Stewart-Warner, T. C. Hunter was the lucky fellow whose name was drawn when they passed out a "Varsity" radio. Lee Gatewood, who was absent from school a couple of weeks due to an ailment, made the inspection trip with the M. E.'s and is back to his books again. For entertainment in Chi there were Kitty Davis', the Rialto, Blondie's, the movies, and—who says we're not cultured—some took in the opening of the opera season. Frank DeWolf just couldn't make it for the optional trip to the steel mill on Saturday morning—his pin followed him to the big city and they went steppin' Friday night. That a particular blond at Illinois Bell was much nicer than the girls at Western Electric was the first important observation made and noted by Howie Reisman. The ceramics are said to have practically taken over the tavern next to the hotel in St. Louis. A few of them spent most of their time on the elevators—the attraction being the operators, not the machines. The North Shore train left Thursday morning without Ray Hicks while he got a few extra winks of sleep—but he just hopped the next train north and one of those "girls-in-every-port" met him at the station and got him out to Allis Chalmers in time to start his tour through the plant.

The Technograph is making an effort to bring to light student activities that, many times, do not come to attention. One of these is the under-graduate thesis work which qualifying students substitute for elective subjects during their senior year. Many students are carrying on experimental research that is of vital importance to the professional field.

R. G. Richards, making a photo-elastic study of stresses in airplane wing spars, spent a day at the McCook Air Field at Dayton, Ohio, where he obtained hearty cooperation from the engineers. In another case, the industrial need of a chain link company suggested to *A. R. Starr* the photo-elastic study of stress distribution in plates containing various types of holes. It was found that taking out more material from certain sections of a member actually strengthened it by redistributing the stresses.

C. B. Lyon has chosen to examine the problem of loss of head of water traveling through special types of valves.

A lumber association is very much interested in the outcome of *C. B. Williams'* experiments on composite beams in which concrete and timber are used together, the concrete on the compression side and timber on the tensile side. In order to improve the looks of surface concrete for decorative purposes, *R. P. Massarsky* is investigating the properties of special gap gradings.

R. P. Molt is writing a very up-to-date thesis on the fatigue properties of the new commercial material, high strength cast iron now used in Diesel crankshafts.

Studying the fatigue properties of wire, *C. P. Wampler* is working on actual strands that failed in use. *W. D. Dugan* is trying to tie up the experimental and the theoretical results of an investigation of the hydraulic ram.

A problem encountered over and over again in the well drilling business is that of corrosion fatigue. When a metal pits due to corrosion, very small local stresses are set up and eventually the metal fails. The problem is being fought by *H. H. Benninger* in his research on various protective coatings.

B. R. Price is studying a little known low alloy steel containing lead which was recently developed by a large steel company.

R. E. Lorentz, Jr., is writing his thesis on "The Effect of Grain Size on the Mechanical Properties of S. A. E. 2345 Steel."

Louis D. Flesch is doing similar work on 7030 brass.

L. R. Kovac is studying the metallurgy of cast iron glass moulds. The problem deals with the determination of metallurgical factors that control the life of glass moulds. A glass industry and a foundry are supplying the materials for the investigation.

C. S. Nielson has for his topic the "Study of the Malleablizing Process for Cast Iron." The aim is a reduction in the time required for malleablizing and an improvement in the quality of the final product. A commercial foundry is supplying the material for this work also.

KEEPING OUT THE COLD

A Description of Equipment Used by the Heating and Ventilating Engineer to Determine the Heat Leakage of Windows

You, my reader, will some day be Lord and Master of a household. When that time comes, you will understand why Dad objects to leaving the outside door open on New Year's Day. Now Dad probably doesn't know it, but in his battle to keep down fuel costs he has a staunch ally, known as the heating and ventilating engineer. Dad doesn't need a college education to know that a lot of his coal dollars leak out at the windows. But his friend, who has spent four years studying to become an engineer, has devised ways to find just how much heat is lost through a window. First he separates the losses into two classes; thermal-conductivity, which means direct heat flow through the wood and glass; and air-infiltration, which means the leakage of air through the cracks. He finds each of these losses separately and adds them together to get his final result. This sum comes to about forty per cent of the total heat loss for the usual home without weatherstrip or storm-sash.

The apparatus, of which a cross-section is shown at the bottom of the page, is used by a well-known commercial testing laboratory to determine both the thermal-conductivity and the air-infiltration through windows. It consists essentially of two adjoining rooms with the window in the removable wall or panel between the rooms. Outside air conditions are similated in one of these rooms, known as the Cold Room. Normal room conditions are reproduced in the Warm Room.

The Cold Room measures about eight feet by eleven feet by eight feet high, and its three walls, floor, and ceiling are of eight-inch cork with plaster surface. The refrigeration is provided by four independent compressors, each with its own expansion coil located in the rear of the Cold Room along the wall farthest from the panel. This system will hold the Cold Room at minus forty degrees Fahrenheit when a metal panel is in place and the Warm Room is at a temperature of seventy degrees. The Cold Room is entered through an insulated vestibule or lock, furnished with refrigerator doors. The equipment includes an air circulation fan, electric lights, telephone, 110 and 220 volt electrical outlets, emergency alarm button, and thermocouple connections. A six inch conduit connected to the air blower enters through a side wall. There is also a connection to the Emswiler gage used for measuring the air pressure in the room.

The Warm Room measures about eight feet by nine feet by eight feet high and is of similar construction except that it is mounted upon casters so that it may be moved away from the Cold Room when the panel is being changed. It is entered directly through a refrigerator door. The electrical heating system can either be manually or thermostatically controlled. The equipment includes an air circulation fan, electric lights, telephone, 110 and 220 volt electrical outlets, thermocouple connections and the Guarded Enclosure or Hot Box. There is a connection to an Emswiler gage outside.

The Hot Box is shaped like the frustum of a four-sided pyramid. The larger base is open and is slightly larger than the window frame. It is sealed to the panel, enclosing the window. In the back of the box is a metal plate containing orifices used in the infiltration tests but sealed during the conductivity tests. There are about fifty differential couples threaded through the walls of the box. All the couples on each wall are connected in series and the couples on all five walls may be connected in series. The Hot Box contains electric lights, heaters and air circulation fan, all shielded from the test

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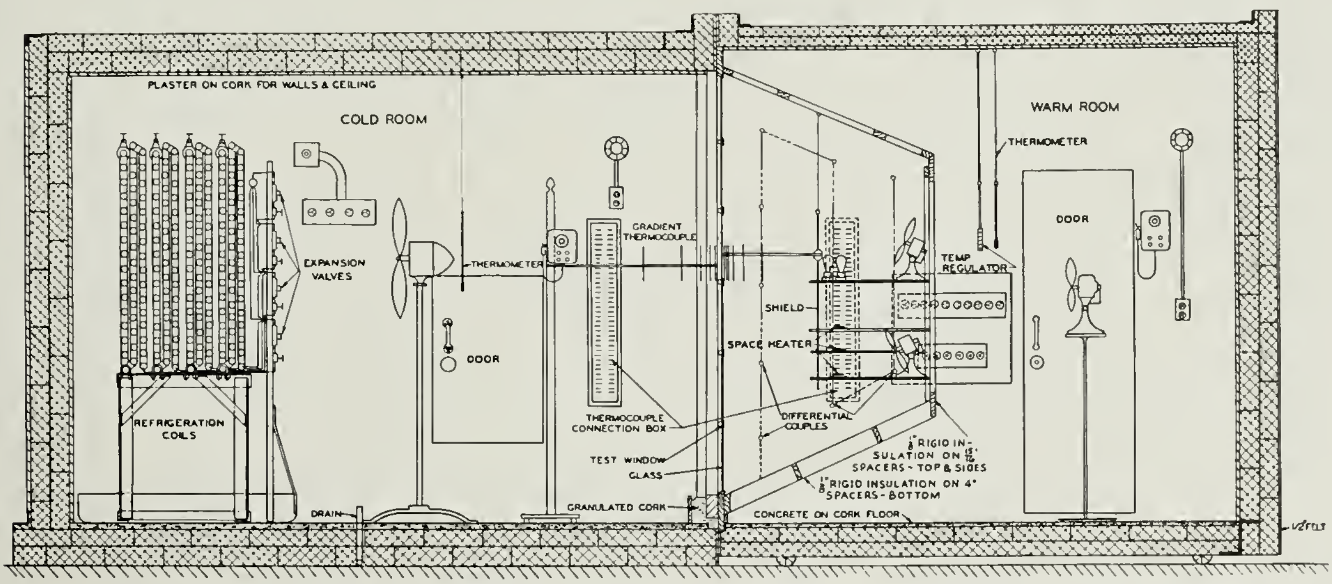


—*Courtesy Pittsburgh Testing Laboratory.*

Window Testing Apparatus

★ WHO'S WHO IN ILL

- *R. P. Hoelscher*
- *W. J. Putnam*
- *E. W. Lehmann*

PROFESSOR RANDOLPH P. HOELSCHER hails from Evansville, Ind. At Central high school he participated in the school debating and dramatic activities. Because of the persuasion of a high school physics teacher he entered Purdue University to obtain a bachelor's degree in civil engineering in 1912. The adventure of civil engineering beckoned and he spent the next four years as a structural engineer. This he followed by two years of teaching physics, mechanics, and drawing at Baldwin-Wallace College. In '18 he came to the University of Illinois as an instructor in the general engineering drawing department. He obtained his M.S. degree from Illinois in 1927 and two years later Purdue conferred the professional C.E. degree upon him. He has passed the state exam in structural engineering and maintains a permit to practice in Illinois. Professor Hoelscher is president of the Illinois Union board of directors. He has served as chairman of the committee on admissions of the University and is at present on the commencement committee. Societies in which he claims membership are Tau Beta Pi, Triangle, the American Society of Civil Engineers, and the Society for the Promotion of Engineering Education. He has served as secretary-treasurer of the central Illinois section of ASCE and as president of the Indiana-Illinois section of SPEE. Most students know him best as the co-author of the elementary drawing text.

PROFESSOR WILLIAM J. PUTNAM was born in Rosamond, Ill. He attended high school at Illinois Academy, which has since been moved from the basement of University Hall to the University High building north of Springfield. He then moved across Green street to get his degree in electrical engineering in 1910. In four years with the Illinois Traction, he advanced from a construction foreman to the assistant superintendent of sub-stations. But in 1914 he returned to our campus as an instructor in the theoretical and applied mechanics department. He secured an M.S. degree in T. & A. M. in '19 and a professional M.E. degree eight years ago. His thesis for the latter was written about research on highway guard-rail design. Since then, Professor Putnam has written a number of research bulletins published by the Engineering Experiment Station. He has served on the committee on college policy and development. He is now a member of the committee to supervise the use of WPA funds in research projects and of the committee on student affairs. A list of the organizations to which Professor Putnam belongs reads like a roll call of engineering societies. They include Sigma Xi, Phi Eta (graduate discussion fraternity), Theta Tau, American Society for Testing Materials, American Institute of Electrical Engineers, Illinois Society of Engineers, National Society for Promotion of Engineering Education, and Association for the Advancement of Science. He worked his way through college, but advises students not to work if possible, for they miss everything but the classroom.

PROFESSOR E. W. LEHMANN comes from the deep South—from Oldenburgh, Miss., to be exact. He went the rounds of the engineering schools of the country, including Cornell University, the University of Wisconsin, Texas A. and M., graduating from Mississippi A. and M. in electrical engineering in 1910. He stayed at his Alma Mater to teach physics till 1913 when he received a scholarship at Iowa State. The next year he was made assistant professor of agricultural engineering there. Two years later he moved to the University of Missouri to become head of the department of agricultural engineering. While at Missouri he was agricultural engineering editor of "Successful Farming." In 1921 he came to our campus to head the department of agricultural engineering. He was a pioneer in the rural electrification movement and has served as a member of the state rural electrification committee since its founding. He also pioneered in the field of rural sanitation. He planned the organization of the first CCC camps established in Illinois and had worked at the control of soil erosion long before the soil conservation service sprang into being. Professor Lehmann is a member of Phi Kappa Phi, Alpha Zeta, Alpha Tau Alpha, Gamma Sigma Delta, Sigma Xi, Acacia, and the Rotary.

GINEERING WORLD ★

C. J. Bush ●
P. J. Zuercher ●
F. H. McKelvey ●

FRANK McKELVEY was born right here in Champaign, but took his first step on a farm near Sparta. Springfield furnished his schooling till June of 1935 when his teachers recommended that he be graduated from high school and the board of directors gave him a diploma. That engineering was in his blood he proved in grade school by winning a prize for manual training proficiency. In high school he devoted his spare time to the debating society and to the yearbook. Frank enrolled in the University of Illinois in the fall of '35 and his name was entered on the rolls of Phi Delta Theta that same year. Although an engineer and an active member of the student branch of ASME, Mac's sphere of activity has been south of Green street. He was elected to the Student senate last fall by a majority of a single vote. He is a member of the board of directors and of the cabinet of the Y.M.C.A. As the engineering member of the board of directors of the Illinois Union, he is also a member of the Engineering Council. His first two vacations from college were spent as a carpenter with a construction gang, but last summer he decided that he wasn't getting enough book learning here, so went to school at the University of California. Frank goes to class in the M.E. laboratory, where he expects to learn enough about production and factory management to make his living a year hence.

PAUL ZUERCHER put in his appearance in the household of a Broadhead, Wis., cheese merchant on June 20, 1917. When he was nine, the Zuercher family moved to Park Ridge, Ill. While making a perfect scholastic record at St. George high school in Evanston, Paul earned letters in track and football. By his work as a freshman in the University, he won membership in Phi Eta Sigma and the Sigma Tau medal for the first ranking freshman engineer. He became a member of Eta Kappa Nu and of Tau Beta Pi last year. This year he is serving as president of the electrical honorary and as recording secretary of the latter. Zurch was active in the forming of MIDA. He is a member of the student branch of AIEE and a member of the staff of the Technograph. He passed both rhetoric courses by proficiency, and is now looking for a plot for his great American novel which he hopes some day to publish. His one boyhood ambition to become a big league baseball player has survived three years of college. Another hobby is drawing pencil portraits and 'tis said he is good. Besides the stuff that the E. E. professors hand out, Paul's big problem at present is the weaker sex. His affection fluctuates with the weather and some say that it is a little squaw who occasions his visits to a Wyoming Indian reservation every summer. In preparation for a career in communication engineering, Paul has worked for the Lyon and Healy company on their amplifier assembly line during the last two summers.

CLARENCE BUSH came to our campus from Dwight, Ill., in the fall of 1935. He played football for Dwight high school and for this and for completing four years of scholastic work, they presented him with a diploma in the spring of '34. Part of the next year he spent in travel. He toured the West, exploring the beauties and interesting spots of Yellowstone, Salt Lake City, and the Pacific coast. He also took a turn through the East, stopping in Washington, D. C., and other cities. Since he enrolled in the University, he has seen service of the business staff of the Technograph. He has been one of the most active members of the student branch of the American Society of Agricultural Engineers. Last year he wrote the minutes, and this year he serves as president. This office also gives him membership on the Engineering Council. When he graduates he will be able to say that he earned a large percentage of his college expenses. For recreation, he strives to roll that perfect 300 that is the hope of all bowlers. During his vacations, Bush has been employed by the United States Department of Agriculture and the Soil Conservation Service. Machinery and power, as used by the farmer, are his favorite technical subjects and he hopes that some farm implement company will want to use his knowledge next June.

• BONEYARD PHILOSOPHY •

Activities Build Personality

In the spring of the year, a young man's fancy may turn lightly to thoughts of love, but if he is a college senior, he is also thinking seriously about the task of getting a job. For years, the employers coming to the campus to hire students have depended a great deal upon the interview as a means of selection. Personnel men lament, after hours, that a man's whole life may hinge upon 15 minutes of conversation, but they continue to pick their men that way. Why? Because they know that a man's worth to them will be largely dependent upon his personality.

Most men use the word "personality" easily, but they hate being asked to define it. However, no man but hopes that his is a pleasing personality. A pleasing personality might be likened to a house. It is built upon the foundation of a love for humanity, an interest in people. The walls are built of the experience of mingling and working with others. The rafters are made of the habits of congeniality. The roof, without which a house is practically worthless, is shingled when one has learned how to make others like him.

The foundation is, in every case, already in place. Some people may apear to not like their fellows, but this is either self-consciousness or ego, not a normal condition. Dig down a little and one always finds solid rock. So, in the building of this structure, the first task is to erect the walls. Somehow, if one just works hard enough to build up the walls, the roofing seems to fall into place. Fortunately, on the campus, as elsewhere in the world, others have already put up the studding. Activities form an excellent framework for the walls. Nowhere, except at his house, will the student find such opportunities for meeting and mingling with his fellows. Any student knows that he makes few friends in the classroom. Friendship comes from working or playing with a person. Activities form the framework for the building of personality, for which colleges claim so much credit.

For examples of personality's importance to an engineer, and of the great personality building power of activities, one does not need to travel to the city to the engineering department of some large company. One needs only to look about him, in his daily routine. Take faculty members for examples. Compare two of your present instructors. Let's take the uninteresting one first. Certainly he knows his subject, but what do his classes consist of. Simply a recitation of the day's assignment. Never a joke, an interesting story, a practical allusion. Furthermore, he seems uninterested in the thoughts of his students. But really he isn't. He just doesn't know how to show his interest. He lacks experience at mingling with his fellows. Now let's study the real teacher. His classes are interesting and varied. He seems to know how to get the students to take charge of the discussion. He shows an interest in their thoughts on the lesson. And his background generally explains the difference. He is an active club member, and adviser to certain student activities. He was a leader when he was in school. He may not be doing all the study, research, or writing that he could, if he were not engaged in these other activities. But what scientific fame he is passing up, he is receiving pay for. Alumni like to drop in to see him. Too, Johnny Jones, famous scientist, first became interested in his speciality in old Prof Scott's class.

A man's personality can either be a balloon, boosting him upward, or a sandbag, dragging him down. But it need never be a burden to anyone, if he honestly works to develop a pleasing personality. Why not decide now to be more friendly to all your acquaintances, and to get into some activity to meet and work with other fellows.

The Engineering Library

The popularity of our Engineering Library is increasing, as is attested by the letters requesting book loans which come in on an average of one or more per day compared to the few each month not so many years back.

E. I. DuPont Ne Mours and other well-known commercial houses, such as Corning Glass Works, Shell Petroleum, and General Electric, coupled with universities of all sizes from coast to coast including Cornell, Princeton, Purdue, University of Toronto, Massachusetts Institute of Technology, and others have been making constant use of the Engineering Library. Furthermore, our library has on file letters from the U. S. Bureaus of Mines, Commerce, and Reclamation requesting technical information.

An absolute accounting for the library's wide spread popularity cannot be made, but the supposition is that companies closely related in work have passed the word to organizations in slightly different fields and so on until the fame of the Illinois Engineering Library has spread throughout all phases of engineering science.

One of the most important reasons for the library's universal use is the promptness with which the books on hand are supplemented by the most recent works of authors and commercial engineers in every known field. Some of the newest additions are:

Cost and Tariffs in Electricity Supply, D. J. Bolton; Public Utility Regulation, Wilson, Herring, and Eutsler; Engineering Law, Laidlaw and Young; Modern Management, J. E. Walters; and Wireless Engineering, L. S. Palmer.

Engineering's Advance?

Dean M. L. Enger, and Professors J. J. Doland, and W. J. Putnam are helping in the restoration of the saw and grist mill at New Salem, Illinois. They drew plans for the structure according to the principles of operation in the days the mill was built. A model of the mill wheel was constructed by Professor Putnam and tested in the hydraulics laboratory, proving to be 56.5 per cent efficient.

• OUR SOCIETIES •

TAU BETA PI

Tau Beta Pi held its first business meeting of the year on October 20 and made plans for the future.

Arthur Hamilton, Professor of Romance Languages, was the guest of honor at the first dinner meeting, held on October 28. In addition to the actives, several faculty and graduate members attended. Dinner meetings will be held weekly throughout the semester.

ENGINEERING COUNCIL

Maurice Carr .... *President*
Bob Diefenthaler .... *Vice President*
Bob Phillips .... *Secretary*
Forrest Nelson .... *Treasurer*

These officers lead a crew of eleven presidents of the student branch societies. There are proposals before the council for an all-engineering smoker and for an all-engineering society intended to bring popular speakers to the campus and to co-ordinate the engineers in the University. Problems which confront the council are the Engineering Open House and the lack of funds. Planning for the Engineering Open House has begun, and very fine plans they are. Meetings are held at 7:15 every Friday night in 207 Engineering hall.

SYNTON

Stephen Bushman .... *President*
Goodwin Peterson .... *Vice President*
Ralph Baxendale .... *Secretary*
Stanley Pierce .... *Treasurer*
Lloyd Rigg .... *Chief Operator*

At the close of the football season Synton inaugurated a code class which meets each Saturday at 2:00 o'clock. This class, which gives instruction in the use of Continental Morse Code, is under the direction of Lennart Hartman and is open to all University students. The practice is held in Room 236 Armory.

ASME

During the month of October, ASME members were diverted from their regular Wednesday night labors by two very entertaining speakers.

On October 12, Mr. W. J. MacPherson, Industrial Relations Manager for the Public Service company of Northern Illinois, spoke on the work of engineers in utilities. Mr. MacPherson's non-technical talk gave the members a new conception of the old "success formula."

Mr. R. C. Woodward, Chief Metallurgist for the Bucyrus Erie company of South Milwaukee, addressed the student branch on October 26. His lecture, "Metallurgy in Heavy Industry," was illustrated by motion pictures of large shovels and road machinery in operation.

AIEE

On October 19, Mr. I. Buys, Chief Engineer of the Illinois-Iowa Power company, addressed the student branch on the opportunities open to engineering graduates in a power industry.

After his talk, the meeting was conducted by the senior program committee, Amos Bateman, Frank DeWolf, and Melbourn Pehl. A "Professor Quiz" contest was held between eight faculty members and eight seniors. Each participant had submitted ten non-technical questions, and the most appropriate ones had been selected by the committee. The faculty demonstrated its professorial superiority by downing the seniors, 215 to 147.

• THE ILLINI TRAIL •

—'90—

Fred N. Waterman, M. E., retired from active engineering work when he became president of the National Tube Company. Fred married Miss Ivy June Walters in 1900; and the couple have three children: Fred Jr., who went to Cornell and M. I. T.; Philip, who is a Dartmouth '30; and John, a Lehigh '30.

—'96—

F. L. Thompson now lives in Chicago. He is Vice-President and Chief Engineer of the Illinois Central System. He married Miss Maude Martin in 1900, and to them were born two children: Donna G., Mrs. David D. Wilson; and Ruth L., Mrs. William E. Dee, Jr., graduates of the University of Illinois and Northwestern University, respectively.

—'07—

Merle J. Trees, C. E., makes his home in Chicago and is employed by the Chicago Bridge and Iron Company, manufacturers of steel plate fabrications. Mr. Trees and Mrs. Trees, then Emily Nichols, married in 1909, and they have two children: Kathrine, a graduate of the University of Chicago, and George, a senior in the University of Illinois, College of Engineering.

—'14—

Harry Gardner Wood, E. E., supervises the sales of Diesel engines in five Atlantic coast division offices of the Worthington Pump and Machinery Corporation. Harry married Miss Helen Weliber of Urbana, in 1917; their daughter, Julia Ann Wood, is a member of the class of '41 at Vassar.

A. E. Tarry, E. E., is the chief of the frame and wiring department of the Western Electric Company, Chicago, Ill. He married Miss Elsie Madaline Gmaehle of Crown Point, Ind., in 1912. They have four children: Angeline Marie, B. S., University of Illinois, class of '34; Irene Lillian, who finished her junior year at the U. of I. in 1934; Allen Martin, who finished his junior year at the U. of I. in 1938; and Daniel, who is spending his first year at Oak Park high school.

—'15—

George O. With, M. and S. E., is Sales Manager of the Concrete Bar and Sheet Piling department, Carnegie-Illinois Steel Corporation, Chicago. He married Marie Milligan. Their son, George Jr., is a sophomore at LaGrange high school.

—'16—

Harold E. Wilson, Mining Engr., is the head of the H. E. Wilson Engineering Company. His wife was Mabel Luke before their marriage in 1923. The six Wilson children are: Betty Sue, age 13; Harold Jr. and Edwin, age 12; Frederick, age 10; Ruth, age 7; and Calvis, age 2.

—'17—

MacDonald C. Booze, Cer., is Vice-President of the Charles Taylor Sons Co., of Cincinnati, O. He was a football letterman while at Illinois. He has four children, one of whom is now a senior in Commerce.

Fred A. Brooks, E. E., is now employed by the University of California as an Agriculture Engineer. He is doing research work. In 1929 he married Miss Margaret Ward of Milton, Mass., a graduate of Smith College and Brookings Institute. They have four children.

—'20—

W. T. Stephens, E. E., is a sales representative for the Central Station division of the Westinghouse Electric and Manufacturing Co. In 1925 he married Miss Florence G. Gallentine, a graduate of the University of Illinois. They now live in Madison, Wis.

—'22—

D. I. Taze, M. E., of Cleveland, O., is now employed by the American Blower Corp., as manager in charge of air handling equipment for the Cleveland district. Taze married Miss Kathleen Millington of Grand Rapids, Mich., in 1933. Mrs. Taze was graduated from the Fairmount School, Washington, D. C. They now have one child, Kathleen Cheswith, age 2.

—'23—

W. I. Stemwell, C. E., is in charge of expediting and scheduling work for the T.V.A. projects at Gunterville, Chickamauga, and Watts Bar. He married Miss Lucille Lhota in 1924. Now they have three children, Jane Frances, William I. Jr., and Richard. Bill is registered in the graduate school of the University of Tennessee.

Paul F. Witte, M. E., is one of the partners of the Witte and Burden Advertising Agency of Detroit, Mich. In 1928 he married Miss Helen Lois Clark. They now have two children, Helen Ann and Jane.

George F. Yacky, M. E., is employed on the design and construction of hydro-electric plants by the city of Los Angeles, Bureau of Power and Light. He was married in 1934 to Alma Houghton of Santa Barbara. They have one child, George Jr.

—'2,—

Marden F. Wilson, who received his M. E. degree in 1937, manages the American Steel Foundry plant in Pennsylvania. In 1931 he married Miss Ruth Birdmark of Chicago. They have one child, John Marden, born in 1932.

—'27—

W. R. Woolley, C. E., inspects Federal aid highways in Indiana, Illinois, Michigan, and Kentucky. Married to Kathryn Dilly '27, he now has two children, Susan and David.

—'28—

F. W. Wodrich, Jr., E. E., is purchasing agent of the Kendall Refining Company, Bradford, Pa. He married Vernie Rathmell '31, of Chicago. They have two children: Marie Elizabeth and Dayton Rathmell.

Harrison L. Winter, C. E., is a sales representative of the Millers' Mutual Fire Insurance Association of Illinois. Married to Helen Turner of Alton, he has two children: Helen Janet and Harrison Turner.

—'30—

Russell C. Nebeck, E. E., is foreman of the Walworth Company's lubricated valve department at Kewanee. In 1934 he married Eva M. Wood of Kewanee; they have two children, Pevere Mildred and Delores Ann.

—'31—

C. Donald Stewart, C. E., passed away in April, 1936. He married Anne Stewart and lived in Evanston.

Don Johnstone, C. E., who was editor of the *Technograph* in 1930-31, is now editor of *Civil Engineering*, an A. S. C. E. publication. Harold T. Larson, also an Illinois man, is editor of the A. S. C. E. *Proceedings*.

—'32—

Joseph Tiffany Jr., C. E., is an Associate Engineer at the U. S. Waterways Station, Vicksburg, Miss. He works on the design, construction, and operation of the hydraulic models used in the study of waterways and harbors. Editor of the Technograph in 1931-32, Tiffany regards the experience thus attained as the most valuable training of his college career.

Karl Smith '38, G. Kenneth Lowe '32, and William Pittman '36, all work for Charles Taylor Sons Company, manufacturers of fire brick and refractories. Lowe married a girl from Columbus, O., this spring, and lives in Cleveland. Smith and Pittman are still single.

FILL 'ER UP

(*Continued from Page 4*)

Ethyl is more than twice as efficient as any of these other agents as only a minute trace of it is needed to increase the anti-knock rating of a gasoline to the desired value. However, as the concentration of ethyl increases, the effectiveness it produces decreases. The greatest disadvantage of ethyl is that it tends to deposit lead on the spark plugs and exhaust manifold and to corrode the valves slightly. In any instance, however, the damage done by the ethyl is more than offset by the damage that is averted in preventing knock.

At the present time much work is being done to develop high octane aviation fuels with ratings of 100 and upwards. Many compounds have been considered in searching for high octane blending hydrocarbons. Most widely used are iso-octane and iso-pentane. Others used are the aromatics, ethers (isopropyl), ketones, and alcohols. Each agent has its advantages and disadvantages and there is much dispute over which is best. In this country iso-octane is preferred but in Europe the aromatics are favored because they work better in their water-cooled aviation engines. The alcohols, ketones, and ethers are not so successful as the others because they contain oxygen which results in a lowered heat value. It is worthy of note that most of this advanced research is being carried out in our own country in the laboratories of the fuel companies, plane manufacturers, and universities.

A very self-satisfied man arrived at the Pearly Gates and asked for admittance.

"Where are you from?" asked St. Peter.

"Hahvahd."

"Well, you can come in, but you won't like it."

KEEPING OUT THE COLD

(*Continued from Page 7*)

panel. The entire electrical input to the Hot Box is metered. The heaters are controlled manually from outside at the instrument bench. A rubber hose leads from the Hot Box to an Emswiler gage.

Temperatures are measured electrically by means of copper-constantan thermocouples connected to terminal blocks permanently installed in both rooms, with cables leading from them through cold junction boxes and selector switches on the instrument bench to an L&N portable potentiometer. The exact positions of the couples are governed by the special test, but in general, average temperatures near the panel in the Cold Room, Warm Room, and Hot Box are obtained. The differential couples are used to detect any small difference of temperature between the Warm Room and Hot Box, that it may be reduced at zero. An integrating watt-hour meter, which can be read to one watt-hour, is used to measure the electrical input to the Hot Box. Air velocities are measured with a Kata thermometer. A mercurial-thermometer type of hygrometer, placed in the current of air from the fan, is used to measure humidity in the Hot Box. For some tests the humidity is controlled by means of chemicals.

The procedure for measuring the conductivity of a window is as follows. The thermostat in the Warm Room is set at seventy degrees or at the temperature set in the test specifications, and the heater system turned on. The Cold Room is generally run at about minus twenty degrees Fahrenheit. The desired Cold Room temperature is obtained by regulation of the expansion valves and the setting of the mercoid thermostat controlling the compressor motors. The heaters in the Hot Box are controlled manually to keep the readings of the differential thermocouples at zero. When the whole system has come to equilibrium, which takes about twenty-four hours, the test is begun. Readings of temperatures, differential couples, and the watt-hour meter are made every half hour for a period of five to eight hours. Because the Warm Room and Hot Box are at the same temperature, no heat can flow between them. Therefore, all the heat supplied to the Hot Box must flow through the test panel into the Cold Room. This amount is found in Btu per hour by multiplying the watt-hour input by 3.412 and dividing by the length of the test. The small amount of heat flowing through the panel around the window is calculated from previous test results and subtracted from the total heat flow. This difference is then divided by the number of degrees temperature difference on the two sides of the window to obtain the thermal-conductivity of the window in Btu per hour per degree Fahrenheit of temperature difference across the window.

The infiltration test procedure is entirely different from that of the conductivity test. It is run entirely at room temperature. Air pressures are measured by a recording aneroid barometer for the Warm Room pressure, which is atmospheric because the door is left open, and by Emswiler gages in the Hot Box and Cold Room. An Emswiler gage is an instrument which actually weighs air pressure. It consists of a tube leading from the air chamber and opening into a fixed hollow cylinder inverted in oil in a container resting on the pan of a sensitive balance scale. A conversion factor for multiplying grams weight to obtain pounds-per-square-inch air pressure has been determined. Air is forced into the Cold Room by the blower until the difference in pressure across the window or between the Cold Room and Hot Box is the equivalent of a certain wind velocity on the Cold Room side. This pressure difference is measured by a differential Emswiler gage. Then the pressure in the Hot Box and that in the Warm Room are measured. From these two readings it is possible to caluculate the amount of air flowing through the orifice in the plate in the back of the box, which will be the same as the amount of air flowing through the cracks in the window. The infiltration is measured at different wind velocities and a curve plotted between wind velocity and leakage. The number of Btu's necessary to heat air from any lower temperature to seventy degrees can be obtained from tables. Therefore one can calculate the amount of heat lost through infiltration through the window when the air outside is at any temperature and the wind at any velocity.

Besides these standard tests, this apparatus is used to find the thermal-conductivity of doors and different types of wall. It has been used to determine the maximum relative humidity it is possible to maintain in a house with certain types of windows, when winter conditions exist on the outside. Also, it is possible, by the use of the pitot tube, to find the places in a window where the leakage is greatest.

Professor: "And in final proof of the theory of evolution we now have the "Intelligentia" instead of the old-fashioned "Smart Alec."

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.

Of The Illinois Technograph published six times a year (Sept., Nov., Dec., Feb., March, May) at Urbana, Illinois, for October 1, 1938.

State of Illinois }
County of Champaign } ss.

Before me, a notary public in and for the State and County aforesaid, personally appeared Edward S. Fraser, who, having been duly sworn according to law, deposes and says tbat he is the business manager of The Illinois Technograph and tbat the following is, to the best of his knowledge and belief, a true statement of the ownership, management and the circulation, etc., of the aforesaid publication, for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations.

That the names and addresses of the publisher, editor, and business manager are: Publisher, Illini Publishing Company, University Station, Urbana, Illinois:

Editor, Maurice Carr, Urbana, Illinois.
Business Manager, Edward S. Fraser, Urbana, Illinois.

That the owner is The Illini Publishing Company, a non-commercial organization whose directors are W. E. Britton, A. R. Knight, F. H. Turner, F. S. Siebert, Richard Nelson, Dorothy Chapin, Garth Elzea, Mary H. Moss.

EDWARD S. FRASER, Business Manager.

Sworn to and subscribed before me this 7th day of October, 1938.
(SEAL)

ALICE SMITH, Notary Public.

• TECKNOKRAKS •

A passenger boarded the train at Lyons, entered a sleeper and tipped the porter liberally to put him out of the train at Dijon. "I'm a very heavy sleeper," he said, "and you must take no notice of my protests. Seize me and put me out on the platform."

He slept. He woke as the train steamed into Paris. In a raging fury he went to the porter and expressed some emphatic opinions in a varied vocabulary.

"Ah," said the porter calmly, "you have a bit of temper, but yo' am nuthin' compared wid de chap Ah put of de train at Dijon."

* * *

Little Jim: "Are you a *trained* nurse?"
Nurse: "Yes."
L. J.: "Well, let's see some of your tricks."

* * *

"Papa, what do you call a man who runs an auto?"
"Well, that depends on how close he comes to hitting me."

* * *

Mique: "I hear that your roommate has a baby saxophone."
Ique: "Yeh, and it'll be an orphan soon."

* * *

"It will all come out in the wash," said the contractor as he looked at the bridge he had just built.

Little Willie: "Mother, where do they keep the cross-eyed bear in Sunday school?"
Mother: "What in the world do you mean?"
Little Willie: "Why, they're always singing about the holy cross I'd bear."

* * *

Bellhop (after guest had rung for 10 minutes): "Did you ring, sir?"
Guest: "No, I was just tolling. I thought you were dead."

* * *

Stranger: "Please, sir, can you direct me to the library?"
Stude: "Sure. See that girl ahead of you all dressed up and no books under her arm? Well, just follow her."

* * *

Her husband had just come home and had his first meeting with the new nurse who was remarkably pretty.

"She is sensible and scientific, too," urged the fond mother, "and says that she will allow no one to kiss Baby while she is near."

"No one would want to," replied the husband, and then the fur flew.

* * *

Patient: "Doctor, how are my chances?"
Doctor: "Oh, pretty good, but I wouldn't start reading any continued stories."

G-E Campus News

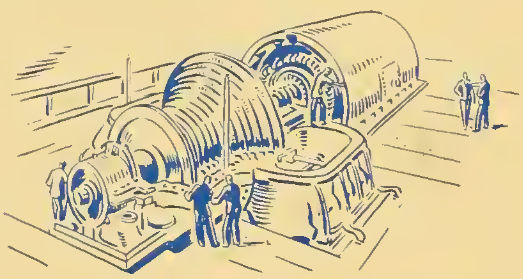
"PINHOLE DETECTOR"

COUNTING traffic, guarding jewels, opening doors—all are in the day's work for photoelectric relays.

But in a great rolling mill one is acting in the unusual role of pinhole detector, a role developed by General Electric at the suggestion of the Bethlehem Steel Company. As steel strips, a yard wide, leave the uncoiling machine at a speed sometimes approaching 900 feet a minute, the G-E relay looks for defects—"pinholes."

When the light beam of the unit, aimed at the strip, hits any defects, a diverter mechanism goes into action and throws faulty sections off the production line.

On that part of the G-E Test course known as "Industrial Control Test," student engineers sometimes work with these ingenious devices, testing and experimenting in a search for new applications.



100,000 HORSEPOWER

AN 80,000-kilowatt turbine-generator, using steam at a pressure of 1250 pounds per square inch and at 900 F in a single cylinder to generate 100,000 horsepower, is being built at General Electric's Schenectady Works. It will be installed in a new $9,500,000 steam-electric station at Oswego, N. Y.

The latest results of constant research and experiment by G-E turbine engineers are embodied in this new unit. It will be the first large 1200-pound condensing unit built in a single casing; the generator will be hydrogen-cooled to reduce windage losses; special alloys are being used to meet high pressures and temperatures.

The gigantic boiler is as large as a 9-story building 36 feet wide and 54 feet deep. Steam will shoot from it into the turbine at a pressure of 1250 pounds per square inch. One twentieth of a second later the steam will be cool water, the effect of the amazing change being to drive the unit's rotor at 1800 revolutions a minute.

Soon the foremen will report—"work completed." Tests will begin, calling into action student engineers—recent graduates of engineering schools and colleges. Then, an estimated 14 months after work began, the turbine will be shipped from Schenectady.

FROM MODERNISTIC CABINETS TO 36-INCH STEEL PIPE

WHEN inspectors of the City of Los Angeles Water Department were confronted by 13,000 feet of steel pipe waiting for their inspection, they were dismayed. For inspection meant checking every square foot of the pipe to see that the layers of enamel were of a specified thickness on both the inner and the outer surfaces.

It meant the tedious task of stripping and micrometering samples of the pipe at random, the accepted but not infallible method.

On a search for a better way went one of the inspectors. He found a magazine article about General Electric's electromagnetic thickness gages being used to measure, without marring, the thickness of the enamel coating on refrigerator cabinets. The aesthetic difference between a modernistic cabinet and a steel pipe didn't bother the inspector—he simply bridged the gap with his imagination.

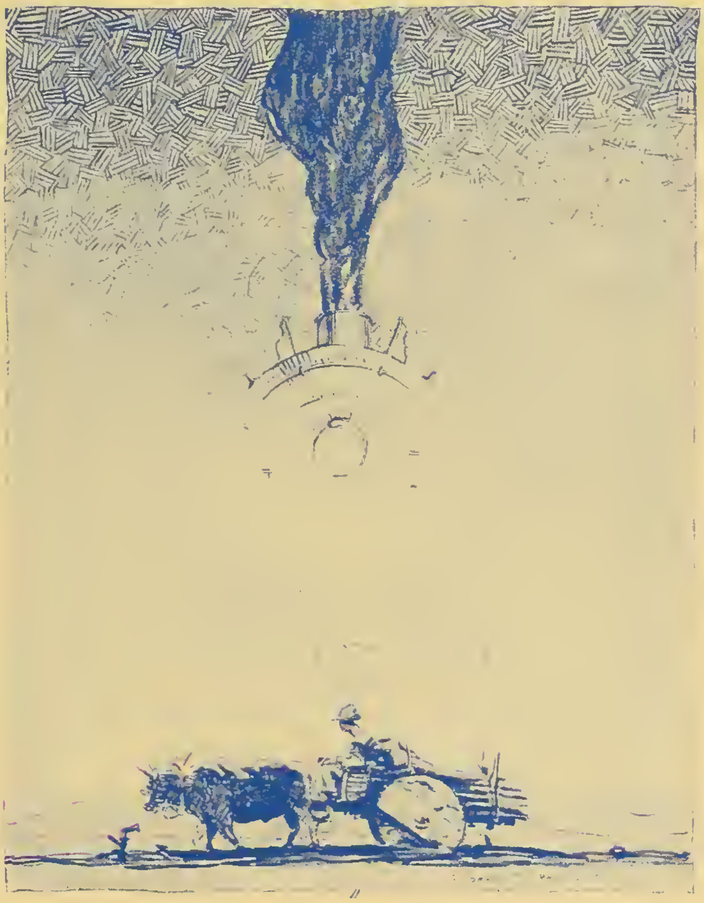
A gage was adjusted to the requirements of the unusual situation; with it the inspectors did the job better, more quickly, more accurately, and more easily. Not only did the gage, with its fingers of magnetic flux, check the entire surface of the pipe, but it reported back the thicknesses with an accuracy of a thousandth of an inch.

GENERAL ELECTRIC

90-100D11

THE TECHNOGRAPH

UNIVERSITY of ILLINOIS



FEBRUARY 1939

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MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

THE ILLINOIS
TECHNOGRAPH
UNIVERSITY OF ILLINOIS
Established in 1885

FEBRUARY, 1939

Volume 53 — Number 4

MAN has long dreamed of the day when he would be able to extract gold from the waters of the sea. The first step in the fulfillment of this dream was taken a few years ago when a plant for the extraction of bromine from the waters of the Atlantic was established on the Virginia coast. Wayne Moore explains the operation of this plant, which may lead to greater things than the recovery of gold.

● Did you know that in case of fire, a fire-proofed wooden building is safer than a steel or concrete structure. Work done at the University of Illinois indicates that wooden structural members may come into fairly common use in the future.

● Boxes for your contributions to the North of Green page have been placed in the Engineering Library and in the Talbot Laboratory.

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●

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OIL REFINERY

THE ILLINOIS TECHNOGRAPH

Published Six Times Yearly by the Students of the College of Engineering, University of Illinois

Volume LIII FEBRUARY, 1939 Number 4

FROM FARM TO OIL FIELD

A Story of the Discovery and Growth of the New Oil Fields of Southern Illinois

by

TOM SHEDD

•

The recent newspaper story of the Illinois farmer who bought each member of his family a new car for Christmas illustrates vividly the remarkable changes in the lives of many of the people of southern Illinois during the last two years. These changes are a result of the tremendous increase in oil production which has followed the discovery of new fields in several counties in the southern part of our state. Oil production in Illinois has jumped from 400,000 barrels a month to nearly 3,000,000 barrels. During the first ten months of last year our state produced 16,854,000 barrels; enough to supply the nation's need for 5.2 days.

In spite of the suddenness of this increase in oil production, there has been no hysterical boom in Illinois as there was when oil was discovered in Texas and Oklahoma. Although there was a scramble to lease land for drilling when the first discoveries were made, production and discovery soon subsided into an orderly but rapid program. The people of southern Illinois had been through such a situation before and refused to become unduly excited over the prospects. "Boom towns" are almost non-existent because there were many well-established towns and cities, and the oil men prefer to live in the towns where there are good hotels, residences, church, and school facilities. The automobile has made it easy to commute to the site of their work from comfortable homes and the ramshackle temporary houses of most oil booms are not seen. The facts that leasing prices have become very high and that numerous wells have been dry holes have also tended to discourage any mad boom characteristics.

Illinois is no newcomer among the oil producing states, but it still ranks behind a number of others. The principal field was in the southeastern counties of Clark, Crawford, and Lawrence. Other fields, many abandoned, were scattered about in other localities in the southern part of the state.

The train of events which culminated in the discovery of the new Illinois fields began in 1928 when the Mount Pleasant field was discovered in Michigan. This discovery was especially interesting because it was made in the region that had been thought to have no oil—the *Michigan Basin*, a large depression in the earth's crust known to geologists as a *geosyncline*. Illinois has such a basin in the southern counties of Wayne, Marion, and Hamilton. It had also been thought to have no oil because it was believed that any oil which had been present would have shifted to the margins of the basin. The discovery of the Mount Pleasant field, however, focused attention upon the Illinois basin. Geological surveys of the region were begun and in 1935 oil companies began to lease land for drilling. Some companies leased without knowledge of the subsurface structure but the larger companies were able to finance seismograph parties for locating deposits. In many cases the land was leased for as little as ten cents an acre for ten years.

Oil was first discovered in the Bartelso field in Clinton county in May of 1936. No further discoveries were made until the Patoka field in Marion county was brought to light in February of 1937. Then came the Clay City, Cisne, and many others until there are now about fifteen new fields of varying size and importance. Many additional areas are being surveyed and drilled. The largest of the new fields is the New Centralia field just northwest of Centralia which had more than 500 producing wells on October 31, 1938. The Beecher City field, east of Effingham, has 250 wells; the Clay City field has 190 wells; the Lake Centralia field just east of Centralia has 160 wells; and so on—the total number of producing wells in the new fields now being nearly 2,000.

The general method by which an oil field is discovered is as follows. A general area that may produce oil is located. Geological surveys follow by which geophysical information about the subsurface structure is obtained. Numerous methods are used in making this ssurvey but the seismograph system is probably the most interesting and most used.

There are two methods of seismographing: the refraction and the reflection methods. The first named was used in the Gulf coast region of Texas but is seldom used in Illinois. It consists of setting off a charge of dynamite in the center of a ten to fourteen mile circle of seismograph detectors. These pick up and record the ground vibrations set up by the explosion and from these recordings it is possible to compute the velocities of the vibrations through the intervening ground. The velocity of the vibrations gives an indication of the type of structure below the surface.

The system used in Illinois is known as the reflection seismograph method. A dynamite charge is set off at a certain point and at an accurately measured distance from the shot—usually about a quarter of a mile—geophones pick up the vibrations. The electrical current produced is amplified and photographed from an oscillograph screen. When the charge is set off, ground vibrations travel in all directions. Should the vibrations that go downward strike a thick rock layer, they are reflected back toward the surface and may reach the detectors. The distance from the shot to the detectors and the speed with which vibrations travel in various media are known. Thus it is possible to calculate the depth of the reflecting layer. By taking numerous observations a map of the subsurface contours can be drawn. Any formations which might be favorable for the discovery of oil are outlined on this map.

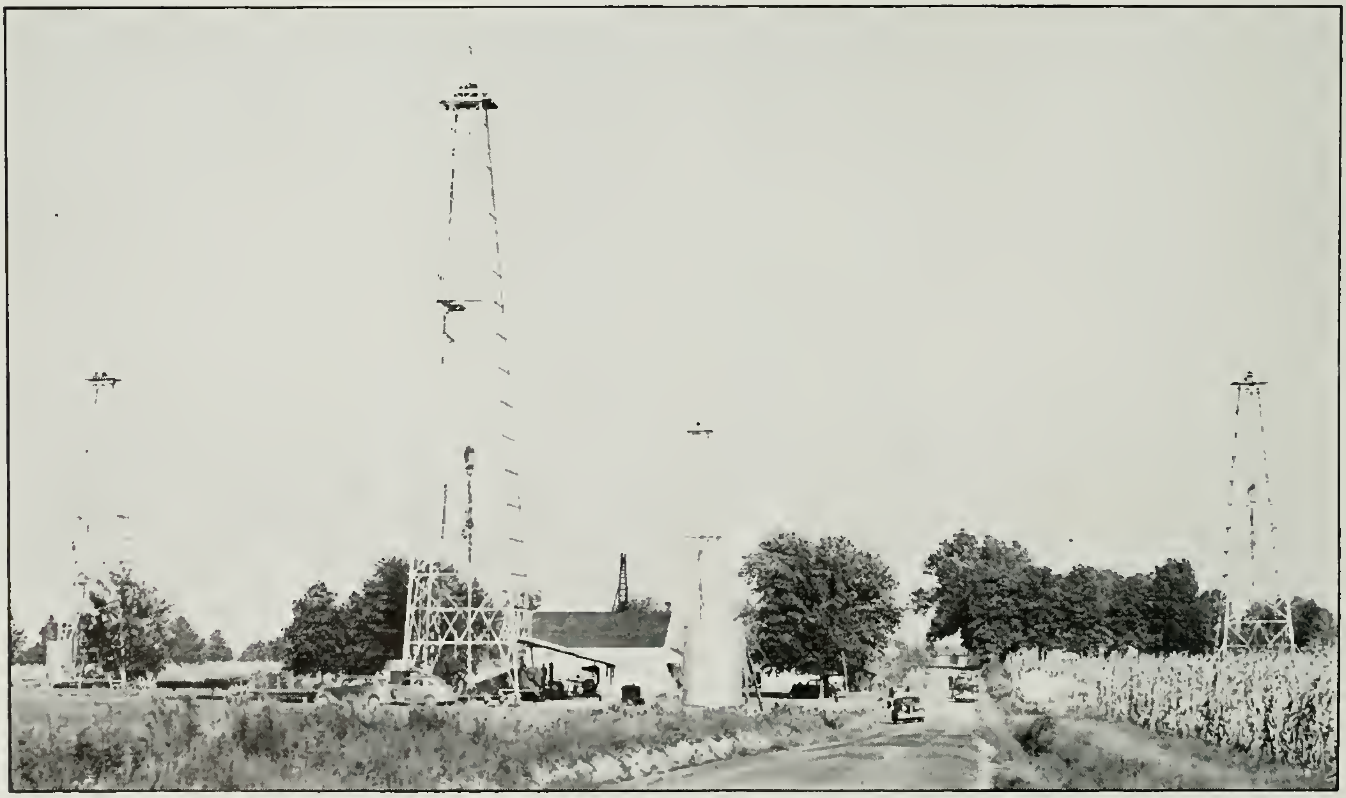
But the discovery of oil cannot take place until a well has been drilled. There are two methods by which oil wells are drilled. The older method involves the use of cable tools. The drill, a sharp, heavy, metal tool known as a *spudder* is attached to a cable and lowered into the hole as the drilling proceeds. The motion of the tool is a vertical reciprocating one. The spudder must be taken out at intervals so that the dirt that has been loosened may be removed. Wells over 7,000 feet deep have been drilled by this method.

The method of drilling which is most extensively used today is the rotary drilling system. The tool has a rotary motion in a horizontal plane. It is attached to a drill pipe which is connected to a bar of square cross section. The bar passes through a square hole in the *rotary table* which is really a horizontal gear wheel driven by a gasoline or steam engine. The square bar is free to drop as the drill cuts out the earth below it and can be raised by means of a rope. The *grief stem*, as this bar is generally called, is 50 to 60 feet in length. The derricks used for lifting it are about 100 feet in height. Drilling need never be stopped to remove the debris from the hole as it is washed out by water pumped down the drill pipe. Clay is often mixed with the water and as the water rises to the surface the clay is plastered to the sides of the hole, tending to seal off water bearing and other strata encountered in drilling. Holes as deep as 15,000 feet have been drilled by the rotary method.

In the southern Illinois fields, gasoline driven drilling rigs are the most common. All varieties and sizes are seen. Some of the lighter set-ups are portable, being mounted on trucks.

Practically all the wells in the Illinois basin are pumpers; that is, the oil must be brought to the surface by some form of pump. Some of the new wells have flowed for a time, but eventually have had to be pumped as the gas pressure decreased. The gas content of the Illinois wells has been rather low. In some places the gas is put back into the well in an attempt to maintain the pressure. This method helps to cut down the waste of production. Wasteful production methods have lost to the country many millions of barrels of oil, which are still in the ground and cannot, by present methods, be recovered.

It is possible, by modern methods, to obtain practically all the oil that is in a field. Methods of conservation are being practiced by the most successful and forward-looking of the companies now operating in the Illinois basin. The state administration has announced that it is in favor of conservation regulations. With such laws and a wise administration and enforcement, Illinois will recover a maximum amount of oil from the new fields and the prosperity of the oil producing sections of the state will be assured for years to come.



—*Courtesy Oil and Gas Journal*

Four Wells in a Schoolyard in Lake Centralia Field

WOOD COMES BACK

Tests Conducted in the Talbot Laboratory Indicate that Wood Possesses Structural Advantages that Steel Does Not Have

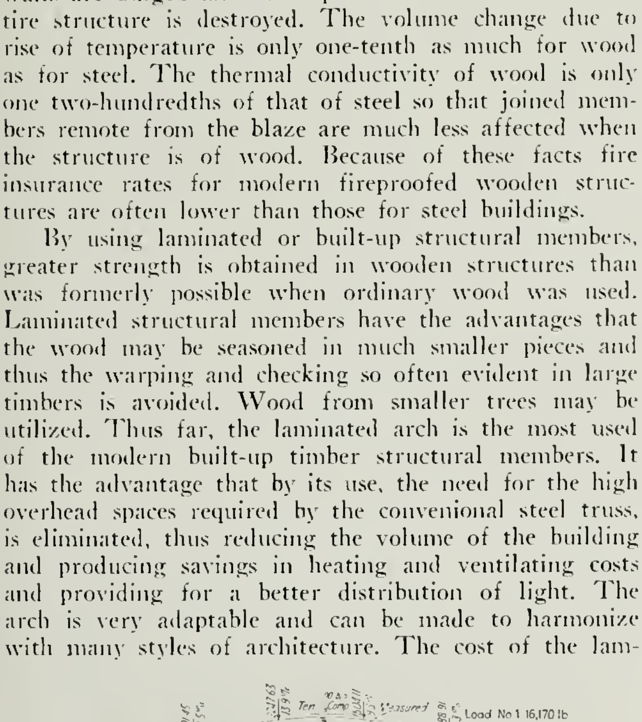
by

ED DYER

We are living in what is oft termed the "Age of Steel." In metropolitan areas, wood, as a building material, has been almost entirely supplanted by steel and concrete. This change can be attributed to the two facts that steel is fireproof and that it is stronger. But wood is now making another bid for power and, although it will never regain its former position, will undoubtedly be used more in construction in years to come than in those just past.

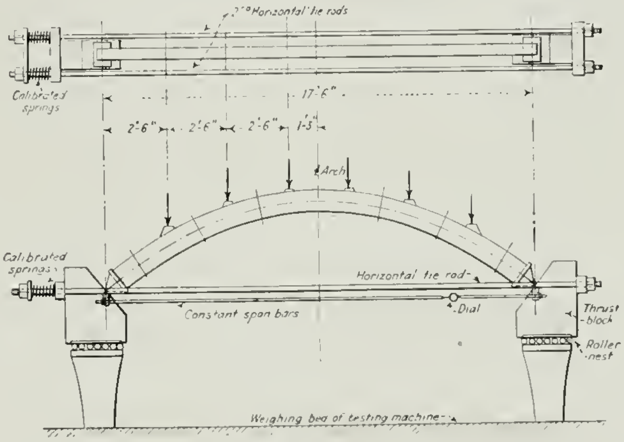
First, fireproof construction is not now limited to steel and concrete, for wood can now be treated to make it fireproof. In fact, fireproofed wood has many advantages over steel in case of a fire. Steel, when exposed to intense heat, quickly loses its strength and collapses whereas wood does not so readily weaken. Also, a steel member, because of the high thermal coefficient of expansion of steel, expands so much during a fire that walls are bulged and often pushed over so that the entire structure is destroyed. The volume change due to rise of temperature is only one-tenth as much for wood as for steel. The thermal conductivity of wood is only one two-hundredths of that of steel so that joined members remote from the blaze are much less affected when the structure is of wood. Because of these facts fire insurance rates for modern fireproofed wooden structures are often lower than those for steel buildings.

By using laminated or built-up structural members, greater strength is obtained in wooden structures than was formerly possible when ordinary wood was used. Laminated structural members have the advantages that the wood may be seasoned in much smaller pieces and thus the warping and checking so often evident in large timbers is avoided. Wood from smaller trees may be utilized. Thus far, the laminated arch is the most used of the modern built-up timber structural members. It has the advantage that by its use, the need for the high overhead spaces required by the convenional steel truss, is eliminated, thus reducing the volume of the building and producing savings in heating and ventilating costs and providing for a better distribution of light. The arch is very adaptable and can be made to harmonize with many styles of architecture. The cost of the laminated arch is about the same as that of the steel truss for which it may be substituted, but great savings are effected by use of the arch for the thickness and height of walls may be reduced and columns are eliminated for the laminated member is generally built as a framed arch and columns.



Relation Between Computed and Measured Stresses

Although laminated timber arches were introduced in Germany as early as 1907, it has been only within



Test Set Up

the last ten years that they have interested American engineers. At the University of Illinois, a test program under the direction of Professor W. A. Oliver was initiated a few years ago and is still being carried on.

The tests have been made on relatively large models. Four arches have been constructed and tested and preparations are being made for the testing of laminated rigid frames. The arches were tested as two-hinged, unbraced ribs. The span was 17.5 feet, the rise was 3.5 feet and the size of the section was 4.5 x 10 inches. Two of the arches had 23 laminations each seven-sixteenths of an inch thick. The other two had 13 laminations each one and nine-sixteenths inches thick. The wood used for any laminated structural member must be free from knots, checks, and other defects. The kind of wood depends upon the strength and finished appearance desired. The test arches were made from straight-grained, short-leafed yellow pine with a moisture content of 10 to 12 per cent. The boards, without preliminary treatment, were bent to conform to the desired shape with their broad sides, and thus the glued joints, perpendicular to the plane of the arch. They were cut in lengths such that their ends were staggered and no two joints were at the same section. The end joints were symmetrically

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• OUR SOCIETIES •

ENGINEERING COUNCIL

On January 13, Dean M. L. Enger entertained the members of the Engineering Council and the faculty advisors of the activities represented by the members of the Council at a dinner at the University Club. After the table had been cleared the group collaborated in the writing of a final draft of the constitution for the Illini Engineers, an all engineering society that is being formed. This constitution will be submitted to the student branches for ratification immediately after the beginning of the semester and the organization formed as soon as enough of the student branches ratify.

SBACS

On the evening of December 3, about eighty couples assembled in the upper parlors of the Woman's building and danced to the music of Johnny Bruce and his orchestra at the third Annual Ceramic Ruckus. True to tradition, the programs were something new and different. They were made by tying small glazed drain tile to the programs. The students advance the idea as one for the industry to investigate.

On November 16, the juniors beat the seniors in a quiz contest.

On December 13, Mr. Sweeley of the Chicago Vitreous Enamel Company gave a talk on the problems encountered by the engineer in the enameling industry. This was Mr. Sweeley's third visit to address the student branch in as many years. At this meeting the members of Keramos challenged the faculty to a quiz contest.

Plans are being made for the student branch's part in the National Ceramic Convention to be held in Chicago in April. The Illinois student branch is to act as host to all the other branches in the country.

ASCE

The student branch of the American Society of Civil Engineers held their election on January 12. The following men were elected to administrate the affairs of the branch during the second semester:

Tom Chapman.......................................*President*
A. B. Reid.......................................*Vice President*
George Lyons.......................................*Secretary*
Nellow Farneti.......................................*Treasurer*

An amendment to the constitution was approved. It changed the manner of election of the vice president.

ASME

Mr. William Littlewood, vice president in charge of engineering of the American Air Lines, spoke to the student branch, November 30, on "Air Transport Engineering."

At the December 14 meeting the second semester officers, elected the previous week, were announced as follows:

Joe Morrison ....*Chairman*
Norman Fehrm ....*Vice Chairman*
Gilbert La Roche ....*Secretary Treasurer*
Bill Beckerle, Keith Pfundstein,
and Bob Roose ....*Publicity Committee*

Mr. J. M. Davis, a research engineer in the Caterpillar Tractor company, spoke on the problems encountered in the field performance of diesel engines. Two reels of sound motion pictures showing Caterpillar diesels in operation were also shown.

ASAE

At the November 10 meeting, Reid Bishop gave a talk, which he illustrated with slides, on problems encountered in soil conservation and the prevention of soil erosion. Mr. Bishop was employed by the Soil Conservation Service and is on furlough, enrolled in the College of Engineering. He explained the work of the soil conservation engineering in making maps, designing dams, and laying out terrace systems.

On December 1, Mr. Petersen, a University of Nebraska graduate who is conducting a research project in the Agricultural Engineering department here, spoke on the tractor tests conducted at the University of Nebraska, where he was previously employed. Mr. Petersen explained the testing methods and illustrated his talk with slides showing the equipment used. Nebraska tractor tests, required by law before a tractor may be sold, are recognized all over the world. Copies of a report of an official tractor test were distributed and discussed.

At the meeting held December 15, Herman Finkel reported on the annual winter meeting of the American Society of Agricultural Engineers, which he attended as a student branch delegate.

SYNTON

Synton's 160-meter transmitter has been put on the air again, and a new six-tube communications receiver has been installed in the station. Code classes under Len Hartman, E.E. '41, continue to be held each Saturday at 2 p. m. in the Synton room in the Armory. They are open without charge to all University students.

AICHE

At a business meeting held November 2, the group heard a talk on synthetic resins by one of the members, who related some of his observations while employed in a resin factory during the summer.

This year, the local chapter has a paid membership of sixty-seven, the largest since 1932.

ETA KAPPA NU

After a pledge period of several weeks, the following men were initiated into Eta Kappa Nu at the Inman hotel, Sunday, December 18:

Mike Jezewicz	Shannon Powers
Ray Keiffer	Frank Thoma
Jim Murphy	Jim Tracy

The initiation ceremony was followed by the banquet held in conjunction with Pi Tau Sigma and Chi Epsilon.

The new officers, elected January 12, are:

Clifford Poarch ....*President*
Frank Thoma ....*Vice President*
Shannon Powers ....*Recording Secretary*
Milburn Pehl ....*Pledgemaster*
James Murphy ....*Sergeant-at-Arms*
Richard Wetzel ....*Treasurer*
Joe Spengler ....*Bridge Correspondent*

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BROMINE FROM THE SEA

Man Realizes the First Step in the Dream of the Extraction of Elements from Waters of the Ocean

by
WAYNE MOORE

In the seven years from 1924 to 1931, the annual production of bromine in this country rose from two million to nine million pounds. Most of this increase was necessitated by the increase in the use of anti-knock gasoline. When tetra-ethyl of lead is used alone, it leaves a deposit of lead oxide in the cylinders. This lead oxide deposit accumulates until it becomes objectionable in that it interferes with the flow of heat out of the cylinders and raises the compression ratio. It was found that when ethylene bromide is added to the gasoline, the end products of combustion are volatile and thus this accumulation of lead oxide is avoided. It is for this reason that tetra-ethyl of lead for the treatment of motor fuels is made from ethylene dibromide and sodium-lead alloy.

—*Courtesy Dow Chemical Company*

Bromine Extraction Plant

With the increase in gasoline sales, the industry saw that the available commercial supply of bromine would have to be augmented in some way. Since brines had already been the source of commercial bromine, the logical step was to turn to sea water for the supply. But the concentration of bromine in sea water was just about that of the waste from the older process and for this reason, the old process proved very inefficient when applied to sea water. The process consisted of three parts: 1) the oxidation of the brine with chlorine to free the bromine, 2) blowing the freed bromine out of the solution with air, and 3) the absorption of the bromine in an alkali carbonate solution from which it was recovered later.

Not only was the concentration of sea water too low but it was alkaline, and the bromine was hydrolyzed after oxidation so that it formed bromic and hydrobromic acid. This hydrolysis had been permitted in the brine plant because the bromine concentration was great enough to make it economical to do so. But this was not true with sea water. It was found that by adding acid to the water, the bromine would not be hydrolyzed and a satisfactory yield could be obtained. A control was worked out which utilized the fact that every bromine solution has a different oxidation potential depending upon the concentration of the bromine ions and the collective effect of the other ions present. This is measured by the difference in voltage between a saturated calomel electrode and a platinum electrode. Thus it was made possible for the plant operator to control the process without wasting large quantities of acid and chlorine.

After the process had been perfected in the laboratory to the point where it extracted about fifty per cent of the bromine from the sea water, a search was started for a suitable site upon which to erect a trial plant that could later be enlarged. After a careful examination of the sea coast, a spot at the mouth of the Cape Fear River was selected. It had all of the requirements: 1) there were no streams entering the ocean for several miles up the coast, 2) it was possible to get rid of the effluent water without diluting the source supply which was to be obtained on the other side of a long promontory of land, and 3) there were no large quantities of industrial waste in the water. After six months of operation of the trial plant, the process was perfected to the point that a commercially profitable plant could be erected.

In 1933 plans were made to construct a plant with a capacity of 15,000 pounds of bromine a day. As this was the first plant of its kind in the world, many unique features confronted the engineers. One of the first brain teasers was the intake canal. It was decided to place piling out into the sea to form the intake. Thus a large volume of water could be handled and yet the intake be kept open. In the trial plant the engineers found that a single row of piling could not withstand the sea. They solved the problem by making each wall of the channel a double row of piling spaced about fifteen feet apart. Partitions were placed between these walls of sand and thus the completed wall was made up

(*Continued on Page* 13)

—*Courtesy Dow Chemical Company*

Sea Water Intake

★ WHO'S WHO IN ILL

● *E. C. Schmidt*

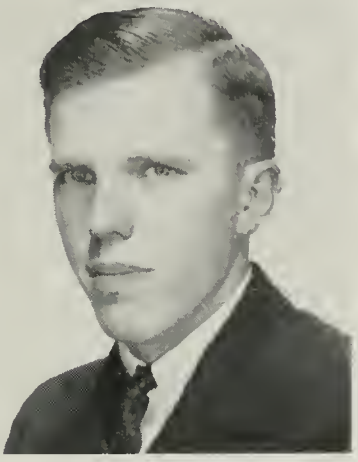
● *C. T. Knipp*

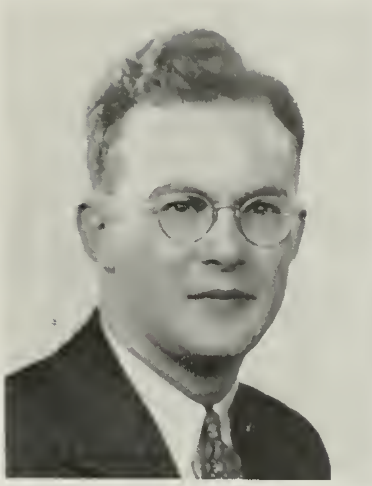
● *C. C. Wiley*

PROFESSOR EDWARD C. SCHMIDT was born in Jersey City, New Jersey. The manufacturing city of his birth fostered in him an interest in mechanics, an interest which he furthered in his studies at the Stevens Institute of Technology where he was graduated in 1895 with the degree of mechanical engineer. After graduation he worked for a number of engineering firms, chiefly as a designer and as an engineer in charge of installation and maintenance of power plants. In the year 1898 he began his teaching career on our campus. The next four years he served as instructor and assistant professor of experimental engineering and railway mechanical engineering. He then abandoned the schoolroom for the commercial world the second time, but returned in 1906 as head of the newly organized department of railway engineering. When the United States entered the World war, he was commissioned a major in the ordnance department and served until July, 1919. After two years more of commercial engineering he resumed his old position as head of the department of railway engineering and has been in the harness ever since. Professor Schmidt has written numerous technical bulletins on railway research. He is a member of the American Society of Mechanical Engineers, Society for the Promotion of Engineering Education, Western Railway club, an associate member of the American Railway Association, and an honorary member of the Railway Fuel and Traveling Engineers' Association. "Who's Who in America" discloses that he also belongs to Tau Beta Pi and Sigma Xi.

PROFESSOR CHARLES T. KNIPP was born in the town of Napoleon in the Buckeye state. Evidently he heard the phrase "Go West, young man," for he obtained his A.B. in Physics from Indiana University in 1894 and the M.A. degree two years later. He taught at Indiana for two years before going to Cornell to obtain his Ph.D. Three more years were spent at Indiana and then, in 1903, he arrived on our campus as an assistant professor of physics. He taught electrical measurements and other advanced courses until his retirement two years ago. In 1917 he was made professor of experimental physics. Professor Knipp has published over one hundred articles on theoretical and experimental physics. Among his contributions to the physical sciences are the alpha-ray track apparatus, electrodeless discharge, and the cold cathode rectifier. He is a popular lecturer, probably because of the effective demonstration method that he uses. His "singing tubes" demonstration is his most famous. Professor Knipp is a member of the American Physical Society, American Institute of Electrical Engineers, The Optical Society of America, Society for the Promotion of Engineering Education, American Association for the Advancement of Science, Indiana State Academy of Science, and the Illinois State Academy of Science of which he was president in 1921. His name is listed in "Who's Who" and in "American Men of Science." He has been initiated into Sigma Xi, Phi Beta Kappa, Tau Beta Pi, Synton, and was one of the first faculty men initiated into Eta Kappa Nu.

Congenial PROFESSOR CARROLL C. WILEY was born in Edinburg, Illinois, the son of a Methodist minister. As a result of frequent moving, he received a diploma from two high schools in the same semester. When he was graduated from the University of Illinois in 1904 he was a member of Tau Beta Pi and Sigma Xi and had attained the rank of First Major of the Cadet Corps. Following graduation he worked for the Weir Frog Company, the Lorraine Steel Company, and the American Bridge Company. But in 1906 he returned to our campus to teach civil engineering and to study for the C.E. degree which he obtained in 1910. Professor Wiley is a member of the American Society of Civil Engineers and a charter member and past president of the central Illinois section of that society. A member of the Illinois Engineering Society, he has twice served as chairman of its road and street committee. He is also a member of the Institute of Traffic Engineers, Society for the Promotion of Engineering Education, and Alpha Kappa Lambda. Among engineering literature are his books "Principles of Highway Engineering" and "Route Surveying," which Professor Pickels helped write, and many articles. His interest in photography and travel has been pushed to the background by such engineering work as the writing of texts, supervision of experimental work, and advisory work on highway and construction jobs. His special interest has always been in traffic engineering. It was through his efforts that the design of Illinois license plates was changed in 1938. His idea of engineering is that it is simply applied common sense.





S. Sachs ●

N. E. Dillow ●

G. D. Walraven ●

GEORGE WALRAVEN, our student colonel, just missed being a fire-cracker by two days, back in Centralia in 1917. After a short sojourn in Washington, D. C., the Walraven family returned to the Middle West and now live in Decatur. George kept busy at Decatur high school by playing football, running the mile, holding class offices, as president of the Hi-Y club, sports editor of the annual, and business manager of the school's stage productions. In 1935 he decided that the University was the proper place to get a college education because of its reputation and the moderate costs. A chemical engineer, his special interest is in the chemistry of oil. Perhaps his education has something to do with his ability to get along with the president of W.G.S. When a freshman, George thought that it would be fun to ride horses so enrolled in the cavalry. This year he holds the highest rank in the University brigade. He is president of the military council, a member of Scabbard and Blade and of the cavalry club, honorary captain of Pershing Rifles, and a member of the Student Senate. He was a member of the Pershing Rifles drill team for the last three years. George has learned to like riding so well that he now counts it as one of his hobbies, along with camping and collecting first-hand fish stories. Earning his room and board through N.Y.A. work, meal jobs, and shoe selling, has kept him more than busy during the past three years. During the last two summers he attended military camp and worked at the Gary plant of the United States Steel corporation.

In EUGENE DILLOW'S case it's "like father, like son." His father is group superintendent of a public utility company and Gene wants to get into power transmission work after he graduates. Born on August 2, 1918 in Dongola, Illinois, he has been on the move through central and southern Illinois ever since. During his three years at Christopher high school he balanced a five point average with debate, dramatics, band, editing the school paper, working on the annual staff and being manager for the athletic teams. Instead of going back for his senior year, Gene enrolled at Culver-Stockton college in Canton, Missouri. His interest in music, dramatics, and debate continued and he joined Pi Kappa Delta, the forensic honorary. During his sophomore year he was advertising manager of the paper. The reputation of the University among practicing engineers attracted him and he enrolled here as a junior in electrical engineering. He is a student member of the American Institute of Electrical Engineers, Phi Kappa Phi, Tau Beta Pi, and Eta Kappa Nu. He worked in last year's electrical show and is now continuing his journalistic career on the business staff of the Technograph. His high school hobby, radio, has been sadly neglected of recent years. For the past two summers he has travelled about the state as field cashier for an electrical utilities construction company.

SAM SACHS, the second son of a Chicago grocer, was born on August 14, 1917. While a student at Roosevelt high school, Sam became interested in play production, which is still his favorite pastime. He was also active in the Hi-Y club, civics club, and served on the Prom committee during his senior year. Sam took life easy for the first two years after graduation and attended Wright Junior college. Finally captured by the romance of engineering, he entered the University of Illinois in 1936. He immediately made a visit to the Theatre Guild office in the heart of Lincoln hall and has worked on the crew of almost every show produced since then. His biggest job was the designing and construction of the sets for the recent production "Tosca." Last spring he was chosen as senior production manager, the first time such an office has been given in the Illini Theatre Guild. He spent the summer just past as technical director for the Summer Theatre. He is a member of Mask and Bauble, Arepo, and Pierrots. Blue Pencil, senior men's honorary, and the American Society of Mechanical Engineers list his name on their membership rolls. At the Mansion House he has been house secretary, social chairman, and president. To keep himself in pocket money during the long hard winters, he has designed machinery for the Illinois Tool company and does construction work for the Engineering Experiment station in the M.E. department. His professional ambition is to become chief design engineer for the best company he can find. Sam claims, "There have been an amazing number of women in my life."

Engineers Are Active . . .

After a Thorough Investigation, Don Stevens Concludes that the Boys from North of Green Street Help Run Campus Activities

Dirty, greasy, ill-mannered men who study until two in the morning and have massive *slip-sticks* projecting from the pockets of misshapen, corduroy trousers as they ambulate about the campus north of Green street—these are the engineers. At least this is the engineer as the suffering students on the *other* side of Green street usually think of him. The law, the L. A. and S., the commerce students look upon him as a grind. "The engineers do not have time for activities," they maintain. It's time for us to correct these mistaken ideas and to give a true picture of the hard working engineer.

Engineers are not *dead-heads*. Many boast a long list of activities other than engineering activities. Others have one or two outside interests. Engineers making Ma-Wan-Da last year included Hal Goeke, student colonel, and John Robinson, trackster. Sachem, junior honorary, initiated Loren Ashwood, Bob Diefenthaler, and George Farnsworth a year ago, and Erwin Dueringer last spring. Ashwood is track manager; Diefenthaler, track captain; and Farnsworth, after three years on the business staff of the *Illini*, is circulation manager of the *Siren*. Erwin Dueringer is comptroller of Sigma Phi Epsilon and is a member of the Y. M. C. A. Cabinet. He serves on the Illibuck committee of Sachem and is a member of Star and Scroll. Most of his activity associates do not realize that he is an engineer—possibly because he wears a tie and combs his hair.

Members of engineer Diefenthaler's track squad are James Mulford, Wayne Yarcho, and H. C. Whitmarsh. The Varsity Men's Glee Club includes Bernard Epstein, Stan Howell, Ross Lemmon, and Don Stevens from the north campus. Workers for the Theatre Guild are construction crew head Sammy Sachs, his assistant, Louis Wahler, and Erv Mueller, and Dave Stinson. Ken Brooks, the Homecoming badge chairman of last year, served as a cheerleader for the past two years. Tom Morrow is a member of the Y. M. C. A. board of directors and serves as chairman of the meetings committee.

Engineers form a large part of the famous Illinois bands. Among the Concert Band boys are Ken Ackerman, Ed Dolch, H. D. Eglin, John Engstrom, Elwyn King, Ken Malick, Charles Mantz, Clarence Sandy, Howard Yarnell, and Al Hatch. Some 25 engineers are to be found in the ranks of the First Regimental Band and 20 others are in the Second "Reg."

Leo Sainati pitched for the Illini baseball nine last spring. Norm Fehrm is a member of the Dolphins and Joe F. Smith is a sophomore football manager. George Perkins, swimming manager also serves as head usher during the football season. Travelling over to the esthetic side of University activities we find that Dan Hazen is a member of the University Concert and Entertainment Board. Allen Adams works for the Star Course.

Among the politicians, engineer Norm Seip is president of the Junior class and a member of the Student Senate. Frank McKelvey won a seat in the Student Senate last fall and he is also a member of the board of directors of the Illinois Union.

Down in the Armory, chem engineer George Walraven runs the show as student colonel. Other members of the Military Council who are from north of Green are Ed Fraser, Maurie Carr, Phil Clementz, Art Brown, Bill Dunn, Ray Hicks, and Ken Gonseth.

These engineers are engaged in south campus or all-University activities. No mention has been made of the men in engineering activities. There are eight student branches, the Engineering Council, four all-engineering fraternities, five branch fraternities, and the Technograph. The engineers sponsor St. Pat's Ball, the Electrical Show, and the Illinois Student Engineering Exhibit.

Who will now claim absolute monasticism as the only forte of the engineer? He is as human as anyone in this University. According to polls conducted during the past several years, the engineer spends 32 per cent of his time in classes and doing homework, 30.8 per cent in sleeping, and 37.2 per cent of his time in activities. The engineer is not just a grubbing, greasy bloke—he is an average active student.

Wood Comes Back

(*Continued from Page 5*)

placed with regard to the center line of the arch. Th only nails used were those necessary to hold the boards in place while the glue was being applied. A water resistant, casein glue was used. After the glue had been applied, the arch was subjected to a uniform pressure while it dried.

The hinges upon which the arch rested were hardened steel knife edges which were embedded in steel castings which were in turn embedded in heavy concrete blocks. Th concrete blocks were tied together with two, 2-inch nickel steel rods which resisted the horizontal thrust of the columns when the arch was loaded. Provision was made to measure the amount of horizontal thrust and also that the span of the arch would remain the same during the entire test.

The tests were made to determine the relationship between the actual stresses produced in the laminated arch as computed from the strains measured in the laboratory and the stresses as calculated by means of the elastic theory applied to the two hinged arch. The actual value of the force of horizontal thrust was also compared with the theoretical value.

The arches were tested by loading them in a 300,000 pound testing machine. The load was distributed from the movable head to the six arch-load points by means of a system of levers. Strain gauges were placed on every lamination on both sides of the arch at each of the seven strain sections. Small nails were used with these strain gauges on two arches but it was found that regular strain gauge plugs gave more accurate results. All strains were measured over four inch gauge lengths. On one arch, measurements were made between laminations to determine the amount of slip.

The relationship between the calculated and measured stresses is shown in the figure. The straight line represents the computed values, which very closely approximate the measured values. Probably the two most important reasons for the difference between the test data and the straight line are the weakening due to joints in the laminations and weakening due to slip between laminations because of poor glueing. Other factors having an effect are non-uniformity of the wood; the shifting of the neutral axis as the load increases, an action typical of wooden beams; and the increase in stress in the wood past the proportional limit stress. That increasing the stress beyond the proportional limit value has an effect is evidenced by the increase in the variation between the calculated and measured values of stress after the proportional limit stress has been exceeded. However, the theoretical and actual values check very closely. The same is true for the horizontal thrust forces. The evidence would indicate that the laminated timber arch acts very much like an ideal or theoretical arch.

The ultimate loads that the different arches withstood varied from 101,000 pounds to 137,000 pounds. The arches with the thicker laminations stood up a trifle better than the ones constructed from thinner sections.

Preparations are being made for the testing of two-hinged rigid frames. It is probable that these members will be stronger than the arches for a better method of fabricating and gluing has been discovered since the arches were made. The joints are scarged diagonally and end glued in the new specimens. The results of the first set of tests show that the laminated timber structural member is practical and already a few buildings utilizing this type of construction have been built.

Our Societies

(Continued from Page 6)

MU SAN

The annual formal initiation was held December 18 with seven active members and five faculty members present. The men initiated were:

Lawrence Bremser	George Kennedy
Robert De Jonge	James Mulford
George Fieldhouse	Harold Nelson
John Hallden	Steven Nichiporuk
Otto Hallden	Harold Wustman

W. H. Wisely '28, Assistant Sanitary Engineer of the State Department of Public Health, spoke at the meeting and recommended that the seniors search for favorable working conditions.

RAILWAY CLUB

On November 9, at the brakeshoe laboratory, behind the Transportation building, Professor H. J. Schrader demonstrated the method used in testing brake shoes. In the past, this work has been very valuable to the railroads, and new tests are constantly being made.

The Railway Club, which thus far has had unusually good attendance at its meetings, has planned several interesting programs for the remainder of the year.

Fifteen persons turned out when S. H. Pierce, instructor in G.E.D., showed two reels of movies on the Chicago elevated lines at the last meeting of the Railway Club. Mr. Pierce, who has worked for the "L," gave a very enlightening description to accompany the picture. All railway fans are urged to come.

TAU BETA PI

On Sunday, January 15, Alpha of Illinois chapter of Tau Beta Pi recognized the outstanding scholarship of the following men by formal initiation:

Amos W. Bateman	Charles D. Evans
Harold Bunte	Alfred B. Horn
John E. Cordes	Ralph J. Johnson
Robert S. Darke	Roy E. Lorentz, Jr.
James F. Dick	William D. Lyon
N. Eugene Dillow	Lewis E. McCown
Edward D. Ebert	Thomas M. Morrow
Melvin E. Eilers	M. Milburn Pehl
Bernard Epstein	John H. Wetzel

Richard A. Wetzel

The initiation was followed by a banquet which was attended by both student and faculty members. Dean M. T. McClure spoke on "The Atmosphere of Scholarship."

KERAMOS

At a banquet held November 17, eight students were initiated into Keramos, selection being made on the basis of character and scholastic achievement. The neophytes are:

Justine Boeker	John Morris
Val Cichowski	Jack Veale
George Eyerly	John Webber
Vaylord Luster	Allen Young

Work has begun on enameled porcelain plaques being made for the members. The plaques are in the shape of the fraternity pin and are enameled gold and black, the colors of the pin. Pictures of the group were taken for the *Illini Ceramist*, the yearbook published by the S. B. A. C. S. A committee has been appointed to assist in the promotion of Ceramics registration.

PI TAU SIGMA

The election of second-semester officers was held January 11 following the initiation of Assistant Professor L. H. Thomas of the department of Mechanical Engineering. The officers are:

Stan Baker .... *President*
Durwood Evans .... *Vice President*
Vernon Zwicker .... *Treasurer*
Frank Rasmussen .... *Recording Secretary*
Roger Campbell .... *Corresponding Secretary*

Ten men were initiated at the fall election:

Richard Akemann	Keith Carter
Merrill Anderson	Oliver Durrant
John Bunting	Edward La Bond
Sam Capizzi	Leonard Minick
Walton Carlson	Robert Sutherland

The annual presentation of *Mark's Mechanical Engineer's Handbook* was made January 11 to Rune E. Levine, whose freshman average was 4.7. The handbook is given in recognition of scholarship to the sophomore Mechanical Engineer who made the highest scholastic average for the two freshman semesters. The presentation was made preceding the technicolor sound movie, "Steel—Man's Servant," in the Lincoln Hall Theatre.

Bromine from the Sea

(*Continued from Page* 7)

of cells, each 21 feet long and 15 feet wide. The intake was 200 feet long, and these cells were made one at a time and filled with sand dredged from the channel. Fifty foot, steel, interlocking piling was used and the piles were driven with water jets.

From the intake the water flows into a settling basin where foreign particles are removed. At the far end of this basin are four concrete cells, the first three having floating strainers to catch floating logs, while the fourth has a conveyor screen which removes any small floating debris. At the end of the basin are two centrifugal pumps of a combined capacity of 58,000 gallons per minute, which raise the water over a concrete dam so that it cannot flow back into the sea when the plant is not in operation. The water flows across the peninsula to the plant. In warm weather the water is sidetracked through a shallow pond where it is warmed, thus making the process more efficient. The extraction plant is located near the river and about five feet above it. Some excavation was done in order that the water would not have to be pumped to such a great height during the process.

In the actual extraction process the water is pumped to the top of the blowing-out towers in a 42-inch, rubber-lined, pipe. At the bottom of this pipe the acid is introduced from a number of small rubber-lined pipes, and a little further up the chlorine is introduced through several similar pipes. At the top the water passes through box distributors where it is broken into 3,200 smaller streams before being introduced into the tower. Air is drawn through openings at the bottom of the tower and passes upward in a direction counter to the flow of the water. This chamber is filled with wood cuttings. The water leaves the bottom of the tower and is emptied into the river. The air, now carrying the liberated bromine, passes into the absorption tower where a soda ash solution is sprayed through the bromine laden air, absorbing the bromine and forming sodium

(*Continued on Page* 15)

• NORTH OF GREEN •

Did you know that "Huey" Long, Effingham's contribution to the senior engineers, used to ride home every week-end on his motorcycle? He has discontinued the practice this year so that he can stay on the campus and study—or is it because you have some "femme" keeping you here, Omar?

A nomination for one of the junior classes' smartest boys goes to Ernie Richards. His chief dissapointment about last year was that he got only a "B" in M.E. 87. Imagine a "B" in an engineering course being a disappointment!

August Chiary doesn't mind expressing his preferences with regard to the form of equations. In senior design class he recently took Mr. Brielmaier to task for setting up an equation in a slightly revised form: "I always like to have the constant in the numerator, so change it please."

Upholding the reputation of the class of '42 at the Freshman-Faculty dinner were some 135 of the Frosh. Professor H. F. Moore gave a talk that kept even Bob Taylor, Cer.E., awake. Roy Hammar and Don Stevens sneaked into positions at the speakers' table for reasons that we cannot fathom. Bob McCreary and Erwin Dueringer, co-chairmen of the event, receive many compliments on their program.

For a complete description of the effects of "zombies" upon the human body we refer you to George Trees and Frank McKelvey. On the inspection trip they conducted a thorough-going research project, the results of which they have so far kept a secret.

Seven engineers were among the group of fifty recently initiated into Phi Kappa Phi, national scholastic honorary. They were: Gene Dillow, E.E., Bob Gaines, M.E., Bob Holmes, Ch.E., Al Horn, E.E., Vi Sing Hyue, G.E., Harold Kleckner, M.E., and Kenny Poarch, E.E.

Many T.&A.M. 3 students got their first glimpse of the photoelastic, fatigue, and rail-investigation laboratories on a short inspection trip through the Talbot laboratory after Christmas vacation. Every day visitors from other cities come to see the laboratory, but students seldom get any further than the crane bay railing.

Students in M.E. 87 had guilty looks on their faces recently when they found out that they hadn't been getting away with anything but that their instructors knew that they had been fudging time on their shop work.

Either our Illini Engineers are just good boys or their follies are well concealed, judging by the difficulty we have in getting wind of their activities in off hours.

Where does Ernie Richards, of the "B" mourning fame, go, all dolled up, nearly every Monday or Tuesday night?

The boys in Mr. Fett's E.E. 25 classes respect his Solomon-like wisdom. Just before the Christmas vacation he delivered this bit of wisdom: "Now I don't want any of you to take any books home over vacation. You certainly won't even open them, but if you have them with you, they'll just haunt you and spoil your vacation." How sad—but, oh, how true!

Bromine from the Sea

(*Continued from Page* 13)

bromate and bromide. There are several of these absorption towers in series in each extraction unit and as the concentration of the bromine in the soda ash solution reaches a certain point in the first tower, it is drained out, all the other solutions moved to the next tower, and a fresh solution started at the end tower. Each absorption tower through which the bromine laden air is passed has a soda ash solution having a lower bromine concentration than the last. The floor of each absorption tower is elevated on concrete arches for two purposes: 1) to obtain gravity flow of the soda ash through the tanks below, and 2) to make the detection of leaks in the floor more simple.

The sodium bromide-bromate solution is stored in tanks and when it is desired to remove the bromine, the solution is acidified and the bromine distilled off. Ethylene dibromide is also produced in this plant. This is done by passing ethyl alcohol over a heated kaolin catalyst to form ethylene. Ethylele dibromide is made by bubbling the ethylene through liquid bromine at about 32 degrees Fahrenheit.

The acid used in the process is sulfuric acid and is delivered to the plant in the concentrated form. It is diluted in rubber-lined tanks, 16 feet in diameter and 10 feet high. The chlorine is kept in tanks that hold one ton each. These tanks must be kept at about 70 degrees Fahrenheit. The chlorine is conducted to the 42-inch mixing pipe in liquid form and is vaporized in a steam jacketed vaporizer.

The control laboratory for the process has meters which show the pH of the water and the oxidation potential of the liberated bromine. The valves which control the acid and chlorine are now hand operated but will be made automatic by coupling them to these two meters.

It is interesting to note that the plant power house produces steam for heating and evaporating purposes only. Electrical power is purchased. The plant has it own boat which brings in all supplies from Wilmington, North Carolina, which is twenty miles away.

The plant, which was completed just five months after the plans were begun, is now producing 15,000 pounds of free bromine a day which is being converted into about 16,000 pounds of ethylene dibromide with an efficiency of something over 90 per cent. As has been said before, this plant is unique in that it is the first successful plant for the removal of elements from the waters of the ocean. It may be the first step in the fulfillment of man's age-old dream of extracting gold from the sea.

• TECKNOKRAKS •

Down south there lived a negro who was crippled and consequently was unable to do any work. His wife was blessed with the uncommon name of "Combustion." And as a result of this, he was called "Nitrogen," because he was unable to support "Combustion."

* * *

"Hey, Bill, your doctor's out here with a flat tire. He wants to know what it's going to cost him," announced the garage owner's assistant.

"Diagnose the case as flatulency of the perimeter, and charge him $5.00," came the answer.

* * *

A Frosh on his first field trip had caught a butterfly in his net and had run straightway to the Professor who was on his 106th field trip.

Frosh (excitedly): "What do I do now?"

Prof. (sarcastically): "Climb up the pole and stab it."

* * *

"Well, and what did you think of the beauties of the Maine Woods?"

"Didn't see a single girl after leaving the depot."

* * *

Things that never worried Grandma:

Middle Age Skin
Dishpan Hands
The Dishpan Line
Halitosis
B. O.
Lost S. A. (Stocking Appeal)
Pink Toothbrush
Acid Skin
Honeymoon Hands
Skin Vitamin
Tattle Tale Gray

* * *

First Prof.—"The students were so entranced in my lecture room that they forgot to leave at noon."

Second Prof.—"Why didn't you wake them up?"

* * *

There's no excuse for anyone being a failure these days when you can get a book free that will tell you all about how to be a success.

One day Aunt Ella was explaining the meaning of various words to her young nephew. "Now an heirloom, my dear, means something that has been handed down from father to son," she said.

"Well," replied the boy, "that's a queer name for my pants!"

* * *

"I want a shave," said the sergeant as he climbed into the barber's chair. "No haircut, no shampoo, no rum, witch hazel, hair tonic, hot towels, or face massage. I don't want the manicurist to work on me, nor the bootblack to handle my feet. I don't want to be brushed down, and I'll put on my coat myself. I just want a plain shave, with no trimmings. Understand that?"

"Yes, sir," said the barber quietly. "Lather, sir?"

* * *

"So I told the freshman to indorse the check his family had sent him."

"Did he do it?"

"Yes, he wrote on the back, 'I heartily indorse this check.' "

* * *

She: "Do you think there are divorces in heaven?"

He: "I don't think so. You can't get a divorce without a lawyer."

G-E Campus News

NEW-TYPE STREAMLINER

A NEW-TYPE 125-mile-an-hour streamliner the 5000 horsepower steam-electric train now being put through its final tests by G-E engineers—soon will be speeding on its first westward run over the Union Pacific's historic "Overland Route."

Nearly two years have been spent by General Electric and Union Pacific engineers in designing and building the streamliner. The result is that the power plant of the new train is capable of doing twice the work of a conventional steam locomotive for each pound of fuel used, and of making three times the mileage without stopping for fuel or water. Six large motors in each of the two cabs drive the locomotive, the electricity being supplied by a geared turbine-electric generating unit similar to those used on many ships.

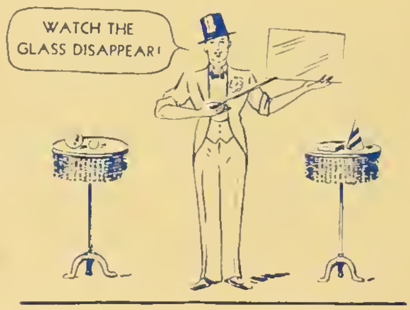
As the new 15-car streamliner speeds between Chicago and the Pacific Coast, at times winding through passes more than 7000 feet above sea level, it will be another symbol of the constant search by General Electric's transportation engineers for more efficient means of travel. This search is one in which the engineer with years of experience gives invaluable training to the Test men young student engineers recently graduated from college —who assist him.

TELEVISION AT THE NEW YORK WORLD'S FAIR

IF YOU have a favorite line or two from Kipling or a famous Shakespearean speech you like to give now and then, consider the *ne plus ultra* of settings for the presentation—a complete television studio, with an audience as standard equipment, recently announced by Dr. W. R. G. Baker, Union '16, managing engineer of the General Electric radio division and an ex-Test man.

For you are invited to turn actor in the G-E building at "The World of Tomorrow," the New York World's Fair. At your service will be a program director, who will initiate you into the experience of acting before the camera, and complete television equipment of the latest design—receivers, camera, transmitter. And between acts you will be able to see and listen to programs that are being broadcast by television stations throughout the New York area.

Demonstrating television to the public is not new to General Electric engineers. Nine years ago, Dr. E. F. W. Alexanderson—one of the G-E consulting engineers and an ex-Test man—and his assistants demonstrated television to a theater audience in Schenectady. But great advances have been made since then, and when you act for your friends at New York you will be using the latest equipment that science has to offer.



NOW YOU SEE IT— NOW YOU DON'T

IN THE G-E Research Laboratory, at Schenectady, there is a framed photograph which at first glance does not appear to be unusual in any way. But when it is viewed from an angle at which the glare of light reflected from the glass becomes noticeable, the picture does tricks —part of it becomes almost obscured by the glare, yet the rest remains clearly visible.

The explanation is that each surface of the clear portions of the glass is coated with a transparent film—a film four millionths of an inch thick, or one-quarter wave length of light, and having the proper refractive index. These films, recently developed by G-E scientists, cause the light rays reflected from the film surfaces to counteract one another. The reflection of light from the glass is thereby prevented.

Whereas the process is still in the laboratory stage, it is believed that it will soon be available for many optical uses.

GENERAL ELECTRIC

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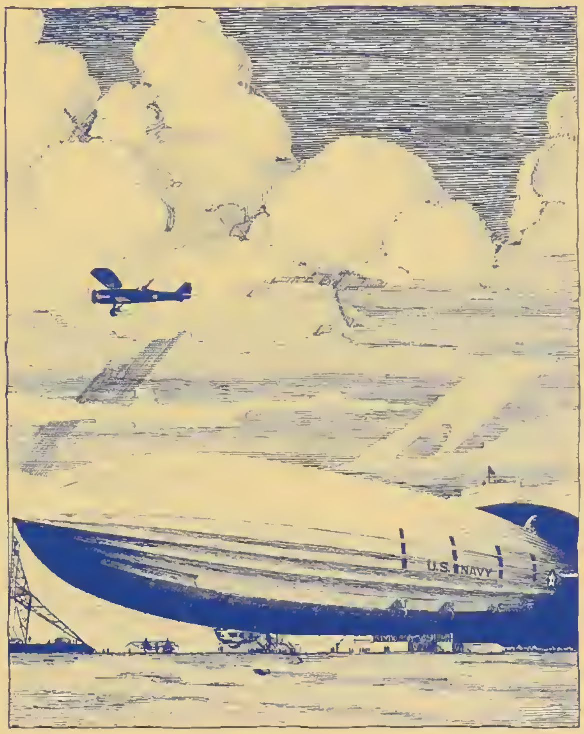
THE TECHNOGRAPH

UNIVERSITY of ILLINOIS



MARCH 1939

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MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

MARCH, 1939

Volume 53 Number 5

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One often hears the expression, "Times are changing." This is as true in engineering as it is in any other part of our economic system. Industry is now calling for an engineering graduate with a different type of education than the one that most technical schools have been furnishing their students. Maynard Hufschmidt, a senior, looks over the situation, and drawing upon the experiences of four years of engineering education, gives some useful advice for those who are just starting out.

● The third biennial Engineering Open House will be held this spring. The Engineering Council has set the date for the first week-end in May and preparations have begun. Read in this issue a preview of this great show that exhibits the educational advantages of our college.

● The Technograph wishes to apologize for not giving credit to *World Petroleum* who furnished the frontispiece for the February issue.

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Courtesy Metals and Alloys

YESTERDAY

Courtesy Metals and Alloys

TODAY

THE ILLINOIS TECHNOGRAPH

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Engineering Education

A Senior Looks Back and Then to the Future

by
MAYNARD HUFSCHMIDT

William Lyon Phelps, Yale's famous Professor of English, in a conversation with a prominent eastern engineer, asked him, "What studies in college would you advise for one who intends to become a civil engineer?"

The successful executive replied with no hesitation, "Anything—so long as it has no connection with engineering!" The engineer then amplified his statement by citing the cases of young engineers in his employ. The graduates with a strictly technical education surpassed their more broadly educated fellows at first, but soon fell behind them. He attributed this to the advantages possessed by the more liberally educated men because of their wider background.

The attitude of this engineer is typical of the point of view of our business, educational, and governmental leaders toward engineering education today. There was a time when, seemingly, industry could not get enough highly specialized men. Except for a few industries, notably aviation, the situation has changed and men with specialized education find it difficult to find places to use their training. As long as industry was expanding, it encouraged the education of specialists; in fact, many schools were founded in order that the supply might meet the demand. But the drastic curtailment of production which occurred during the past decade depleted this market for the specialist. The business upturn of 1937 found a new type of engineer in demand; one whose technical training had been supplemented by education in other fields.

Surveys conducted by engineering schools have borne out the fact that it is the broadly educated engineer who achieves the greatest degree of success. A survey by the University of Michigan covering its engineering graduates during the period from 1925 to 1936 found that starting salaries fluctuated with business conditions, being highest in 1929 and lowest in 1934. The significant finding of the survey was, however, that during the depression years the engineer did not always get work in his specialty. Hence the engineer with a broader education had the advantage, in the sense that he was better adapted to meet existing conditions. This survey also showed that, after 10 years of employment, men who had advanced the most were those with wider educational horizons: the men who had engaged in activities and had tried to increase their non-technical knowledge.

A survey by Pennsylvania State College showed substantially the same results. Certain exceptions should be noted here: chemical engineers and men trained in aeronautics have no difficulty in procuring jobs and advancing rapidly. This may be attributed to the rapid expansion of these industries and to the shortage of experienced men. But the opposite trend is shown in civil engineering, which field finds increasing difficulty in absorbing all its graduates each year. Many civils are now branching into other fields, where their success is dependent upon their ability to meet new situations.

An increasing number of engineers are finding employment in government work. For many years the government has hired engineers as purely technical men. Recently, with the broadening of governmental activities and the increase in economic planning, engineers have been hired to serve in advisory capacities. There is every indication that this trend will continue. To be a success in these new governmental positions, an engineer will need a much wider knowledge of affairs than a purely technical education can give him.

What are the engineering schools doing to meet the challenge of these changing conditions? Two trends in engineering education have been noted: Some industries, who feel that the schools do not fully meet their needs, have set up technical schools of their own. The aviation industry is a good example of this; several fine technical schools have been opened in California by the leading airplane manufacturers. The radio industry also has its own technical schools for training personnel. The engineering colleges, however, are moving in the opposite direction. Several eastern schools, notably Cornell, now require two years of education in liberal arts before enrollment in engineering, thus lengthening the educational term to five years. A few schools, including the University of Illinois, have set up courses in general engineering, in which the attempt is made to give a more general education, yet retain the four year course. Some engineering educators are advocating the retention of the specialized four-year curricula, but the reduction of the courses in each curriculum to the study of fundamentals that can be retained by the student. The time that would be gained in this manner would be used to give the student a more general and more liberal education. These attempts, while indicative of the future methods for training engineers, are still too few to have much effect upon the majority of engineers now attaining their education.

What, then, is the student who attends the average engineering school to do? Must he accept the fact that his course is laid out for him and let himself be molded by it alone? Indeed not! He can do a great deal for

(*Continued on Page 11*)

I SEE

Students Present the Third Open House

by FRANK BUTTERFIELD

A full sized locomotive running at top speed without moving an inch, the step by step production of building brick, concrete cylinders subjected to a squeeze of 2,000,000,000 pounds—these are some of the sights which will greet the 10,000 visitors to the Engineering Open House at the University of Illinois. This public exhibition, formally known as the "Illinois Student Engineering Exhibition," is intended to show guests, by means of routine tests and activities, the basic principles of engineering. It is one of the few times the College of Engineering may be observed performing all its normal operations at one time.

The Mechanical Engineering department, the largest department in the college, will have in operation its laboratory engines—auto, diesel, steam, and gas. The huge heating, refrigerating, and air conditioning equipment will be of interest to many since the recent commercial applications in these fields. In the shop laboratories students will be pouring cast iron, brass, and aluminum, running the machine tools, and operating the little gasoline engines manufactured in these shops. Periodic demonstrations will be made of steel hardening and heat treatment.

In the Transportation building spectators may see the General Engineering Drawing department in full swing, drafting, lettering, rendering, and reproducing drawings. The department of Mining and Metallurgy has prepared exhibits of mine construction and operation and will display blasting and surveying equipment. Operation of pneumatic drilling equipment and assay apparatus will be explained. The department is especially proud of its new metallurgical laboratory where a great deal of work has been done on the micro-structure of metals and fatigue in welded joints.

Almost everyone will linger in the Physics building before the fascinating demonstrations of the properties of fluid air and of intricate glass blowing. Many historic and spectacular experiments will be performed here with electrical and magnetic apparatus. Electrical discharges and ion activity are especially beautiful.

In the kiln laboratory of the Ceramics building students will be kept busy operating brick making, clay mixing, and sand blasting machines and burning materials in the kilns and furnaces. Visitors will see the manufacture of pottery by jiggering and casting and the strength testing of pottery and porcelain. On the second floor will be microscopic studies of ceramic materials and exhibits of iron enameling.

In the locomotive laboratory, where important brake shoe research has been carried on, an Illinois Central locomotive will be in continuous full-load, normal-speed operation on its test mounting. Traction tests and fuel consumption tests will be run several times during the program. The Railway Engineering department's test car, an electric car equipped for making motor performance investigation and rail tests, will be on its siding just north of the locomotive lab. The department also has displays of signal block systems and historic apparatus.

Student civil engineers will demonstrate the use of a triangulation tower and surveying equipment. Distributed about Engineering Hall will be pictures and models of important hydraulic projects, bridges, and highway development work. Military engineers will display bridge models and explosive equipment. Visitors interested in agriculture should be sure not to miss the Agricultural Engineering and soil conservation equipment.

In the Electrical Engineering Laboratory visitors will learn the principles and latest developments in radio, television, and telephone as well as the cost of operating standard household appliances. Demonstrations will be made of electric and magnetic measurements, vibrations of quartz crystals, and the transmission of sound over light waves. In the Electrical Engineering Annex spectators will see startling direct current discharges in the high voltage laboratory, and lighting equipment and fundamentals in the illuminating laboratory.

Perhaps the most interested crowd will gather in the Talbot laboratory when four-foot reinforced concrete cylinders are crushed by a 2,000,000,000 pound pressure in one of the world's largest testing machines. Routine tests will also be made on steel, cast iron, and timber members. In the hydraulic laboratories may be seen water pumps and turbines and displays of sanitation and water supply.

Everyone is invited and there is no toll. All this display will take place in May when, for the third time, the College of Engineering opens its doors and puts on this great exhibit for anyone who wishes to attend. The show is a student responsibility and is entirely of student planning and execution, but receives the utmost co-operation from members of the faculty. Thus it is a true exhibit of the educational facilities of the College of Engineering of the University of Illinois.

Infant

Meet the baby of the Mechanical Engineering family—M. E. 84, Welding. Yes, the course in welding has at last been started. After three years of planning and preparation the new laboratory in the Foundry building has been completed and this semester has been put into use.

The course is taught for senior mechanical engineers who have had the course in the heat treatment of metals, M. E. 89. The two hours of classroom work each week are devoted to a study of the uses and processes of welding. The three hours of laboratory work furnishes experience in both oxy-acteylene and arc welding. The purpose is not to make welders out of the students, for that actually requires months of practice, but rather to teach them to know when, where, and what kind of welds can be used in design work. Instruction is being furnished by Professor D. G. Ryan and Mr. R. D. Williams.

Railroad Evolution

Intricate Steel Castings Replace Fabricated Parts

by GENE STERNBERG

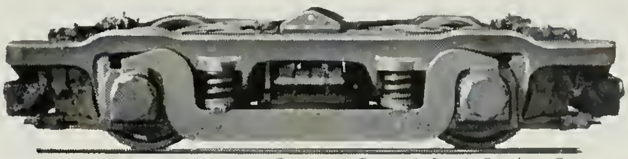
From the days when railroad freight and passenger traffic was confined to a few hundred miles of track that lay between the principal Eastern cities till the present time when a network of railways serves every part of the country, the greatest expense of providing and maintaining efficient transportation facilities has been the construction and up-keep of the power and fuel units of trains, the locomotive and the tender.

The first locomotives and tenders, built up from many parts, were a constant source of expense to the railroads. This expense consisted for the most part of replacing the fasteners used to hold the parts of the frame together and to attach such parts as the cylinders, front deck, air pump brackets, and engine truck center pins. The bolts underwent so much strain due to the vibration of the engine that they were worn or sheared off and many of them had to be replaced several times between shoppings of the locomotive. Machinists often had to ream out the old bolt hole and replace the bolt with a larger size. It was not uncommon for a set of bolts one and one-half inches in diameter to be increased to as much as two and one-fourth inch bolts. This increase lessened the amount of metal between bolt holes and eventually frame cracks resulted, which simply entailed more expense.

Immediately following the World war, railroad engineers began to plan the construction of the one-piece locomotive bed which would do away with much of the trouble given by fabricated beds. The development was slow and many difficulties were encountered before the frame that is used today was evolved. It had already been determined that the empirical design formulas for cylinders could not be applied to a one-piece bed and consequently the first beds had to be comparatively simple in design, incorporating only the main frame with cross braces and front deck. Even this simple bed made it necessary to discard old practices of the foundry and finishing departments for the designer's work was changed from the determination of the number, strength, and spacing of the holding bolts and rivets to the determination of the distribution of the metal throughout the casting so that maximum strength with minimum weight might be obtained.

After the development of the first bed, the advancement of the integral locomotive structure came more rapidly. The cradle was added in 1924 and the steam cylinders, heretofore the greatest cause of trouble in frame loosening, were incorporated in 1926. At the same time the boiler saddle was made an integral part of the frame and thus a steady support for the boiler was insured. Since that time other parts of the locomotive have been incorporated as a part of the bed structure till the old fabricated structure has become almost extinct except for old switching engines. That the unit bed is used extensively is evidenced by the fact that forty-two railroads in the United States, Canada, and Australia have equipped approximately 1,650 locomotives with the bed since its inception. The permanent alignment of the various parts, the impossibility of frame loosening and the greater strength of the cast steel unit bed have all helped to lower the maintenance bills of the railroads.

Along with the development of the unit bed came improvements in other parts of the locomotive. The pilot, or "cow catcher" as it is popularly known, has had to be redesigned because of the greater speeds of the trains of today. It is now a strong, one-piece casting and is designed to throw objects away from the engine and not to deflect them under the locomotive.



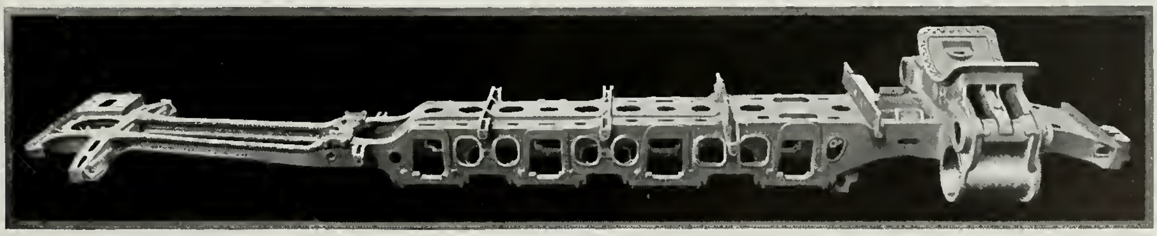
—Courtesy General Steel Casting Corp.

Four-wheel Truck

The guiding trucks have been redesigned for greater strength and so that they would distribute the weight evenly whether the train was on the straightaway or a curve. This even distribution has done away with much of the vibration of the locomotive. The greatest improvement in the drivewheels has been their redesign so that balance is obtained. The throw of one drive wheel, when not counterbalanced, can subject the track to a force as high as 30,000 pounds which is applied at what is theoretically a point contact. Drivewheels are now designed and cast as a unit which greatly increases their strength and produces better balance. The trailer or follower truck has also been through the designer's shop and a stronger, evenly balanced unit is now used.

With the advances in foundry practices, it was soon made possible to cast as one piece the comparatively thin fire and ash pans which had been fabricated from rolled stock. In addition to lowering the susceptibility to sur-

(*Continued on Page* 12)



Courtesy General Steel Casting Corp.

Cast Steel Locomotive Bed

★ WHO'S WHO IN ILL

• *A. R. Knight*

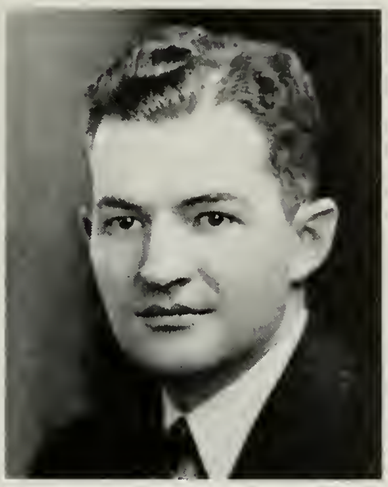
• *H. F. Johnstone*

• *A. I. Andrews*

PROFESSOR A. R. KNIGHT likes teaching and scouting "because they both have to do with boys." His father, professor of Industrial Arts at Ohio State, introduced "Buck" to engineering at an early age. Even as a high school student he spent his spare time and summers at electrical power work. At Ohio State, military and politics were his non-technical interests. After graduation, he taught for two years at the University of Pennsylvania. Coming here in 1913, he assisted in teaching and studied, obtaining his M. S. in 1917 and the professional degree in E. E. four years later. Most of his summers, until recently when scout camp became more interesting, have been spent in working for power companies. Professor Knight is co-author of a bulletin on watt-hour meters and of a book, "Introduction to Circuit Analysis," which will soon come off the press. He is a member of Tau Beta Pi, Sigma Xi, Eta Kappa Nu, and Sigma Tau. Sigma Pi, social fraternity claims him and he is an honorary member of Triangle. He is actively connected with the Faculty Players Club, Masons, Kiwanis Club, Illini Board of Control, Illini Theater Guild, the Episcopal Church, and the Society for the Promotion of Engineering Education. He has been local Scout Commissioner for the past seven years. Atop all these activities, Buck still finds time to be a camera fan and to act in plays on the Lincoln Hall stage.

PROFESSOR H. F. JOHNSTONE was born on a farm in the old South, where he obtained that likeable note that is evident in all his speech. After securing his B. S. degree at the University of the South at Sewanee, Tenn., in 1923 he came north to the University of Iowa to procure his doctor of philosophy degree in chemistry. He was a Sigma Nu as a student and is still active, being a division inspector. After teaching chemistry for two years at the University of Mississippi, he came north again, and he has stayed. He went to work for the Engineering Experiment Station, and the fruits of his labors are recorded in Bulletin 228. In 1925 he was appointed associate professor of Chemical Engineering. Students under his direction have continued his work, which has been on the removal and recovery of sulfur dioxide from flue gases. That he has been to a measure successful is evidenced by the fact that he has obtained 11 U. S. and four foreign patents. Honorary fraternities that claim his membership are Sigma Xi and Phi Lambda Upsilon. He is a Councilor of the American Chemical Society and serves in the American Institute of Chemical Engineers as faculty adviser for the local student chapter, as a member of the Educational Projects Committee, and as a member of the National Student Branch Committee.

PROFESSOR A. I. ANDREWS started life in Baraboo, Wis. He earned his bachelor and master degrees in science at the state university, losing only one year which he spent in the U. S. N. R. While at Wisconsin he captained the track team, his events being the hurdles. And he is still adept at clearing the barriers of life. His professional interest began with chemistry, traveled to refractories, and is now enamels. The doctor of philosophy degree which he holds was conferred upon him at Ohio State where he taught chemistry. After obtaining this degree he spent a year as professor of ceramic engineering at Alfred University. In 1925 he came to our campus as an assistant and in 1933 he had reached his present position as professor of Ceramic Engineering. Along with his duties as a pedagogue he has done a great deal of work for a number of commercial firms. Professor Andrews claims membership in Sigma Xi, Alpha Chi Sigma, Keramos, and Acacia. He serves as chairman of the Committee on Definitions of the Porcelain Enamel Institute. Some 30 articles have been published under his name and the books, "Ceramic Tests and Calculations" and "Enamels" are credits to his authorship. What time he can find, he spends at outdoor sports as a member of the Pollywog Association.


I. T. Chapman ●
J. W. Morrison ●
O. H. Paddison ●

OSBORNE H. PADDISON got his first glimpse of the light of day below the Mason-Dixon line in the deep, deep South of Savannah, Ga., on January 6, 1918. He followed the natural course of elementary education, going through the Savannah grade schools and high school. In high school he was a participant in all the school athletics and in the speech society. During each of his last three summer vacations from high school, he made a trip to Europe, working his way across the waters as an ordinary seaman on various vessels of Uncle Sam's merchant marine. Howie came into the engineering profession naturally, since his father was an engineer before him. Accordingly, after graduation from high school in 1935 and a year at the Armstrong Junior College of Savannah, he journeyed into Yankee territory to the University of Illinois, where he had been attracted by the enviable reputation of the Chemical Engineering department. He pledged Theta Chi, was duly initiated, and is now scholastic chairman. Paddison is president of the student chapter of the American Institute of Chemical Engineers and a member of the Engineering Council. Those swell programs at St. Pat's Ball can be laid on his doorstep. After being graduated next June, he plans to continue his study at the Massachusetts Institute of Technology. His major technical interest is in the petroleum and rubber industries.

JOSEPH MORRISON touched terra firma for the first time in Fieldon, Ill. He attended the local grade school but moved to Jerseyville for his high school training. He was a very busy fellow during those four years, playing football and basketball and foiling the villain by saving Jerseyville's fairest "Nells" in the school plays. After a four year interim between high school and college, he enrolled in engineering at the University of Nebraska where he played freshman football. But destiny led Joe to the Mechanical Engineering department of our University. Here he has an enviable record with scholastic average well enough above the four point mark to warrant a Pi Tau Sigma bid. This semester he is guiding the activities of the student branch of the American Society of Mechanical Engineers and is a member of the Engineering Council. His special professional interest is in the design and construction of internal combustion engines. Joe has spent his summers in the employ of the Western Cartridge company, where he has done everything from pickling brass to pouring lead. But he does not recommend the latter job as a good summer position. At present he is working in the Talbot laboratory on the investigation of reinforced concrete slabs. An avocation is an interest in architecture and he has a desire to draw the plans for his own house.

THOMAS CHAPMAN began life in Robinson, Ill., on February 19 just 22 years ago. Moving to Sandoval, he began his education in the grade schools there, but later moved to Bridgeport before entering high school. In high school his time was taken by band and orchestra, speech, serving as editor of the school paper, and as vice president of his class. He was led by a liking for mathematics and construction work to enroll in the Civil Engineering department of the University of Illinois. Here his activities have been many and varied. He has served as secretary-treasurer and as vice president of the student chapter of the American Society of Civil Engineers. This semester he wields the gavel and represents the chapter on the Engineering Council. Tom is a member of Triangle fraternity, Phi Eta Sigma, and Tau Beta Pi. He earned the Chi Epsilon award for the outstanding sophomore civil engineer. He has become a regular fixture on Honor's Day, his name decorating the coveted lists every year since his entrance into the University. His spare time, if it can be called such, Tom spends in working for the surveying department where he has charge of the equipment. Last summer, he had charge of a WPA project engaged in locating and mapping underground conduits. He spent the two preceding summers as a roustabout in the oil fields. In his course at the University he is preparing to fill a position in the petroleum industry.

• OUR SOCIETIES •

TAU BETA PI

The second-semester officers, elected at a recent meeting, are as follows:

Bob Gaines .... *President*
Milburn Pehl .... *Vice President*
Warren Dugan .... *Recording Secretary*
Jim Dick .... *Corresponding Secretary*
Frank De Wolf .... *Treasurer*

ASAE

Professor Lehmann talked to the student branch on January 5 and showed movies which he took last summer in Europe. A reel compounded of strips taken by the various student branches was also shown. On January 19, Professor Foster spoke on rural architecture and illustrated his talk with slides tracing the development of rural American architecture. During Farm and Home Week, the student branch operated a refreshment stand in the Architectural Engineering Building. The funds derived will be used to defray partially the expenses of delegates to the national convention in late June.

SGE

"—to further the mutual interests of its members and to promote good fellowship among them. That is the purpose of the newly reorganized Society of General Engineers. Its officers have been elected as follows:

Maynard Hufschmidt .... *President*
Melvin Eilers .... *Vice President*
Bill Gilbert .... *Secretary*
George Miller .... *Treasurer*

The constitution of the SGE has been lifted intact from the old organization, which became inactive in 1934. Local speakers will address the group, as often as not on non-technical subjects, at its five or six meetings this semester. Membership dues will be $1 for the school year (50 cents for this semester). Good luck to you, fellows!

ASME

On February 22, motion pictures furnished by the International Harvester Corporation illustrated some applications of Diesel power in the oil industry. On March 1, J. L. Drew, of the St. Louis Airplane Division of the Curtiss Wright Corporation, discussed some problems in the development of a modern transport airplane.

RAILWAY CLUB

New officers to guide the club through the second semester, elected at the last meting of the old semester, ar:

Don Lyons .... *President*
Malcolm Harvey .... *Vice President*
Tom Shedd .... *Secretary-Treasurer*
Dick Rayer .... *Publicity Committee*

A hilarious "Professor Quiz" program occupied the meeting of February 15. Several of the fellows proved they know a great deal about railroading; the contest was such a success that the club plans to have another in the spring.

The club welcomes all interested rail fans at its meetings.

ETA KAPPA NU

A new idea! The Chicago Alumni Chapter is sponsoring and the seniors are paying for the publication of data sheets of Eta Kappa Nu seniors in the Middle West. About 200 copies will be planographed and mailed to prospective employers.

SBACS

At a recent meeting, two sales engineers from the General Refractories Company discussed the opportunities in refractories for ceramic engineers. The ceramic's basketball team lost its first game to the Linco filing station team, 18 to 12. A total of seven or eight games are to be played, however, so they are just warming up.

MU SAN

Newly elected officers are:

Ralph Johnson .... *President*
George Perkins, *Vice President and Treasurer*
Otto Hallden .... *Secretary*

ILLINI ENGINEERS

In the September issue of the *Technograph* was published a proposal for an all-engineering society. Since then, little has been heard of the idea, but the Engineering Council has been hard at work fashioning a constitution—the Constitution of the Illini Engineers. The purpose of the organization, is stated in its constitution as follows: "—to unite the engineering students, faculty, and alumni of the University of Illinois, and, through this union, to promote interest in the welfare and traditions of the College of Engineering."

The society dues will be $1.75 per year and will pay for membership in a departmental society and a subscription to the *Techonograph*. Again quoting the constitution, "In order that this body may be organized, membership in the SOCIETY for the second semester of 1938-39 shall cost 25 cents and shall not include part membership in any student branch society nor a subscription to The Illinois Technograph."

The Illini Engineers is the "biggest" idea coming out of the engineering campus in several years. We all know that starting friction is greater than running friction; so come on—let's all join and push it off to a flying start.

SIGMA TAU

Professor Wiley spoke at the meeting of February 17, comparing and correlating engineering and architecture. He was pinch hitting for Professor Provine, Head of the Department of Architecture, who, barring illness, would have spoken on "Interviewing the Young Engineer." Commissioner of the Bureau of Reclamation, John C. Page, who spoke last year before the student branch of the ASCE, will address Sigma Tau sometime in the spring.

MINERAL INDUSTRIES SOCIETY

The mining and metallurgical engineers have elected the following officers to head their departmental society:

Lewis Kovac .... *President*
Joe Waisman .... *Vice President*
Bob Hogue .... *Secretary*
Tom Simms .... *Treasurer*

St. Pat's Ball

Friday night, March 17, some 300 engineers and their best girls gathered in the lower gym of the Woman's building to celebrate the birthday of St. Patrick, the patron saint of their profession, by dancing to the very excellent music of Barney Rapp and his New Englanders. Decorations consisted of a giant St. Pat perched atop a huge slide rule hung behind the band and of plaques around the floor, each honoring one of the student branches. The program also carried out the slide rule theme. At 11 o'clock, to top off the evening's celebration, Tom Morrow, popular M. E. senior, was crowned "St. Patrick" to rule for the rest of the evening.

But it seems proper that a few words should be said about this custom of honoring the birthday of St. Patrick. Many colleges claim the honor of holding the first St. Pat's celebration, but credit usually is given to the boys at the Missouri School of Mines who started the ball rolling back in 1903. On St. Pat's day of that year they claim to have found a mysterious stone bearing the inscription "Erin go Bragh." Many professors of arts and languages tried to translate this and some Irishmen still claim that it means "Ireland Forever," but an engineer succeeded in making the correct translation, which is "Pat was an engineer." It has been said that since the translation was made, none but engineers can see the stone as it is invisible to all others. Since that time, Pat has been given credit for discovering and inventing many of the tools of the engineering profession such as the calculus and the slide rule.

The first St. Pat's day celebration at Missouri was a calm affair. All engineering students took a holiday from classes and attended the morning prayer in a body. From this quiet beginning, the custom has grown to nationwide importance. At Missouri it is now a three day celebration. The engineering campus is gaily decorated. Grads come back, for it is a bigger day than Homecoming in the fall. Outstanding alumni are made Knights of St. Patrick. Numerous events such as an open house, a beard growing contest, and an all-engineering barbeque enliven the holidays. The celebration is ended at St. Pat's ball, the biggest dance of the year.

At Wisconsin the engineers have a full day holiday. In the afternoon they hold a big parade through the streets of Madison. Prizes are given for the best floats. The lawyers, arch enemies of all engineering students, try to spoil the day by breaking up the parade. There are numerous skirmishes and last year even the sorority girls rained missiles on the heads of celebrators as they passed through the streets. The parade ends outside of Engineering Hall, where the lawyers, by this time augmented by most of the rest of the University, make a last attack. Last year the fire hoses had to be used to beat off the invaders, and when the last besieger had given up, there were six inches of water on the lower floor. After the battle, the engine boys have to go home and put on their Sunday best to attend the St. Pat's Ball.

At Minnesota classes are dismissed for two days. They have a parade, too, but the past few years the police have kept the lawyers at a distance. There is a big picnic and an athletic field day. Events end in a St. Pat's Ball.

But at Illinois, long known as the deadest engineering campus in the country, the engineering students con-

(*Continued on Page* 12)

Drying Seed Corn

The Engineer Applies the Scientific Method to the Solution of an Agricultural Problem

by HAROLD KLECKNER

When Illinois farmers spend millions of dollars annually for seed, they have the right to know that a high percentage of that seed will grow. Stuck away in a remote corner of the Agricultural Engineering building is a rather expensive piece of experimental apparatus calculated to aid in assuring the farmer that so far as the drying of seed corn is concerned, his money is being well spent. Started in 1931, the apparatus was sufficiently complete by 1936 for tests to begin. Since 1936 extensive work has been done to improve the parts of the apparatus regulating temperature and humidity. The apparatus is now being used to study the effects of different drying rates and of different drying temperatures upon the quality of seed corn.

The laboratory drier, as the apparatus is called, essentially provides for the circulation of air, whose temperature and relative humidity are controlled, through a sample of seed. By means of a balance, the loss of moisture of the sample measured, and by suitable instruments the temperature, volume, and humidity of the circulating air are measured and controlled. This control apparatus can be divided into three classes: that for the control of the dry-bulb temperatures, that controlling the wet-bulb temperature, and that regulating the quantity of air blowing.

Both heat and moisture are added to the air that is circulated through the sample. Electric coils totaling 24,000 watts in capacity furnish the heat, permitting the use of temperatures above 270 degrees Fahrenheit although none higher than that have been tried yet. The moisture is added in the form of steam. In this regard, two limitations increased the amount of work necessary for perfecting the apparatus. The steam added must be dry and the control must be very rapid and exact. As perfected, this part of the apparatus consists of two units, a small gas-fired boiler and a bank of four electric heating coils. The boiler is operated without the use of a float valve by discharging a stream of water over the feed pipe and thus maintaining a controlled height, fluctuations being eliminated by the use of a flutter valve. Dry steam is obtained by keeping the water level below the top of the tubes, thus forcing the steam to pass over heated surfaces as it leaves the boiler. The bank of electric heaters is always used to furnish a part of the required steam since their control is very easy and exact. Surrounded by a very thin film of water, they can furnish steam almost instantaneously.

Laboratory Drier

The quantity of air flowing through the drier is measured by a Thomas Air-Flow Meter, one of the most accurate instruments available.

The most important part of the drier equipment and the part that caused the most trouble is the apparatus that measures the dew-point temperature of the circulating air. The dew-point temperature is a measure of the per cent of humidity of the air. For a drying process it is necessary to keep the humidity constant and the degree to which this is accomplished determines to a great extent the accuracy of the data obtained during a test.

The elements of the dew-point meter are the "gap," a vacuum tube relay, two mechanical relays, a small electric heater, a thermocouple, and a recording potentiometer. The heart of the meter is the gap. This is a small glass tube, about half the length of an ordinary test tube, with a flat, closed end. Two platinum wires are imbedded in this end, spaced one-sixteenth of an inch apart, and overlapped for half an inch. The glass is ground down until parts of the wire are exposed. The other ends are connected to the grid circuit of the vacuum tube relay, which, in turn, by means of the mechanical relays, operates an electric heater. The outside of the glass tube is exposed to the air in the duct; the inside of the tube is connected to a source of cold air. The cold air serves to condense moisture on the outer surface of the tube. The moisture increases the conductivity of the glass between the platinum wires sufficiently—from zero to about 5 x 10 mhos — to permit a current to flow between the plate and filament of the vacuum tube. This operates the relays and turns on the heater which heats the air inside the tube. The heating will evaporate the moisture, which decreases the conductivity to zero and turns off the heater. This cycle repeats about once a minute. Embedded in the glass tube is a thermocouple which records the temperature of the tube on the potentiometer. These temperature recordings will vary from the dew-point temperature to a temperature slightly above the dew-point. Thus there is obtained an accurate measurement of the dew-point temperature of the circulating air.

The laboratory drier is an excellent example of good experimental technique. Each instrument for measurement and control was developed with the idea of obtaining the greatest accuracy and dependability from that particular instrument. As a result of the care taken, each piece of the equipment gives extremely accurate results, and the accumulated errors from all the measurements are therefore small.

Engineering Education

(*Continued from Page 3*)

himself while yet in school. He can, for instance, choose his elective courses in such a manner that he will get this broader education that industry is demanding. This means that he must elect courses in other departments of the college and of the university. Some suggestions are courses in economics, history, sociology, music, philosophy, and elementary law. He should develop his style of writing and manner of speaking by taking courses in speech and English and by practising these two arts at every chance that he gets. Faculty men are glad to be regarded as humans rather than just machines who pass out assignments and grade papers. They can and will give valuable advice about the selection of electives and the guidance of outside reading.

Along with this broadening of the curriculum, the engineering student should join campus organizations and enter into activities. By acquitting himself well in one or two activities, he will acquire poise, self-confidence, and executive and organizational abilities. While doing all this he should still keep up with current events and integrate his knowledge with world happenings. This seems like a large order for four years when one considers the fact that in his four years the engineer takes the equivalent of one semester more than the liberal arts student. But it can be done—and by the average engineer. It may mean a regimentation of time—a few less bull-sessions and picture shows—but it will be worth it. Any advance a student may make in this direction will help to set him apart from his fellow students—the ones who possess only technical knowledge.

The engineer should be a man who has integrated his technical knowledge with an understanding of the social, political, and economic life of the world. He uses the scientific method in piecing together the structure of civilization, much as he applies it to the construction of a complicated machine. He is a worldly man, capable of mixing with people. He speaks and writes well, being able to explain his work as well as he does it. His mind is broad and open to all logical ideas, yet he has that critical sense so necessary to the engineer. His education is broad, encompassing many fields not directly related to engineering. He has a well developed social and moral conscience, a good sense of values, and a definite set of ideals. His education and experience have caused him to form a definite philosophy of life, which he applies to all his thought and actions. A man so well versed and so gifted would be the ideal engineer.

• TECKNOKRAKS •

SHE: "My hands are cold."
HE: "Here are my gloves."

* * *

Jones: "I sent a dollar for an appliance to keep down gas bills."
Bones: "What did they send you?"
Jones: "A paper weight."

* * *

Jack: "I'm worried. My girl is running around with that new doctor in town."
Jim: "Feed her an apple a day."

Railroad Evolution

(*Continued from Page 5*)

face corrosion—scale accumulates on rolled stock—the unit steel structure eliminates the warping caused by the excessive heating of the fire box and the air leaks in the built up pans which were responsible for the loss of a great deal of heat.

Before the power unit of the freight or passenger train could be fully utilized, it was imperative that engineers perfect a tender that would carry the maximum amount of fuel and water. Until 1908, the fabricated frame was used, but at this time, the speed of trains began to be increased and there was a call for larger tenders so that trains would not have to stop so often to take on water. The unit tender frame made of cast steel resulted. It had greater capacity and strength. The newer locomitive tenders have the water scoop attachment by means of which the tender can be filled while the train is in motion. This device has made possible the saving of a great deal of time on long runs.

It is evident that the one-piece steel casting has played an important part in the improvement of locomotive and tender design. The reasons it has been so universally used may be summed into the following points: The one-piece casting has cut maintenance cost greatly by the elimination of bolt and rivet fasteners; the elimination of fasteners has prevented any frame loosening and the telescoping of parts in accidents; the decrease of frame troubles has allowed engineers to devote their time to the problems of safety and comfort; the permanence in structure and alignment of the unit casting has made possible advances in balance which lessen pound on the rails and jolt and strain on the train.

"What did the dean want to see you for?"
"Nothing at all."
"What do you mean?"
"A zero in M.E. 85."

* * *

Co-ed (answering the door bell): "Time for the dance?"
Frosh (beholding an evening gown for the first time): "Yes, put on your dress and come on."

* * *

Night Watchman, on the south campus: "Young man, are you going to kiss that girl?"
He (straightening up): "No, sir."
Watchman: "Here then, hold my lantern."

* * *

Sorority sister: "Mable has been wearing a strange expression lately, hasn't she?"
Ditto: "Yes, she's trying to resemble her photograph for the Illio."

St. Pat's Ball

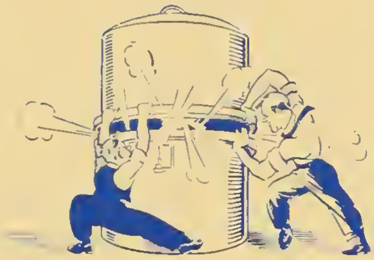
(*Continued from Page 9*)

tinue to tell themselves that they have too much work for such foolishness. Five years ago, St. Pat's Ball was held for the first time. It was a success and it was hoped that it could be extended to become an annual day of celebration for engineers. But the following year few engineers thought it even worthwhile to attend the Ball. The next year, the Engineering Council circulated a petition which practically every engineering student signed, pledging himself to attend St. Pat's Ball. The Cabaret Dance was the result. It made money, but unfortunately the floor was far too crowded. Again last year the petitions were signed by nearly 2,000 engineers, of whom only 400 or 500 actually attended the dance. That dance just paid for itself. This year the Council realized the futility of having the students sign petitions and planned for a smaller dance of only 600 couples. But it turned out that they had again over-estimated the activity of the engineers and the dance was moved to a smaller floor.

As a result of the history of St. Pat's Ball at Illinois, the Engineering Council is going to recommend to the juniors who serve next year that they sponsor a small dance for the seniors, as they seem to be the only ones really interested. This dance could be held in the new Union Building with a good local orchestra. The same carnival spirit would reign and would not be dimmed by the knowledge that the dance was losing money.

If engineering students had the unity on this campus that they have at other schools, St. Pat's Ball would not now be a thing of the past. If the students really unite next year and prove that they really want a dance by raising the money before making the request for a dance, they might be able to hold it again. Attendance at St. Pat's Ball should be a matter of loyalty to the school. Students should not hold off buying tickets until they know what orchestra will play. The fact that it is St. Pat's Ball, their own dance, should be reason enough to bring at least 1,000 of the 2,000 engineers out to really celebrate the birthday of their patron saint.

G-E Campus News



A BIG SQUEEZE

IT TAKES a lot of squeeze to put a 1,000,000-volt x-ray equipment in a container only four feet in diameter and seven feet long, especially when its less-powerful predecessors required a special building 62 feet long, 32 feet wide, and 36 feet high. But recently, G-E scientists applied the necessary squeeze and completed some surprisingly compact x-ray equipment.

Such squeezing naturally involves a few innovations in design. So innovations were introduced. The 11-section x-ray tube was put inside the novel transformer, in the space normally taken by an iron core. Gas having an impressive-sounding name, dichlorodifluoromethane, was used instead of oil as an insulating medium, 100 pounds of this gas doing the work of six tons of conventional oil.

Then the equipment was mounted in the grounded metal container, thereby enclosing the 1,000,000-volt circuit and eliminating the hazard of electric shock. Looking at the apparatus, you note a striking absence of moving parts, for the control of the apparatus is essentially electrical.

The first of the new units will be installed this spring in Memorial Hospital, New York City, providing medical science with another powerful weapon in its constant war on disease.

LIGHTS! ACTION! CAMERA!

IN A specially constructed room alongside the studios of the G-E international short-wave stations, the familiar words, "Lights! Action! Camera!" will soon be heard. For General Electric's new television station at Schenectady is nearing completion.

The television transmitter, perched atop the Helderberg Hills 12 miles outside the city, will be at least 250 feet higher than the station in the tower of the Empire State building, New York. And, broadcasting with 10,000 watts, it will be the most powerful television station in the United States.

There will be -literally- no strings to the transmitter. C. A. Priest, Maine '22 and an ex-Test man, Engineer of the Radio Transmitter Engineering Department of General Electric, has announced that an ultra-short-wave transmitter will be used instead of the usual cable to relay the images from the Schenectady studios to the main transmitter in the Helderbergs.

THE "HOUSE OF MAGIC" BECOMES TWINS

THE world-famous G-E "House of Magic" show has become twins. It had to, for it was placed in the predicament of having to be in two places at one time—the New York and the San Francisco Fairs.

One twin—directed by R. L. Smallman, Calif. Tech '33 and ex-Test man—is already holding court on San Francisco's Treasure Island, site of the Pageant of the Pacific. The other makes its bow April 30, opening day of the New York World's Fair. Its director is W. A. Gluesing, Wisconsin '23, also an ex-Test man.

The thousands of visitors to these Fairs will see such feats of modern magic as a voice-controlled toy train, a magic carpet, zigzagging pictures of sound. They will see the stroboscope, which makes it possible to see the spokes of a whirling wheel just as if the wheel were motionless. They will see a light beam sawed by the teeth of a comb.

However, entertaining as these demonstrations are, they represent far more than mere tricks of modern magic. They symbolize the work in pure science that is constantly taking place in G-E research laboratories—work which is the basis of General Electric's contributions to the world of the future.

GENERAL ELECTRIC

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THE TECHNOGRAPH

UNIVERSITY *of* ILLINOIS

MAY 1939

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MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

THE ILLINOIS

TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

MAY, 1939

Volume 53 — Number 6

MANY young men "go a-prospectin'" for new worlds to conquer. They dream of going into business for themselves, of inventing something new, of becoming successful overnight. One fertile field for dreaming which is revived frequently by ambitious inventors is the possibility of eliminating the Open Hearth furnace from the steel making process. Men would like to dump the iron ore into a blast furnace and tap off the finished steel at the bottom. Can it be done? Read what a student has been able to learn about the process.

● The Technograph wishes to correct the statement of the March issue that, at the I-SEE, concrete cylinders will be squeezed in a 2,000,000,000 pound machine. The capacity of the test machine is 3,000,000 pounds but this still makes it one of the world's largest.

● The University is expanding. This means that construction work of engineering interest is taking place every day. The Technograph brings you two articles, one about the new Natural Resources building and another about the old and proposed power plants.

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THE ILLINOIS TECHNOGRAPH

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Submarine Adventures

A New "Earth" is Found Under the Sea

by

E. H. KING

For the past year and a half, Professor F. P. Shepard, who has been with the Geology Department of the University of Illinois since 1922, has been studying the submarine topography of the area lying between San Diego and Los Angeles, California, and extending more than 150 miles out to sea. His party has gone as far as

The Schooner, E. W. Scripps

300 miles to sea and 600 miles up the coast past Monterey Bay covering approximately 23,000 square miles of Pacific waters.

The recovery of rounded pebbles and cobbles on the floor of the ocean some 5,000 feet below the surface led Professor Shepard to believe that at one time the sea level was much lower than it is now. And further investigation revealed a whole world covered with water.

"I found the floor of the ocean to be very similar in topography to our present dry land," said Professor Shepard. "If the present sea level were lowered sufficiently, canyons, rushing torrents, basins filled or partly filled with deep lakes, and mountain masses would appear. One volcano that I know of would rear its head ten thousand feet above the surroundings—frozen lava and all."

In addition to finding the rounded cobbles indicative of a once lower sea level, the Shepard party found deltas at the mouths of canyons, which seemed to be a sign that rivers formerly flowed through these canyons. An impressive canyon in Monterey Bay—a witness to long years of service as a river bed—is similar to, but 1,200 feet deeper than the famed Grand Canyon. It varies from an altitude of 360 to 6,960 feet below sea level, while the Grand Canyon varies only from 8,050 to 2,600 feet.

Curiously, these great canyons do not have much sediment in them. Geologists consider this as unusual, but Mr. Shepard explains that there are periodical land or mud slides which clear the silt away. As the sediment collects, it gradually amasses weight until it finally slides down the steep canyon walls and floor. In fact, soundings taken at the same spots at different times have shown definite variations in depth, and this is conclusive of the fact that slides do occur.

Another factor keeping the canyons free of sediment and disproving the old theory that deep water is still water, is the presence of perceptibie currents at all depths of the ocean. Most of the current observations made by the Shepard expedition showed definite movement. In the canyons, currents have been found ranging up to 0.5 miles per hour.

(*Continued on Page* 10)

Dietz Inspects His Core Drill

Campus Construction

by

by DON STEVENS

A major part of the current building construction program that is in progress on the University of Illinois campus is the new Natural Resources Building. This red brick and reinforced concrete structure is rising beside an extension of South Drive just across from the Architecture building. It will house the Illinois State Geological Survey and the Illinois State Natural History Survey, and is the first unit in a development that will later include a greenhouse, garage, and industrial laboratory. The million dollar building will be of the Georgian style of architecture that has been used for all of the newer University buildings. Fifty-eight thousand square feet of floor space will be available in the four story structure that will house modern, well equipped laboratories and offices.

A few of the structural details include stone sills for windows, exposed piping for all but the first floor, and a slate roof with rock wool insulation. There will be a small mezzanine floor in additon to the basement and four main floors. A rock garden on the south side of the building makes drainage of the outside walls necessary on that side. Because of the problems found in providing for office and laboratory space on the same floors, laboratories have been planned for the best and least expensive arrangement. Services provided for the laboratories include distilled water, hot and cold water, gas, and vacuum. A long east and west corridor offers access to the rooms on each floor. Stairways are located near each end of the building and an elevator is centrally located. One of the newest features of this type of building that will be used is a terra cotta finish for all the laboratories.

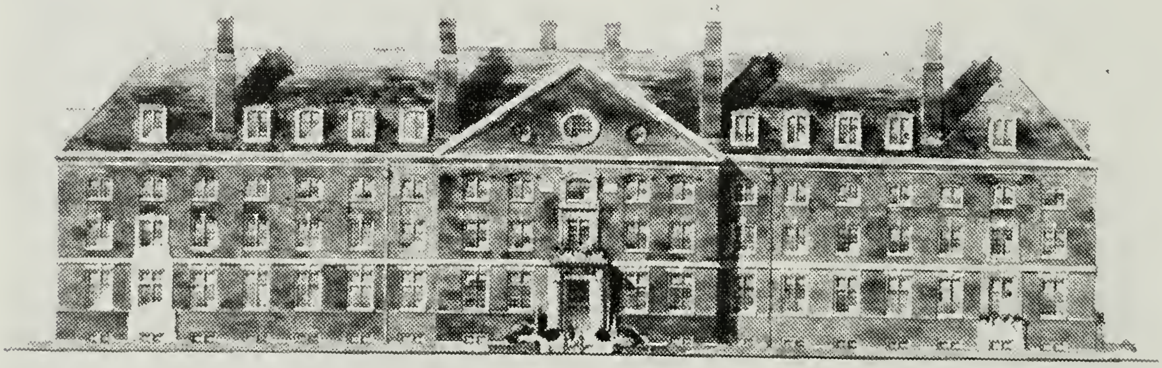
Division of space between the Geological and Natural History Surveys will be approximately in a three to two ratio. Each floor will be divided between the two departments, with the Natural History Survey on the west. A listing of the various offices and laboratories will give the reader a picture of the diversified use of the space.

Inside the main library when constructed. Soon we will see the interior of the new Natural Resources Building.

The basement will contain the fish pathology laboratory and tank room, entomology laboratory, shop, plant pathology laboratory, industrial minerals office and files, rock and clay laboratories, grinding room, and geological files.

The principal attention of the public will be focused on the first floor which houses the main offices at either end of the hall. The main doors open into a hallway which leads to a foyer and reception and conference rooms. This floor also has entomology laboratories, paleontology, petrography, and industrial minerals offices, and the mailing and filing rooms.

Offices and laboratories found on the second floor will include those of aquatic biology, limnology, insect survey, game management, forestry, sub-surface geology, mineral economics, engineering geology, oil and gas, and coal divisions. Occupying most of the third floor will be the geo-chemical section of the geological survey. Plant pathology office and laboratory and a herbarium will share the remainder of the floor space. Space on the top floor will be devoted to libraries, drafting rooms, educational extension exhibits, and paleo-botany laboratory. Publications will be stored on this floor.



Architect's Drawing of the Natural Resources Building

Steel by a Direct Process

Theoretically Possible; Can You Make it Practical?

by GLENN VOIGT

Although it does not seem within reason that a reader of this magazine will, in the near future, invent a direct means of making steel on a large scale, the vision of such an accomplishment is colorful, and the enormity of the problem, with its powerful economic significance, hyptnotizes the dreamers among us to the extent that we are somewhat like the lady who wept at the plight of a fictitious character in a play while, in reality, her chauffeur was freezing to death outside; we allow imagination to replace good judgment.

The "wild ideas" of men like Galileo, Edison, and Marconi taught people not to discard seeming absurdities. Thus inventors and metallurgists have tried again and again to make, directly from the ore, an iron that can be easily worked. The Ford Motor Company, for instance, has carried on experiments to determine the possibilities of producing steel economically by direct reduction of iron ore. Many other companies and individuals have prospected in a like manner.

But the fact that steel making consists in converting multitudinous random grades of iron ore to numerous pre-determined kinds of steel has hindered attempts to perform the necessary industrial operations simultaneously, and we are disposed to reduce iron ore first in a blast furnace and refine it later in a separate furnace.

An historical resume of steel making will serve to clarify the argument.

Man has known how to get iron for thousands of years. Probably the first method was to heap iron ore on burning charcoal and fan the fire with crude bellows. The Catalan forge, which is said to have originated in Catalonia, Spain, and which is still used by some races, embodied this principle. The iron oxide heated with some form of carbon was simply reduced to free iron. These early furnaces, however, were not hot enough to melt the charge, and the iron, mixed with slag, formed a pasty mass which was hammered into various shapes. This product was known as wrought iron and it served mankind well until accidentally, by stronger blasts of air, there occurred a melted product which was unwelcomed because it was brittle when cooled. It was found, however, that this brittle cast iron could be made malleable by re-melting and "puddling" it in a shallow hearth in the presence of oxygen. Iron workers noticed that it was cheaper for them when they used this resultant high-temperature process even though it was complex. Certain men, nevertheless, clung to the idea that a simple high-temperature process could be found and so they designed and patented apparatus to do this. In *Tiemann's Iron and Steel*, third edition, 1933, are listed some ninety of these processes for making iron directly from the ore.

About this same time it was found that a new and very useful product named steel could be made from the pig iron tapped out of a blast furnace. Again certain gentlemen of the steel industry have insisted that a single furnace could be built to carry on all the reactions, enabling the manufacturer to charge a furnace with iron ore and tap out finished steel. These reactions consist of reducing the ore; oxidizing the carbon and other impurities from the pig iron; and again adding the desired amount of carbon and also certain alloys.

It may seem that these reactions are a roundabout way of reaching the goal. For instance, we make iron in one furnace and convert it to steel in another, whereas the primitive worker made it in a single step. It is here that our problem lies. The solution may be one of two things; the designing of a single furnace which will operate continuously to produce steel from the iron ore; or the perfection of existing apparatus and the method of using it. We will now describe two theoretical schemes for carrying on a direct process, and then we will discuss the practical problem as it is today according to current authorities.

In any kind of continuously operated blast furnace it is difficult to prevent the free iron which comes into intimate contact with the unburned coke found at the bottom of the hearth from becoming saturated with carbon and other impurities in quantities not characteristic of steel. To combat this, Herman A. Brassert of Chicago, an international authority on iron and steel, patented an apparatus similar to the ordinary blast fur-

—*Courtesy Power Plant Engineering*

Making Implements Direct from Iron Ore

nace excepting that the hearth and bosh were increased in diameter from that of the other part of the furnace and there was a pedestal of fire brick built up in the center of the hearth on which the charge of iron ore, coke, etc., was supposed to rest. The purpose of this apparatus was to support all of the coke above the level of the metal which would collect in the annular space around the central pedestal. As the iron was reduced, it would not be long in contact with the coke and would collect around the pedestal as practically carbon-free iron and with a minimum of other impurities.

It was the intention periodocially to stop the combustion against the central column of coke and to direct this combustion against the metal bath to refine it so that it could then be tapped out of the furnace as steel.

If these things could be done, it would be possible thus to make steel of a sort but the support of the charge on a central pedestal would be rather hazardous,

(*Continued on Page* 12)

Power, More, More . . .

A Story of the University Power Plant

by WALTER PAHL

"The rapid growth and development of the University of Illinois rendered it imperative that increased facilities should be installed for the proper heating of the buildings already erected on the campus," wrote Professor L. P. Breckenridge in 1898. Words to the same effect were echoed in 1909 and are now re-echoed in 1939. In the process of growth and expansion, once again present power plant facilities are inadequate.

Forty-two years ago the completion of the Library with the accompanying need to supply heat to 3,000 additional square feet of radiator surface, furnished the necessary impetus for the construction of a new power plant. In designing the new plant, the designer, Professor Breckenridge, summarized his objectives in the following eight statements that he made in *The Technograph* of 1897.

1. To concentrate at the lowest point of the campus all heating boilers.
2. To provide increased draft, so that cheaper grades of coal may be used.
3. To prevent smoke.
4. To provide a system of tunnels large enough to carry the heating, water, gas, compressed air, vacuum mains, as well as wiring for electric light and power purposes.
5. To concentrate all engines near the boiler house so that all exhaust steam may be used for heating purposes.
6. To provide 1,000 incandescent lamps for the buildings and 20 arc lights for the campus.
7. To provide electric current for running electric motors for power purposes at any point on the campus.
8. To arrange the entire plant so that as far as possible it may be available for educational purposes.

The plant itself included a 250 horsepower National Water Tube boiler, installed in December, 1897, and a 500 horsepower Babcock and Wilcox boiler, added in May, 1938, along with a 100 horsepower horizontal tube boiler that was moved from the old plant. The boilers were operated at a pressure of 300 pounds per square inch, which Professor Leutwiler believes was the highest boiler pressure used west of the Allegheny Mountains at that time.

In the engine room, two phase, 440 volt, alternating current generators, totaling 120 kw. were installed. The power plant operated with this equipment until 1909, when the echo of the story of 1897 was heard.

At this time (1909) the equivalent of 200,000 square feet of direct radiating surface required heating. Although all buildings were adequately supplied with heat during the previous winter, it was necessary to overload the entire power plant to do so. Boilers at the time had a capacity of 1,800 horsepower. In designing a new plant, 500 horsepower boilers were considered. However, if 500 horsepower units were to be used, a basement, not in the plant constructed in 1897, would be necessary. For this reason, it was decided to build an entirely new plant at an initial cost of $75,000.00 for buildings and equipment.

Babcock and Wilcox, natural draft, chain grate, 500 horsepower boilers were selected. Two were installed in the original plant. These boilers operated at 150 pounds pressure. To supply electrical energy, a Ball engine driven, 250 kw., 440 volt, two phase, generator and a 125 kw. steam turbine were installed.

However, in 1914, more capacity was needed, and two more 500 horsepower power boilers, duplicating the first two were added. Expansion didn't stop here, for in 1919, two more were added, and in 1925, another two, making the total installed horsepower 44,000. All of these boilers were equipped for natural draft operation, but, when it became necessary, in 1930, to repair the first two original boilers, they were remodeled to operate with forced and induced draft.

To keep pace with the boiler room expansion, the electrical generating system underwent change and expansion also. In 1921, the original 120 kw. generator was retired to make room for the first of two 500 kw., 2,300 volt, three phase generators. A duplicate of the 1921 addition was installed in 1924, and, finally, in 1929, a 1,000 kw. unit was added. Also during this period, the standby connection with the local power company was increased from 250 to 750 to 1,000 to the present 1,500 kw. capacity, making a total electrical capacity of 3,400 kw.

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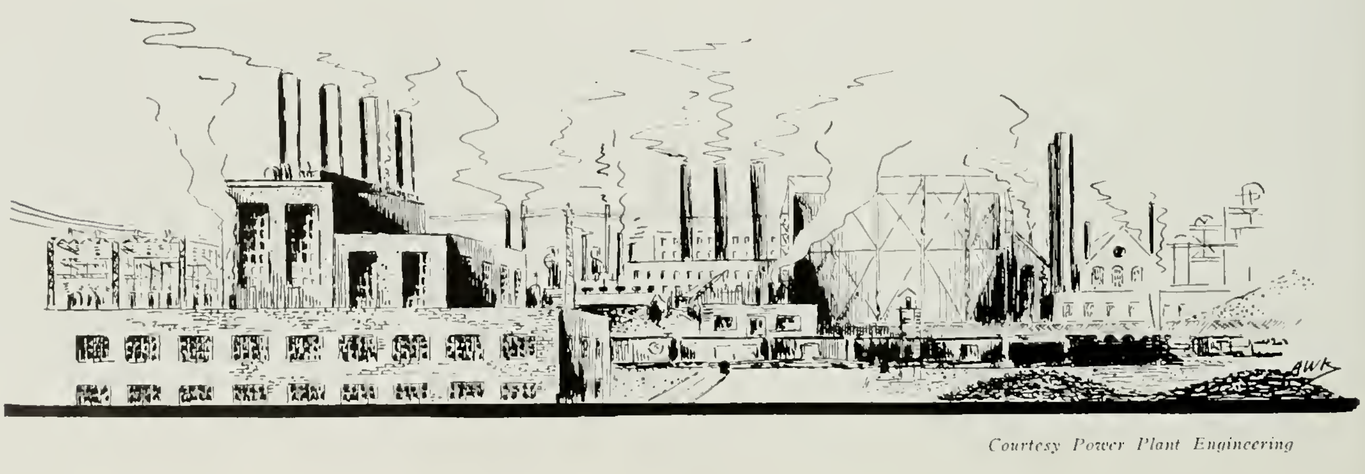


Courtesy Power Plant Engineering

THE ILLINI TRAIL

—'08—

Emil A. Weber, C. E., Secretary-treasurer of the Marine Contracting and Engineering Company, is living at 923 Commercial Street, Manitowoc, Wis. He was married in 1919 to Esther M. Krueger. The couple have two children, Ruth and Joyce.

—'15—

Roy Zipprodt is now an Associate Professor of Civil Engineering at Columbia. He has charge of instruction in Reinforced Concrete and conducts research in the same field. He worked previously for the Portland Cement Association and also as a structural engineer. He has been married since 1915 to Edna Bradley, formerly of Champaign. He has a son, Elliot, in junior high school.

—'21—

Ernst Zimmer, C. E., unmarried, has kept his hands full for the past fifteen years working for the Kansas City Bridge Company. He served his time in the field as a timekeeper and engineer and is now an office engineer. His company is constructing the six main piers for the Mississippi River bridge at Baton Rouge, La. The largest pier is 63 feet by 82 feet at the base and goes to a depth of 180 feet below the low water level.

—'23—

Harold Yackey, M. E., superintends the Pipe Line Division of the Union Oil Company of California. He lives in San Luis Obispoc, Calif., with his family. He married Eleanor Swan of Los Angeles in 1927 and has two children, Harold, Jr., 9, and Alice,6.

—'24—

Carl Anderson, M. E., is employed by the Chicago Board of Education as a heating and ventilating engineer, designing power plants and heating and ventilating systems for new Chicago schools.

—'32—

C. R. Slonneger, M. E., who did graduate work at M. I. T. on Engineering and Business Administration, is now an Industrial Engineer in the Armstrong Cork Company. His work deals with labor control, costs, and budgets. Being still a bachelor, he doesn't worry yet about a home budget.

—'36—

An instructor in T. A. M. here at Illinois, Winston Black, completed two years of graduate work at Lehigh University last summer. Winston likes teaching and also a certain young lady but has found that he dislikes the course known as "Differential Equations," which he took last semester.

Bob Reynolds is a foreman in the "Milrite" Department of Caterpillar and really enjoys his work. He helps build and install jib cranes and monrails, move machines, and take care of steel construction.

Charlie Prout works with the U. S. Engineers at Arkport, N. Y., on an earth fill dam on the Canister River. He says that he has learned a lot about construction methods and the problems of contract work. He is saving his "extra" money for a car and has not yet made plans for a dual life.

Power, More, More . . .

(*Continued from Page 8*)

Until recent years the primary function of the University power plant was to supply heat—electrical energy generated was a by-product. The turbines merely acted as pressure reducing valves through which very little heat of the steam was lost. This is still true at present, but the present generating equipment does not have the capacity to supply all the required electrical energy. Exhaust steam from the turbines is used for heating purposes, along with live steam that is added when necessary. The steam is transported underground through steel pipes in tunnels and conduits. At present, the longest distribution line is to the hospital, a distance of over a mile.

Now, in 1939, the re-echo of the need for modern equipment and increased capacity is again heard. Once more, due to "rapid growth and development," present facilities are inadequate to supply demands imposed upon them. Five new buildings are under construction. When they are completed, no amount of overloading can possibly supply their needs.

Plans for a new plant are in progress and they include a new location, a new generating voltage, and an adequate, balanced capacity. A new location is necessary because the present load center is near the Auditorium, and as the campus is expected to expand to the southwest, the load center will follow in that direction. Citizens of the city of Urbana desire to remove the branch line, over which a major part of the 36,000 tons of coal burned by the plant each year are transported. For these reasons it has been proposed that the new plant be located along the Illinois Central tracks, north of Stadium Drive. The new generating voltage will be 4,000 volts, four wire, three phase. The greatest need the new power plant will supply is a remedy for a lack of capacity. And, with an increase in capacity and a central location, a more efficient supply and distribution will result.

Submarine Adventures

(*Continued from Page 5*)

These currents are of an erratic nature. They do not flow in one direction as do our rivers and the waters of the Gulf Stream; neither do they follow the movements of the tides, but they change direction at much more frequent intervals and they are largely independent of surface motion. Factors not definitely known tend to force the water towards some point, and, in order to relieve this pressure, deep water flows occur. These currents also account for another phenomenon which is interesting to geologists. That is the fact that subterranean hills have very little sediment on them; usually solid rock is exposed.

The canyons off Southern California begin almost at the coast line and terminate at the opposite end in huge depressions which are similar to those of lakes. These "lakes," however, would be much deeper than any lake in North America. Several of them are more than 2,000 feet deep, and one was found that varied in altitude from minus (below sea level) 3,500 to minus 6,400 feet. In our Great Lakes the deepest point is only 1,200 feet below the surface. Crater Lake, located in Oregon, is our deepest "dry land" lake. Formed from an exploded volcano and only ten miles across, even it is not more then 2,000 feet deep. The submarine lakes are not as extensive, however, as the Great Lakes, although they do compare in area with any other of our large lakes.

"Our party also found extensive deposits of phosphates, more extensive than any known to exist on land. We also discovered considerable rock formations which might suggest the presence of oil," Professor Shepard said. "But," he added, "while at some future time these deposits may have a commercial value, at present they are merely items of interest."

Working from rowboats and small launches as well as from the schooner, *E. W. Scripps*, which was loaned to the expedition by the Scripps Institution of Oceanography, they were able to go further to sea than was possible otherwise. The group was able to go directly to points of interest with the aid of the Coast and Geodetic Survey maps which showed the approximate topography. When over the site, they determined the depth by echo soundings, which consist of sending sound signals to the bottom and measuring the time of return. After they had thus determined the contour of the bottom, they set to work dredging and coring. Dredging consisted of sending a bucket, open at one end and screened at the other, down to the bottom, and operating it much like a drag line excavator. In this way chunks of rock, some of them granite, were brought to the surface.

Coring, a neat method for determining the composition of the sediment, was done by an instrument perfected by two graduate students of the University of Illinois; R. S. Deitz and K. C. Emery, who accompanied Mr. Shepard. This instrument consisted of a twenty-foot pipe, weighted at the top, and with a slightly bulbous nose and a constricted opening at the other end.

(*Continued on Page* 14)

Steel by a Direct Process

(*Continued from Page 7*)

but the doubt as to the practicability of this process has been so great that Mr. Brassert, with all of his influence with the iron and steel people of the United States, Great Britain, and Germany, has been unable to persuade anybody to make a trial of this process.

Mr. T. F. Bailey of Canton, Ohio, has invented a process which was to use a tall stack similar to a blast furnace to sift pulverized iron ore into the top so that it would fall in small particles downward through the stack and at the same time to burn carbonaceous fuel in the bottom of the furnace to carbon monoxide. This would pass upward in counter current to the falling particles of the ore, thus reducing the ore particles to metallic iron containing the impurities in the ore. As these fine particles of iron reach the bottom, it was the intention to retain the temperature of the bottom of the furnace sufficiently high so that this metal might be somewhat purified in the hearth of the furnace and tapped out as steel of a sort.

This process is also of such a nature that no one has given Mr. Bailey any encouragement as to its practical application.

Prof. Dr. C. Benedicks of Sweden has told us of the Flodin-Gustafsson process which was carried on in an electric arc furnace at the Hagfors iron works in his country. The process was tried also for the production of stainless steel. Neither result was satisfying, however, and no further use of the method has been made.

In a letter to *The Technograph* Mr. Arthur G. McKee, president of Arthur G. McKee & Company, Engineers and Contractors, Cleveland, Ohio, wrote:

"The real fact of the matter is that the blast furnace is a remarkably efficient tool for smelting iron ore and producing pig iron or hot metal and it would seem to me that the logical course of development would be to devote some very intelligent effort to the improvement of the processes of making steel out of hot metal instead of trying to do all of the things necessary to reduce the iron ore and make it into all of the multitude of grades of steel in one operation.

"I would call your attention to the fact that the production of automobiles, for instance, has been cheapened and perfected on the basis of doing the hundreds of things necessary to assemble an automobile as the unit moves through the plant and comes out finished at the end of the line and no one thinks of trying to put all of the things on the automobiles at one point or at one time and it is my impression that the smelting of iron ore and the making of the resultant iron into finished steel of the desired quality are and should be two distinct operations and I believe that the best results in the making of steel will be operations separate and perfecting each of them to the highest degree."

Repeating Mr. McKee's statements, Dr. John Johnston, Director of Research for the United States Steel Corporation, said at a meeting held Thursday, November 11, 1937:

" . . . there are great technical obstacles, which remain to be surmounted, in the way of a lessening of the number of separate steps in the current production of steel articles of the quality now demanded. Some minor steps have been simplified or eliminated, others will be modified; but there is no indication of a major change in the general methods of large-scale steel production in the near future."

Actually, the fluid condition of cast iron and the ease of handling it in large quantities have made it very difficult for any direct process to compete with the modern one.

These opinions should not disappoint the foresighted reader, but should merely focus attention upon a different ideal. As James Allen said in his essay, *As A Man Thinketh*, "Humanity cannot forget its dreamers; it cannot let their ideals fade and die; it lives in them; it knows them as the realities which it shall one day see and know." The sentiment is true but we must face the problem carefully and direct our dreams to something that is not too far removed.

"Rather than produce steel directly from iron ore, says Dr. A. B. Wilder, professor of Metallurgical Engineering at the University of Illinois, "it appears to be more practical to study the proposition from the viewpoint of making the production of steel products a continuous process. That is to say, the modern blast furnace, steel refining, casting, and rolling operations might be conducted as a continuous process. Steps have already been taken in this direction and in recent years a great deal of attention has been given to the rolling of steel directly from the molten state by the use of water cooled rolls. The advantages of certain continuous processes have been well demonstrated in the field of Chemical and Mechanical engineering.

—Courtesy Blast Furnace and Steel Plant

"A Remarkably Efficient Tool . . ."

"On the other hand, the engineer can contribute a great deal by improving the efficiencies of existing processes and by providing means of establishing exact methods for the statistical control of steel making processes."

The steel industry, therefore, has been and is spending its efforts and money trying to understand its own present complex processes. Here lies the strong challenge to a person's ingenuity. Opportunities for better temperature control of the liquid steel and the silica brick, for a rapid method of chemical analysis that is accurate and sure, for absolute control of factors that now rest solely on the personal skill of the operator are of genuine significance. (*Continued on Page* 14)

The value of such work lies in its difficulty. According to Boylston, "When it is remembered that the average modern furnace of, say, 700 tons production of pig iron per twenty-four hours must be kept running continuously, day and night, until it is necessary to shut it down for repairs or lack of demand for the iron, and when it is recalled that about 7,570 pounds of solid material must pass through the furnace for each ton of pig iron every twenty four hours, it will be realized that a tremendous plant of smoothly and regularly running powerful machinery is needed to handle this great quantity." And for producing steel from iron, there are insurmountable difficulties in finding more efficient means than the open hearth or electric furnace. Here is indeed a problem for the man who sees rather with his eyes than with his hopes and dreams.

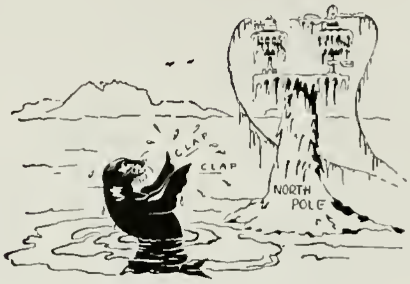
Submarine Adventures

(*Continued from Page 11*)

With this tool they were able to obtain cores up to twelve feet in length. The average length, however, was about six feet.

The work which Professor Shepard has been carrying on should have a bearing on geological theories. The acquisition of more knowledge concerning our submarine topography and the composition of the sea bottom is of itself extremely important. Also, the discovery of mineral deposits beneath the sea may at some future time be of importance. And since much of the work was in the daily study and observation of the shifting of the sands in shallow water, particularly around piers, these observations will be extremely valuable in the study of beach erosion.

G-E Campus News

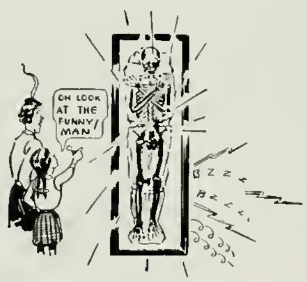


IT CUTS SOME ICE

NICODEMUS, the brown-nosed seal, playfully swam up to the North Pole, tripped the circuit-breaker and plunged Santa's workshop into darkness.

Absurd? Not as far as the successful operation of G-E outdoor air-break switches is concerned. These have been placed in a special room in the General Electric Research Laboratory at minus 20 degrees Fahrenheit, sprayed with water, and tested when coated with ice to a thickness of one and a half inches. The powerful leverages shattered the ice as easily as a walrus swallows a fish. In each case the switches opened and closed properly.

This test is just one of the many which G-E equipment must pass. And the observers, who check the operations with pitiless eye, are members of the G-E Test Course — young college men in their first year with the Company.

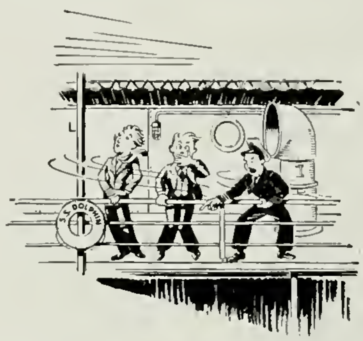


OH! MUMMY . . . !

A SKELETON in the closet—a white-robed ghost in the attic—even Ichabod Crane's headless horseman—may well feel jealous of Harwa, the Egyptian mummy. For while conservative ancestors content themselves with rolling in their graves in a genteel way, Harwa is floodlighted in a golden glow in full view of the public in the G-E building at the New York World's Fair.

This unusual exhibit is designed, not to frighten women and little children out of their wits but to demonstrate one of the many uses of x-rays. By pressing a button, an x-ray machine is turned on, and an image of Harwa's skeleton appears on a fluorescent screen which moves in front of the mummy. The principle employed is the same as that by which a doctor may fluoroscope a broken bone, except that the entire body of an adult person is viewed.

Harwa lived 2800 years ago, in Egypt. From inscriptions on the coffin lid it is learned that he was overseer of storage houses on the great farming estate of one of the temples of Amen, chief god of the empire. Pathological study of the mummy by means of x-ray indicates that Harwa was probably forty years old at the time of his death. And now, nearly 3000 years later, he is in his portable grave, a citizen of ancient Egypt in the World of Tomorrow.



FLOATING POWER

THE surging waves of a stormy sea are beautiful to an artist, disconcerting to a food-loving passenger, but just another problem to an engineer. Whenever a sleek, ocean liner plows her bow through a heaving swell, her engines feel an added load, and her captain wonders if the fuel will last. So, G-E engineers built an all-electric meter that will accurately measure the power put out by the propeller of any boat, from a tiny tug to a transatlantic greyhound.

The meter is essentially a combination of two electric generators mounted a little distance away from each other on the propeller shaft, and connected to instruments which can be located at any point on the ship. The generators are so mounted that at no load the voltages generated are exactly 180 degrees apart in phase and therefore add to zero.

When a load is placed on the revolving shaft, the torque causes a small angular twist in the shaft; consequently, the two generated voltages no longer add to zero. The resultant voltage is proportional to both the shaft twist and the propeller speed, and hence the meter can be made to read directly in horsepower. The installation can easily be modified to indicate total horsepower-hours and to write an automatic log of the power delivered during the trip.

Among the G-E engineers who developed the device are A. V. Mershon, Pratt Institute '13 and Union College '15, and C. I. Hall, U. of Illinois '10.

NEW YORK WORLD'S FAIR — SEE THE G-E "HOUSE OF MAGIC" — SAN FRANCISCO INTERNATIONAL EXPOSITION

GENERAL ELECTRIC

90-155C

THE TECHNOGRAPH

UNIVERSITY *of* ILLINOIS

A Synthetic Silk is One of the Modern By-products of Coal

SEPTEMBER 1939

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MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

THE ILLINOIS TECHNOGRAPH

Published Eight Times Yearly by the Students of the College of Engineering, University of Illinois

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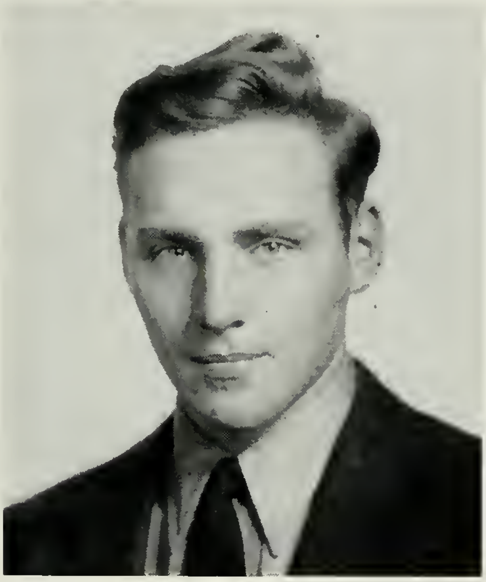
Bits About 'em

"Action is the distinguishing characteristic of Greatness." E. St. Elmo Lewis

HARRY PRINCE, C. E. '40, has merely made a continuation of his activities enjoyed through his high school days in Kewanee, Ill., where he grew up and obtained his elementary education. His activities in high school in plays, debate, yearbook, Hi-Y and the various functions which demand a high school fellow's attention



PRINCE will be kept busy at many posts this year prominent among which will be military activities. This summer he attended Camp Custer along with 45 other Illinois engineers who gained outdoor experience in realistic military conditions.

paved the way for his making the place for himself on the University of Illinois campus. Engineering was his chosen profession when he left high school, and the University of Illinois had been plugged to him so excessively and well that he had already chosen it as the ground for his engineering training. Since his step into the stream of Illinois activities he has been made Vice President of the ASCE, has become a member of Sigma Tau, a member of Phalanx, and the president of Chi Epsilon, and has become Secretary of the Tau Nu Tau Society.

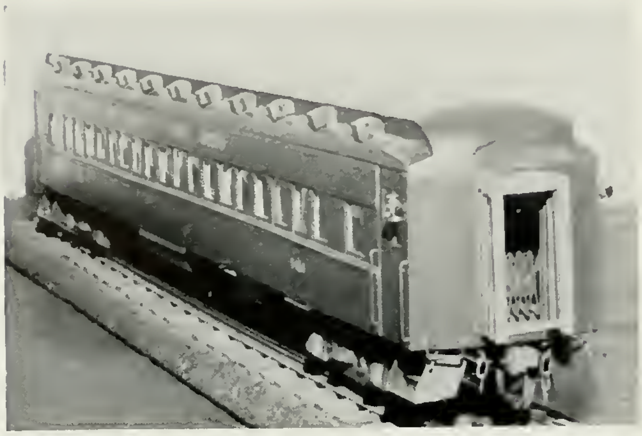
Harry has spent his summer vacations rather constructively, dividing them between working as a spray painter in a boiler shop and as a surveyor helper on the Mississippi River for the U. S. Army Engineers. Structural engineering is his forte, although he has not got around to figuring just what specific type of structural engineering in which he wishes to specialize. This summer, upon returning from R. O. T. C. camp, Harry hitchhiked to the State Fair at Springfield but it took him 1500 miles.

PROF. JOHN S. CRANDELL, since his graduation from New York University in 1904, has done a multitude of things, among them song-writing, general civil engineering work, research, and, in the main, highway engineering work, both in practice and in education. He has been in Europe four or five times and has spent some time in Panama. During his college years, he was quite prominent in song and play writing and producing. The plays and light operas he brought out while in school forecast the future success of his two Broadway hits, "Yankee Brigands," and "The Debutantes." The N. Y. C. R. R. claimed him for several years following; and after some time as a faculty man at Penn. State, Prof. Crandell did some work as a consulting engineer for the Barrett Co. until 1926. Since then he has been at the University of Illinois, instructing in highway engineering, writing songs we have all heard the University bands play, writing innumerable articles for publication, and dreaming of his farm back in Pennsylvania. In the summer look for him in Pennsylvania; in the winter at his carpentry building cabinets whenever time

CRANDELL, who likes to write songs and poetry, mends his own road while vacationing in Pennsylvania.

permits. Prof. Crandell's memberships in societies, engineering associations and fraternities are numerous. He is author of Section 20, American Civil Engineering Handbook and has patented a number of inventions, the most widely known among them being a bituminous mastic cushion for block pavements, and the Crandell spacer for wood block pavements.

Model Railroading is Fun



— Courtesy of the Model Railroader

A "super-detailed" O gage passenger model

By T. C. Shedd, Jr.

Only a few years ago any adult who "played with trains" was considered by the public at large a potential case for the nut house, a person to be looked down upon as having the mentality of a twelve year old child. After all, who ever heard of a sane person playing with trains? But times change; in the last five years the hobby of model railroading has emerged from the status of a juvenile pastime to take a place with stamp collecting, photography, and other popular avocations. It is estimated that there are probably 50,000 serious model railroaders in the United States today, and the number is increasing rapidly.

Scale model railroading has for many years been an accepted hobby in Great Britain, but up until the Century of Progress Exposition in 1933 it had only a few devotees in this country. The large model displays of several leading railroads at the Chicago fair made many new friends for the hobby, and its growth thereafter has been rapid.

There are two general types of model railroads. Some use the ready-built toy or "tinplate" trains and track. This equipment is inexpensive and runs well. But toy trains, as anyone will readily agree, often have only a general resemblance to real ones. For this reason, many model railroaders prefer to buy or build their own equipment, which, being built to exact scale, is realistic in almost every detail.

Scale model railroads today are built in numerous different scales and gages of track, but three scales and gages (the distance between the inside faces of the running rails) account for perhaps 92 per cent of the model roads in this country. Listed in order of their popularity as revealed in a recent poll, they are:

"HO" gage: track 16.5 mm. wide; equipment built to scale 3.5 mm. = 1 ft.

"O" gage: track 1¼ in. wide; equipment built to scale ¼ in. = 1 ft.

"OO" gage: track 19 mm. wide; equipment built to scale 4 mm. = 1 ft.

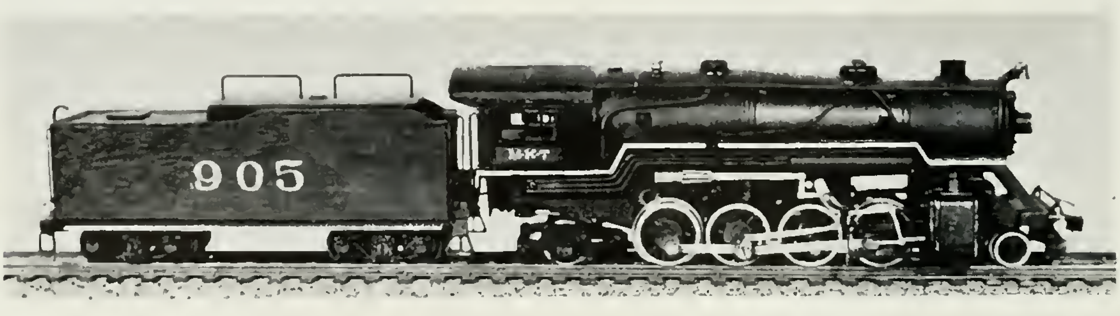
Of these three gages and scale, "O" is the oldest; its track gage of 1¼ inches is the same as that of the majority of the tinplate trains being made today. "HO" gage has gained greatly in popularity in the last few years. Its chief advantage is the fact that, since it is about half the size of "O" gage, it allows the laying of about four times as much trackage as would be possible with "O" gage for any given amount of space. The cost of "HO" equipment is also proportionately lower.

The locomotives used on model railroads are an interesting study. Almost every type to be found on a real railroad is modeled by enthusiastic fans. Dinky roundhouse switchers, streamlined passenger engines, huge articulated freight "hogs," and diamond-stacked old timers—all are found on American model railroads.

In the old days the scale model fan had to build his own establishment of a home pattern shop and foundry for making cylinders, drive wheels, truck sides, and many other cast parts.

Such labor is no longer necessary except in the less popular scales; it is usually cheaper and more satisfactory to buy ready-made castings for locomotives and to build up the rest for one's self, or to buy the complete locomotive kits which are now on the market. These kits contain all the necessary parts to build a complete engine. Sets are available for a large number of locomotive types in the more popular scales. In HO scale, for example, at least twenty different kits are now being sold.

In the case of cars the story is much the same; the variety of kits available is truly astonishing. In HO scale alone there are at least 150 different kits being manufactured at present. Wood, cardboard, and castings are the materials most generally used in car construction.



— Courtesy of the Model Railroader

"O" gage scale model made by rebuilding a standard toy engine

Track for scale model railroads is always built as realistically as possible. Up to the present time, due to production difficulties, nearly all the rail sections available are somewhat oversize. Rail is generally brass or steel. Some aluminum is also used. Steel is the most realistic; but brass is somewhat easier to work and is less subject to corrosion. In O gage and to a lesser extent in HO and OO, the usual practice is to use wood ties. These are laid on a "ballast" material, usually of roofing paper, although sometimes sand or fine gravel is used the more closely to simulate actual practice. The rail is spiked to the ties with scale spikes or small nails. The entire track structure is mounted on narrow boards of ply- or pressed-wood cut somewhat wider than the track. These boards are, in turn, placed on tables, the tops of which are three feet or more off the floor. The planning of a track layout is a subject far too detailed to discuss here. Several books on the subject have already been published.

Switches are either made up from standard rail or rapidly gaining popularity, utilizes both rails for the power circuit. This method is especially successful in HO gage, where a third rail is difficult to maintain. The flow of current is through the wheels of the locomotives. No rails are left for signal circuits; consequently signalling is likely to be difficult and expensive. Another difficulty is that the wheels on one side of each car must be insulated from the axles.

In some cities, model railroad clubs are growing rapidly. The larger clubs may have their own railroads on which members combine their equipment to form one large system. These club railroads are operated like full sized ones, with dispatchers, towermen, engineers and section hands. Members work their way up from the lower positions to the coveted engineer and dispatcher posts. Trains are operated on timetable schedules; every effort is made to run the system in accordance with actual practice. With a club railroad, it is possible for a person who has no space for a home layout to derive the fullest enjoyment from the hobby.

—Courtesy of the Model Railroader

Scenes on the "Hell West & Crooked" Railroad—an HO gage line

are assembled from commercially available kits of parts. A noticeable difference between scale and tinplate railroads is the fact that curves of large radii are used on scale layouts; four feet is considered the minimum radius to allow the operation of scale equipment in O gage. These large curves, of course, require considerable space.

Model locomotives are usually driven by small motors which run on low voltage alternating or direct current. For O gage, series-wound motors which operate on either AC or DC, 12 to 18 volts, are the most popular. A transformer usually is used to deliver this voltage from the AC house mains. The same system is also used for OO gage. In HO, DC supply from a 6 volt storage battery or rectifier is almost universal. HO locomotives use motors with permanent magnet fields. These motors, which operate only on DC, can be reversed simply by changing the polarity of the supply voltage.

Several forms of current distribution systems are employed by model railroaders. The outside third rail, as used by the New York Central and other railroads, has been almost standard. Overhead trolley is a very satisfactory method for roads which follow electric prototypes. In either of these systems one of the running rails is used as the return circuit; the other running rail is available for signal circuits. The two-rail system, now

This article has only touched in the briefest way some of the high spots of model railroading. One reason for the increasing popularity of this avocation is that one of its many phases appeals to almost everyone. Cars, locomotives, track, signalling, operation, clubs—all these sides of the hobby make it one of the most interesting imaginable. In the opinion of its followers, at least, there is nothing to compare with it!

Bibliography

Periodicals:

The Model Railroader. Published monthly. Wauwatosa, Wisconsin.

Model Craftsman. Published monthly. Mount Vernon, New York.

Railroad Magazine. Published monthly. 280 Broadway, New York City.

Model Builder. Published bi-monthly. 15 East 26 St., New York City.

Books:

Yates, R. F., *Making and Operating Model Railroads.* New York, D. Appleton-Century Co., 1938.

Beal, Edward, *The Craft of Modelling Railways.* London, Thomas Nelson and Sons, Ltd., 1937.

KNOW *Your Illinois*

Article No. 1—Meat Packing

By Bob Tideman

Jean went in first—in fine spirits. A moment later she staggered out, crying fearfully. I went in with the rest—gnawing a chocolate bar. The squealing of hogs rent the air and a persistent odor was everywhere. I leaned over the rail as nonchalantly as I could, gazed at the dying hogs and at the blood flowing on the floor, and took another bite of my chocolate bar.

Jean had been profoundly shocked by the stockyards. She loved bacon, but she didn't really know it came from hogs like those. She would have preferred to remain ignorant and enjoy her bacon without a shudder.

But why avoid truths that seem unpleasant; we must admit openly that mutton is dead sheep and beef is dead cow. Besides this, the gap between the pasture and the frying pan is so valuable to Illinois industry that we should feel proud of it. Let us bridge the gap.

Farmer Brown has some hefty half-ton cattle and 250-pound porkers that he's been stuffing as he watches market prices. They're full grown and ready to sell, so on a fine September day when the market prices are fair he hies them off by railroad to Chicago, several hundred miles away. No, Mr. Brown is not an Illinois farmer; he lives west of the Mississippi, but he prefers the Chicago market because there, at the world's greatest meat-packing center, he can sell quickly and at a fairly constant price.

Every packing plant operates its own refrigerating system, and many, especially in Chicago and East St. Louis, own power plants, carpenter shops, laundries, gymnasiums, railway cars, and motor trucks. In the value of products, the meat packing industry ranks first among all industries in the United States. About one and one half billion dollars worth are produced each year. Does it surprise you to hear that Illinois ranks first among all the states? More than three hundred million dollars worth annually, or about one fifth of the total, is produced here.

His livestock arrives consigned to his "commission man" who will sell for him. It is placed into clean paved pens, fed, and watered, and soon buyers offer their bids. In less than twenty-four hours, perhaps even one hour after their arrival, Farmer Brown has exchanged his livestock for cash.

The animals are driven into the pens of the packing company which bid highest and consequently bought them. Let us follow first a hog through the conveyor system. He is crowded with many others on to the floor beneath a huge, slowly rotating, vertical wheel. He squeals and dodges frantically, but his time comes, and he is shackled to the wheel by a hind leg, lifted, and transferred to a sliding rail. A knife thrust severs his neck artery and the blood drains. Scalding and scraping remove the bristles and hair, and the hog is scrubbed—clean for once. A short stick with an attached hook is set between the hind feet tendons, and the carcass is hung from a trolley on an overhead rail. As it passes the various workmen, it is split open, dressed, trimmed, drenched, and finally delivered to the cooler. About half an hour has passed since the hog was shackled to the wheel.

After chilling for about twenty-four hours, the carcass is divided into various cuts, which fall to the shipping and curing rooms. The live hog entered at the top of the building and has been falling ever since, both in elevation and dignity. In the curing rooms, many processes are under way—smoking, salting, pickling, lard rendering, and others. The smoking is done in large rooms, one above the other, with vents between and a fire of hickory logs at the bottom.

The killing and dressing of sheep and cattle is very similar to but not the same as of hogs. Cattle are stunned before being dispatched, and sheep die without a murmur. Beef is usually cut into sides or quarters; veal, lamb, and mutton carcasses are usually delivered whole. In the killing and dressing departments we encounter federal inspectors at every turn, many of them trained civil service veterinarians. Every animal is inspected several times in several different ways, before the stamp of approval is given and the meat sent to the cooler.

It is easy merely to say, "Then the meat is delivered to the retailer," but before the era of refrigeration, fresh meat could be transported only in winter, and even then a warm spell could ruin carloads of valuable meats. In certain sections there was, in cold weather, a "fresh meat season" welcomed perhaps as cheerily as Christmas itself. However, with the development of the refrigerator car, fresh meat all year around became a commonplace convenience. Later, the development of mechanical refrigeration proved to be the emancipation of the meat packing industry. Formerly, the ice house was often larger than all the rest of the plant, and because of the lack of "refrigerators on wheels," the average distance from pasture to frying pan was well under a hundred miles. Nowadays, the refrigerator system is only a small integral part of the whole plant, and the average distance between producer and consumer is barely under a thousand miles! Much meat prepared in Chicago travels hundreds of miles in refrigerator cars to local wholesalers, who deliver it in refrigerator trucks to meat markets.

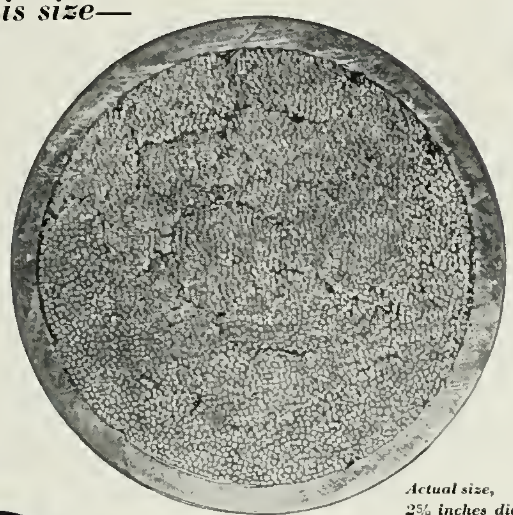
Perhaps you have wondered, as you reach into your pocket, where the money goes when you bring home the bacon. It is almost invariably true that about one-half goes to the farmer, about one-sixth to the stockyards, and about one-third to the wholesalers and butchers.

As the industry has developed, increasing use has been made of by-products, until today it is actually true that only the pig's squeal is wasted. The by-products from cattle and sheep are so valuable that a dressed carcass can sell for less than the live animal! Among the 140 by-products are sandpaper, isinglass, ammonia gas, insulin, and violin strings.

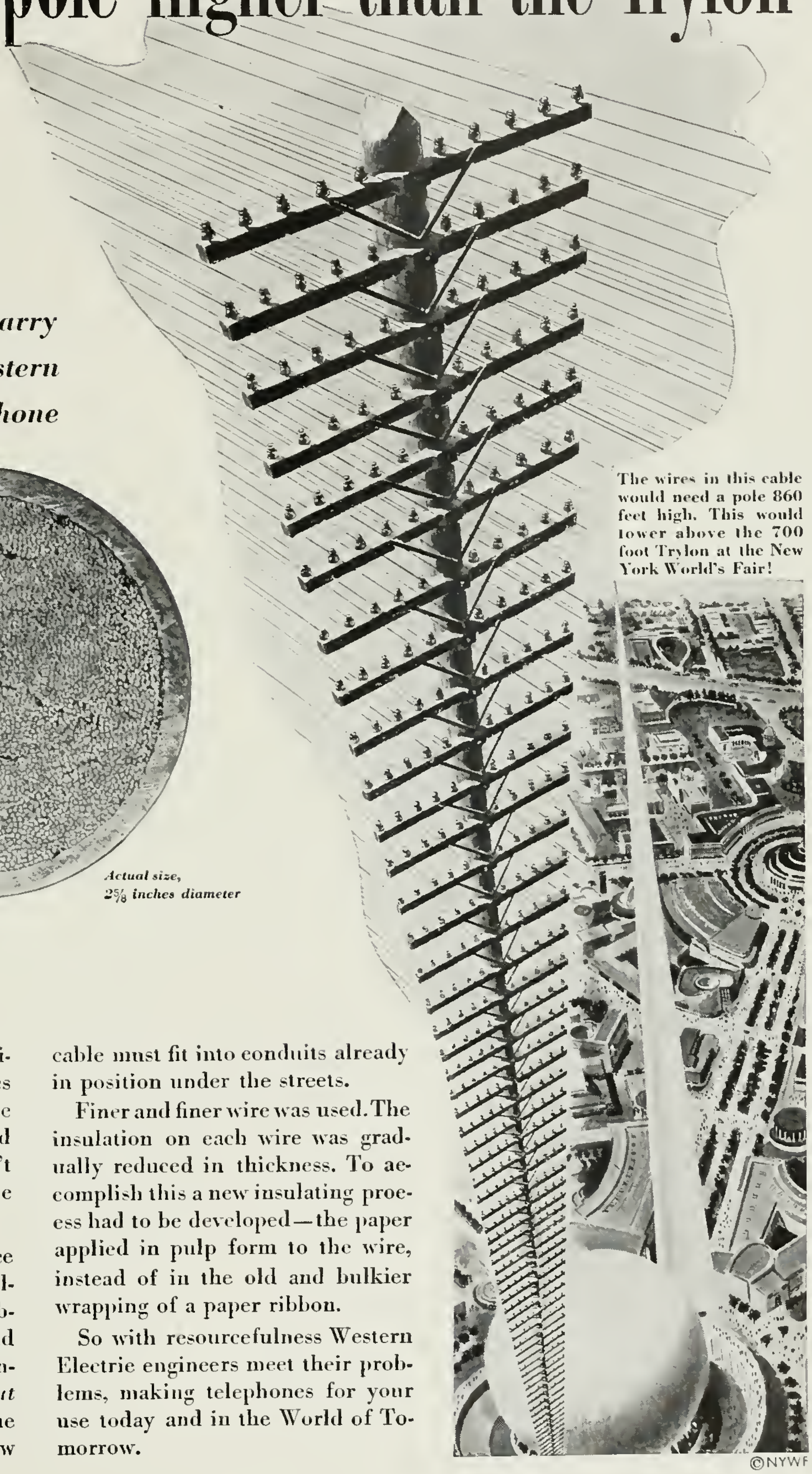
I guess Jean was right. The stockyards are bloody, ugly, and smelly, but the nation demands meat. Poppa says, "Steak!" Junior cries, "Bacon!" and the wheels of the industry spin a little faster and the stench becomes a little stronger. Surely the hogs squeal and bleed, but in Illinois alone, each day's produce is worth more than $800,000. I say, "Give me my pork chop," I can hold my nose.

A telephone pole higher than the Trylon

. . . would be needed to carry the 4,242 wires that Western Electric packs in a telephone cable this size—



Actual size, 2⅝ inches diameter



The wires in this cable would need a pole 860 feet high. This would tower above the 700 foot Trylon at the New York World's Fair!

©NYWF

Either fantastically high poles would be needed—or many people who now have telephones would have to go without. Streets couldn't hold enough poles for the telephone requirements of a modern city.

To handle the demand for service Western Electric's Engineers in collaboration with Bell Telephone Laboratories' scientists have sought and found ways to make cable containing more and more wires, *without increasing the cable's diameter.* The need for compactness is because new cable must fit into conduits already in position under the streets.

Finer and finer wire was used. The insulation on each wire was gradually reduced in thickness. To accomplish this a new insulating process had to be developed—the paper applied in pulp form to the wire, instead of in the old and bulkier wrapping of a paper ribbon.

So with resourcefulness Western Electric engineers meet their problems, making telephones for your use today and in the World of Tomorrow.

Western Electric *. . . made your* **BELL TELEPHONE**

• OUR SOCIETIES •

ILLINI ENGINEERS

Officially in full swing and replacing the old Engineering Council is the Illini Engineers whose purpose is "—to unite the engineering students, faculty, and alumni of the University of Illinois, and, through this union, to promote interest in the welfare and traditions of the College of Engineering."

Dues are $1.75, seventy-five cents being applied on the student's departmental society and an equal amount for eight issues of the student magazine, the *Technograph.* The society's standing committees are as follows: membership, program, publicity, athletics, open house, employment, social, guide service, curricular, and scholastic.

Tom McCrackin, C. E. ....*President*
V. J. Cichowski, Cer. ....*Vice President*
Robert Roose, M. E. ....*Treasurer*
I. L. Waisman, Met.............*Recording Secretary*
R. M. Sinks, E. E.........*Corresponding Secretary*

RAILWAY CLUB

Don Lyons ....*President*
Dick Rayer ....*Vice President*
Del Eglin ....*Secretary-Treasurer*
Dick Stair ....*Publicity*

The Railway Club is an organization of railroad fans, and is open to anyone on the campus who is interested. Meetings are held twice a month featuring speakers, quiz programs, and trips to points of railroad interest.

Information about the first meeting of the fall semester may be obtained by consulting one of the above officers. Rail fans and model railroaders are cordially invited to come and meet a swell bunch of fellows.

ASAE

Lynn K. Huffman ....*President*
J. P. Crandell .... *Vice President*
R. Rhae Pickens ....*Secretary*
G. E. McKibben ....*Treasurer*
E. G. Gallagher ....*Reporter*

The Illinois student branch of American Society of Agricultural Engineers sent four representatives to the National Convention this year. Those selected to represent the University of Illinois at the Convention, held in St. Paul, were L. K. Huffman, J. M. Trummel, R. Rhae Pickens, and L. G. Melvin. The convention, which was held at the University of Minnesota farm near St. Paul-Minneapolis during the week from June 19 to 24, provided a great many interesting contacts for those privileged to attend and furnished several new ideas for the organization in the fall.

AIEE

The student branch of the American Institute of Electrical Engineers is interested in aiding and developing the abilities of the students by affording them opportunities to carry out activities similar to those of the professional society, such as, holding meetings and presenting and discussing papers, reports, and abstracts. This club is noted for its interesting smokers and its enthusiastic membership.

SBACS

V. J. Cichowski ....*President*
J. W. Briscoe ....*Vice President*
R. R. Rough ....*Secretary*
R. L. Garret ....*Treasurer*

The student branch of the American Ceramic Society carries out a very active program during the school year. A dance, the Ruckus, is given annually, and the Pig Roast, a traditional banquet, enjoyed at the close of each year. The club also publishes a year book, *The Illinois Ceramist.* The club meet twice a month and prominent men from the ceramic industries are invited to speak.

AIChE

The winners! Last semester "Five Point" Don Hanson, now president of AIChE, won the medal awarded annually to the junior chemical engineer who has maintained the highest scholastic average during his freshman and sophomore years. Lee Lyons and Bob Holmes won, also, the first and second prizes of ten and five dollars for the best solutions to the AIChE contest problem. Their solutions will be entered into the national competition.

ASCE

The student chapter of the American Society of Civil Engineers is begining its first semester of its fifty-sixth year as a campus organization with the following officers:

Tom McCrackin ....*President*
Harry Prince ....*Vice President*
Davis Stinson ....*Sectretary*
William Brett ....*Treasurer*

AIME

The American Institute of Metallurgical Engineers has not announced its program but will probably place a large placard of coming events in a prominent place.

ASME

R. W. Roose ....*Chairman*
G. L. LaRoche ....*Vice Chairman*
Jack Carter ....*Secretary-Treasurer*
Prof. D. G. Ryan ....*Honorary Chairman*
Sam Capizzi ....*Publicity Committee*
A. L. Danielson ....*Publicity Committee*
Thomas Jackson ....*Publicity Committee*

The purpose of the student branch of the American Society of Mechanical Engineers is three-fold: it serves to unite the mechanical engineering students with the practicing engineers of the professional society; it brings to the campus speakers who talk about the practical side of engineering; it helps the student get acquainted with the faculty members. Membership in the student branch of the American Society of Mechanical Engineers reached 160 last semester, the largest in its history. It was second only to the branch at Purdue and leads even Purdue in percentage membership.

MIS

Officers of the Mineral Industries Society are:

J. L. Waisman .... *President*
E. R. Buchholz .... *Vice President*
Joe Lange .... *Secretary*
R. S. Hogue .... *Treasurer*
H. L. Walker .... *Faculty Adviser*

GENERAL ENGINEERS

A new society which made great progress under the leadership of pioneer Maynard Huffschmidt last semester and which shows promise of being an active and interesting organization this year is the Society of General Engineers. Officers are:

William Shive .... *President*
William Chamberlain .... *Vice President*
Ken Hamming .... *Secretary*
Joe La Mantia .... *Treasurer*

SYNTON

One of the most unusual organizations on the campus is the local chapter of Synton, professional radio fraternity. While many of its activities are common to other fraternities, both professional and social, its central theme is unique.

Radio communications form the principal activity of this fraternity. Since 1925, when the first chapter of Synton was founded at the University of Illinois, its members have maintained a short wave station in the University Armory. Most of its members are licensed operators who own and operate their own amateur stations at home. Since very few of them bring their radio equipment to school with them, the Synton station is used considerably for keeping schedules with home stations and for keeping in touch with other friends over the air.

W9ZOL, as the station is officially designated, is licensed to Synton through Prof. H. A. Brown, of the Electrical Engineering Department, who acts as trustee. The room in which it is located, 236 Armory, is furnished as a club room. Synton operated W9ZOL twenty-four hours a day during the annual amateur DX contest held last year in the spring. With the aid of a newly-acquired Comet-Pro communications receiver and the 300-watt transmitter, stations in all parts of the world were worked. Synton members all over the United States will soon be communicating with one another as a result of a new program to equip all active and alumni members with crystals on the same amateur frequency.

ALL SOCIETIES

Here are some figures on the memberships in the departmental societies last year. Look 'em over.

Society	*Members*	*In Curriculum*	*Percentage*
AIChE	66	286 (LAS)	23%
AIEE	128	306	42%
ASAE	27	30	90%
ASCE	172	260	66%
ASME	160	557	29%
EPS	22	34	65%
MIS	67	128	52%
RC	9	24	38%
SBACS	70	150	47%
SGE	22	132	17%
Total	743	1907	39%

THE ILLINI TRAIL

(This column has been compiled by Elwyn King, M. E. '42, to whom alumni correspondence should be addressed.)

•

Hail, Illini Engineering Alums! Since this intellectual boiler factory north of Green Street has just made an addition to your ranks, the class of '39, the *Technograph* has to keep pace with an enlarged section devoted to Illinois.

Recently I had the pleasure of talking to Sigfried H. Westby, '28. For the last ten years he has been in the Chicago office of the Illinois State Highway Department. Though I had never seen "Coolie" before, we had an enjoyable chat, and it was interesting to get his views on engineering and also his remembrances of his college days.

Class of '34, let's see what some of your members are doing. Robert F. Hoffman and Herbert R. Stopes are both with the Tennessee Valley Authority. They both live in Knoxville and are working on silt investigations. After two years of construction work at the Milwaukee Filteration Plant, H. N. Kingsbury became a district engineer for the Wisconsin State Board of Health. He lives in Ashland.

Walter J. Hoffman became a land appraiser for the village of Glenview, Illinois, after graduation. In two years he joined the water department. From there his trail led to a city engineering job and then to statistical work and physical appraising. In May, 1935, he was appointed village manager and is still in that capacity.

F. R. Brown and V. G. Kaufman are connected with the United States Waterways Experiment Station at Vicksburg, Mississippi. C. C. Arze is in South America. James Hamilton is with the Chicago Bridge and Iron Company.

In the five years since Leslie E. Colby has been out of school, he has been a surveyor, a flying cadet at Randolph Field, a draftsman, and at present he is a construction inspector at the Sardis Dam at Sardis, Mississippi. The work is being carried on by the Department of Rivers, Harbors, and Waterways of the Federal government.

Russell G. Carlin is another alum that has had varied experiences. After graduation he worked in the statistics department of the City Light and Power Company of Seattle, Washington. From there he went to the South Works of the Carnegie Illinois Steel Corporation, in Chicago. He has done mapping, railroad track layouts, estimating of proposed construction, and inspection of actual construction. He has designed structures ranging from auditoriums and post offices to sewage plants. At present he is engaged in estimating and designing reinforced concrete structures.

Arthur C. Carlson is with the Building Engineering Department of the Illinois Bell Telephone Company. His work has been in the design, installation, construction, and inspection of their buildings. He has designed and installed ventilating and heating equipment, humidification systems, flood control protection systems, has worked on the accoustical treatment of buildings, and also has had experience in cost studies.

Any of you grads (young, old, or otherwise) know any yarns about your college days that are fit to print? I'd like to sit in on a bull session with you and listen to them. Since that isn't possible, why not write us and tell us about them? Let's take another look and see what more of our alumni are doing. Richard T. Larsen, '29, has been with the United States Bureau of Reclamation since 1930. Friends perhaps remember seeing him and Westby running surveys near their home town of Elgin. Starting as a junior engineer, he became an assistant, an associate, and now is the resident engineer in charge of construction on the Salt River Project in Arizona.

From the class of '26 is William Fischman, Junior Subway Engineer. His work is in connection with Chicago's system of freight tunnels. W. C. King, '29, is in Whiting, Indiana, with the Standard Oil Company. C. K. Willet is in private consulting work in Dixon, Illinois.

Another of our graduates to leave the United States is Clement V. Lloyd, '28. For the past ten years Lloyd has been engaged in the maintainence and construction of roads, bridges, and public buildings in Jamaica, British West Indies.

Wayne R. Wooley has been with the United States Bureau of Public Roads since he graduated in 1927. His first two years after graduation consisted of time studies and cost analysis in several southeastern states. He also worked in the Washington laboratory of the bureau. Since 1929 he has been the Materials Engineer of District 7 and has his office in Chicago.

After two years as sales engineer for the American Steel and Wire Company, Don W. McGlashon, '25, went with the Portland Cement Association as a sales promotion engineer and at present is located with this company. Frank A. Strouse, '25, joined the McClintic Marshall Corporation immediately after graduation. He rose from a shop apprentice to a draftsman, then to an estimator and designer. Shortly after this he became the Assistant Works Manager. In 1931 he left McClintic Marshall to become the supervisor of piece work in the Fabricated Steel Division of the Bethlehem Steel Company.

Since he graduated in 1922, Earnest E. Michaels has been with the Chicago Bridge and Iron Company, first as engineering assistant, then as chief draftsman, and then as assistant manager of operations. Since 1930 he has been the manager of the company's Birmingham (Alabama) plant.

After holding various jobs from the time he graduated until 1928, Cyrus C. Fishburn, '16, located permanently with the Bureau of Standards at Washington, D. C., where he is an associate engineer in masonry construction.

Your Magazine . . .

THE TECHNOGRAPH is a student magazine the purpose of which is to publish items pleasing and beneficial to students, faculty, and alumni of the College of Engineering, and to present opportunity for students to write technical and non-technical papers.

It is our wish that you follow the pages of *The Technograph* during the next seven issues; that you cooperate with us in bringing patronage to our advertisers; and finally, that you have the best of luck throughout the rest of the year.

Students, we welcome you to apply for work on the editorial or business staffs. Those already in our midst are: Marvin E. Veerman, Thomas McEneely, R. A. Thorton, M. P. Williams, George H. Hargitt, W. W. Witort, George W. Somers, V. H. Evans, Joseph Collins, Vernon Steiner, Robert Tideman, G. B. Carson, Bob Hafner, Elwyn King, Thomas Shedd, Jr., Walter Pahl, Hideo Niiyama, James Thale, Roy Hammar, Don Stevens, Gene Sternberg, and Wayne Moore.

This issue brings you the first of a series of articles on our State of Illinois. Watch each issue to see if you "Know Your Illinois." "Tommy" Shedd who usually has his model railway on exhibit at our open houses, brings his version of the hobby to you and urges you to try it out.

In view of the so called "awakening" of the engineering students, it seems timely to open a section of The Technograph for the purpose of stimulating or encouraging any tendency toward a closer communication among the students and faculty, and alumni. Hereafter it is our intention to devote space for letters to the editor. This means an opportunity for anyone who so desires to voice his opinion on topics that should be of interest to our readers. There are many "gold mines" hidden in the ranks of our students, and it should be proper that their theorizing and philosophizing which would, if heard, promote a good 'ole bull session, should be presented for the public eye. We invite, therefore not only your letters of facts but also those in which you may expound the benefits and drawbacks of a summer job or of laboratory technics.

No letters will be published which, in the opinion of the editor, will bring discredit to the college.

Lester Seiler .... *Business Manager*
Glenn Voigt .... *Editor*

COAL BY-PRODUCTS

With a gayly feathered hat, Mrs. Society may ride out of town "tarred and feathered" and in great dignity; grateful for the fine dyes and perfumes derived for her pleasure from common coal tar. And more than that, she may now go so far as to wear artificial silk stockings made from coal which far surpass rayon and pure silk hosiery in many respects.

Today many of our most useful products are made from coal gas residuals—by-products obtained by the coking of coal. Not long ago these gases, vapors, and liquids were thrown away, but the industrial chemist has found ways of converting them into useful products very necessary to our civilization. Now, as a result, the coke by-product plant is a complete and self-contained unit within the steel making industry with which it has little connection except for the fact that the steel plant must have coke and gas.

During the summer, many do not realize that their soft drinks are sometimes sweetened with saccharine, 150 times sweeter than sugar, that this product is derived from coal tar, and that the vanilla or bitter almond flavoring in their delicacies are also such products. Among the many drug store goods of this family, we are particularly interested in novocaine, aspirin, salversan, phenol, acetanalid, salcylic acid, and picric acid which serves the triple purpose of being a medicine, a dye, and an explosive.

Clothing may not only be dyed with synthetic indigo, but it may be cleaned in naptha, preserved in moth balls made from napthalene, and perfumed with geranium, violet, hyacinth, or musk—all coal tar products. T. N. T. (*Trinitrotoluol*) and nitro benzol as explosives are vital to our national defense. Benzol, toluol, and solvent naptha, among other uses, are quite essential to the paint and rubber industries.

Phenol, produced from benzol, sulphuric acid, and caustic potash, when treated with formaldehyde is transformed into bakelite and similar resins used in the rapidly growing plastic industry.

As a general statement, it may be said that from 10 crude compounds removed from coal tar are produced about 300 very complex substances from which about 900 dyes, and numerous drugs, explosives, and perfumes are made. The 10 crude substances are benzene, toluene, xylene, phenol, cresol, napththalene, anthracene, methyl anthracene, phenanthrene, and carbazol.

DUAL CURRICULUM

In keeping with the trend toward a higher degree of specialization in professional fields, the College of Engineering of the University of Illinois is offering a "Dual Curriculum" but limiting it to the superior students only.

The dual curriculum has no fixed standards in regard to studies. Its purpose is to give the exceptional student opportunity to train in some technical problem which may not be adequately covered in any of the regular courses. For instance, one student whose father was a heating and ventilating contractor, was able to enter this business because he had tentative plans to go on in his father's business. Another might want to make an intensive study of soil mechanics or spherical bearings. The student in this special course graduates with the degree of his original department.

Anyone contemplating this curriculum should discuss it with Associate Dean H. H. Jordan, with the head of the department in which he is registered, and with the professor under whom the specialization would take place. If the student has proved himself capable, and if the consultation shows that such action might be desirable, the matter will be taken up with a committee of which the Associate Dean is chairman. If the vote is favorable, the student is free to go into the special curriculum and to actually begin his life's work under able guidance.

Believe in Your Ambition, Freshman

Give a man a cigarette, a car, and a suit of clothes and he will make you think he is the biggest executive in town although he may be only a clerk in a grocery store. This is a man's vanity. Give a woman some cosmetics, a fine dress, and a funny hat and she will look like the executive's wife. This is a woman's vanity. Give some girls a sorority house and you'd think they belonged to the elite "400." You'd think they earned the distinction.

BUT, put a man on an island, with no promise of ever seeing anyone again, and he will pine away. Warden Lewis E. Lawes has said that a man in solitary could learn to sleep 22 out of 24 hours! In society, this prisoner would be alive 16 hours a day conversing, boasting, smoking a big cigar, seeing things, doing things, satisfying his vanity—living in a land of make believe.

Sometimes a college student sees deep into reality and rebels at pretending. He becomes suspicious of his previous conceptions, and soon his vanity and the desire to excel is gone.

FIRST YEAR MEN, the only things in life that have value are those which are accepted on principle. You may easily lose your belief in the principle that time spent studying at your desk is more valuable than an evening at the movies. You may think many of our accepted standards to be delusions. You may ask for proof that "honesty is the best policy." You may wonder at the reward for following the straight and narrow path. As a matter of fact, we really don't know whether it is better to sleep our lives away, like the prisoner, or to work them away, but let's work them away. It is like "civic-pride," the word sounds good.

Take faith in your pretensions. Vanity is a pretension but it is the gasoline of human lives. Do not condemn it; it is what makes us ambitious to do things, to strive for power, to develop a good personality, to act pleasant. We admire the American Indian's vanity, for he would rather die a silent, courageous death than show cowardise in the sight of his fellow man. Throughout all history it has been vanity that forced man to adopt certain principles, or ethics, that governed his speech, his dress, his character and behavior.

FIRST YEAR MEN, you are given 10,000 fellow students, a place to spend four years, and some vanity to inspire you. True, your ambition is merely an ideal which may fade at times, but play the game the best way you know how. If you fail here, you may fail anywhere you go and it will be because you have not found the reason for taking faith in certain principles placed before you, possibly by your professors.

Reconcile yourself to man's vanity, for, "keeping up with the Joneses" is God's way of keeping us busy till we die. And there is no substitute for honest and sincere work.—*Editor.*

MEMBERS OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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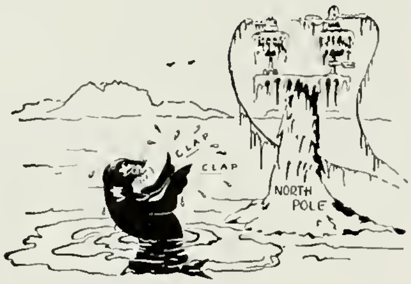
G-E Campus News

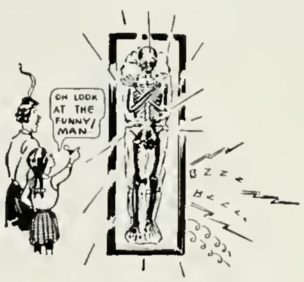


IT CUTS SOME ICE

NICODEMUS, the brown-nosed seal, playfully swam up to the North Pole, tripped the circuit-breaker and plunged Santa's workshop into darkness.

Absurd? Not as far as the successful operation of G-E outdoor air-break switches is concerned. These have been placed in a special room in the General Electric Research Laboratory at minus 20 degrees Fahrenheit, sprayed with water, and tested when coated with ice to a thickness of one and a half inches. The powerful leverages shattered the ice as easily as a walrus swallows a fish. In each case the switches opened and closed properly.

This test is just one of the many which G-E equipment must pass. And the observers, who check the operations with pitiless eye, are members of the G-E Test Course—young college men in their first year with the Company.



OH! MUMMY...!

A SKELETON in the closet—a white-robed ghost in the attic—even Ichabod Crane's headless horseman—may well feel jealous of Harwa, the Egyptian mummy. For while conservative ancestors content themselves with rolling in their graves in a genteel way, Harwa is floodlighted in a golden glow in full view of the public in the G-E building at the New York World's Fair.

This unusual exhibit is designed, not to frighten women and little children out of their wits but to demonstrate one of the many uses of x-rays. By pressing a button, an x-ray machine is turned on, and an image of Harwa's skeleton appears on a fluorescent screen which moves in front of the mummy. The principle employed is the same as that by which a doctor may fluoroscope a broken bone, except that the entire body of an adult person is viewed.

Harwa lived 2800 years ago, in Egypt. From inscriptions on the coffin lid it is learned that he was overseer of storage houses on the great farming estate of one of the temples of Amen, chief god of the empire. Pathological study of the mummy by means of x-ray indicates that Harwa was probably forty years old at the time of his death. And now, nearly 3000 years later, he is in his portable grave, a citizen of ancient Egypt in the World of Tomorrow.

FLOATING POWER

THE surging waves of a stormy sea are beautiful to an artist, disconcerting to a food-loving passenger, but just another problem to an engineer. Whenever a sleek, ocean liner plows her bow through a heaving swell, her engines feel an added load, and her captain wonders if the fuel will last. So, G-E engineers built an all-electric meter that will accurately measure the power put out by the propeller of any boat, from a tiny tug to a transatlantic greyhound.

The meter is essentially a combination of two electric generators mounted a little distance away from each other on the propeller shaft, and connected to instruments which can be located at any point on the ship. The generators are so mounted that at no load the voltages generated are exactly 180 degrees apart in phase and therefore add to zero.

When a load is placed on the revolving shaft, the torque causes a small angular twist in the shaft; consequently, the two generated voltages no longer add to zero. The resultant voltage is proportional to both the shaft twist and the propeller speed, and hence the meter can be made to read directly in horsepower. The installation can easily be modified to indicate total horsepower-hours and to write an automatic log of the power delivered during the trip.

Among the G-E engineers who developed the device are A. V. Mershon, Pratt Institute '13 and Union College '15, and C. I. Hall, U. of Illinois '10.

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THE ILLINOIS TECHNOGRAPH

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Harvesting Pineapples in Hawaii

Personal Experiences of

HIDEO NIIYAMA
C.E. '41

When Middle Western people learn that I am from the Hawaiian Islands, they eagerly ask questions, most of them concerning the same thing. "Are the gals down there as pretty as they look in pictures? You must get an eyeful of those hula dancers. I'll bet surf-riding is a lot of fun!" This is the general run of the questions. A great many people have the impression that Honolulu is a collection of grass shacks inhabited by people who lie on the warm beach and sing and dance all day, in a very primitive fashion. In reality, Honolulu is a thriving American city of more than 130,000 people, larger than any city in Illinois except Chicago; being supported largely by sugar manufacturing, pineapple canning, and the tourist trade.

Hawaii leads the world in pineapple production, shipping about 20,000,000 cans of the fruit annually. The soil and the semi-tropical weather enhanced by the northeast tradewinds are ideal for the growing of pineapples. Here the temperature averages about seventy degrees, and very seldom does it vary as much as ten degrees. The islands are of volcanic origin and the soils are basaltic, with a high content of iron.

The commercial production of pineapple has been highly industrialized, and a description of the canning process would mean a tedious description of the miraculous machines. The "Ginnaca" which peels, cores, slices, and racks the fruits in short order, is one. The fact that two-thirds of the five thousand odd workers in a canary are women, mostly of high school age, may make you think otherwise, but I found the field work more exciting.

The most extensive pineapple fields on the island of Oahu are located between the two mountain ranges that fence the islands. Nestled in a gulch, circled by acres of pineapples, is Kunia Camp, maintained by the California Packing Corporation. Here, in the very shadows of Schofield Barracks, I learned to pick "pines" and had a whale of a time doing it.

The pine-pickers' day begins at four in the morning, when the night watchman bangs on the doors of the rooms in Bachelor's Row to wake the men. The watchman, stout fellow, is on the receiving end of some very harsh words as he goes around flashing his light into the faces of laggards. At 4:30 a. m. the camp gong is rung, and sleepy laborers in all stages of partial dress straggle out to the office for the day's assignment. The houses are still nothing more than darkly silhouetted masses at this hour and many are the times we tramped on some prize plant that an industrious housewife was carefully nursing. By the time the huge blots take the shape of identical, drab, reddish-brown houses the men are away on a huge truck to do the day's work in the fields.

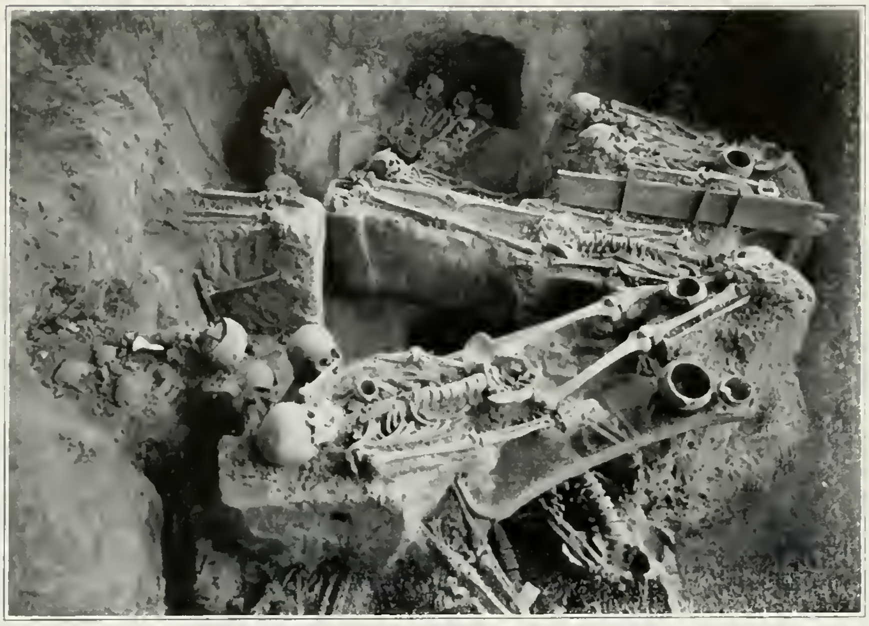
In pineapple picking the men are generally split up into gangs of about forty. This group in turn is divided in half, the stronger ones doing the picking and the others the top-cutting and packing. A foreman, a checker, and a water carrier complete the personnel of each field gang. The pickers, wearing heavy gloves and goggles, plunge into the crowded paths between the rows of plants, and pick the fruits by grasping their tops and pushing down. The plants grow neck high and the pines sit on the top. Each plant bears fruit three consecutive years, but the fruits grow inferior each year. The pickers carry the pineapples in "Pitas" bags and empty them at the end of the row. The normal capacity of the bags is about a dozen fruits, but those amazing Filipino men are able to carry thirty or forty by piling them with their tops inside, and the fruits themselves bulging out in golden fans.

The "cut-top" men cut the tops off the picked fruit, trim the bottoms, and pack them into crates. The checker sees that the fruits have been properly handled and segregated by size. Heavy trucks transport the crates to the switches, where they are loaded into freight cars and rushed to the canneries in Honolulu.

As the day wears on, the burning sun, the constant pricking of sharp leaves, and the red dust begins to tell on the men, and they attempt all kinds of dodges to do the least amount of work in the longest possible time. All old timers smoke Bull Durham. The few seconds of rest gained while "rolling their own" makes their tough jobs more bearable. The company allows workers to eat as many pineapples as they wish while working, and they take good advantage of the privilege. I learned to pick the tasty ones very soon. The idea is to tap the fruit with the index finger and repeat the procedure on the palm of the left hand. If the sounds are identical, the pine is A-1. There is nothing quite like a fresh pineapple, cold with morning dew.

Except when the harvest is in full swing, the worker's day ends at 3 p. m. "Pau hana" is the welcome call when everyone climbs back on the truck and heads home.

After a hasty clean-up, our camp usually headed for



Know your ILLINOIS...

Any Saturday, Sunday, or holiday will find Monk's Mound crowded with pleasure seekers. Young people have long made it a weiner roasting spot without peer; older folks find it a most enjoyable place to while away free afternoons; Boy Scouts visit the place frequently and camera fiends are constantly in abundant evidence. Its broad, grassy top and the view it gives of farmlands and neighboring manufacturing centers equal the

Indian inhabitants of Southern Illinois of several hundred years ago have left a permanent record of their history and habits in several groups of earthern mounds in St. Clair and Madison Counties, immense works obviously erected for religious rites or other public purposes of the constructing tribes. The largest and most impressive of these groups is that known as The Cahokia Mounds, scattered on both sides of the highway serving as the dividing line between the territories of Madison and St. Clair Counties. Smaller and less important groups of mounds have been found a few miles from the Cahokia group in Mitchell and Lebanon, Illinois. As late as 1818 a distinct path from the Lebanon earthworks to the Cahokia group could be distinctly traced, providing definite evidence that the Indian builders were directly related or nomadic descendants of the same ancient tribe or race. Yet it has to this time been impossible to definitely fix the credit for the construction of these earthworks as the first French settlers reached the Illinois region many years after the Indians responsible for the mounds had migrated or become extinct. It has, however, been conclusively proven that the tribes of the region were not natives of Illinois but migrants from the southern states of the Americas, where agriculture was the main livelihood.

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the volleyball courts for a quick game. The Filipinos play a unique variety, in which they kick the ball over the net instead of using their hands. I gave that game up after kicking the ball out of the lot a few times. At night all the younger fellows would gather on the front porch and disturb the others with their attempts at harmony. A few of the Hawaiian boys were fine instrumentalists and they "really got in the groove." There was one fellow who could play a ukulele with one hand. He sang best on a stomach full of beer. Then there was Ricardo, a Cuban ex-navy man, who told us all about the feminine interests in the Orient.

There were some drawbacks at Kunia, and one of them was the shower facilities. We never took showers before bedtime, because we would be dirty again by bedtime. Dry, red dirt, rising from the fields above, sweeps down across the camp and smothers everything. It collects on one's skin and dries stickily. Clothes get brown in half an hour.

Payday was a day of headaches for the camp bosses. Not because they begrudge the workers their pay, but because they were sure a good percentage of the workers would not show up for work for a few days. The Filipino really goes on a mean binge. Most of the Ilocanos owned fighting cocks, and they would bring them out on paydays for some spirited fights. The fights were bloody affairs. The propositions were all challenges. My cock against yours for $50, winner take all. The spectators form a ring. The two owners get in the center and hold their battlers tightly, teasing them continually to make them fighting mad. For instance, the owners make each rooster give the other a few pecks on the head and neck. When the cocks are crowing murder at each other, the respective owners swiftly withdraw to the corners and watch the fight with $100 worth of eagerness. You see two streaks collide in the center of the ring, a flash of knives, and soon one proud fighter quivering in the dust, a bleeding mass of defeated fowl. Bets are paid off, and the ring is cleared for the next contest. The losing rooster is usually too decrepit even for the frying pan.

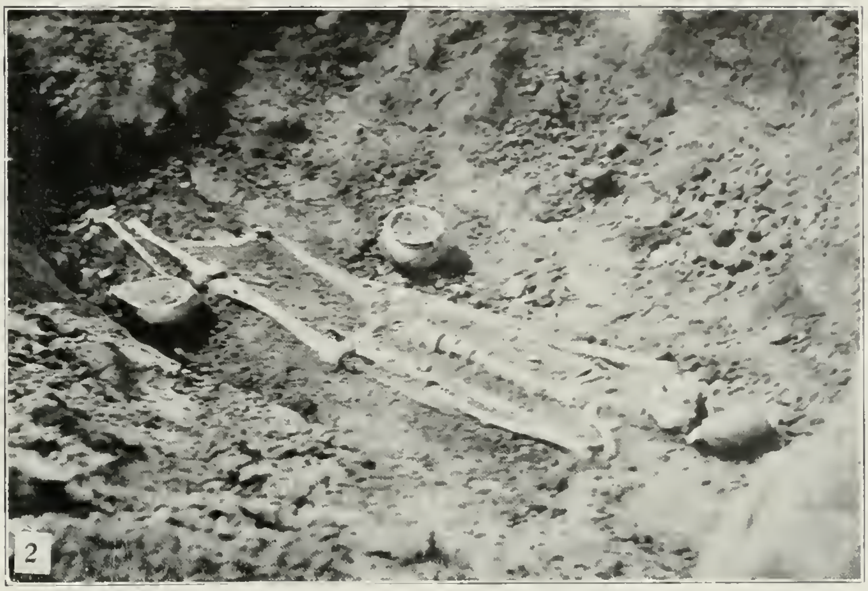
The younger boys of us usually went to the army post or to nearby Wahiawa town for excitement. The soldiers put on attractive sports carnivals which we made a point of seeing. One time ten of us rounded up about 30 of the boys from a nearby CCC camp and set off to Wahiaha to find excitement or to make some. We came upon a Japanese box dance and took possession. Fortunately the dance was easy to learn, and we managed to do a pretty fair imitation of the routine. The managers thought of asking us to leave, but only for a moment. The boys danced conventionally, if not very gracefully, and added color to the affair. The girls were friendly to dance with and soon everyone was having a good time. They even gave us Japanese towels with which to wipe our hands and faces, as is the custom at these dances. Judging from the boasts, everyone had an enjoyable time. I did. That goes for my entire season at Kunia.

Article No. 2—

Indian Mounds

by

GENE STERNBERG '42



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beauty of the densely wooded slopes. At the foot of the trail leading to the great mound is located a small museum, of Spanish architecture, which houses the well-exhibited examples of the handiwork of the ancient artisan inhabitants. One would have a mighty hard time convincing the people of Southern Illinois that their Monk's Mound is not the foremost historically beautiful spot in the State of Illinois.

Several years ago 144 acres in the Cahokia area in Southern Illinois were set aside as a state park. The park district contains 11 of the largest and most important structures, the most widely known being Monk's Mound, the major subject of our discussion. Monk's Mound, aside from the fame arising from its enormous size, has attracted much attention from amateur archeologists and educational institutions, who have found the abundance of Indian pieces buried there much to their liking. A museum has been erected at the foot of the great mound to accommodate the never ending supply of Indian relics unearthed by various searching parties who have made Monk's Mound their favorite digging spot. As an organized group, the University of Illinois has done a great deal of research throughout the mounds and has given much toward the preserving of the history and the fascinating lore discovered there. Men who have spent their hobby time in gathering and tabulating data from the mounds have also done more than their share to keep these landmarks alive for posterity.

The picturesque name of Monk's Mound has been handed down from the colony of Trappist Monks who dwelt on its larger terrace from 1808 to 1913, when they were driven out by a vicious siege of malaria.

The entire group of mounds, and Monk's mound in particular, represents an enormous outlay of labor even when considered spread over a succession of generations. It is almost inconceivable that a primitive people could have fashioned a regular truncated pyramid, 1080 feet long, 710 feet wide, and 100 feet high, with the base covering an area of sixteen acres, three acres more than that covered by the historical Pyramid of Cheops near Giza, Egypt. These facts of size make it even harder to believe that men, women, and children, handicapped by the lack of modern construction facilities, could have had the patience and stamina to construct the lasting tumulus that is today one of the most magnificient of Illinois' spots of beauty. It has been estimated that it would take one thousand men five years to set up the great earthwork if they were forced to use the primitive implements available to the Indian laborers. The dirt was chipped or broken loose with shell, wooden, or stone hoes and spades and transported to the mound site in crude skin or bark fiber bags. If it would take one thousand men five years to erect Monk's Mound, how much time and labor would be expended in raising the eighty-five mounds once scattered over the surrounding 3000 acres? Destruction of the mounds to make way for railroad rights of way and the cultivation of the land by farmers of the region have reduced the present number of the earthworks to between fifteen and twenty. The farmers, in tilling their acres, have never ceased finding relics of ancient Indian life.

Peculiarities in construction of the great tumuli astound the layman. It seems incredible that the mounds were once almost perfect truncated cones or pyramids, the corners of the pyramids directly facing the four major points of the compass.

A discussion of the number and variety of the objects recovered from the mound groups would require volumes, and a mere list of the effects with defining characteristics will be given here. Thousands of arrowheads of all shapes and sizes have been found. Agriculture implements consisted mostly of spades and hoes, notched and unnotched, oval and flare bitted. Caches of unused spades and hoes have also been recovered. The theory has arisen that they may have been stored or used as an indication of family wealth. Mortars and grindstones of finely grained sandstone recovered show that sharpening tools was not done by chipping alone. Beads, pendants, earrings, and like ornaments have been found in abundance, the trinkets made of shell, bone, and stone, fantastic in their crude beauty and charm. Metal pieces recovered have been very rare, only a few made of copper, galena, and hematite ores. The pottery working skill of the tribes is manifest by the great number of vessels of striking serviceability and craftsmanship.

Follow this interesting column in each issue of The Technograph

Freshman Explodes a Bomb

(The following is taken from a Rhetoric theme of R. S. W. written last year)

I am proud to be a student in one of America's finest universities. But I am ashamed of my superiors for feeling that they are doing me a service. I am a student in the College of Engineering of this university merely because I could not afford to attend a specialized engineering school, and did not have the proper connections to get started in a promising position.

My ambition is to become an engineer—a good engineer. I don't believe that I am in the proper place to achieve this goal, but what can I do about it? Nothing. I must accept my fate. For four years I must pay out fabulous sums of money for the privilege of trying to make a group of professors think I know something. If I am successful, they will give me a diploma. I will have

the degree of Bachelor of Science in Mechanical Engineering. I will be ready to take my place beside any engineer in the world. I will advance past the non-university engineer as if his years of practical experience were actually handicapping him. Or will I?

What shall I have learned during my four year seige? Undoubtedly I shall have picked up a great deal of information which will help me as an engineer. Also in order to get my diploma, I will have necessarily absorbed a considerable amount of knowledge which will be of absolutely no use to me. During this, my first year at the University, I am taking a required course in Rhetoric. Rhetoric is a splendid subject for journalists. As an engineer, I fail to see what good it will do me. I am well aware of the fact that engineers must write reports. However, I have received no instructions as to how an engineering report should be written, beyond the fact that it must contain unity, coherence, and emphasis. It seems incredible to me that an engineer should write about the weather in one of his reports unless the weather is a factor to be considered. Yet three semester hours have been spent teaching me to talk about what, and only what, I am supposed to be discussing. I have been taught several "tricks" as to how to secure better coherence in my work and to emphasize the proper points, but most of these seem to me to be the natural thing to do. Certainly I have not learned enough this semester to consider the time profitably spent. And next semester I will learn how to write narration, which undoubtedly is far from the field of engineering.

Military science, physical education, and hygiene are other subjects which have value in themselves, but which take up far too much of the student's time and money. As I advance in the school, useless course after course will be forced upon me. Mathematics which I will forget after the final examination, and will never again use, will take up much of my time in my sophomore and following years. Languages and non-technical subjects will haunt my study hours from now till Commencement Day. Only six of the one hundred thirty-six semester hours ahead of me will be taken up by technical specilization. If I desire to get much out of my chosen technical option, I must take graduate work.

The University method is a well established educational order, and since engineers must be educated, most employers turn to these graduating classes for their new blood. But these men have been found to be lacking in sufficient engineering education; so large concerns give the cream of the crop an extra two years of technical training. For those young men who find it impossible to attend college, apprenticeship schools have been established. In these, the student learns the machinist's or pattern maker's trade, and if he is of sufficient intelligence, he has an opportunity to study engineering. But these schools are very few and very small, and only a slight percentage of the thousands of applicants ever enter their portals. In fact, most schools of this type limit their student body to young men who have lived for a number of years in the city in which the shop is located. Only a few of those accepted have the chance to do any real engineering. Prospective engineers, on the whole, are still left without a place to study.

The best possible education is open to the student with a well-padded billfold. Especially in the field of aeronautical engineering, specialized vocational schools have been set up. Here the student studies absolutely nothing but subjects which he will use. Languages and unnecessary higher mathematics have no place in a school of this type. The student's program has been set up by industrial leaders who know just what he will need and what will be of no value to him. He studies the material and applies his knowledge by actually designing and building. He is in close contact with manufacturers and has many opportunities to watch industrial production methods. When he graduates at the end of two years, he has the same degree he would get in a college, and a great deal more practical knowledge and experience.

Senior Answers

Dear R. S. W.:

Many freshmen object strenuously to the "useless" courses which they are required to take during their first two years at Illinois. Some, for example, fail to see what good rhetoric can possibly be to an engineer. However, it may be pointed out that, in addition to being of use in writing reports, a good training in English is a training in clear and logical thinking — and the ability to think clearly and logically is perhaps the most necessary attribute of a good engineer.

With the engineering curricula already failing to cover many subjects which an engineer could profitably study, doesn't it seem logical to assume that if rhetoric were a useless course the authorities would have eliminated it from the list of required studies? Schools which teach only technical subjects may train good shop foremen, but they do not produce good engineers. A good engineer should not only be a whiz with his slide rule, but should also have some acquaintance with subjects not directly in his field. The really great engineers have been men who could write fluently and logically, who took an interest in the affairs of their countries, who read good books in other fields of endeavour, in short, men whose educations were balanced.

A university can give you a start toward a balanced education; a strictly technical or trade school cannot.

Thomas Shedd, E. E. '40

Descriptive Geometry

Dear Editor:

For some time I have been harrassed by one of those persistent pests who took *Descriptive Geometry* and didn't see the value of the course. I won't side-step my guilt. I'll admit that for some time I felt the same way about that infamous "descript" course. Now I must seek to redeem myself to some extent, for I have found a little of the greatness of the course. Perhaps I can convince him, and then you, too.

Descriptive Geometry is a fine puzzle. It makes one think logically to solve that puzzle in distinct steps. Every problem is a challenge, and it's surprising how many freshman engineers try to evade that challenge. I can see now that each problem was a private little course of training in itself. Yet all of the problems are tied together to provide a formidable brain-tussle.

There are undoubtedly many applications of this type of geometry to the modern engineer's life. Projection of lines is the background of engineering drawing, and the theory of surface intersection is essential in efficient mechanical design. Development has always intrigued me. I think it affords the best application of the subject to everyday life. Funnels, air-conditioning, and furnace ducts, and footballs are all easy representatives of development work. "Unfolding" the object before one's eyes requires imagination and is a real adventure in finding what makes things "tick." You know that these architecture students are proud of their perspective and shadow drawings, but even I found a big "kick" in learning of their principles while studying this course.

Even if the practical applications were overlooked, the hours of brain and imagination-training provided by G. E. D. 2 would make it valuable in any engineer's language. I think you will agree that "descript" is really a good course and we are glad to have had its training.

Very truly yours,
Donald K. Stevens, Cer. '42

Time Study

Dear Mr. Editor:

During the past summer, I was fortunate enough to be employed in a radio coil factory on a job which I thought would offer an opportunity to gain experience in electrical engineering. Actually, however, it brought before my eyes a different field of engineering, one which is neglected here at Illinois.

I am speaking of the problems of production, speed, and efficiency. My boss, who was interested in the courses offered here at Illinois, was advising me as to which subjects to take. "I can get plenty of engineers," he said, "who can design test equipment. My problem is to find an engineer who can design coils and equipment with a view to making assembly as simple as possible! The engineer must then be able to go into the factory and find out where the 'lines' are slow and eliminate the difficulty." He went on to say that there was plenty of room in industry for men with a college background and some experience in time study and production.

Perhaps the "line" needs some explanation. In general, the radio coil, in our instance, was wound on a cardboard form by the first girl on the line. She passed the coil on to the second girl who removed the insulation from the end wires with sand paper and passed the coil on to the third girl. This girl attached the ends of the wires to the lugs on the cardboard form. The coil was then tested and adjusted for correct inductance. (This was my job). Finally it was soldered, coated with shellac, and baked for three or four hours. If any one of the workers is slow, all the other workers are slowed down and production is decreased. The amount of work done by each worker must be so adjusted as to make all operations of approximately the same difficulty. This is the problem of the production engineer.

Take a look in the Chicago Tribune want ads some Sunday morning. There are more ads for time study engineers and production managers than for any other type of employment.

Yours truly,
James Thale, E. E. '42

Founding the Einstein Bureau

Albert Einstein — we've all heard of him. He's the man who invented "Einstein's Theory," with all the reputed inconceivabilities. Einstein offered a couple of theories on relativity — now don't stop reading yet; I admit I don't know beans about them — but one of these theories is called the "Special Theory of Relativity," and the other, I guess, must be just the "Plain Ordinary Theory of Relativity."

Anyway, when I took sophomore physics (or vice versa) Prof. Loomis, head of the department, taught the class. One of the dozen or so sleep-chasing remarks he made was that in just two or three weeks he could give us all a good idea of Einstein's Special Theory of Relativity. The class, as one, choked on a mental gasp, "Who, me?" Prof. Loomis replied with regrets that the sophomore course was too short to include it.

Well, thinking about it afterwards, it seemed a shame to miss studying such a much-talked-of-and-little-talked-into subject. Why think how much fun it would be to explain the theory to the little girl-friend. My, my, wouldn't she be proud! But seriously, aren't you getting tired of hearing only *about* the theory?

The math department includes the topic of relativity in its curriculum, but what engineer will take the burden of an extra course in advanced math? Not I.

So in the spirit of a reformer, I ask, "What's to be done?" and answer my own question. If we students will demonstrate a desire to learn something about the theory of relativity, perhaps we can talk someone in the physics department into conducting a series of no-credit no-grade classes in the subject, perhaps in the evening, once or twice a week. If you can spare the time to attend possibly ten such classes, send a post card to

The Einstein Bureau
213 Engineering Hall
Urbana, Illinois.

If sufficient number of cards arrive to warrant some high-powered fast talking, the bureau will take the matter up with Prof. Loomis and attempt a solution. Remember, if there's no grade you can't flunk, so let's hear from you.

—R. T.

"Did you see May?"
"May who?"
"Mayonnaise."
"No, she was dressing."

* * * *

"That's the cat's pajamas!" remarked Mr. Henpick, as he picked up his wife's sleeping togs.

* * * *

Life: One damn thing after another.
Love: Two damn things after each other.

MILITARY ENG

—Illinois-Michigan Bridge Buildi
—T. N. T. All Wet . . . But Help

T. N. T. (Tau Nu Tau), military engineering honorary society, sent forty Second Lieutenants to Camp Custer this summer from Illinois. These officers were recently advanced to positions ranging from First Lieutenant to Lieutenant Colonel of the student corps.

The purpose of the R. O. T. C. camp is to put into practice those things that the student has learned during the school year, and, since it is to be expected that the Reserve Officer will at some time command troops, all Reserve Officers must attend these camps both before and after receiving their commissions. In this way students are given first hand knowledge of the conditions under which troops actually serve and of the newer weapons which are constantly being added to the army equipment.

Training is given in bridge building, rifle and pistol marksmanship, defense against gas, trench construction, barbed wire erection, overnight maneuvers, bridge and road repair, demolitions, combat firing, care of animals, field fortifications, scouting and patrolling, guard duty, command of troops, close order drill, extended order drill, demonstrations of infantry weapons and new infantry drill, and ceremonies and inspection.

The most interesting competition among the engineers at Camp Custer, Michigan, this summer was the pontoon bridge constructing. The Illinois Engineers were teamed with Michigan against Michigan State and Wisconsin. Each team received detailed instructions and had time to practice their routine in erecting a heavy, Civil-war-type bridge over the waters of Eagle lake.

The Michigan State-Wisconsin team was first in the competition. The flooring was laid on five heavy stringers which were supported on rectangular barges or pontoon boats. The amazing teamwork of this side was enough to take away all hope of another record that day, for they broke the existing record of fifteen minutes for the completion of the entire job. The Illinois team got into a huddle. Everyone knew that the slowest speed in building the bridge was in lashing the stringers to the

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About to place the first trestle of the heavy pontoon bridge in Eagle Lake are, left to right, John Webber, Art Cocagne, Louie Schumm, George Eyerly, Joe McIntosh, Bruce Carroll, and Hugh Brzycki.

Next, Brzycki, Cocagne, Schumm, Bilhorn, and Eyerly hasten the trestle alignment while Edwin Bodmer (on pontoon) awaits his move.

In the final operation, the planking details swiftly lays the remaining flooring.

The bridge completed, Captain Barney, instructor, and Sergeant McDowell, 5th engineers, make their final inspection.

ERS AT CAMP

Sets Unorthodox Record
Michigan State-Wisconsin Victory

boats. How tedious that job did seem! Wasn't there some unorthodox means of winning this fight? "When duty calls 'you must,' the youth replies, 'I can'." Someone got an idea. Words began to fly. The student who was in command of the team, reported to Captain Keith R. Barney, one of the judges of the contest.

"The boys want to try a new idea, Captain. Instead of waiting until the flooring is laid to carry the stringers out to the end, they want to float them out and keep two gangs working at the same time.

"There is nothing preventing the use of that method," was the reply, "but you have had no preparation, no practice."

Only rapid plans were made. All agreed, the signal was given. Oral orders filled the air. The abutment section rapidly went to work. After some delay the stringers were floated out. There was no current. It was easy to lash them between the abutment section and the pontoon boats. The Tech-Wisconsin team began to take interest when they saw what was happening and they soon became wildly excited. Nevertheless, the work went on; the anchors of the remaining three boats had been lowered and these boats were brought into place as the stringers were floated out. The lashing detail was able to work without a stop, keeping well ahead of the men bringing up the floor boards.

For a time the last two pontoons were badly out of line—much to the delight of the team on shore. Excitement reached a peak. The last pieces were brought up. The final side rail went into place. "Fall in" was the command. Each man wondered about the bridge alignment as he hurried to his place. The time . . . 12 minutes! Captain Barney and Captain Benjamin R. Wimer examined the bridge and then announced that the Michigan Tech-Wisconsin team had done a better job on the abutment and on the alignment but that this was offset by the good lashings made by the Illinois-Michigan team, who, having set a time record of 12 minutes, were pronounced THE WINNERS.

Grub is served from the mess wagon in regular army style. "We had plenty of vegetables and steaks," says Hal Nelson, president of T. N. T.

At night the boys find plenty of social entertainment, but during the day, odd moments are spent napping, sunning, and bulling.

On the firing point with 70 seconds to load and fire 10 shots.

On the last day, Sergeant Webb is "ducked" by his company as a farewell salute. Joel Taylor and Bob Harmon, Illinois men, enjoyed the ceremony.

Who's Who in Illini Engineering —

PROF. ALONZO P. KRATZ, although he teaches no M. E. students, is nevertheless, one of the cogs in the machinery of the M. E. department, where he directs research. He started life in Champaign and has been here ever since. While earning his B. S. in M. E., he kept in condition as a member of the gymnastic team. After serving the Charter Gas Engine Co. for several months, he returned to start working for his Master's Degree. After the degree in 1909, he did research in combustion engineering and also taught some classes. Since his marriage in 1920, he has been Research Professor of M. E., which position has allowed him to give instruction to graduate students only. That he is co-author of twenty-two Engineering Experimental Station Bulletins is ample proof that sleeping is not his hobby. Sixty-five technical papers bear his name, the later ones dealing with heating, ventilating and air conditioning. Prof. Kratz is a member of Acacia and Gamma Alpha, a full member of A. S. M. E. and American Society of Heating and Ventilating Engineers. He also holds honorary memberships in Pi Tau Sigma and the National Warm Air Heat and Air Conditioning Association. Golf absorbs some of his time with his fond fiddle serving to help him forget some of the higher scores.

JAMES L. MURPHY of Fairfield, Illinois, a senior in electrical engineering, is secretary of the student branch of the American Institute of Electrical Engineers. During his sophomore year his name was on the list of those receiving class honors and last year he made college honors.

Following graduation from high school, Jim worked in his father's jewelry store. But after a year he came to Urbana and enrolled in the school of liberal arts. Soon he began working in the office of the Dean of Engineering where the work was such that he found engineering to be so interesting that he switched courses and is now "north of Green Street."

Murphy's main outside interest is music, originally intended to be his life's work. Experience derived from playing in his father's town band and in the high school band made Concert Band material of Jim at the University until class schedules conflicted. He now plays in the First Regimental Band.

During the summer he still works in his father's jewelry store and likes it. Asked about activities, Murphy said that he was anxious to cooperate with student affairs and he felt that instigating the Illini Engineers was a beneficial move.

Murphy in a "Studious" Mood

COL. CHARLES J. TAYLOR, Engineers, an Assistant Prof. of Military Science and Tactics, is a native of Kansas. When he was three, the Taylor family moved to Wyoming. As a result, Charles attended the State University of Wyoming. The Wyoming baseball team lost a good man when young Taylor entered West Point after his third year in college. He left West Point in 1909 as a Second Lieutenant and spent the following year at the Engineers' School. Before the World War, he was a specialist on sea-coast fortifications and saw much active service in that capacity in many sections of this country, in Hawaii, and Manila Bay. He was commissioned as Colonel in 1918 and until 1925 did much construction work and obtained a few more years of education. The latter consisted of courses taken at the School of the Line, the General Staff School, and the Army War College. In 1925 Col. Taylor became a General Staff Member, Headquarters of the Fifth Corps Area. University of Illinois Engineers in the R. O. T. C. have known him since 1936. His two sons are seen north of Green Street, one of them being in Engineering Physics, the other a jump farther away at University High. Col. Taylor is especially interested in books of science and still finds much interest in construction work, an interest which has stayed with him since his non-commissioned days.

* * * *

It wasn't my fault. I wouldn't have taken the date, but Harry's girl liked her and wanted to see her get around. I didn't have any excuse, and they bought my ticket to the Frolic.

When she came down the stairs I shuddered. I grabbed Harry. She was dressed in lavender or something, her slip showed decidedly, her dress was low in the back, and I could see her skinny bare shoulder blades. Her hair was corn color, and she wore horn-rimmed glasses. She liked me, of course, and made passionate love all the way down. When we danced I held her away as much as possible, but I couldn't prevent her knees from knocking mine.

On the way home, she said she liked my car better than hers. I asked what kind of a car she had, and she said it was a Packard. I wondered what business her father was in, and she said he was president of a big bank. In June we were married.—*Kansas State Engineer.*

THE ENGINEER

(Reprinted from November, 1937, Technograph by request)

One day, three men, a Lawyer, a Doctor, and an Engineer, appeared before St. Peter as he stood guarding the Pearly Gates.

The first man to step forward was the Lawyer. With condence and assurance, he proceeded to deliver an eloquent address which left St. Peter dazed and bewildered. Before the venerable Saint could recover, the Lawyer quickly handed him a writ of mandamus, pushed him aside, and strode through the open portals.

Next came the Doctor. With impressive, dignified bearing, he introduced himself. "I am Doctor Brown." St. Peter received him cordially. "I feel I know you, Doctor Brown. Many who preceded you said you sent them here. Welcome to our City!"

The Engineer, modest and diffident, had been standing in the background. He now stepped forward. "I am looking for a job," he said. St. Peter wearily shook his head. "I am sorry," he said; "we have no work here for you. If you want a job, you can go to Hell." This response sounded familiar to the Engineer, and made him feel more at home. "Very well," he said; "I have had Hell all my life and I guess I can stand it better than the others." So St. Peter was puzzled. "Look here, young man, what are you?" "I am an Engineer," was the reply. "Oh yes," said St. Peter; "Do you belong to the Locomotive Brotherhood?" "No, I am sorry," the Engineer responded apolegetically; "I am a different kind of Engineer." "I do not understand," said St. Peter; "What on earth do you do?" The Engineer recalled a definition and calmly replied: "I apply mathematical principles to the control of natural forces." This sounded meaningless to St. Peter, and his temper got the best of him. "Young man," he thundered, "you can go to Hell with your mathematical principles and try your hand on some of the natural forces there!" "That suits me," responded the Engineer; "I am always glad to go where there is a tough job to tackle." Whereupon he departed for the Nether Regions.

And it came to pass that strange reports began to reach St. Peter. The Celestial denizens, who had amused themselves in the past by looking down upon the less fortunate creatures in the Inferno, commenced asking for transfers to that other domain. The sounds of agony and suffering were stilled. Many new arrivals, after seeing both places, selected the Nether Region for their permanent abode. Puzzled, St. Peter sent messengers to visit Hell and to report back to him. They returned, all excited, and reported to St. Peter:

"That Engineer you sent down there," said the messengers, "has completely transformed the place so that you would not know it now. He has cooled the Fiery Furnaces for light and power. He has drained the Lakes of Brimstone and has filled the air with cool and perfumed breezes. He has flung bridges across the Bottomless Abyss and has bored tunnels through the Obsidian Cliffs. He has created paved streets, gardens, parks and playgrounds, lakes, rivers, and beautiful waterfalls. That Engineer you sent down there has gone through Hell and has made of it a realm of happiness, peace, and industry!"

* * * *

"Walled in, by gosh," said the drunken one after feeling around the lamppost.

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ILLINOIS OIL and MUD

by

WAYNE MOORE

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In the past three years Illinois has risen from the list of states who could say that oil was one of their natural resources to the state listed under the caption, "Outstanding Field of the Week," in the *Oil and Gas Journal*. In fact production has been established so rapidly and so easily in Illinois that it is sometimes called the "producers paradise." This paper is intended to point out briefly the major problems encountered in drilling wells in Illinois and to show how the engineers have met many of them.

When drilling contractors first came to Illinois from Oklahoma and Texas, the first problem that they faced in the way of adapting their equipment to the new conditions was brought about by the shallowness of the wells to be drilled. They had been accustomed to drilling wells 4000 to 8000 feet in depth, and here in the new field it was necessary to drill only between 1600 and 2500 feet in most instances. For this reason, drawworks, blocks, crowns, and drill pipe in Illinois are lighter, but they still retain a good margin of safety with greatly increased portability. This last feature is of great importance in Illinois because of the large number of moves to be made and the adverse conditions under which they are made in bad weather. In almost all cases the rigs are adapted to internal combustion engines instead of steam for power with diesel and butane engines heading the list. Highly unitized rigs of the portable type are very popular in that they may be torn down, loaded, set on the floor, and rigged up in a minimum amount of time. In most cases six lines are strung on the blocks, and four inch drill pipe is used.

The practice is to start drilling with water in place of mud and then to add prepared mud as the "pay" is neared. When wells are drilled much below the McClosky, there is danger of losing circulation so that cottonseed hulls are added to the mud to help plug the cavities and to wall up the hole. As the Devonian is approached, this danger of losing circulation increases until in wells drilled beyond the Devonian the mud must be carried below nine pounds per gallon and very thick.

Controlled-directional drilling has not been used to any great extent until recently. At the present time, in order to space wells under the Lake Centralia, the contractors are using this method of drilling. Since the lake is a source of drinking water, it is necessary to keep all contaminating impurities out of the water. This prohibits the use of barges for drilling and also the cost of drilling from barges would be prohibitive. In the directional drilling plan, the rig is placed on the shore of the lake and the bottom of the hole will be placed under the lake-bed at a predetermined point by slanting and curving the hole. This requires a careful control by both the survey company which superintends the work and by the crews which carry out the plans. The direction of the curve and the precise location of the bottom of the hole is determined by a photograph. In order to keep the drilling mud from getting into the lake, the slush pits are metal tanks.

In moving the rigs from place to place is found one of the big headaches of well contracting in Illinois. In general when the weather is good, the usual methods of truck transportation are sufficient. In rainy weather, it is not uncommon for the trucks to sink in up to the bed in mud so that even "cats" (tractors) cannot be used to drag the trucks through. In fact several trucks were actually pulled in two last winter in attempts to drag them through. If the equipment must go to the location and the "cats" cannot stay on top of the mud enough to pull, the rigs are placed on mud-boats and towed in. When it is necessary to move the derrick, it is always skidded whenever possible. This consists of placing the derrick foundations on rollers and sliding it to the new location. This is most common when the wells are twinned, however.

At first the contractors had little fear of sticking the drill pipe in Illinois because of the shallow depth. It soon became apparent, however, that the shale here would have a tendency to ball up on the drill collar and thus stick the pipe when a narrow place was encountered coming out of the hole. This is a real problem. Because of the smaller drawworks and lighter equipment throughout, less pull and force may be used to break the pipe loose, and it often has been necessary to circulate oil through the drill pipe to work it loose. A mud pressure of about 500 pounds is carried to speed up drilling and to keep the bit from balling up with shale. Cone rock bits are used throughout so that a fast, straight hole may be drilled. Drill stem tests are made often to determine the straightness of the hole. This consists of lowering a small bottle with some hydroflouric acid in the bottom down the inside of the drill pipe and letting it set long enough to etch a ring around the bottle. If the ring is in a plane at right angles to the vertical axis of the bottle, the hole is straight. If it slants, the direction of the slope determines the direction the hole is off and the approximate angle of slant. A more accurate check can be made by one of the well survey companies. Many of the surveys employ the resistance of a formation to a flow of electricity to determine the porosity and the possible saturation of that formation with oil and water.

These are some of the problems that our state's newest industry has presented to the engineer and the engineer's answer. The problems are still in existence though, and so new ideas are necessary if the industry keeps on being, "The greatest game on earth," as someone has named it.

ILLINI ENGINEERS?

All good things don't come easy. In the spring of 1938, Sid Berman and Maurice Carr, both '39, suggested a new all-engineering society for Illinois engineering students. In the fall they gave it a name, REMCA (first letters of society names), and drafted a constitution. It was presented to the Engineering Council, opposed, favored, changed, and finally adopted under the new name, Illini Engineers. It was ratified by about four societies and opposed vigorously by the M. E.'s who stood to lose. It was then forgotten; the summer passed; school started. At registration, Bill Shive, R. M. Sinks, and J. L. Waisman, presidents of the Railways, the Electricals, and the Miners and Metallurgists asked, "What about the Illini Engineers?" Who knew? I didn't. Where were the posters, the membership blanks? The next day, however, Tom McCrackin and V. J. Cichowski put in their lot; and this group revived the society, sold three memberships, had a conference with Professor Doland, and quit. No one seemed to care.

But a spark was left and a meeting was called. Dean Enger, Professors Doland, Evans, and Thomas and others graciously donated their time. Representatives from each society and *The Technograph* were there. Each man took a turn to give an opinion, each one, at first, protecting the assets of his particular group. Beautiful pictures were painted of our future engineering campus. Then condescensions were made; financial sacrifices were proposed; but, no agreement yet!

Chichowski and Sinks, who were very democratic and sincere in their attitude, cornered the discussion for a time, and, with the aid of McCrackin, it was decided to charge only 25 cents dues and to cut the subscription to *The Technograph* out of the offer until higher fees could be charged.

Suddenly, out from behind the clouds came a noble gesture. Here had been a handful of boys preparing a tonic for a disinterested student body and about to administer it, almost free of charge. It must have been the invisible spirit of our old patron Saint Patrick that said, "Consult the students. See what they want." Again plans were changed. Drafts of circulars were typed and revised for presentation to the student body. New ideas began to come in. The last report was of a proposal to omit student dues but to allow each society to pay a fee for its members on a percentage basis.

Does it not seem that your leaders have been sincere? They have talked and listened; called meetings, consulted the faculty; drafted constitutions; accepted individual defeat for the common good . . . in an honest effort to bring something of a help to the student body that they hope will be accepted *as* a help.

Will you accept our fellowship, Illini Engineers? Will you join in our sports, listen to our speakers? Will you attend our smokers, drink our cider? If not, what is left? Classrooms, slide rules, and the walls of Engineering Hall . . . no St. Pat to grace our ballroom again. We can let the faculty supervise the Open House and remind us of the E. E. Show. Students, your circulars about the Illini Engineers will be ballyhoo and your new society will be an historic engineering "feat" at the *foot* of a dump heap if you do not stand for your part.. —Editor.

* * * *

A neat piece of military strategy used by the Germans in the last war was to name their ships after jokes so the English wouldn't see them. —*The Wisconsin Engineer.*

Rhetoric and the Engineer

(By Arthur Cutts Willard)

The ability to express oneself accurately and clearly through the spoken and written word is an asset in any profession, vocation, or station in life. This is so obvious that it deserves mention only because that which is self-evident too often escapes attention simply because it is so elementary.

It is inconceivable that an institution of higher education should not expect its students to acquire this ability before they are graduated, regardless of the professions for which they have been trained. Hence, the study of

President Willard

rehetoric and English literature is and always should be a standard requirement in college curricula. Rhetoric is fully as important to the student of pure and applied science as it is to the student of the classics or humanities. For example, the terminology used by the professional engineer is often difficult for the layman to understand. It is important, therefore, that the engineer be able to express himself in correct language which is intelligent to his fellow men in other walks of life.

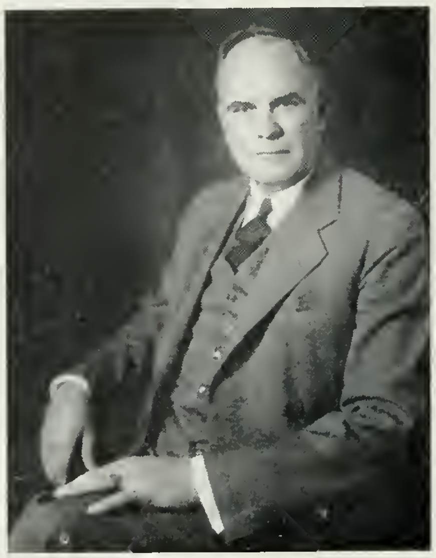
With few exceptions, men and women do not lead cloistered lives. Because they mingle with many others engaged in a variety of pursuits, having different points of view and philosophies, it is a distinct advantage to any individual to develop a broad cultural background for his chosen profession. Example of this advantage can be

(Continued on Next Page)

George B. Allen, Alum

(Interview by Elwyn King)

With highly mechanized armies moving in Europe, I enjoyed listening to George B. Allen's ('11) account of the attempts to motorize the American field artillery in France during the last war when he was in charge of all experimental work for the Field Artillery Board in France. He commented that while the increased speed with which guns were moved was important, the main reason for the change was that they couldn't work mules twenty-four hours a day. Mr. Allen received a citation from General Pershing for his work. Since he



Mr. Allen, Chief Engineer

was engaged in experimental engineering rather than actual army operations, this citation must have been for even greater service than ordinary.

George Allen is the Chief Engineer for the Dodge Brothers Corporation. His is the responsibility for all work done on the company's products from the time the blueprints come into the factory proper until the finished car is on the highway. As he stated it, "Our chief problem is to give a good product to the public." Then, with a smile, "But we don't give it away, we sell it!" Whenever trouble arises, whether it is manufacturing, sales, or service, Mr. Allen's group, Dodge Engineering, must find a solution. One instance of the breadth of their work is that they must approve every statement made by the advertising department about the mechanics of the car. One does not ordinarily relate salesmanship to engineering.

Although he is 52, Mr. Allen does not look more than 40. He has been married twenty years; the Allen family lives in an attractive home at 809 Lakepointe, Grosse Point Park, Michigan. Mr. and Mrs. Allen have two children, the one a girl in her sophomore year at the University of Michigan, the other a robust lad of 14.

Mr. Allen first worked for the Chalmers people, and in 1916 he went to the Liberty Motor Car Company. After this he went overseas with the A. E. F. He feels that the most outstanding thing about this period was that, "My army work was educational to my profession," which was a rare thing to happen to a civilian. He returned to Liberty upon his arrival home. After remaining there until 1923, he became the Experimental

ALLEN *(Continued)*

Engineer for Dodge Brothers, a job that meant driving occasionally from coast to coast testing automobiles, as well as laboratory work. In 1929 he became the Chief Engineer for the company.

A member of the Society of Automotive Engineers and a Tau Beta Pi man, Mr. Allen believes that, "The successful engineer must know a good deal about other things than engineering." He pointed out the importance of salesmanship to engineers. Whether the youth learns the important things besides straight engineering in school or out is unimportant in Mr. Allen's opinion — as long as he learns them. He feels that the hardest job of the college graduate is to work into the "atmosphere" of the factory. These new men must see the problems of the corporation and must have "the right disposition and attitude both to the work and the workers," which seems to be sound advice for us to follow when we graduate.

RHETORIC *(Continued)*

found in almost any conceivable situation involving human relations.

Referring again to rhetoric, and particularly its place in an engineering curriculum it should be evident upon a few moments' reflection that even within a given profession where men use a common technical terminology the exchange of information and ideas is facilitated by the ability to express them readily in simple, correct language. To be sure, it is possible to convey ideas without regard for grammar, but no engineer would excuse another if he used technical terms incorrectly, and by the same token it is inexcusable for a professional man to use faulty English.

The truly educated man is not only well grounded in his field of specialization but he has a background of general knowledge, or at least an acquaintance with other fields of learning not necessarily related to his own. Engineering students will be well advised to include in their curricula a generous number of courses in the social sciences and the humanities. In no field of the applied sciences is a general, cultural background more important than in the several engineering specialties. The professional engineer comes into contact with an infinite variety of situations in which his technical training needs to be supplemented by a good deal of knowledge in other fields.

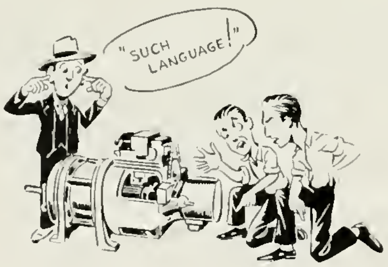
G-E Campus News

ENTERTAINING ROYALTY—BY PROXY

WHEN Great Britain's King and Queen visited the New York World's Fair on their international social call, 20 farmers were able to watch the royal pair as closely as if they were entertaining Their Majesties out on the farm. And the rural folk were 130 miles away from the Fair grounds.

This long-distance watching was made possible by G-E television engineers. Directed by C. A. Priest, Maine '25 and ex-Test man, radio engineer for General Electric, they were simply proving that television programs could sometimes be received at a far greater distance than the previously supposed limit of 40 to 50 miles.

For, instantly and clearly, while the King and Queen inspected the Fair, television reproduced complete details of their visit to the group—130 miles away, atop the Helderberg Hills near Schenectady. Not far from the scene of this experiment is General Electric's powerful new television station, W2XB, soon to go on the air.



TECHNICAL DOUBLE TALK

WALKING through one of General Electric's factory buildings, a visitor paused in front of two young men kneeling in front of an electric motor. He was mystified to hear, "Say, Bill, put a tac on that BTA, and after you've hooked up the pots and c-t's and plugged power, see if she still swings and hunts!"

All of which made as much sense to the visitor as "gate," "jive," "alligator," and similar swing-music terms mean to a symphony conductor. Translated, the young man was merely asking his co-worker to connect certain instruments to the motor, turn on the power, and notice whether the motor ran smoothly.

Few of the graduate engineers selected by General Electric for its Test Course are familiar with this Test man's jargon when they arrive. But after a few days in the shops the new man, too, is rattling away in the technical double talk as expertly as his elders.

TRAVELING HOTEL

NEXT Spring, when a hotel-on-wheels rolls into Bombay, India, some of the citizenry may have grave doubts about their sanity. Or they may blame the blazing tropical sun. They'll be wrong. Lawrence Thaw's trans-Asiatic motorcade will be completing a 14,000-mile safari from Paris.

Quite obviously, such things as 14,000-mile trips require quite a bit more than *savoir-faire* and an adventuresome spirit. Preparation, and plenty of it, was required by Mr. Thaw. This brought into the picture—both directly and indirectly—G-E engineers.

The four mobile units of the motorcade boast of the latest G-E two-way radio, for maintaining contact between the various vehicles throughout the journey. During tests two of the units maintained contact when as far as 200 miles apart. Air conditioned throughout, the deluxe trailer contains all the appliances and equipment normally found in a modern home—from tiled bath and indirect lighting to an array of electric appliances.

GENERAL ELECTRIC

90-181C

THE TECHNOGRAPH

UNIVERSITY of ILLINOIS

Student Flying Over Randolph Field

NOVEMBER 1939

20 cents

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THE ILLINOIS TECHNOGRAPH

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Volume LIV Number 3

NOVEMBER, 1939

Alma Mater—

"Where Illini Labor and Learn"

Major-General H. H. Arnold
Chief, U. S. Army Air Corps

Progress in Air Corps Materiel

UNITED STATES AIR CORPS USES LATEST DEVELOPMENTS OF ENGINEERING WORLD

•

Representing an investment of $10,000,000 in the world's most modern aeronautical engineering equipment, the United States Air Corps Materiel Division laboratories might well be the goal of the engineering student who looks to his future in the rapidly-growing aviation industry. Opportunities for service there exist today under the Air Corps expansion program which will practically double the Air Corps in the next few years, because additional engineer officers of the Air Corps will find their places along with the country's foremost aeronautical engineers, on the staff of the Materiel Division laboratories. Perhaps the best route for the aspiring student engineer exists through the flying cadets—to a reserve commission, active duty with the Air Corps, regular army commission, study at the Air Corps Engineering school, and then assignment to the Materiel Division.

The laboratories at Wright field, near Dayton, Ohio (home of the Wright brothers), are only a part of the Air Corps Materiel Division. Wright field, dedicated in 1927, comprises 746 acres and is occupied by the laboratories and a 520 acre field for actual flight testing. Adjoining Patterson field, occupying 3,800 acres, is allocated to the use of the Fairfield air depot. The Materiel Division also has supervision over three other depots in the United States at San Antonio, Texas; Middletown, Pennsylvania; and Sacramento, California; and three more, one each in Panama, Hawaii, and the Philippine Islands. Under the direction of Brigadier General George H. Brett, assistant chief of the Air Corps, the Materiel Division is charged with having in readiness for immediate production and service the most advanced types of aircraft, engines, armament, and other equipment, procuring this equipment in necessary amounts to issue to the tactical services of the Air Corps, and maintaining it throughout its service life. The Materiel Division also supervises three procurement districts and six industrial planning districts, to which the Air Corps looks for mass production of fighting planes in the event of an emergency.

The history of the Materiel Division dates back to the establishment, in 1917 under the Signal Corps, of a laboratory for aeronautical experiment, testing, and research, in order to provide adequate aviation equipment for war purposes. The field was named McCook field, honoring General Anson McCook, who with his seven sons fought in the Civil war, and who were known as the "Fighting McCooks." By 1919 McCook field had 254 acres, 69 buildings, including hangars, shops, laboratories, offices, hospital, and wind tunnel. In 1926 the Air Service became the Air Corps and the engineering division became the Materiel Division. McCook field,

● Two types of military air craft with which the U. S. Army Air Corps pursuit squadrons may be equipped in the near future: (upper) the Seversky XP-43; (lower) the Bell XP-39 Pursuit-Interceptor.

—All Pictures Courtesy Aero Digest

Recent type of single-place fighter already ordered in quantity. This is a Curtiss P-40.

proving too small, the laboratories were moved to the present location, Wright field, in 1927.

During the twenty odd years of its existence the Materiel Division has figured directly or indirectly in virtually all aircraft developments, commercial as well as military. In many instances its contributions have been of major importance, definitely influencing aircraft operation or performance. The present high-powered air-cooled engine is the direct result of intensive study begun in the McCook field laboratories in 1919 in the cooling of valves and cylinders. The methods evolved there resulted directly in the production of the famous Wright J-5 "Whirlwind." The higher powered air-cooled engines of today gradually followed. As the result of an investigation of heat losses in water-cooled cylinders, ethylene-glycol was tried as a possible high temperature cooling compound at McCook field in 1923. The result was a gradual obsoleting of water-cooled engines, a 65% reduction in radiator size, and a decided saving in weight. The development of superchargers was a pioneering venture on the part of Materiel Division engineers and this has become a prime factor in the high performance derived from present power plants. In the past several years, the supercharger has been applied to cockpits for the comfort of passengers. The Lockheed C-35, built for the Air Corps, incorporates a supercharged cabin, which not only proved highly successful in test flights but has caused the supercharger feature to be adapted to other types of aircraft for altitude flying.

The Materiel Division has helped to perfect many other important features of the modern airplane. In cooperation with the fuel industry, 100 octane fuel has been developed, which has resulted in a decided increase in power output of engines of a given size. An oil dilution and priming system has been worked out which greatly facilitates the starting of engines in cold weather. Instruments have been designed to record vibration in propeller-crankshaft combinations, so that simple damping mechanisms could be worked out to decrease propeller-crankshaft flutter. Airport and airplane lighting systems have been greatly improved as a result of the Materiel Division's research. Navigation and flight instruments have been developed to the point that it is now possible for an airplane to land completely blind and also automatically. In cooperation with the Signal Corps, the radio beacon was developed so that it now forms the highway of the air. As a result of studies begun at McCook field, wooden propellers have given way to metal propellers and more recently to constant-speed, controllable pitch, full-feathering propellers. After long experimentation, it is now possible to photograph points 331 miles away, and the fog and haze hindrance may be overcome by using super-sensitive, haze-penetrating film.

Engineering graduates or students with at least two years of college, from 20 to 26 years of age, have a very good chance of being accepted for the flying cadets. Application may be made by writing the Commanding General, Headquarters, Sixth Corps Area, New Post Office Building, Chicago, Illinois. College training waives the necessity for an academic examination, but good health, especially eyes and nervous system, is a prerequisite in the physical examination. Successful candidates (a new class is dispatched each six weeks) receives nine months training at selected civilian fields, and at Randolph and Kelly fields, San Antonio, Texas. Completion of the course bring the student his wings, a commission in the Air Reserve, and extended active duty with a tactical unit, with the opportunity to secure a commission in the regular army. After further training with the tactical unit, the young officer may apply for detail as a student in the Engineering School. Flying cadets are paid $75 a month, plus ration allowances and clothing. As a second Lieutenant, the flyer is paid $205.50 a month, and a $40 quarters allowance if the government is unable to furnish quarters. As a First Lieutenant the flying officer receives $298.50 a month, with a quarters allowance of $60. Upon completing his three year tour of active duty, the officer receives a bonus of $500 if he returns to civil life.

Boeing X-B-15 Long-Range Bomber

University Spreads Its Wings

UNIVERSITY OF ILLINOIS ACCEPTED AS FLYING AND GROUND SCHOOL

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Forty-nine men and one woman at the University have become "flying Illini." The ground school work began on November 13 and 14 in two sections. The sections meet from 7 to 9 p. m. twice a week and will continue into the second semester until 72 hours have been used in this type of instruction. The actual flying work will begin about December 1. The Champaign airport has been approved by the Civil Aeronautics Authority as the official flying field. It will be equipped with five planes, for instructional purposes, of an approved type and an equal number of certified instructors.

Applications for training in this civilian flight course were considered by the selection committee composed of: R. R. Hudelson, C. E. Palmer, R. B. Browne, D. D. Feder, W. C. Robb, and H. H. Jordan, chairman. To be eligible for application the students had to be between the ages of 18 and 25 and were to have sophomore standing in the University. For those under 21 a Consent and Release form signed by a parent or guardian had to be filed with the committee. The committee's selection was based upon the student's ability to carry the training program as an extra-curricular activity, noninterference with necessary work, and the passing of the prescribed health examination. Seniors were given preference over juniors, et cetera. Accepted students were required to pay the University a fee of $34 to cover the costs of insurance, transportation to the airport, and the complete ground school and flight instruction. The fee for the health examination was $6.

The ground school will be carried on four hours a week for twelve weeks during the first semester. The instruction is presented in the evening and covers the following subjects: history of aviation (2 hours), civil air regulations (12 hours), navigation (15 hours), meteorology (15 hours), parachutes (1 hour), aircraft and theory of flight (15 hours), engines (5 hours), instruments (5 hours), and radio uses and forms (2 hours). Flight instruction will be given three hours a week over both semesters in one hour periods best suited to fit the student's program and the airport restrictions.

This is the first ground school work that has been given in flying at the University of Illinois since the World War. It is interesting to note the advances that have been made in aviation in this intervening 20 years. The first air-ground contact by radio was made in 1916, but today the airplane is dependent upon radio for safe, efficienct operation. At the close of the War the largest engine in use by the Allies was the Liberty which was rated at approximately 420 horse-power. Today the army has available engines which are rated at 2000 horse-power. This list of advances is practically limitless, but we are by no means close to perfect yet. Perhaps one of these "flying Illini" will someday step into aviation's Hall of Fame along with the Wright brothers; who knows?

Illini May Pilot Planes Like This

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I WANTED WINGS

(From *I Wanted Wings*, by Bierne Lay, Jr. New York, Harper and Brothers, 1937.)

If you are at all interested in aviation—and who nowadays isn't?—and particularly if you have any ambition to become a service pilot, you should place "I Wanted Wings" on your "must read" list. For the thrills and dangers, joys and sorrows of army flying are portrayed between the covers of this book in a most entertaining and exciting way.

The author was a college student when the flying bug first bit him. After taking a flight in a barnstormer's plane, he became obsessed with a burning desire to become an army pilot. Upon graduation he took the stiff health exam necessary for admission to the Flying Cadet training course—but failed to pass due to a slight eye defect. Undaunted, he set out to correct his deficiency. He finally succeeded after six months, during which time, having graduated, he walked the streets ceaselessly in search of a job. He was placed on the waiting list to enroll at Randolph Field, San Antonio, Texas; and the following year was ordered to report.

At this point the author's story really begins. He tells in a vivid style of the hardships and joys of his eight month stay at Randolph Field. He tells of the "Hell Month" to which he and all the other new students were subjected—a hazing which would make our local "Hell Week" seem like a Sunday school picnic. He describes his first solo flight, his first crack-up, his promotion to Kelly Field, headquarters of the more advanced course. Nearly all of those who had begun the course with him have fallen by the wayside, but he has at last attained the rank of second lieutenant in the Air Corps Reserve; he has earned his coveted "wings." His dream has finally become a reality.

Lieutenant Lay spent two years on active duty following his graduation from "the West Point of the Air." He was one of the intrepid pilots who carried the mail in 1934, when the government cancelled the private air mail contracts, and although the Air Corps can be accused of inefficiency as the result of the twelve pilot deaths which occured during the period of Army operation, the author points out that the Army had to set up, in two weeks, a complete air mail service equivalent to the one which the commercial lines had built up over a period of years. Its pilots were not familiar with the

Know your ILLINOIS . . .

Article No. 3—Steel

by

BOB HAFNER, MET. '40

The steel industry is perhaps the basic industry of America. In this country it contains the largest known combination of management and capital—the U. S. Steel Corporation. The industry is without doubt the barometer not only for American business but for American labor. The manufacture of iron and steel products, and of products depending upon iron and steel as raw material, is Illinois' second ranking industry.

The iron ore for these industries is secured from the Lake Superior region and transported to Chicago in giant lake steamers carrying between ten and twenty thousand tons. Since the Great Lakes are impassable in winter months, immense stores of the ore must be accumulated at the plant during the navigable season for use during the winter months.

The ore, together with coke and limestone, two minerals abundant in Illinois, is charged into a blast furnace. The charge is then heated, the molten ore reduced, and the pig tapped off, sometimes at the rate of twelve hundred tons per day. Illinois ranks third in the nation in tonnage of pig iron produced annually. She will probably produce some two and one half million tons of pig iron this year, which is enough to build a railroad half way around the world. To produce this pig iron she will spend $35,000,000 for materials, fuel, and other necessities. She will receive in the neighborhood of $46,000,000 for the finished products.

Illinois ranks fourth among the states in the number of blast furnaces within the state. Three establishments in the state own a total of seventeen of them. To manage her furnaces and supervise labor, she employs 219 salaried officers, earning $485,000 per year. While Illinois employs only one thousand, or six percent of the total number of workers in the country, they earn approximately $1,551,000, or eight per cent of the total wages paid.

After the pig leaves the blast furnace, it must be further refined, as it contains much carbon, silicon, and manganese. Three methods are available, the Bessemer process, the open hearth, and the duplex process, which is merely a combination of the two. The greater part of the steel produced is made by the duplex method. The Bessemer process is the speedier method, but is is not as efficient nor as thorough. Essentially, the principle used in the purification processes takes advantage of the fact that pure metals in the molten state tend to separate from molten metals in the oxide state. The Bessemer operation is so rapid that no external heat need be applied. A normal "blow" will last for twenty minutes. During this time, the impurities oxidize, or combine with the oxygen in the air. These then separate out, float on top, and are poured off. The product remaining is called steel. Any iron with less than 1.7% carbon is known as steel. The life of a converter is limited, for the bottom must be repaired after every "blow" and replaced about once a week.

The open hearth process is essentially the same in principle as the Bessemer, but a heat will take eight hours. A far superior product will be obtained however, as the furnace atmosphere can be controlled and temperatures regulated with refined controlling methods, both of which help to make a superior product. Economically, the Bessemer stands before the open hearth.

Three million long tons of steel billets, sheets, and other products are run through Illinois' thirty-five rolling mills and processing plants every year. 25,000 men are employed and pocket an average of $1360 annually. Supervising them, 3100 officers earn an average of $2500 per year. The great purchasing power of the steel industry is one or the reasons why the industry is so often called the barometer of business.

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routes they had to fly under midwinter weather conditions. The deaths which occured were a logical result of the hurried manner in which the system had to be assembled. The author tells of a night air mail trip between Chicago and Terre Haute, with both his compass and radio out of order—nothing but the stars with which to navigate on an unfamiliar route, on a winter night with the temperature below zero.

One of the most thrilling chapters in the entire book is entitled, "They Bring Me Back Alive." The author and two passengers had gone up in a big Keystone bomber for the purpose of making a routine formation flight. It was a cold winter day at Langley Field, Virginia, where Lieutenant Lay was stationed at this time. A high wind was blowing as the planes got into the air. At 2,500 feet the wheel suddenly came free in Lieutenant Lay's hands. The ailerons were out of control. He found that he could maintain some control of the plane using the motors and rudder, so he climbed to 5,000 feet and took stock of the situation. Deciding that it was impossible to land the plane, he motioned for his two companions to "bail out," and followed them himself, leaving the plane to its fate. As he floated down in his parachute, Lieutenant Lay first feared he would strike a hangar or building at Langley Feld. Then he discovered that the wind was carrying him out over a finger of Chesapeake Bay. He tried to guide his 'chute to land across the bay, but seeing that this would fail, he began to strip and unbucle his parachute. His fingers having already become numb with the cold, he was unable to undo the straps, with the result that when he struck the water, he was dragged halfway across the inlet, under water. He was nearly drowned, before the parachute, acting as a sail, dragged him to shore. Rescue boats had, in the meantime, pulled out from the other shore, and the author was pulled from the icy waters of Chesapeake Bay after a harrowing experience.

Yes, if you want thrills and excitement, together with an insight into the workings of the Army Air Corps, you certainly must read "I Wanted Wings."

U. of I. Student's Theory of Heat

[Last semester John Sloniger, M. E. '41, author of this article, brought this idea of heat to the local A. S. M. E. speech competition. He has since had it criticized by members of the Physics department, and enough discussion has resulted to warrant a review of it in the Technograph. The editor feels that this type of original thought and research on regular courses of study is to be encouraged. Discussion of this theory from the readers and original papers on other subjects of engineering interest will be welcomed.]

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Many theories pertaining to heat, light, and energy have been developed by various philosophers and scientists for centuries in an effort to give us a better understanding of these powers. As a result, great progress has been made since the first Greek philosophers set their minds to the study of the laws of nature, for the present day world is built on science. But there is still much to be learned. We know that light, heat, and energy are very closely related. As yet, however, we have not been able to show a simple logical relationship between the present day theories pertaining to these subjects. It would be helpful in the advancement of science if we had a simple theory showing the relationship between light, heat, and energy.

As a result of considerable literary research, I have pieced together a theory which appears to be of this nature. This theory may not exactly picture light and heat as they really are, but it does seem to conform with experimental results.

I like to think that light and heat are made up of particles having several very important characteristics. Namely these particles are about the size of electrons. They have negative gravitation; in other words, they have a repulsive force between each other. And they also have the characteristic of being neither attracted nor repelled by any of the elements that are known by the chemists.

Heat particles, thus defined, may exist either in a free state or in a chemically combined state with the atoms of an element. The temperature of a volume of a substance is determined by the number of free heat particles in it. Chemically combined heat particles within a substance have no external heating effect. They are, literally speaking, bottled up and cannot escape. When free heat particles chemically combine with an element, they raise the energy level of the atoms. On the other hand, when a chemical reaction takes place and heat is given off, heat particles are released from the atoms, and their energy levels are lowered.

A chunk of coal is a good example of heat particles chemically combined with an element. The heat particles are, as before, bottled up in the coal. The atoms of coal have a high energy level. When coal burns, heat particles are released, and the energy levels of the atoms are lowered.

Free heat particles may also be bottled up to a certain degree. When a piece of iron is heated, free heat particles are shot into the iron. A white hot piece of iron contains energy which may be represented by the many heat particles contained within the iron. When white hot iron cools, energy is given off in the form of light and heat. This energy may be represented by the free heat particles radiating from the iron with the speed of light. The particles emitted from white hot iron succeed each other within a distance equivalent to the wave length of visible light; in other words, the frequency with which the heat particles are emitted from the iron is equal to the wave frequency of visible light. After a white hot piece of iron cools for a certain length of time the iron turns black and light ceases to be emitted, but heat continues to radiate from the iron. The explanation for this is: the heat particles emitted from a hot black piece of iron have a frequency equal to that of invisible infra-red light radiation.

A particle theory of heat also offers a very simple explanation of how water is converted into steam when heat is applied. Water is made up of molecules that have a gravitational attraction between each other. When water is converted into steam the volume increases many times. From observation and reasoning it appears as though the expansion of steam is the result of the hot molecules of water having a repulsive force between each other. As previously defined, heat particles possess negative gravitation. When water is heated, heat particles are shot into the molecules of water, and after a certain number of heat particles have attached themselves to the molecules of water the force of repulsion of the heat particles overcomes the force of attraction of the molecules of water. When this takes place the molecules of water are pulled apart, and the water converts into steam.

I believe that this theory could be very helpful in the thermodynamical analysis of steam, for it gives a physical picture of heat and its relationship with steam, which seem to conform qualitatively with the fundamental laws of thermodynamics. It is for future experiments to prove this or some modified particle theory, for it seems imperative that we do have organized knowledge of present "wave" forms of energy.

EMPLOYMENT . . .

The annual canvass of the civil engineering graduates of the University of Illinois for the years 1923 to 1938, which was completed in May, 1938, shows emphatically that, for this group at least, employment conditions have been highly satisfactory. Also, it seems quite probable that opportunities for engineering graduates in general are much better than is commonly supposed.

For the graduates for the years 1923 to 1938, 98 per cent were employed and 91 per cent of these men were engaged in civil engineering or closely allied fields such as contracting. The statistics for the depression years of 1930 to 1938 are almost exactly the same and all but one of the 51 members of the class of 1938 who replied are employed on civil engineering work. The lowest percentage of employment during the period over which the canvasses have been conducted was in 1933, the first year, when 92 per cent were employed.

The number of replies received in the last canvass was about 750, which is about 85 per cent of the total number of graduates for the years 1923 to 1938.

—W. C. Huntington, Head of Department

Prof.: Did you follow me?

Stude: Yes sir, except when you were between me and the board.

Prof.: I try to make myself clear, but I can't make myself transparent.

* *

A spinster took two young hopefuls to the aviary. When they came to the stork she began a vivid account of the important part the stork had played in their lives. In the midst of her enlightening discourse, one youngster whispered to the other, "Hadn't we better tell the old lady the truth about it?"

* * *

"Why was Adam created first?"
"To give him a chance to say something."

* * *

"Ah wins!"
"Whut yuh got?"
"Three aces."
"No yuh don't."
"Whut yo' got?"
"Two eights an' a razor."
"Yuh sho' does. How cum yo is so lucky?"

MEMBERS OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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Student Engineering Activities

Hazen National President of Pi Tau Pi Sigma

At the annual meeting of Pi Tau Pi Sigma at Camp Custer this summer, Dan Hazen '40, was elected president of the national organization. Hazen, who is also president of the local chapter and Student Colonel of the Signal Corps was instrumental in the reorganization program of the national organization. A new constitution was drafted and the membership requirements were altered. Henceforth, sophomores will be eligible for membership.

The local chapter initiated a group of honor students on November 10. Drill and pistol competitions as well as regular social functions will be sponsored again this year.

Keramos Plans Freshman Award

The freshman student achieving the highest scholastic standing in either ceramics or ceramic engineering will be awarded a suitable prize by the honorary ceramic fraternity. Plans are being made for the admission of eligible students at an initiation banquet to be held prior to Thanksgiving. Three projects for the group are planned: revision of the present card catalogue in the Ceramic Engineering Library, formation of a bibliography of ceramic subjects, and the investigation of some reseach problem.

Mu San Elects Officers

At the first business meeting, Tuesday, October 10, the new officers of the fraternity were elected:

Otto Hallden	President
Howard Spence	Vice Pres. and Treas.
R. G. Thomas	Secretary
E. R. Shields	Historian

ASAE

The Student Branch of the American Society of Agricultural Engineers held its first meeting of the year Thursday, October 5.

Lynn Huffman, newly-elected president, presided at a short business session. Meetings of the ASAE will be held the first and third Thursdays of each month during the school year. Connection of the society with both the Illini Engineers and the Agricultural club was explained to new members by President Huffman, who also named the following committees:

Program Committee
John P. Crandell — B. F. Muirheid

Publicity Committee
Roger M. Smith — R. W. Whitaker

Entertainment Committee
William Lytle — Edward Powlisch

Following the business meeting, Professor E. W. Lehmann gave an interesting and informative talk on the development of Agricultural Engineering, particularly in Illinois, with sidelights on rural electrification and soil conservation. He concluded with some timely and significant observations of the benefits which accrue to the engineering profession from world peace.

After Professor Lehmann's speech, members and guests enjoyed a plentiful supply of cider.

AIEE

On Thursday, October 12, in 215 Electrical Engineering Lab, the AIEE met to hear E. A. Post '36, describe the electrical engineer's place in aviation. This was the first meeting of the Urbana Section and the second of the Student Branch. G. H. Fett opened the meeting and introduced the speaker.

Mr. Post, of the United Airlines communications department, confined most of his talk to the work being done on the radio beacon systems and to the problem of reducing "snow static" in the airplane receiving sets. In general, five-tower, simultaneous-range transmitters are in use today. They are capable of transmitting the radio beacon signals and weather reports simultaneously. There are some 238 of these stations in operation in the United States today. According to Mr. Post, the coming things in airplane radio work are ultra-high frequency radio equipment and the broadcasting of weather reports directly from planes equipped with portable teletype machines.

To the interested alums, Mr. Post's address is Berwyn, Illinois.

MIS

The first meeting of the Mineral Industries Society for '39-'40 was held on October 4, in room 119 of the Physics building. Dr. C. A. Chapman, instructor of geology, spoke on earthquakes from the geologist's standpoint. In accordance with the society's plan to have a speaker at each meeting, Mr. A. V. Lee, principal of the Colonel Wolfe school, and Mr. Reedy of the Timken Roller Bearing company were selected to speak at later dates.

Railway Club, Students Down Faculty

The second meeting of the Railway club was held on Wednesday, October 11, at 7 p. m. in room 105 Transportation building. As was announced, a student-faculty quiz was held, the questions being submitted by the members. The final result showed the students leading the faculty by an average of 25 to 22 points per person. There were plenty of doughnuts and cider for refreshments. In the near future a movie showing the battle of the Southern Pacific Denver and Rio Grande Western railroads in the Royal Gorge will be a feature.

ASCE, Ancient Engineering Structures

"The subject of 'The Engineer and Art'," Professor J. G. Van Derpool told those privileged to attend the second meeting of the American Society of Civil Engineers, Wednesday, October 11, "is one fraught with tremendous implication."

Professor Van Derpool went on to explain this statement by naming over-specialization as one of the primary errors of our rapidly moving civilization. As an antidote for this growing condition, he suggested that "a basis of common knowledge be provided all higher students before their period of specialization begins in concentrated form."

Following his brief talk Professor Van Derpool showed some slides of Greek, Roman, and Gothic architecture to illustrate the influence of the engineer in the Arts of the past and the present.

SGE, Matching Wits

At the first meeting of the year, held September 19, the society was privileged to have as guests several members of the faculty: Dean Jordan, Messrs. Brielmaier and Walker, and Professors Oliver, Espy, and Springer. Members of the society got acquainted with the facultymen. A contest, "Matching Wits," was held, in which questions were asked on history, world events, famous sayings, and humor. Refreshments were served at the end of the meeting.

Notices for future meetings will be posted on the bulletin board in the west entrance of Engineering Hall.

Eta Kappa Nu Holds Weiner Roast

The local chapter of HKN entertained the faculty at a wiener roast Sunday, October 14. Plans were made for a banquet to be held for the Executive Secretary of the national organization on his visit to the campus in December.

ALUMS . . .

By Elwyn King

In August I had an inspiring chat with Charles H. Apple, the chief engineer for District 1 of the Illinois State Highway Department. Our conversation was flavored with Mr. Apple's accounts of student activities during his undergraduate years. I greatly enjoyed his story about taking a student out snipe hunting *two* nights in a row. He didn't know that he had been "taken in" till a co-ed told him at a party! I wish we had a freshman-sophomore pushball scrap as they did in Mr. Apple's time. The class of '14 won both their fracases, the second one being fought in a sea of mud.

Mr. Apple, his wife, who is also a graduate of Illinois, and their four children live at 871 Larkin Avenue, Elgin. Their oldest son, Charles Jr., however, is at the University of Illinois studying chemical engineering. At 48, Mr. Apple is a senior member of the American Society of Civil Engineers. He is responsible for the design, construction, maintenance, safety, and traffic of all state highways in his district. A considerable amount of his work at the present time is in connection with grade separations.

Except for the year of 1918, Mr. Apple has been with the state highway department since he graduated in 1914. His first job was as Junior Engineer — then a Civil Service post. Came the war, and Mr. Apple joined the army. In the spring of 1919 he was back in the highway department and in a short time was made Assistant District Engineer for the area of which East St. Louis is the headquarters. Appointment to the rank of District Engineer came in 1925 when he was made head of the Paris district (No. 5). He remained in Paris until 1935, when he was transferred to District 1 with headquarters in Elgin.

Robert J. Diefenthaler is one of our 1939 graduates who is doing especially well. Receiving his degree at the end of the summer session, Bob immediately went to work in the testing laboratories of the General Electric factory at Lynn, Massachusetts. Bob not only is working regular hours, but overtime as well. When last heard from, he was very enthusiastic about his work. Diefenthaler was well known to all Illini because of his prowess in track. He was captain of the team in 1938. He was in Sachem, Tribe of Illini, and was chairman of the Student Branch of the American Institute of Electrical Engineers.

Another '39 graduate is Sam Sachs, mechanical engineer. At present, Sam is a research assistant in the mechanical engineering department. He is helping Professor Fahnestock in his investigation of the efficiency of radiators and convectors under service conditions. During his undergraduate days, Sachs was very active in the Theater Guild, his interests centering around the designing and construction of the sets. A student member of the American Society of Mechanical Engineers, Sam eventually hopes to become the chief design engineer for one of the big manufacturing companies.

Who's Who in Illini Engineering —




HAL NELSON, E. E. '40, is the original engineering paradox. He started out to become a preacher, bolted into the engineering school and stayed there. Hal was born in Braidwood, Illinois, and has been there most of his life. He attended both the Lockport and the Reed Custer Township high schools long enough to collect three letters apiece in football, basketball, and baseball, a National Honorary Athletic association membership, membership in the glee club and mention as an all-conference tackle. During his stay here at Illinois, he has been one busy boy. He has worked on the Illio, The Daily Illini, Technograph, and YMCA staffs and has spent two years on the football squad and one year trying for the hockey team. He is now president of Tau Nu Tau, second lieutenant in Pershing Rifles, a member of the drill team and leader of the drum and bugle corps, a member of the Military council, Scabbard and Blade, A.S.C.E., Mu San, U. of I. Glee club, and is a forum leader at the McKinley foundation. Hal spends his summers constructing night-gardens, M.C.-ing at a ballroom and puttering with his numerous hobbies. His greatest joy is leading community singing. Hal also works on his hobbies of philosophy, short wave radio and military aircraft study. What I want to know is what he does with all his spare time.

JOHN BRISCOE, Cer '40, is an example of the engineer who can combine studies, activities, and work without suffering. He has a job in the ceramics lab, carries a full schedule, and holds several offices in SBACS. John was promoted from secretary last year to vice president this year. He is chairman of the "Rukus" (dance to you) committee. His employment in the ceramics lab has been setting up apparatus; he recently finished work on equipment to measure, by helium light, the wave length of light rays to an accuracy of 10 to the minus four. John hails from Westfield, Illinois. He is a trasfer student from Hanover college in Indiana, where he played varsity basketball and freshman football. He also was a member of Beta Theta Pi fraternity. He has had various summer jobs. One was playing a saxophone in a dance band. Another summer he worked in the oil fields on a joining rig. His crew never struck oil, but two of their holes were turned into salt water wells. John also worked as an assistant dynamiter on a construction gang. This work entailed placing dynamite under stumps and stones, lighting the fuse and running. He's still here so the job wasn't too dangerous.

KENNETH H. NELSON, M. E. '40, has made his summer vacations as valuable in his engineering education as his time in school. He has worked for the last five summers in the Buda factory in Harvey, Illinois, his home town. Two of his summers were spent in drafting work. He was then graduated into automotive engineering. Last summer he worked in the design department, designing small parts, such as nozzle testers and jacks like those used in the T.A.M. lab. For him, "Engineering is a thrill." He says there is nothing like the satisfaction you get from seeing something you designed turned out in the factory, a finished product, your handiwork. If you think you're good, he advises you to go into some big factory and talk to one of the engineers. "You realize then just how little you know," he said.

Although engineering keeps him busy, Ken has found time to work in Sigma Phi Delta, professional engineering fraternity. He is treasurer of that organization, quite a step for a man who came to Illinois as a junior. His main diversions are tennis and dancing. In high school, he played basketball with such greats as Boudreau, Nisbet, and Benior.

One of the youngest and yet one of the highest ranking students in engineering is HOWARD R. SWIFT, Cer. '40. In high school at Streator he was president of the National Honor Society. His first year in college was merely a continuation of his record high scholarship when he made Phi Eta Sigma and class honors. The following year he again took class honors. As a junior, he made college honors and was elected to Tau Beta Pi, a fraternity which usually admits only senior engineers. His three year average is about 4.7, that potent average making possible his thesis work on the solubility of iron oxide in enamel. Howard is, however, not one of those students who spend all their time poring over their books. He is president of Keramos, honorary fraternity for Ceramists. In SBACS he is freshman chairman and an editor of the annual published by the ceramists. For pastimes he likes music, reading, and especially ping-pong. Every Saturday afternoon is ping-pong time for him. Swift formerly played the baritone French horn in the band but was forced to give it up because of lack of time. During the summer he spends quite a lot of time playing the piano. His other summer occupation is working on his father's farm near Streator.

Third Prize in "What I Did This Summer" Letter Contest by the Harvard Lampoon:

Guess what I did this summer! I went to the beach with Cousin Harry. He is a nice man and helped me with my mud-pies. He was asleep once but I pried his eyelids apart with a little stick and sprinkled sand on his eyeballs. It took him longer than usual to laugh at this fine joke; I guess maybe he was tired or something. Sometimes I climbed in the dunes without Cousin Harry or anybody. One day there were some little rabbits up there which I threw stones at. It was easy because they were young and could hardly run at all. Also I don't think they could see yet. I bet my summer was more fun than anybodys. —Egor Rumford, Aged seven.

Diner: "What's wrong with these eggs?"
Waitress: "Don't ask me. I only laid the table."

* * * *

"Well, son, what have you been doing this afternoon?"
"Shooting craps, mother."
"That must stop. Those little things have as much right to live as you have." —*Rose Technic.*

* * * *

Landlady: "I think you had better board elsewhere."
Student: "Yes, I'll admit I frequently have."
Landlady: "Have what?"
Student: "Had better board elsewhere."

* * * *

Citizen: "Your honor, I'm too sick for jury duty. I've got a bad case of the itch."
Judge (to clerk): "Scratch this man out."

* * * *

"How did you puncture that tire?"
"Ran over a milk bottle."
"Couldn't you see it?"
"No, the little runt had it under his coat."

* * * *

Professor: "Did you read the lesson today?"
Student: "Not all of it."
Professor (after questions): "Did you read any of it?"
Student: "No, sir."

New Expansion Joints

For some time, engineers have sought to reduce the cost of expansion joints in concrete highways, and to provide better protection against cracks and buckles due to temperature extremes. Professors J. S. Crandell, C. C. Wiley, W. C. Huntington, and F. E. Richart have been working on a device which may be the solution to the problem. It is a machine which cuts spaces for the joints *after* the concrete has been laid.

Briefly, the device consists of two emory wheels driven by a gasoline engine and mounted on a frame so that they can be lowered to the surface of the road. The wheels are run across the road from one side to the other, cutting an expansion slot which is then filled with asphalt. Thus the road may be laid in one continuous strip, and the joints installed later.

A short strip of concrete has been laid north of the Physics building, and the new machine is being tested. A section of highway near Danville has already been laid by the new method, using this type of machine.

The Illinois Technograph

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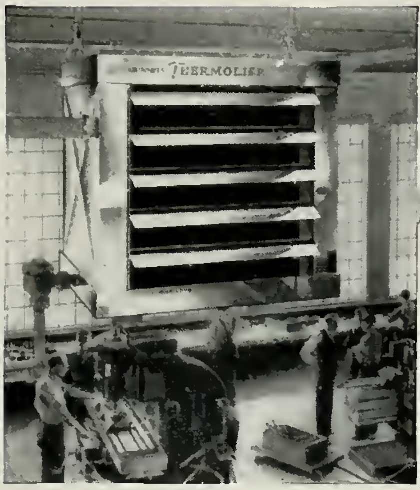
The Co-ed's Lament

My true love is an engineer
And yet it seems he's never here.
For days I sit and plot and plan
Just what will please this splendid man.
At last a thought I evolve,
But he has problems that he must solve.
And all my plans have gone for nil
And I've a holiday to kill.
At intervals when he comes here
He always keeps his slide rule near,
And strewing problem sets about,
Proceeds to work the darn things out.
An hour or two he'll puzzle there
With formula both strange and rare.
I lend my ears to tales of woe
About great things I ne'er can know,
Of stress and strain and heat content
And how to mix the best cement.
He talks of ohms and double E,
And will not snuggle-pup with me.
In fact it seems he only cares
For decimal points and finding squares.
At home or here he hardly seems
The suitor of my girlish dreams.
But stills he's made my destiny,
And so it seems I'll have to be
Till school is through from year to year
The widow of this engineer . . .

Michigan State

GRINNELL

WHENEVER PIPING IS INVOLVED



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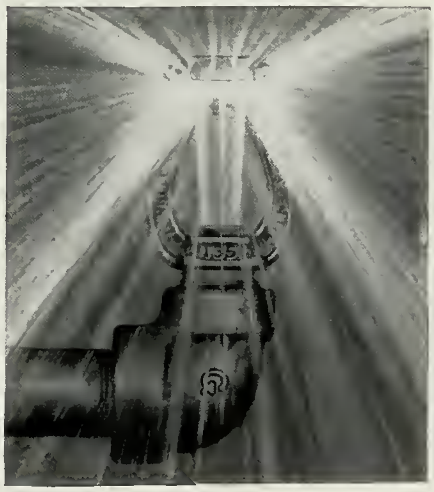

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G-E Campus News

20,000,000TH OFFSPRING

LAST month, the historic city of Lynn, Massachusetts, paraded, unveiled a tablet, and had a ceremony in its new stadium—all because of the 50th anniversary of one of its most prominent families. But commendable as a Golden Anniversary may be, that was only part of the reason. The city was also hailing the arrival of the family's 20,000,000th offspring.

"Watthour meters" is the family name, and it was in 1889 that Professor Elihu Thomson, electrical genius, developed the first practicable meter of this type. Produced by the Thomson-Houston Electric Company, one of the organizations which were merged in 1892 to form the General Electric Company, this early meter stepped into a world having only 17,500 household users of electricity. The 20,000,000th meter joined a world which in 1938 had 22,900,000 household users.

The G-E factories at Lynn today are a far cry from the small factory of 50 years ago which produced little dynamos and arc lamps—two great factories now produce powerful motors, ship-propulsion equipment, turbines, superchargers for airplanes. At Lynn, too, there is a division of General Electric's Test Course for recent graduates of engineering colleges.

SNOW CRUISER

WHEN it comes to dignity, Antarctica's penguins, with their permanent tail coats and stiff shirts, are right in the front row. But their dignity is due for a shock. A "snow cruiser" will soon be rolling across the penguins' icy front yard. Putting it mildly, this cruiser is quite different from the locomotives, trolley coaches, and other vehicles that G-E engineers help to build or equip. But these engineers weren't the least perturbed when called upon to design electric equipment for the strange conveyance. Four G-E traction motors, generators for the two 150-hp diesel engines, and complete control equipment were installed.

The cruiser was designed by the staff of the Research Foundation of the Armour Institute of Technology for use by the Government during the U. S. Antarctic Service under Rear Admiral Byrd. It is so built that it will crawl over crevasses 15 feet wide. Constructed by the Pullman-Standard Car Mfg. Co., the vehicle is 55 feet long and will weigh 75,000 pounds when fully loaded. Ten-foot pneumatic tires support the four wheels. A five-passenger airplane is carried on top.

OPPORTUNITY

IN five universities, eight selected college graduates are doing research work in electricity, physics, and chemistry, aided by Charles A. Coffin Foundation Fellowships. As undergraduates these men attended the U. of Cincinnati, Johns Hopkins, College of the City of New York, U. of Washington, Oberlin, Columbia, Muhlenberg, and Denison.

These awards are granted annually by General Electric in honor of the Company's founder and first president—Charles A. Coffin. Several previous recipients have attained national, and even international, fame; one, Dr. Carl D. Anderson, has received the Nobel Award in Physics—probably the outstanding recognition for scientific achievement.

The committee of three distinguished men who will make next year's awards is composed of: J. H. VanVleck, representing the National Academy of Sciences; Olin J. Ferguson, representing the Society for the Promotion of Engineering Education; and F. Malcolm Farmer, representing the American Institute of Electrical Engineers. Applications for the 1940 fellowships are now being distributed to colleges and universities. They must be completed and returned to the Secretary of the Charles A. Coffin Foundation, Schenectady, N. Y., before January 15, 1940.

GENERAL ELECTRIC

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THE TECHNOGRAPH

UNIVERSITY of ILLINOIS

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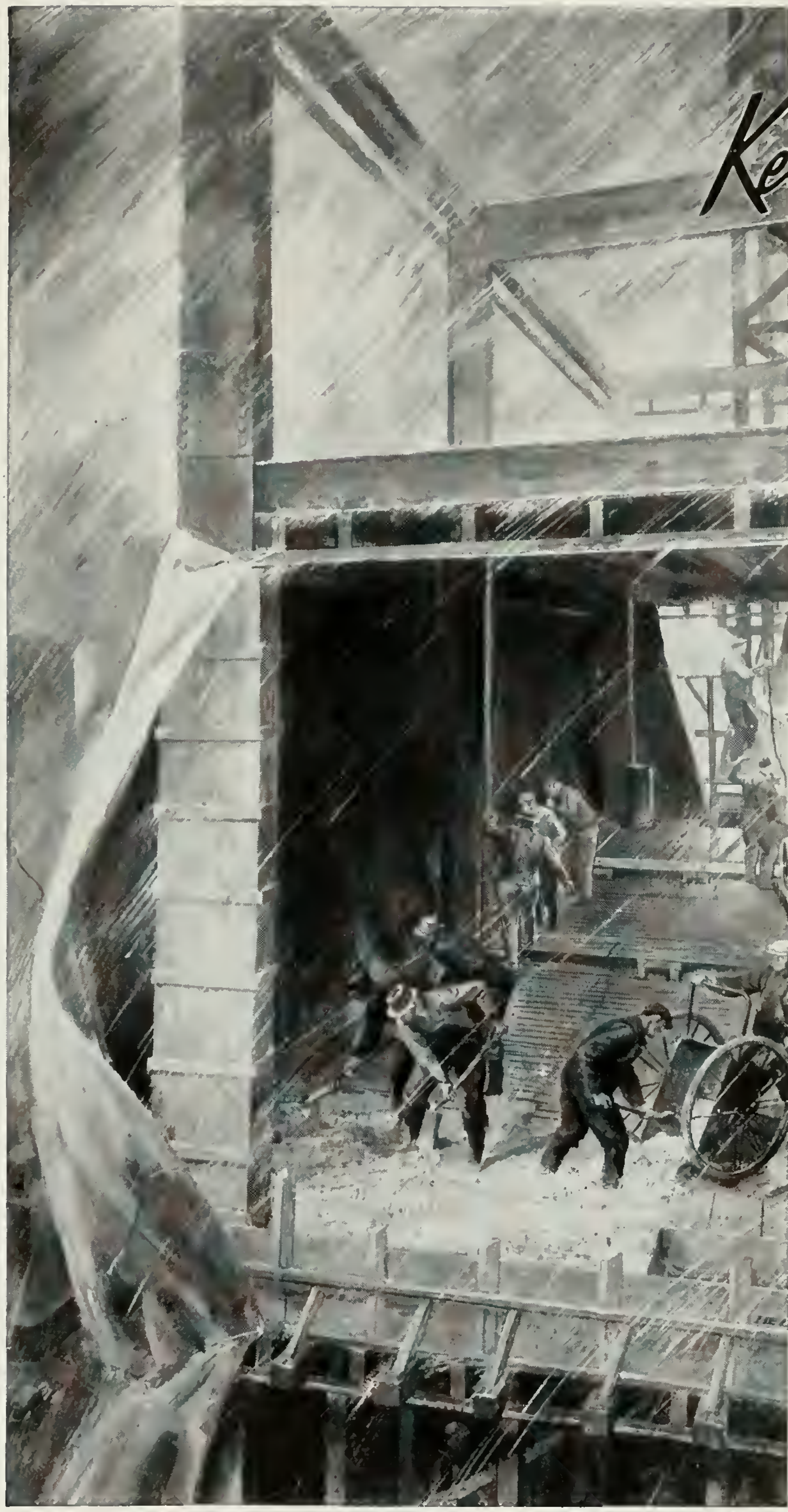

THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

DECEMBER, 1939

Volume 54 Number 4

WHAT WOULD HAPPEN if the daily newspaper came out with the headlines, "Engineering magazine to be organized! Students and faculty have opportunity to publish own work." We would immediately picture an assemblage of worthy engineering ideas; we would expect technical reviews of the most important professional developments; we would look for a complete record of current faculty and student news and for ads representing a cross-section of the country's industrial products.

● The magazine would be published. We would *look* for an assemblage of worthy engineering ideas, for technical reviews of the most important professional developments, and for a complete record of current faculty and student news.

WE WOULD LOOK, AND LOOK, and look.

But it wouldn't be there.

And nobody would do anything about it.

● BUT IF SOMEONE threw a hint, in black and white, that we already have an engineering publication the purpose of which is to publish all these things, the students and faculty who like that sort of thing would begin to investigate their magazine and they would take a free opportunity to do some good work and to publish some of their own material. They would find that the administrators of the college would be very happy for them.

And a dream would be a reality.

● Staff members responsible for this issue are: George Desmond, George Guirl, Gerald Homman, Hideo Niiyama, Bob Anderson, Lyle Schaffer, Tom Shedd, Earl Smith, Gene Sternberg, Don Stevens, Jim Thale, Bob Tideman, Ed Foerster, Joe Collins, and Walter Pahl.

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The Flame and The Weld

Instructions

[EDITOR'S NOTE: *Because of the growing interest in welding here and on other campuses, this article is reprinted from the November issue of Oxy-Acetylene Tips. Due to a lack of space here, the reader is referred to that publication for a chart showing recommended welding methods, flame adjustments, welding rods, and fluxes for welding commonly used metals and alloys.*]

The importance of proper flame adjustment in oxy-acetylene welding and cutting is readily apparent when it is realized that the sole purpose of the various items of equipment used is to enable the operator to produce and control at will an oxy-acetylene flame of the size and character best suited for the work at hand.

One unique feature of the oxy-acetylene flame is that its chemical characteristics, and consequently its action on molten metal, can be varied over a wide range. Determination of these characteristics is brought about by the relative proportions of oxygen and acetylene in the mixture which burns at the blowpipe tip. This proportion is accurately controlled by the blowpipe oxygen and acetylene valves. The blowpipe valves are not simply shut-off valves to provide a means for turning the gases on and off; they give the operator complete control of the flame adjustment at all times.

Fig. 1.—The neutral flame has an approximately one-to-one mixture of oxygen and acetylene

Fig. 2.—This flame is variously called an excess acetylene, a reducing, or a carburizing flame

Once the blowpipe has been lighted in accordance with the manufacturer's direction, the flame must be properly adjusted before the operator can proceed to weld. To accomplish this, the operator, in addition to knowing the composition of the metal on which he is to work, must be familiar with the different types of oxy-acetylene flame adjustments and the methods of obtaining them.

Characteristics of Neutral Flame

The neutral flame occurs when an approximately one-to-one mixture of oxygen and acetylene is lighted at the blowpipe tip. It is called a neutral flame because there is no excess of either oxygen or acetylene. As shown in Fig. 1, it has a characteristic appearance. There are two sharply defined zones. The inside portion of the flame consists of a brilliant white cone from 1-16 to ¾ in. long, depending on the size of tip used, and surrounding this inner cone is a second larger cone or "envelope flame" which is only faintly luminous and which has a delicate bluish color.

Characteristics of the Excess Acetylene Flame

When the oxygen and acetylene proportions are varied from the one-to-one mixture, a decided change takes place in the character of the flame. Slightly more than this proportion of acetylene in the mixture will produce a flame which is variously called an excess acetylene, a reducing, or a carburizing flame. As shown in Fig. 2, this type of flame will be found to consist of three zones instead of the two which exist in the neutral flame. There still remains the inner cone and the bluish outer envelope, but between these, surrounding the inner cone, is an intermediate cone of whitish color. The length of this intermediate or excess acetylene cone varies directly with the amount of excess acetylene in the flame.

The carburizing or reducing flame is used in welding steel by the Lindeweld process, in applying Haynes Stellite alloys, in fusion welding aluminum, Monel metal, nickel and some alloy steels, and for certain other applications.

Characteristics of the Exeess Oxygen Flame

At the opposite end of the flame adjustment range is the "oxidizing" flame which is produced when oxygen is in excess in the mixture. Its characteristics are shown in Fig. 3. The oxidizing flame has the general appearance of the neutral flame but can be readily identified by its shorter inner cone which is "necked in" on the sides, is not as sharply defined, and acquires a purplish tinge as compared with the brilliant white inner cone of the neutral flame.

A slightly oxidizing flame is used for all bronze-welding and bronze-surfacing applications, while a more strongly oxidizing flame is used in fusion welding brass

Fig. 3.—The oxidizing or excess oxygen flame is obtained by supplying additional oxygen to a neutral flame

and bronze. In the latter case, the correctly adjusted flame is the one that will melt the base metal and maintain a bright surfaced puddle which is free from film or coating.

Adjusting the Flame

After the correct welding head or tip for the work at hand has been attached to the blowpipe and proper oxygen and acetylene pressures have been adjusted at the regulators (all according to the apparatus manufacturers' recommendations and instructions), it is a simple matter to obtain the desired flame adjustment. First light the blowpipe, with the blowpipe acetylene valve one quarter turn open (if low-pressure, open wide) and the blowpipe oxygen valve just slightly open. The acetylene will burn with a smoky yellow flame and will give off quantities of fine black soot.

Excess Acetylene

Now open the blowpipe oxygen valve slowly. The flame will gradually change from yellow to blue and will show the characteristics of the carburizing or excess acetylene flame. There will be three distinct parts to the flame—a brilliant but feathery-edged inner cone surrounded by a secondary cone, and a bluish outer envelope forming a third zone.

Most medium-pressure blowpipes will produce a slightly carburizing flame at recommended gas pressures when both oxygen and acetylene blowpipe valves are wide open. If a greater excess of acetylene is desired at this point, close the blowpipe oxygen valve slowly until the secondary cone is of the length required. Conversely, to decrease the excess of acetylene in the mixture, close the blowpipe acetylene valve gradually until the secondary cone is correctly proportioned with respect to the brilliant and sharply defined inner cone. Carburizing or reducing flames are usually measured by the ratio between the length of the acetylene cone or "feather" and that of the inner cone, both being measured from the end of the blowpipe tip.

If any difficulty is encountered in obtaining the desired ratio between the lengths of the acetylene cone and inner cone, first adjust the flame to neutral, and then increase the acetylene until the desired ratio is established.

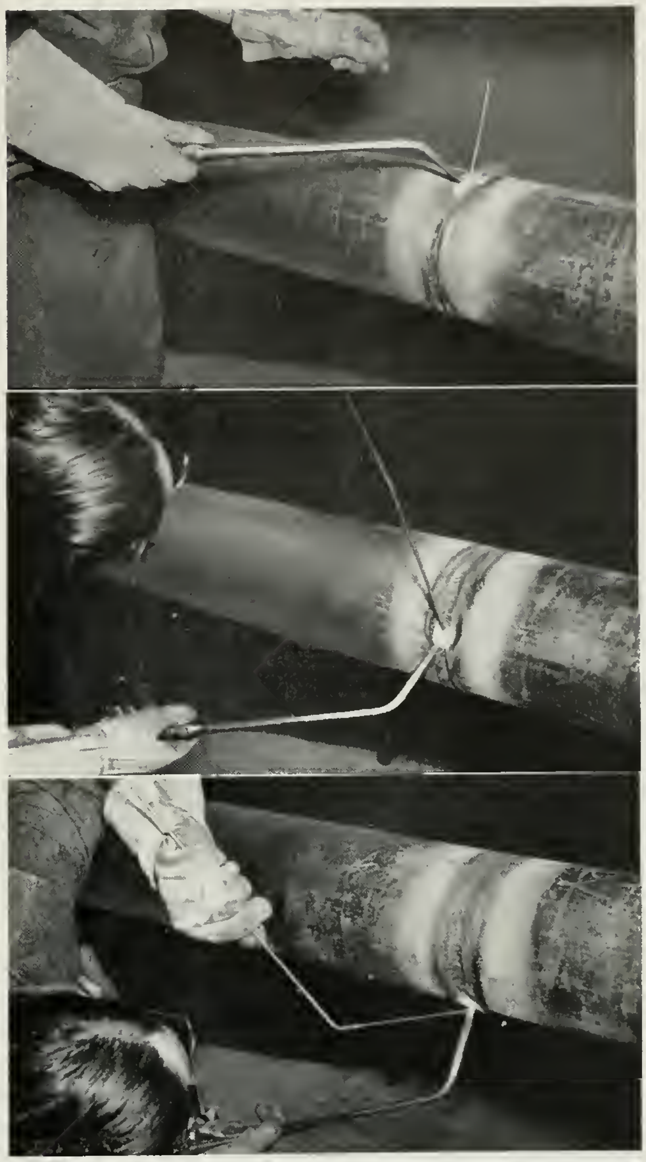
Neutral

To obtain a neutral flame proceed as above with an excess acetylene flame. Then close the blowpipe acetylene valve very slowly so that the secondary cone gets steadily smaller until it finally disappears completely. Just at this point of complete disappearance the neutral flame is formed.

Because the difference between the neutral and the carburizing flame is much more readily apparent than that between the neutral and oxidizing flames, an adjustment of the flame to neutral should always be made from the excess acetylene side. In other words, first adjust the flame so that it shows the secondary cone of excess acetylene, then reduce the amount of acetylene until this secondary cone just disappears.

Excess Oxygen

If an oxidizing flame is desired, proceed as though adjusting for a neutral flame. Then, when the neutral flame is obtained, either increase the oxygen or decrease the acetylene until the correct amount of excess oxygen is noticeable in the flame. The amount of excess oxygen in the flame will vary inversely with the length of the inner cone as compared with that of the neutral flame. Therefore, the proper oxidizing flame can be easily recognized when the length of the inner cone has been shortened the desired amount. The more the inner cone of the neutral flame is shortened, the greater the excess of oxygen in the flame. In some cases, as in fusion welding brass and bronze, the exact adjustment has to be determined by the action of the flame on the molten metal.



These pictures show, from top to bottom, the positions of rod and blowpipe for flat, vertical, and overhead welding

Check Adjustment Regularly

As welding proceeds, the adjustment of the flame should be checked by the operator occasionally to see that there is no variation. Changes may occur from a number of perfectly natural causes. For instance, any fluctuation in the control of gases by the regulators may make it necessary to adjust the flame from time to time.

It will take only a moment for the operator to lift the blowpipe, hold it in a convenient position and check the flame with his goggle-covered eyes. Any necessary adjustment can then be quickly made in the manner previously described.

Seniors See Industry

Arranged by George Guirl '42 from reports on annual inspection tour

Of the 321 "inspectors" to leave Champaign Tuesday, October 24, 104 were mechanical engineers. Arriving in Chicago Tuesday night, this group of would-you-believe-it engineers retired to their headquarters at the Hotel Chicagoan for they well knew that Wednesday's schedule was a full one. Wednesday morning the inspection trip started into full swing with a visit to the Wisconsin Steel Works in southeastern Chicago.

There, the men witnessed production of steel from the reduction of the ores to the final stages of development. From the coke ovens and by-product plant they were directed to where the blast furnaces and open hearth furnaces were being operated. They continued on, then, into the noisy rolling mill section of the plant where trained men called "rollers" worked standing at the center of a circle formed by a moving white-hot steel bar which they fed from one roll to the next.

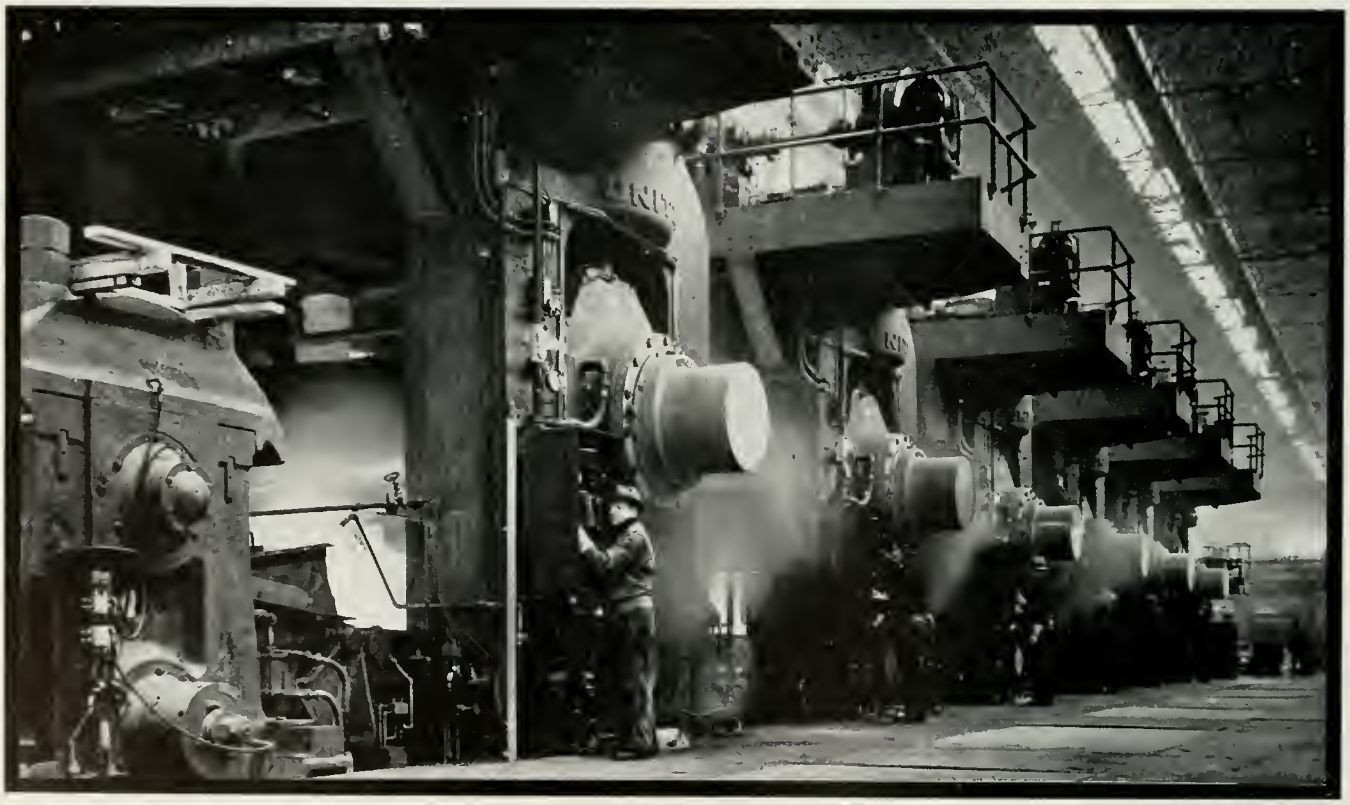
The afternoon tour scheduled for Wednesday took the senior mechanicals through the Electro-Motive corporation at La Grange, Illinois. There the men observed every stage in the construction of modern streamlined and fast-freight Diesel locomotives. They were shocked to see a two-inch solid slab of steel 10 feet wide by 35 feet long being flame cut for the bed. And they were impressed with the perfect beads in the welding operations. For a happy conclusion of the day, 450 facultymen, alumni, students, and various representatives had the annual "get together" dinner at the Medinah club in Chicago.

What the second day of tours was to hold in store for the seniors was found early Thursday morning upon visiting the Western Electric Company. From one department to another the men found ever-busy fingers and machines turning out intricate metal and plastic parts. Some interest was focused on the girl-labor. These women seemed satisfied and highly efficient. At noon the "inspectors" enjoyed lunch at the expense of their hosts.

Thursday afternoon was spent at the State-Line Generating Plant of Chicago. Having such a huge capacity (360,000 K.W.) the plant was enormous in size. Observing the different types of generators, the engineers didn't mind the extremely warm, moist atmosphere, but, after several hours of walking and climbing steep steps, they were glad to return back to their rooms.

Friday morning saw the senior mechanicals eating breakfast at 80 miles per hour in a swaying diner headed toward Milwaukee, there to tour and inspect the Allis Chalmers plant. Among the things seen were wood and metal patterns of all sizes being made, castings poured in mass production, and materials machined and forged. In the tractor plant, a separate department, production tractors were being assembled.

The Friday afternoon's schedule called for a tour of the Kearney-Trecker plant, one of the largest and most complete plants for the manufacture of milling machines. Here the seniors split into two factions headed by M. Rottersmann and Keith Pfundstein, respectively. The first group scrutinized and analyzed the accurate machinery operations and plant layout and routing while the second group made a discovery in personnel—the



This night-time scene of a roughing train represents one phase of steel making seen on the inspection tour

engineering department had two expert and good looking young women on the drawing board.

Civil Engineers

Thursday morning October 26, the civil engineering inspection group, 63 in all, tramped through Chicago Bridge works located in Gary, Indiana. The tour not only included the fabricating industry but also engineering work pertaining to bridge construction. Works of pre-fabrication and bridge-tower construction, bridge superstructure and even a partly constructed arch to be used to span the Mississippi at Rock Island were seen.

After a quick lunch at the Y.M.C.A., the senior civils rolled off to take up a tour of the Universal Atlas Cement Co. Here they witnessed the manufacture of cement from every angle and through every process. An early impression gained while at this huge plant (the largest of its kind in the world) was how cleanliness and order were maintained in a plant of this kind. Modern ventilating systems, flow sheets, burning ovens and many other things were of practical engineering instruction to the men.

Not spending more than two hours at the cement plant the men hurried on to witness the most interesting construction at 127th and Blue Island. At about 4:30 p. m. the "inspectors" dispersed to formulate plans for the evening's entertainment.

General Engineers

To get off to the right start on their tour, the General engineers started Wednesday morning with a visit to the Western Electric plant. Here they observed equipment, processes, and most of all, the bulletin boards (for labor and management notices). "We saw copper bars drawn to fine wire, telephone receivers made from powdered bakelite in less than eight minutes," said one boy. As guest of Western Electric, the generals enjoyed an excellent lunch, then settled down for a short bus ride out to the Wisconsin Steel Works. They, also, enjoyed the thrills of the day watching the blast furnaces operate, and the huge ladles of molten iron being carried around and poured.

Thursday morning, even as early as it was, found the men assembled and prepared as usual for another tour, this time through the American Bridge Company at Gary, Indiana. There the group saw the superstructure to be used in the construction of part of the Shasta dam, huge drum gates for the Grand Coulee dam and a part of the 540 foot span to be erected at the Rock Island dam. Huge presses and punches used in making rivet holes in the structural steel were observed as being "amazing pieces of machinery."

After a lunch at the Gary "Y," the Generals "dusted over the grounds" to the Universal Atlas Cement Company along with the Civils. After the several hours spent at the cement plant, they proceeded to the overpass at 127th street and Blue Island still with the Civils and witnessed the interesting structure still in the process of completion.

This picture was taken on the mining inspection trip, 1931

Civil's inspection trip, 1934. Cameras are not allowed now

Railway Engineers

While at the Electro-Motive Corporation plant at La Grange, Illinois, the Railway E.E.'s had the opportunity of viewing four different types of diesel-electric locomotives. In addition to the switching and streamlined engines, there were under construction at the plant two new types of locomotives, one for branch line work and the other of streamlined freight design.

An interesting note sent in by one of the Railway Engineer students stated that while on their tour in Milwaukee "an entire group of fifty students with the exception of three, went down to the station to watch the 'Hiawatha' roll through after returning from the Allis-Chalmers plant. The three exceptions were the Railway Engineers who couldn't find the station, although it was but a block away."

Friday found the Railway Civils at the Proviso yard of the Chicago Northwestern observing different phases of operation. The Railway E.E.'s spent most of Friday inspecting the west-end shops of the Chicago Surface Lines viewing maintenance and repair work of all kinds.

Saturday the tour ended with the Railway Civils inspecting the interlocking tower at the Union Station and the Railway E.E.'s inspecting the Burnside shops of the Illinois Central electric lines.

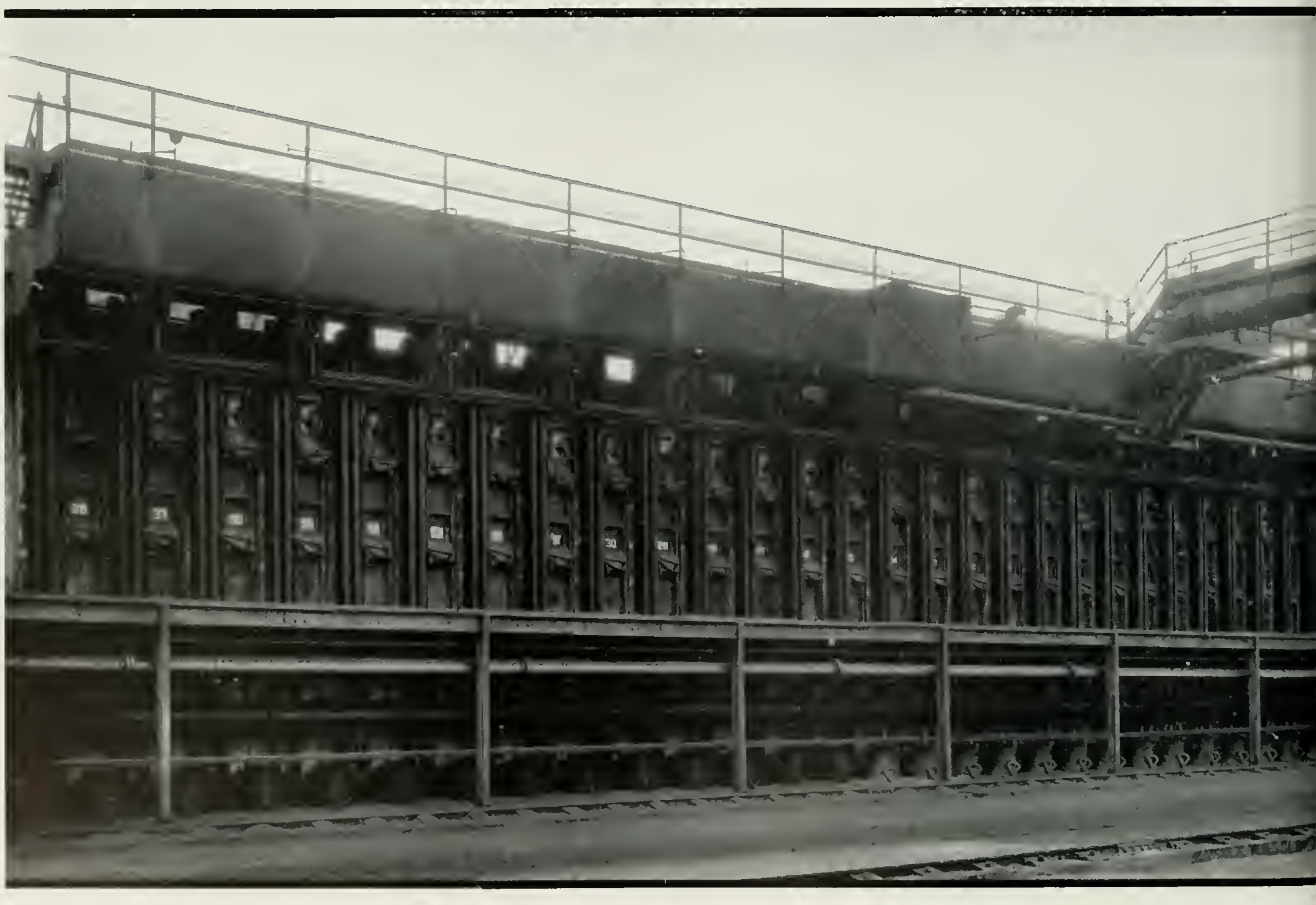
Electrical Engineers

The party of 64 senior Electric Engineers officially started their inspection trip Wednesday also with a visit to the Western Electric's Hawthorne Plant. This plant covers nearly 200 acres and employs 15,000 workers, specializing in electrical apparatus. From the wire plant, past the "pickleing" vats and winding machines, through the moulding rooms, and along the endless block long conveyor belts strolled the visitors assimilating as much "field" knowledge as possible.

During the lunch at the Bell Telephone central office building, the inspectors had a demonstration of how long distant calls are made. While in the building they visited the department that houses the radio network lines were National, Columbia and Mutual circuits to and from Chicago are controlled. From there they went to the cable vault in the basement of the same building. Those vaults are known to be the largest of their kind in the world.

STEEL

THEME OF INSPECTION TOUR
. . . OF STUDENTS' FUTURE PROFESSION



RIDDLE OF IRON

● In an address before the American Iron and Steel Institute in 1930, Arthur D. Little invited his audience to guess a riddle:

What it is that is very hard and very soft; weak and very strong; highly resilient and springless; easily corroded and resistant to corrosion; magnetic and non-magnetic; resistant to atmospheric influences but that takes fire when exposed to air; that welds readily and is incapable of welding; a good conductor of heat and electricity and a poor conductor of both; that is weak and soft at red heat and hard and strong at the same temperature?

The answer to this riddle is iron in its many forms. Every phase of engineering is connected to this versatile metal. On this page are shown some scenes in the development of iron ore to steel. Upper left, Hull-Rust Mine, one of the outstanding operations on the Mesabi range; Lower left, the pusher side of a battery of modern coke ovens; upper right, construction on a blast-furnace; lower right, a finishing train of a rolling mill.

Locating the Decimal Point

By Walter J. Kalisz

There are two steps which we must follow in slide rule calculation: setting the slide rule to find the answer, and locating the decimal point in the answer. We may most readily locate this decimal point by either the round numbers method or the characteristic method.

Of these, the round numbers method is most often used because it is more widely known. In applying this method, we calculate the location of the decimal point by adding the total number of digits, and if the slide is to the right, subtract one digit to get the total number of digits in the answer. When the slide is to the left, it is not necessary to subtract the digit. A more widely used variation of this method is to round out the numbers and calculate the location of the decimal point in our heads if the numbers dealt with are small, or on paper if they are large. For example, if we multiply 321 x 82, we round out the numbers to read 300 x 80 and thus see that we will have 5 digits in our answer.

The characteristic method locates the decimal point of answers to complicated calculations more easily and more rapidly than does the round number method. The characteristic, as all engineers know, is the integral part of a logarithm, the mantissa being the decimal part. We find the characteristic of the logarithm of a given number by subtracting one from the number of integers in the given number. e. g., the characteristic of 52 is 1. If the given number is a decimal fraction, the characteristic is found by adding 1 to the total number of zeros before the first significant figure, the sum having a minus quantity, e. g., the characteristic of .0005 is —4.

Let us multiply 18 x 20. On the slide rule we get a reading of 36. Now the characteristic of 18 is 1 and that of 20 is 1 giving us a total characteristic 2 of the answer. Reversing the process, we see that the reading should have 3 integers, giving us an answer of 360.

But we must modify this general rule whenever we use the right hand index, as indicated by the projection of the sliding scale to the left. Let us multiply 40 x30. Here we see that the sliding scale projects to the left. Applying our characteristic method the characteristic of 40 is 1, of 30, is 1, the total being 2. Moving the sliding scale to the left has the effect of adding another logarithmic scale to the D scale. The addition of this logarithmic scale will increase by 1 the characteristic of the answer, which now becomes 3. We see, then, that our answer must have four figures in it. Our reading of 12 then will be the correct answer by adding two zeros, becoming 1200.

Mother (on entering the room unexpectedly): "Well I never—"

Daughter: "Oh, mother, you must have!"

Under this stone lies Murphy
They buried him today;
He lived the life of Riley
While Riley was away.

Eyerly: "Woman's greatest attraction is her hair."

Barsdukas: "I say it's her eyes."

Boeker: "I strongly disagree, it's her teeth."

Swift: "What's the use of our sitting here and lying to each other?"

Poor Bicycles

By Bob Tideman

Engineers are supposed to be pretty good mechanics —handy at taking apart, greasing, and putting back together, but did you ever see such a rusty, creaky, wobbly bunch of bicycles (mine too) as rest their tired selves between the Physics Building and Engineering Hall while their masters attend classes? Count them on a rainy day, any less?—hardly. The poor decrepit servants wait, mute and faithful, in the cold rain. Ah me!

Gee fellas, ain't it a shame? What're we gonna do? Poor bikies.

Hey, here's an idea. Suppose we chip in and buy another rack. Then at least the bikes could rest themselves comfortably instead of having to sit down on the wet grass.

What's that? You say we don't need another rack? Huh! How'd you like to sit on the wet grass for an hour or so?

Oh—I get it. That's not what you mean. You mean that if we'd always use every other parking space on either side, fewer bikes would be left out.

Hey now fellas, there's a thought. Suppose we all park our bikes in alternating slots. After all, that's how the racks are meant to be used. At 7:45, I've been told, it's pretty hard to discern which is the alternating slot, when there's only one other bike and it's at the other end, but at 7:59½, I know, it's very easy to discern when someone has used the third slot somewhere, dammit. If we'll notice there are four slots between diagonal supports, a simple linear equation will tell us which is the even-numbered slot.

It is a bother, isn't it, to find an empty space one can't get into without moving 10 bikes on either side., And look here, we can spare the late sleeper from having to dash over to the grass to park his bike, so that he's 20 seconds late to his eight-o'clock.

Let's start a society—the S. P. C. B. Ah, I see a new day approaching—when faithful servants need not sit down, but can stand in the rain. Hurrah!

ENGINEER'S TEST OF GOOD WHISKEY

Connect 20,000 volts across a pint. If the current jumps it the whiskey is poor.

If the current causes a precipitation of lye, tin, arsenic, iron slag, and alum, the whiskey is fair.

If the liquor chases the current back to the generator, you've got GOOD WHISKEY.

French Sentry: "Halt! Who goes there?"

Voice: "American."

French Sentry: "Advance and recite "The Star-Spangled Banner."

Voice: "I don't know it."

French Sentry: "Proceed, American."

A parrot was sitting in the luxurious salon of a steamer watching the magician do tricks. The magician served notice that he was now going to do a trick never before accomplished. He pulled up his sleeves and then proceeded to make a few fancy motions. Just at that moment the ship's boilers blew up demolishing the ship. About five minutes later, as the parrot came to, floating about on a piece of drift wood, he muttered: "Damn clever, damn clever."

North of Green Street . . .

The Mysteries of the Diesel

The mysteries of the Diesel are no longer mysteries to the members of the American Society of Mechanical Engineers of Illinois since the discussion by Mr. Robert T. Mees of the Caterpillar Tractor Co. at the October 17 meeting.

Although the first application of the compression ignition system to internal combustion engines is not credited. to Rudolph Diesel, related Mr. Mees, this engine bears his name because he is responsible for the operation of the engine as it stands today. In fact, continued Mr. Mees, Diesel was more of a theorist than an engineer. This is evidenced by the fact that his first experiments were often accompanied by violent explosions.

The members of the ASME were then acquainted with the theory, construction, and operation of the Diesel engine. Why the Diesel uses less fuel, why it is more efficient than the gasoline engine, why its exhaust is almost void of carbon monoxide, and yet why it is not likely to be installed in automobiles, are a few of the points which Mr. Mees covered. At the conclusion of his talk, Mr. Mees demonstrated the fuel injection system of the Diesel with a small model, which exploded the vaporizing fuel with a flaming "pouff."

Synton Hear Own Voices

The members of Synton, national professional radio fraternity, agree that their first meeting, an open house held October 19, was one of the most interesting they have ever had.

"Instaneous Recording" was the subject discussed in a talk by Mr. James Ebel, engineer from WILL. He spoke of the principles underlying the action and construction of recording and play-back machines. How the electrical circuits are varied in the cutting head to secure various frequency and amplitude responses, how various types of records differ in scratch level, and how the cutting stylus is shaped to cut the record are a few of the points brought out in the talk.

Only a shallow pool of molten weld metal should be carried when welding in the vertical position.
See page 5.

Following the discussion, Mr. Ebel recorded and played back the voices of every person in the audience. Everyone was thus given a chance to hear his voice as others hear it. Refreshments were served while turns were taken viewing, through a microscope, the impressions made by the cutting stylus in the record.

Konzo Speaks

The "heat was poured on" as Professor Konzo displayed colored movies to accompany his talk on "Combustion in Under-Feed Stokers" when, at their November 2 meeting, the ASME's were acquainted with the results of tests carried on in co-operation with the National Warm Air Heating and Air Conditioning Association to secure scientific data in this field. Professor Konzo discussed the effects of varying the feeding and burning rates, and the adaptabilities of various coals to the under-feed stoker.

How the various coking properties of coals are related to the formation of coke trees could be clearly seen in the moving pictures. What to the inexperienced eye appeared in all respects to be a beautiful autumn sunset, allowed the engineer to peer directly into the midst of a blazing inferno.

TAM Students, Nature's Impact Limit

In studying momentum and impact, students need a vital definition of energy units that deal with speeds of the human body. Police department records show that impact accidents at 25 miles per hour are not usually fatal, though they may cause considerable property damage and more or less serious injuries. There are, however, a number of other fortunate facts which seem almost providentially helpful in presenting the picture of energy.

For instance, a human being cannot run more than 25 miles an hour, even down hill with the wind at his back. Jesse Owens, world's fastest human being, might do it for 100 yards.

It is probable that Jesse would survive if he ran full-tilt into a telephone pole at that speed. Mother Nature has given man the physique to withstand such a blow.

Oddly enough, the energy to be absorbed if we strike an object while running 25 miles an hour is just the same as if we fell from a height of 20.9 feet. For thousands of years men have been falling off their two-story dwellings and out of trees, where the fall is about 20 feet. It is possible to survive this impact, although it is just about the "shock limit" for the human body.

And, if we call this quantity of energy which each pound of the body and each pound of the car carries at 25 miles per hour, "one Danger Unit of energy," at 35, the blows are twice as heavy. At 75, they are nine times as heavy. Naturally, the body cannot stand such blows.

Know Your Illinois—

Dear Mr. Editor:

Thank you for the September and October copies of Technograph with the publicity material about Illinois to which you called my attention.

Illinois ranks high agriculturally and in the industrial field, and today has several industries which annually produce more than $100,000,000 of finished products. These industries and their annual output include:

Agricultural implements	$155,000,000
Bread and Bakery products	109,000,000
Dyeing and like processes	102,000,000
Printing (exclusive of newspapers)	110,000,000
Printing (newspapers and magazines	106,000,000
Steel works and rolling mill products	163,000,000
Oil production and allied processes	175,000,000
Clothing manufacture (all types)	155,000,000

(Note: figures based on 1935 reports)

Quite a number of other industries manufacture products annually valued in excess of $50,000,000 which includes: boots and shoes, canning, candy, flour and other milled products, soy bean products, unclassified small machinery, paints and varnishes, tin cans and other tin ware.

Incidentally, your story on the meat packing industry is interesting, but the value of this industry's annual production is closer to $600,000,000 today than the $300,000,000 mentioned in your article. Chicago and East St. Louis rank first and second in the nation regarding size of stock yards.

If we can be of further assistance, please call at your convenience.

Very truly yours,
MILBURN P. AKERS, *Superintendent*
Division of Department Reports
Department of Finance
State of Illinois

Poros Metal

Metal will absorb ink like a blotter; it can be used as a wick in a kerosene lamp. "Porous" metal is first prepared in powder form by a chemical or an electrolytic process. This powder is then subjected to a pressure of several thousand pounds per square inch. The compressed metal resulting is given a brief heating process in a furnace. After it comes out of the furnace, it is the finished product—"porous" metal. It looks and feels like ordinary metal, but it it lighter, for the fine grains of powder have been pressed just tightly enough to leave tiny cracks and crannies between the grains. These microscopic openings are, of course, invisible to the naked eye.

When a drop of ink is placed on "porous" metal, the ink runs down between the powder grains. The metal, in other words, blots the ink exactly as a blotter does. When a piece of "porous" metal is set in some kerosene, the liquid works it way up through the cracks; the piece of metal can then be lit with a match and used as a wick.

ALUMS . . .

Stress labor relations and fundamental theory

McCarthy

W. L. McCarthy is one of the members of the class of 1929 in Mechanical Engineering. At present he is with the Delco-Remy Division of General Motors Corporation as the assistant superintendent of the Starting Motor Plant. This plant manufactures some eight thousand starting motors a day.

Delco-Remy specializes in the manufacturing of starting, lighting, and ignition equipment for all the General Motors cars, and also for certain other manufacturers. Immediately upon graduation, Mr. McCarthy enrolled in this division's Student Engineering Course. After plant maintenance department, which acquainted him plant maintenence department, which acquainted him with the entire factory layout. He was next made foreman of the cupolas and permanent molding department, where the company does extensive work with gray iron. From here he went to the plant engineering office to supervise construction work, and four years ago he was promoted to his present position.

The present labor situation governs Mr. McCarthy's opinions on special training for young engineers. He feels that courses are needed in Industrial and Human Relations wherever the engineer may be thrown into close contact with the laboring classes. He feels that the present situation has arisen because of lack of study of these topics, and the engineer with this knowledge will find success a bit easier.

•

After obtaining a B.S. degree in 1925, R. E. Peterson returned to the University of Illinois and in 1926 obtained his master's degree in Theoretical and Applied Mechanics. He immediately went to work for the Westinghouse Electrical and Manufacturing Company in their Motor Engineering department. After a year in the Westinghouse Research Laboratories (28-29), he became the Section Engineer in charge of strength of materials. Finally, in 1931 he attained his present position, that of Manager of the Mechanics Division. This position entails the supervision of work on the strength of materials, vibration, lubrication, and stress analyses, as applied to electrical machinery.

Mr. Peterson is married and has two children. The family lives at 636 Cascade Road, Forest Hills, Pittsburgh, Pennsylvania. In response to our question regarding the special training he thought a young engineer should have, Mr. Peterson replied, "The student planning to go into design or research should obtain a training along strictly fundamental lines. He should master thoroughly the various subjects in physics and mathematics. During the period of study he should not be concerned as to whether or not the information will ever be useful." This comes from a man primarily concerned with research and design, and as such is well worthy of serious consideration by those students contemplating such a vocation.

Third Skin Protects Hand

A recent patent in which glycerine is utilized as an important ingredient, has already begun to attract considerable attention. The patent consists of specifications for a preparation for making an invisible "third skin" for the hands. This preparation, which would seem to fill a long-felt need for many industrial workers, is claimed to protect the hands against dirt, grease, paint, oil, ink, gasoline, acids, alkalis, and so on.

This mixture is said to be invisible, elastic, permits the passage of perspiration without loss of its proctective properties, and to persist in this property for at least eight hours. It may be removed by washing with water. This "third skin" consists of:

Sodium soap	128 oz.
Water glass	110 oz.
Glycerine	100 oz.
Potato starch	100 oz.
Distilled water	2 oz.
Cottonseed oil	32 lbs.
Perfume, if desired, a few drops	

Such a glycerine-containing preparation may be expected to be especially useful for painters, printers, gasoline-station attendants, automobile mechanics, and in short, all workers who come in daily contact with clinging substances that are difficult to remove from the skin. The use of the coating is not limited to the hands alone, but may be used on any part of the skin where protection is desired. The inventor designates his invention as the "third skin" because it covers the two natural skins of the body. *The patent referred to is U. S. Pat. No. 2,120,569, Osmer F. Oliver, of Akron, Ohio.*

Experiment Station

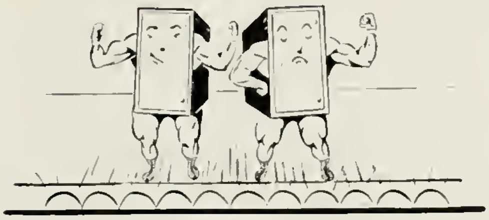
While most of the engineers-to-be here at Illinois were taking Suzy to the show this summer, the Engineering Experiment Station was busy getting new experiments under way and preparing the bulletins for recently completed experiments for publication.

Two bulletins, a circular, and a reprint will soon be out. One of the bulletins is a report of fatigue tests made on the connection angles used on through-truss railway bridges to connect the stringers to the floor beams. The other bulletin deals with the range of stress on the fatigue of S.A.E. 3140 steel in both the hot-rolled and the heat-treated condition. The circular is made up of papers presented at the fifth short course in coal utilization held at the University of Illinois, May 23-25, 1939.

Two new experiments are being conducted in the ceramics and chemistry departments. Dr. Burnham King is experimenting upon the fundamentals of opacity. His experiments are being conducted in the ceramics building. In chemistry Dr. Swan is working upon electrolytic reduction.

The Technograph Staff
Wishes You
A Happy New Year

G-E Campus News

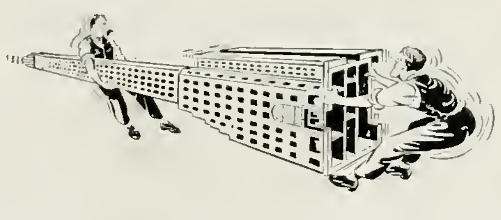


CONQUERING HEROES

TWO newcomers to the G-E family of electric products took the stage recently and proved to 250 industrial, utility, and railroad guests that they could "take it." The pair were oil-less circuit breakers, designed for applications heretofore limited to oil-type breakers.

As are all their brethren, these breakers are designed to protect electric circuits, interrupting those circuits when the current rises to a dangerous level. One of the pair operates magnetically. The other uses high-pressure air. As they should have been, the actual circuit interrupting tests in themselves were properly uneventful. The breakers passed them with ease—even though one test exceeded their interrupting ratings by 50 per cent.

Among those present were three distinguished ex-Test men—E. O. Shreve, Iowa State '04, G-E vice-president in charge of apparatus sales; M. O. Troy, Virginia '96, commercial vice-president and head of the Central Station Department; and D. C. Prince, Illinois '12, head of the engineering department, G-E Philadelphia Works.



SKYSCRAPER STRETCHERS

NEW YORKERS who have the tallness of their city's skyscrapers neatly cataloged in their minds will soon have some mental reorienting to do. General Electric engineers are stretching the towering G-E building in midtown Manhattan.

The actual stretchers are four 25,000,000-candlepower searchlights of a type recently introduced by General Electric. Each contains three "midget suns"—1000-watt water-cooled mercury lamps the size of a cigarette. Four of these searchlights are being mounted so that they will send their streaks of bluish-white light up the building's corners, accentuating the structure's vertical lines and creating an illusion of greater height. Under favorable atmospheric conditions the beam will be visible high above the tower.

Thus, G-E illuminating engineers, some of whom only recently completed the Test Course for engineering college graduates, continue to introduce new methods of illumination. Other examples of their work can be seen in all parts of the nation—on highways, buildings, city streets, athletic fields, and hundreds of other places.

SIT STILL, PLEASE!

SOME photographic subjects are the perfection of immobility, but not so the subjects of W. K. Rankin, G-E engineer. He photographs electric arcs, the flashes of electricity that occur when a circuit is broken.

Before he could photograph these arcs, Mr. Rankin had to catch up with them. He designed what is believed to be the world's fastest camera—capable of taking 120,000 pictures per second. The fast-stepping arcs occurring in various types of electric apparatus can now be more closely studied and the product itself improved.

In making the camera it was found undesirable to use glass lenses. Therefore, the pinhole principle was used, employing 1000 holes of .01 inch diameter through which light passes to the film. The camera is its own darkroom, being surrounded by a case large enough to house its operators.

GENERAL ELECTRIC

90-194C

1940
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THE TECHNOGRAPH

UNIVERSITY of ILLINOIS

Assembling Snow Cruiser

JANUARY, 1940

20 cents

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

THE ILLINOIS TECHNOGRAPH

Published Eight Times Yearly by the Students of the College of Engineering, University of Illinois

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An Engineer's Diary

MAY, 2100 A.D.

By Wayne E. Moore '41

The *Technograph* takes great pleasure in publishing the following material taken from the Diary of John Engineer, the subject of the first successful "long-sleep" experiment of suspended animation. The experiment was started shortly after the beginning of the Second World War in 1939, and was halted in May of 2100, so that the subject would be completely conscious before the morning of May 30, 2100. The foremost hobby of John Engineer before his "sleep" had been following the Indianapolis Memorial Day Race which was held in the city of Indianapolis at that time. The doctors in charge of the experiment wished to determine how much, if any, the subject's memory had been impaired by the test. It was believed that the race would be foremost in his mind, since, at the beginning of the experiment, he was engaged in preliminary calculations and designs for the fuel and exhaust system of one of the cars being built for the race. After his return to "life" and until his death a few days ago, John was under observation by the foremost men in all branches of science and sociology. The following pages taken from his diary reveal, far more clearly than do the observations, the processes which he went through in his readjustment to life as he found it in what to him was a new world.

"May 29, 2100:

"Today has been one of the strangest days of my life. When I volunteered for the 'sleep experiment,' I did not think of its lasting more than a few weeks at the most. My first concern when they told me the date was to ask about the Memorial Day Race, and I was puzzled when they all smiled as if they were quite pleased. Shortly after this, they told me that it was the year 2100. The race is still held on Memorial Day, but it is on a new speedway. The doctors have promised to let me attend it, even though I am still rather weak. I am very curious to see the cars. If they have been improved as much as other things I have seen, they will indeed be marvels of engineering! The room that I was in when I regained my senses was almost like a room which I had dreamed fairies lived in when I was a boy. There were no windows, and no sound ever entered the room. The door was kept closed except when someone passed through it. It seemed to open automatically—some sort of photronic cell controlled it, I suppose; I must remember to ask about that tomorrow, for all the doors that I have seen so far are automatic.

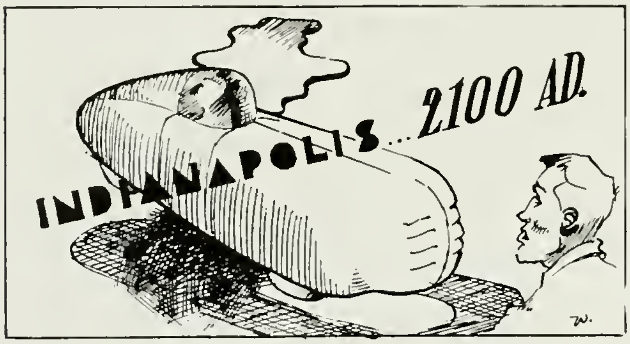
"One of the most puzzling things I have seen today is so unbelievable that I hardly dare to mention it until I am more certain that my mind is completely clear. A short time after I became fully conscious, I felt thirsty; but since so many things were happening, I didn't ask for a drink. One of the doctors, whose sole job seemed to be recording my reactions to the questions the others were asking, brought me a glass of water at almost the same time that I first noticed my thirst. I would have forgotten about it, except that he remarked, 'Here is the drink you wanted.' Several times later in the day, similar instances occurred. It seems that at least a few of

the people know just exactly what I'm thinking all the time. I haven't asked about it yet, because I have so many other questions to ask.

"The doctors have moved me to a hotel now, and I am alone for the first time since early this morning when I regained full consciousness. During the past hour I have been exploring my suite. It has been a lot of fun trying to figure out how all the gadgets work. One of the most convenient things is my telephone. It is an earphone and microphone arranged in a unit much like the cradle telephones which were in use at the time I started the 'sleep,' but a bit lighter. On one side of this telephone is the number dial, and on the other side is a dial which tunes and controls the radio. Apparently, the telephone is a small radio transmitter with a limited range—probably just within the room in which it is used. One of the workers in the hotel said that the telephones have wires from station to station just as before, but that each room has a larger and more complex transmitter-receiver, which sends and receives signals from the portable unit. Each telephone line in a single building operates on a different frequency, so that private lines are assured. I still haven't tired of tuning my radio as

I walk about the room carrying this small phone unit in my hand! My radio is a television set, of course.

"One thing that I have enjoyed is the music I have heard. The instruments are all strange to me, but many of them have sounds similar to those of the instruments which I remember. All the orchestras are small, and most of the instruments are electrically amplified; this is obviously the reason for the small number of players. In the orchestras which seem to be the theater and dance orchestras, many of the instruments are what we used to call 'synthetic'—the tones are produced mechanically. It seems odd that I should have been alive when the first of these mechanical instruments, the electric organ, was popular. I am very anxious to see these instruments personally, so that I can see how they work; the television image is so small that I cannot see the actual working of the instruments.



"I think that I'll go to bed now, so that I can be fresh for tomorrow.

* * *

"May 30, 2100:

"Today I saw my favorite race, but my greatest thrill came from watching and inspecting the cars that were used. They are so different from the old ones that I could only get a smattering of the principles upon which they operate. It was the same race that it has been since its start as the Memorial Day Classic. One of the doctors told me that it was the oldest annual sporting race in the world. The cars were more perfectly streamlined than any that I ever dreamed of in the 'old world.' The drivers are completely enclosed. Most of the cars have engines which operate much like the old steam turbine, a marvel of efficiency in 1940, but these gasoline turbines burn a very light, moderately volatile hydrocarbon fuel. One of the chemical engineers who prepared the high-quality fuels for the race told me that most of the fuels are now made synthetically from plants grown under intensive cultivation processes. This is necessary because much of the oil was wasted in the Second World War. He said that most of the oil produced is used in making lubricating materials which can be reclaimed, rather than in making fuels.

"One of the mechanics showed me a piece of metal from a combustion chamber which had broken from one of the racing engines. It was extremely hard and had a very low coefficient of thermal expansion, according to one of the engineers nearby. The chief property of the metal, however, was its ability to withstand extremely high temperature without losing its structural strength. There is no direct mechanical connection between the engine and the driving wheels; instead of the conventional clutch to which I had been accustomed, a hydraulic drive working upon the principle of the turbine is used. This prevents any sudden shock's damaging either the engine or the gears.

"The engines operate at extremely high temperature, and the exhaust is liberated at a relatively low temperature and pressure. Most of the engines develop about 1,000 horsepower.

"After the race, I asked the doctors, who were still my guides, if I might visit some of the factories in Indianapolis. The plant that we visited was the Whiz Motor Works, where most airplane motors are made. Here again the building was windowless, and the light came from fluorescent tubes in which the light was produced by electrical discharges through gases. There was no glare and no shadow from these lights; the room seemed to glow rather than to be artificially lighted. The air conditioning system must operate on a new principle, for I heard no noise when they showed me the unit. Machines in the plant furnish the heat, someone said. I'm going to visit a heating engineer tomorrow; perhaps he can explain how the circulating and filtering units work so silently.

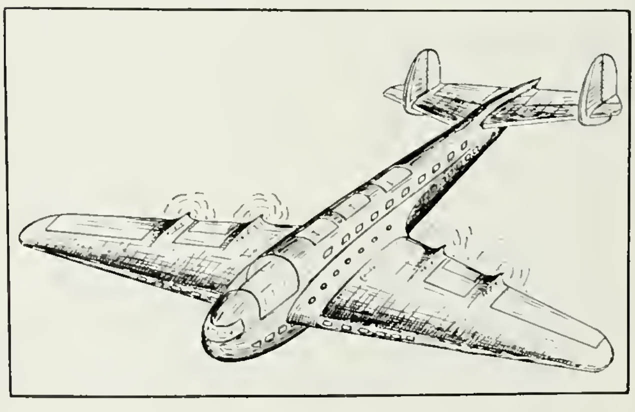
"Here again the engines were turbines, and some developed as high as 5,000 horsepower! I couldn't understand this increase in power until I saw the largest engine being tested. It was turning up 6,000 r.p.m. at an operating temperature of 1,500 degrees Fahrenheit! The rotor shaft was running on alloy roller bearings housed in a circulating oil bath. The lubrication engineer told me that the oil used for lubrication was subjected to a high electric potential discharge through thin layers of oil to improve film strength and heat resistance.

* * *

"May 31, 2100:

"Today I visited the Chicago Municipal Airport. The planes are not the surprise I had expected. The huge airliners are similar to the planes that I remember, except that they are much larger and more refined in design. The engines are mounted inside the wings, with the propellers operating from the back side of the wings, so that the leading edge of the wing enters undisturbed air. This fact is very important in the planes that I inspected today, because the leading edge has a different airfoil from any I remember seeing before, and there are some very complicated looking 'flaps' and slots along the leading edge, which enable the plane to lift its load at a slower speed than the airfoil would normally allow. At the planes' cruising speed, these flaps and slots close automatically, letting the airfoil furnish the entire lift. This results in two different wing sections—one for high speeds and the other for take-off and landing speeds. The plane that I inspected had a cruising speed of 475 miles per hour. It is flown and landed entirely automatically, and the pilot's job consists merely in regulating and operating the automatic pilot. It is possible in an

(*Continued on Page 14*)



Space—Time Universe

By Lyle Schaffer '42

> *"We have found a strange footprint on the shores of the unknown. We have devised profound theories, one after another, to account for its origin. At last we have succeeded in reconstructing the creature that made the footprint. And lo! It is our own!"*
>
> EDDINGTON

One of the greatest of man's inventions is the number system, for it will satisfy both the theoretical and the practical side of mathematics. Today science is continually linking the theoretical with the practical. Practically we take a number of the first power and let it represent linear units. We let the second power represent area, and the third volume. Here we gave way to the theoretical. We had a fourth power but where was the fourth dimension? Today science puts to use the fourth power and it thinks in terms of four dimensions.

When we speak of the fourth dimension and count the fourth dimensional thinkers, we realize that their number is exceedingly small. Henri Poincare said, "Anyone who devoted his life to it might perhaps in the end form some idea of the fourth dimension." Moreover, those who have formed some concept of the super-space and work with the four dimensions do not agree with the theories of one another. The science of the fourth dimension is not yet an exact science. Therefore, I do not propose fully to explain the fourth dimension. More exactly, when you have read this essay, you will be able to distinguish not what it really is, but what it is not.

Although the fourth dimension is not an exact science, we do not suppose that it has not contributed anything of practical worth to the world. The hypergeometry of the fourth dimension has yielded irrefutable results in the fields of astronomy, and evidence of its reality have been adduced in the fields of physics, especially in electromagnetic phenomena. Moreover, the postulates and theorems of the fourth dimensional geometry are as exact and logical as those of Euclidian geometry. Although we cannot visualize them we can at least conceive and study them. The problem of the fourth dimension is not imaginary but abstruse. Since none of the images about us can give us a basis for comparison, it is difficult if not impossible to visualize a fourth dimensional solid as to size and shape. To conceive clearly the fourth dimension we should need other senses, a different brain, in a word the power to break the bonds which hold us within our three dimensional envelope.

All relativists agree that we are living in a fourth dimensional world. The three dimensions are our concepts of it, our manner of relating it to our lives. Our difficulty in picturing the fourth dimension is often related to the difficulty a person of a two dimensional world might have in picturing the third dimension. His world is involved in a three dimensional universe, and the two dimensions are his concepts of it. Let us imagine one of the inhabitants of such a Flatland. That is to say, a being incredibly thin, and flat like a sheet of paper, living on a marble table from which he cannot possibly escape, just as one cannot escape from the earth. He is absolutely unaware of the fact that space exists, so that he has no idea of the thickness or height of objects. He has never seen objects which have height or thickness. Let us cut out of paper two identical triangles, as the two in figure one. Let us then place them into the world of Flatland. Our Flatland friend, having studied the

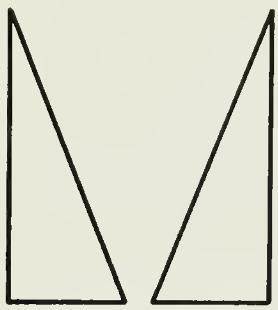


Fig. 1

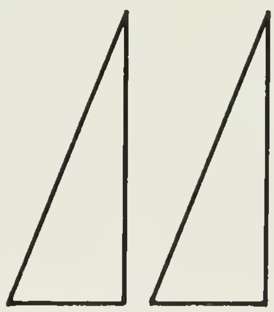


Fig. 2

lines which enclose them, and which are all that he can see and touch, will conclude that the two triangles are equal and similar. He can prove this by sliding one of them over the other, and seeing that they occupy the same area and position.

Let us instead turn one of the triangles over, as in the second drawing. The flat being will once more look at his triangles, and after examining them, the lengths of the sides and the sizes of the angles, he will discover that each has its counterpart in the other, and there is no difference between the two in regard to the area which they occupy. They are precisely similar; but to his inexpressible amazement, he can in no way make one of them fit upon the other as before. Now should a being of the third dimension appear, and turn the triangle through the third dimension, a world which in consequence is immeasurably superior to that in which the flat being is confined, so that the triangle has rotated on one of its sides, it will fit perfectly.

It is the same with us. We cannot visualize the outer world. To us there are only three dimensions. But when problems unsolvable by three dimensional geometry are solved by hypergeometry, we have to accept as did the flat man the reality of a world beyond our comprehension. (e. g. the celebrated displacement of the perihelion of Mercury, a triumph of the Einstein theory.)

Just as a two dimensional figure of Flatland is in reality a cross-section of a three dimensional solid, so is a three dimensional solid a cross-section of a fourth dimensional solid. It is not improbable that the fourth dimension is the movement of the third, or of a solid, in a direction which is not contained in it, and which lies outside all the directions which are possible in a three-dimensional figure.

What then is this new direction? The ordinary mathematical method of measuring the location of an object is to relate its position to an arbitrary set of reference frames. In two dimensions two perpendicular lines are employed; in three dimensions three perpendicular lines are employed. Relativists assume reference frames for all positions, directions, and speed. This introduces the element of time which gives us the fourth dimension. This is the new direction.

So far this seems logical. At this point, however, the relativist's reasoning becomes obtruse. We will yield to this new concept of the variable time, but the relativist then reverts to three dimensional space, and says that time is in reality nothing more than space — not the space of the three dimensions as we see it, but a new space viewed in a different perspective called space-time. The fourth dimension is a continuum in which not lines, surfaces, or solids, but events form a continuity. He speaks not of solids, but of movements or events which play in time the same part that solids play in space. The fourth dimension is an aggregate of events, and the event of space-time corresponds to a point in space, and can be located by an observer with respect to a system of reference frames.

This concept of time relative to space is hard to grasp. "We understand by time," says Ouspensky, "the distance which separates events in the order of succession, while connecting them in different wholes. This distance is in a direction which is not contained in space of three dimensions; this is why it must be the new dimension of space, i. e. the fourth dimension. It cannot be compared with the dimensions of three dimensional space any more than a year can be compared with St. Petersburg. It is perpendicular to all the directions of three dimensional space and is parallel to none of them. By time we are in reality expressing a certain space and a movement in this space; and consequently, extension in time is extension in unknown space." Thus we are forced to realize that time and space are very closely akin and at certain points are interchangeable. "The sense of time is an imperfect sense of space," says Ouspensky, "the fringe and limit of our spatial sense." Space is the present made visible. Time is space that is on the move, and becoming the future or the past. We cannot measure our limited space save by the time we take to traverse it, and we can only measure the space which is beyond our frontiers by the number of seconds or of centuries which light takes to traverse it; and as soon as we endeavor to give time a sort of countenance, we can only imagine it as an immaterial space. There is no difference between time and space except that our consciousness moves along time; and when we no longer are able to follow time, the image of space encompasses us.

Confronted by such a statement we are thrown into a sort of cosmic impasse. When the mathematicians come to the critical point where space no longer responds to their investigation, they call in a fourth variable, (t); it is time that restores equilibrium to their calculations and enables them to carry them further, after which they are compelled to recognize that time is nothing more than space which has changed its name. It is enough, therefore, that space should assume a different name, and operations become possible which, though they seem to be based on a twofold illusion, are none the less capable of attaining truths which experiment will confirm.

When we have grasped this concept of space-time we have the heart of the fourth dimension. Of course there are terms and theorems of the fourth dimensional geometry, but the language and the consciousness of the fourth dimensional thinker is not ours, and it is almost impossible to write about them in our terms. However, a few of the terms of the fourth dimensional mathematician will be of interest, and will help to show how he puts to use the space-time concept.

The fourth dimensional relation between two neighboring events is called an interval, which corresponds to distance in the third dimensional world. The track of a particle through the fourth dimensional space time is called its world-line. World lines have no absolute shape, and they may intersect each other or not. Every world-line must be so drawn as to represent the shortest line between two points, because as we shall see later, space-time is curved and the greater the curvature the shorter is the distance between two points. In other words, every world-line must be geodesic in the fourth dimensional continuum. Geodesic means the shortest distance between two points on a curved surface. The world-line of a ray of light is geodesic in the continuum. Bodies free to move travel in the line of least resistance, that is, in geodesics.

The Einstein theory is based on the density of matter and the curvature of the universe or space. Matter or substance which fills the entire space and identifies itself with space is not uniform, the amount of its curvature and of the curvature of space it occupies is proportional to its density. The curvature of so-called empty space is almost zero. It is not absolute zero, because there can be no such condition as absolutely empty space. Gravitation can be artificially produced by acceleration, and acceleration is the result of the warped condition or the curvature of space. Mass multiplied by time is called action, and action is the curvature of space-time. Wherever there is matter, there is action and therefore curvature.

To summarize, although the superdimensional world is an abstract world where only conditions and states exist, it is the world in which we live. As was mentioned in the comparison with the two dimensional being, his world is a cross section of the three dimensional world about him. Likewise, our three dimensional world represents a cross-section of the fourth dimensional world in which we actually exist. Matter of the third dimensional world represents limitless numbers and varieties of cross-sections of the super-dimensional world. The fourth dimensional form is produced by moving a solid in the perpendicular direction of time. Time, an old variable, which restores equilibrium to the mathematician's calculations, fills a link in the fourth-dimensional concept, and reveals itself as a "blood-brother" of space.

Television Transmitter

TELEVISION'S HORIZON

Another scientific theory has just been blasted into the hereafter. Since the beginning of practical television, scientists working toward its perfection had accepted the theory that television waves were transmitted in straight lines and could not bend themselves around the curvature of the earth; that is, they were limited to the distance of the horizon. The only solution to the problem was the construction of antennae high enough to make possible straight-line sending over long distances. The solution was only a temporary respite, since the practical height of antennae towers is, of course, limited. Television scientists were stumped. What to do now?

Interference between the Philco and Columbia transmitting stations, ninety miles apart, was noted in the Philadelphia area. If stations couldn't send pictures any farther than the visible horizon, how could one station interfere with another ninety miles from it? The heretofore-accepted theory was plainly theory and nothing more. Another of television's obstacles has been set aside.

THOSE VERSATILE E. E.s!

John O. Kraehenbuehl, recently advanced to professorship, is a busy man. Besides teaching classes and doing research in illumination and related problems, he serves three committees, the College Program Committee, the Library Committee, and the E. E. Department Teaching Program Committee. Last summer he and Mr. Horn busied themselves studying the wear of crayons on blackboards. He devised a machine to do the work of wearing out the specimens of crayon. He has green and yellow black(?)boards and uses colored chalk and sponge erasers in his classroom, hidden away in the E. E. Annex.

Several of the staff are studying meter and relay problems. M. A. Faucett and C. A. Keener are preparing a paper on this subject for publication in the journal of the AIEE. Professor Keener also finds time for participation on four college committees: the Dual Curricula Committee, the College Policy and Development Committee, the Program Committee, and the Department Meeting Committee.

Most versatile of all is probably Professor Knight, active in campus dramatics, college committees, Boy Scout work, and research in problems of meters and photography, the latter being one of his hobbies. He is the secretary of the Engineering Faculty and a member of the Committee for Engineering Petitions, the Illini Theater Guild, and the Illini Board of Control. He represents the department in faculty dramatic presentations. Professor H. G. Reich is the flying electrical engineer. When not flying over the country on pleasure or business, he is concerned with research in electronics. One of the results of his work is a device to measure the speeds of automobiles passing a point on a highway. It has proved itself during several years of use by the Illinois Highway Department and several other states. It is a versatile gadget. Last spring it measured the speed of baseballs thrown by visitors of the engineering show. It is also used to measure the speeds of bullets.

The electrical engineers have a knack for gadgets—usually practical ones. H. N. Hayward, who is in charge of the instrument room, is developing a scale drawing device which calibrates instruments by incorporating corrections in a new scale. Professor H. A. Brown teaches and conducts research in radio problems. He and Professor Paine are studying problems of high voltage insulation. It is only natural that Professor Brown is the faculty key man in Synton, professional radio fraternity. He acts as the fraternity's trustee.

THE POLAR GIANT

By George Guirl '42

Seeking to insure the United States' claims in the Antarctic regions, the Research Foundation of the Armour Institute of Technology has designed and constructed a giant "Snow Cruiser" to be used on Admiral Bryd's third South Pole expedition. This strange conveyance was designed to provide a mobile base for the expedition as well as to house much of the scientific equipment and apparatus. A party of perhaps four scientists will take up quarters in the huge machine and from it will make observations and record scientific facts while miles away from their main base.

On previous expeditions, ships were able to come near the shores of the Antarctic regions, but then for only a few months at a time. Tractors were somewhat of a success, but their cruising range and maneuverability were greatly limited. Dog teams could not carry enough supplies and were good for only a few miles each trip. Airplanes required too elaborate and expensive landing facilities.

Only after careful and scientific consideration did Dr. Thomas C. Poulter, scientific director of the Research Foundation, outline the specifications for a transportation unit that would serve in eliminating all disadvantages of former exploration. Dr. Poulter outlined them as follows: "the cruising range of the unit should be from four to six thousand miles and it should be able to travel across any type of rough terrain or open crevasses; moreover, it must be its own base in the event of storm, without having to make elaborate preparation. An auxiliary means of making high altitude observations would be necessary. The unit, however, in the event of a forced or desired stay of several months in one spot should consume no more provisions than the crew itself should need. It should also be desirable that a sufficient amount of scientific and radio equipment be taken along for observations and communication."

The framing structure of the cruiser is the kind used in airplanes; structural members being welded together and covered with very thin sheet metal. All of the frame structure was welded, instead of riveted as is usual. Regular 12-inch structural "I" beams were used in the base or floor of the cruiser, having every other part tacked to them, straightened, then finally welded into place. Throughout the frame structure, special steel was used—steel which could withstand severe shocks and temperatures of fifty or more degrees below zero. Welding, used primarily as a weight reducer, saved 5,000 pounds, bringing the cruiser's total weight down to 45,000 pounds. With a full load of equipment and fuel, it weighs 75,000 pounds. It is 20 feet wide and 50 feet long; as long as three automobiles lined up bumper to bumper.

In the foremost part of the cruiser is the control room, built into a raised hatch to increase visibility. In the control room is the dashboard, eight feet long and covered with a multitude of dials, gauges, and indicators. In the rear of the control room and built upon a catwalk is a chart table upon which the scientists will plot their course of travel. Underneath the catwalk are the welding generator, pumps, and other equipment. To the left and below the control room is the machine shop, in which equipment and apparatus for repair work may be found. On the opposite side of the machine shop is the engine room, in which are located the two 150 horsepower diesel engines with which heat and power are generated. The galley and darkroom are one and the same. In the living quarters are sleeping bunks lining either wall, and a heater, a table, and chairs in the center. Between the rear wheels is storage space for food to last four men at least a year. Directly behind the food storage space is a compartment for two spare tires.

The cruiser carries a huge generator, capable of an output of 200 amperes, which supplies current for the four traction motors as well as for heating, cooking, lighting, and other equipment. Included among its scientific equipment are a photographic darkroom, a two-way radio system, geological equipment, and astronomical data recorders. "It is virtually a traveling scientific laboratory," says one critic.

As was mentioned before, two Cummins Diesel engines are used as basic power units. The diesel engines have coupled to them two 50-kilowatt generators which supply each of the auxiliary traction-wheel drive motors with current. Glycol is the cooling agent for the diesel engines. None of the heat given off by the exhaust of

the engines will be wasted. Devices have been installed with which to warm the airplane engine and with which to heat the tires after they have stood motionless for some time.

Since each wheel is powered and controlled separately, the cruiser's maneuverability is greatly increased. Each wheel can be lowered, raised, and steered separately. Thus the vehicle can move sideways at an angle, turn sharp corners, crawl along with its framework in the snow and ice, or glide along with its body four feet above the ground. Designed to slip across crevasses 15 feet wide, the cruiser should encounter no trouble in maneuvering over the desolate, rough lands of the Antarctic. Its four electric traction motors carry the cruiser, fully loaded, up grades as steep as 37 per cent and on level ground at 30 miles an hour.

The cruiser carries an airplane, with which the explorer's will map lands by using a huge seven-lens aerial camera especially adapted to that use in Antarctica. Mounted on top of the cruiser, the plane can be detached, loaded, and made ready for flight in 10 minutes. It has a cruising range of 1,500 miles, and with it the men can reach the ocean from any interior point, even though the Antarctic territory is larger than the United States and Mexico combined.

An engineering feat within itself was the construction of the pneumatic tires, the largest and only ones of their kind in the world. Since it was required that they have such large surface area, their design was indeed a problem. Each tire is 10 feet in diameter, has 12 plies (automobile tires have only four or six), weighs nearly 800 pounds, and has a contact surface area of three square feet. They were extremely expensive and because they are expected to wear but little, only six of them were manufactured. Along with the tire problem came another question—how were the tires to be changed? An ingenious device was constructed, whereby a simple portable derrick and hydraulic lift are used to raise the wheel and axle into working position. From there on the task is a man-sized job, requiring all four men to "negotiate" the tire into place.

Who were the men to be chosen to accompany Dr. Poulter in the snow cruiser? That was a question of major importance. Dr. Poulter, who made the selection, had set down these requirements as the necessary combined talents of the four men: licensed airplane pilot, airplane mechanic, licensed radio engineer and operator, aerial photographer, navigator, geophysicist, surveyor, diesel engineer, physicist, doctor of medicine, cook, minerologist, geologist, chemist, meteorologist, and amateur astronomer. Each man had a through training in one major field and extensive training in each of three or four other fields listed.

Now that the snow cruiser has been rightfully tested, checked, searched for faults, and given a tremendous write-up in the newspapers, it remains only to be seen whether in its final test it will perform the tasks intended for it.

Poulter and Vagtborg

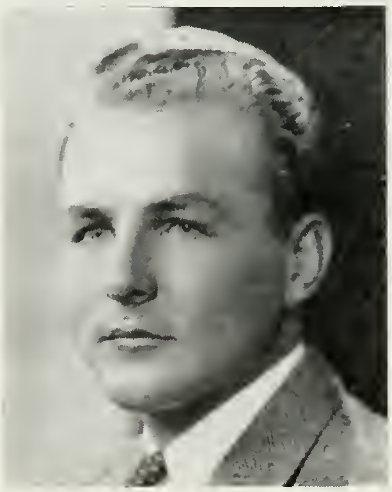
Harold Vagtborg, C. E. '26, Director of the Research Foundation of the Armour Institute of Technology, supervised the planning, building, and financing of the giant $150,000 polar pullman, along with Dr. T. C. Poulter. It was under his supervision and watchful eye that the cruiser made its breaking-in trip from Chicago to Boston.

Graduated from the U. of I. in municipal and sanitary engineering, Mr. Vagtborg became a partner in the firm Allen & Vagtborg, Inc., designers of water treatment and sewage disposal plants. From 1931 until 1939 he taught sanitary engineering at Armour Institute where he received his M. S. degree in 1937. In that same year he became Associate Director of the Research Foundation and later Managing Director.

Presenting . . .

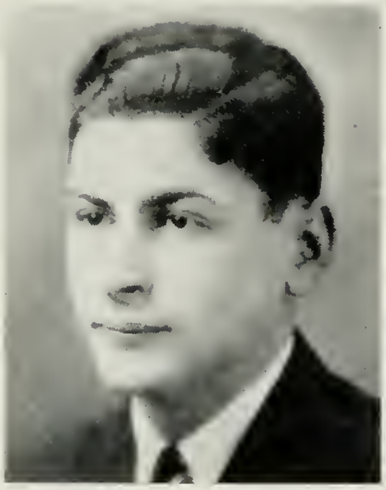
VAL CICHOWSKI, Cer. '40, is one of Horace Greeley's proteges, migrating west all the way from New Britain, Connecticut, to enroll in Illinois' ceramics course. Val received his education in the public schools of New Britain and was graduated from the New Britain Senior High School in the class of 1929. He spent the several years following working in and learning about porcelain enameling. Before coming to Illinois, he attended Trinity College in Hartford for the equivalent of one year. After searching for a good school in which to continue his study of ceramics, he came to Illinois and went to work in porcelain enameling, the work in which he hopes to specialize after graduation this spring. Val has been one of the main cogs in the student branch of the American Ceramics Society, the society in which he served a term as President. He is also a member of Sigma Tau, all engineering honorary; Keramos, ceramic honorary professional fraternity; Alpha Chi Sigma, professional chemists' social fraternity, and Tau Beta Pi, engineering honorary. Industry is Val's forte. Anyone who knows how hard he worked on the enameled porcelain programs for the Ceramists' Ruckus will vouch for that.

VAL CICHOWSKI



THOMAS McCRACKIN

THOMAS McCRACKIN, C. E. '40, is the energetic president of the A. S. C. E. Tom, one of the cadet majors on the colonel's staff of the University R. O. T. C., is an active member of Pershing Rifles, Scabbard and Blade, Tau Nu Tau, the Military Council, and is also President of the Illini Engineers. McCrackin attended Ritenour High School in St. Louis and played football four years, basketball two years, and took a fling at dramatics. He had to leave school for two years to fatten his purse as Corresponding Clerk for the International Shoe Company. Between times Tom tooted a mean trumpet, until he saw the famous Illini band in action. He followed the band right into the Twin Cities and the University. For two summers McCrackin picnicked with pay as U. S. Ranger at Yellowstone National Park. Last summer he spent six weeks at Camp Custer learning some of the things he hopes he never has to apply. From Camp Custer he rushed back to work as assistant engineer on a paving job at Chanute Field. At present Tom is assisting Mr. E. W. Suppiger in the study of Loadings on Concrete Specimens and is also earning tobacco money as agent for McGraw-Hill Publishing Company.



JOSEPH WAISMAN

JOSEPH L. WAISMAN, Met. '40, works hard and studies hard but has a whale of a time meanwhile. He likes music, both classical and swing and thinks women are here to stay. Joe was born in Racine, Wisconsin, on March 10, 1919, and later moved to Chicago. Following graduation from Von Steuben High School Waisman attended Roosevelt, where he was a member of the school chess team and an officer in the R. O. T. C. unit. Here at the University, Joe is always on the go. He was a member of the *Technograph* staff, the Independent Council, and M. I. D. A. He was Vice President and is now prexy of the Mineral Industries Society and is also Recording Secretary of the Illini Engineers. One summer Waisman was a "trucker" at a machine shop in Racine, and the last few summers he has covered the Midwest as a steel salesman. At Illinois he works as a laboratory helper in the Metallurgy Laboratory and as an assistant in the Engineering Library. All his activities haven't kept Waisman from maintaining high scholarship, as evidenced by his membership in Sigma Tau and Tau Beta Pi. Joe is now engrossed in his Bachelor's Thesis on the Heat Treatment of Coal Cutter Bits.

OTTO HALLDEN, C. E. '40, was born in Rockford, Illinois, on February 10, 1914, and attended Rockford grammar schools through the eighth grade. During his high schol years in Rockford, he managed to stay among the first 10 scholastically, while taking part in a number of activities that included the Vice-Presidency of the ninth grade class, varsity swimming, intramural sports, and management of several clubs.

Hallden spent his evenings as locker room attendant and life guard at the Rockford Boy's Club. Summers he spent profitably as counsellor at summer camps operated by the Club.

Upon graduation from high school, Otto spent a trying interval knocking around in a depression-ridden country, working at odd jobs. When his younger brother decided to work his way through the University of Illinois, Otto followed suit, but the Hallden boys struck a snag. They ran out of funds, so Otto went home and worked the rest of the semester, but he came back in February to take another crack. After that single setback, the Hallden brothers found enough work to carry them through their four years.

Otto Hallden is a member of the A. S. C. E., was Secretary and is now President of Mu San. He is deep in the sanitary option in civil engineering and hopes to find employment in that line of work after graduation.

OTTO HALLDEN

Calculating Resistance

Hey E. E.s! For hard-drawn copper wire:

$$R = \frac{T + 234.5}{259.5} \times 1.261^{S} \times L \times 10^{-4}$$

R is resistance in ohms.
T is temperature in degrees Centigrade.
L is length in feet
S is wire size (B. & S. or A. W. G.)

Set your index above the constant 1.261 on LL_2; set your hairline to the value of S on the C scale, and read 1.261^{S} on LL_2 under the hairline. The rest is easy. Once you get the idea, it's as quick as hunting up a resistance table. If the temperature is 25 degrees C., the fraction becomes unity. For multiple-zero wire sizes S must be considered negative. R. Tideman.

A Freshman's Prayer

Now I lay me down to rest
Before I take tomorrow's test.
If I should die before I wake,
Thank God I'd have no test to take.

FOR SALE—One Bed—or will trade for a kerosene lamp. Have changed from the Commerce to the Engineering College.

Absent minded professor (after date): "We'll go on from here next time."

DEPARTMENTAL NOTES

Flame-Produced Ice

"Add a steam engine to a compressor refrigerator," says Dr. R. M. Buffington of the Servel Electrolux Company, "and you get a machine which, without moving parts, will turn heat into ice." The thermodynamic principles of such a machine were explained at the ASME meeting Nov. 30.

These principles were known long ago, according to Dr. Buffington, but were put into use only recently. Two Swedish university students, Von Platton and Munters, by discovering how to circulate ammonia through a constant pressure cycle, pointed the way to the non-mechanical machine which now steals ice from a tiny gas flame. Dr. Buffington displayed a small "flea-powered" refrigerator with an alcohol lamp at one end and frost at the other.

The new officers of the ASME are:

Keith Carter '40.................................*President*
Ed Wanderer '40........................*Vice President*
Tom Jackson '41.................................*Secretary*
Paul Smith '40...................................*Treasurer*

Publicity Committee

Victor Frysinger '40 O. W. Garner '40
Pat Malloy '41

Avery Shows Own Films

At the general engineers' meeting Nov. 21, George Avery showed some beautiful movies which he took in several national parks. Shown in the films were, among other topics, the construction of a dam and of an all-weather road through a narrow canyon subject to wash and slide.

The Society of General Engineers, formed in 1928, for eight years was very active. Absorbed by the ASCE in 1936, it fell into the background and became dormant. Last year, prominent general engineers on the campus formed a nucleus to begin reorganization of the original club. Although the organization has been growing steadily in size and importance since last year, its leaders know that there are still many general engineers on the campus who could gain much from membership in the society and association with its members. A plan is under way to make the Society of General Engineers nationally recognized. The seven chapters in the country need only a few more members and a little more drive to make it one of the top-ranking national societies.

Faculty Research Paper Presented

"The Accuracy of Watthour Meters on Intermittent Loads," research project of Professors Warren and Keener and Mr. Helm, was presented in a most clear and fascinating manner at the last A.I.E.E. meeting. The large number of questions from the audience indicated appreciation and understanding of the well-prepared, copiously illustrated talks. Following the presentation, officers for the second semester were elected as follows:

Spalding Robb '40.................................*President*
Donald Nelson '41....................*Vice President*
Frank Thoma '40.................................*Secretary*
Leo Rosenman '40.................................*Treasurer*
Ralph Kuehn '41................*Publicity Chairman*

Synton Initiates

Recently initiated into Synton, "ham society," were: Albert Fish, Robert Hockfield, Charles Martin, Don Mason, Robert Nelms, Richard Pinsley, Walter Stephens, Wesley Stull, Walter Taylor, and Stanley Wilcox. At the banquet following the formal initiation, Mr. James A. Ebel, Chief Engineer for station WILL, described the enormous amount of work necessary to obtain the data required for the hearing which WILL had before the Federal Communications Commission, when asking for an increase of power. Officers of Synton for the following semester are as follows:

John Jacobowitz, W9OXA................*President*
Geoffrey Vore, W9QBJ............*Vice President*
Stanley Howell, W9QAF.....................*Secretary*
Stanley Peirce, W9MXE..................*Treasurer*
Lloyd Rigg, W9YST................*Chief Operator*
George Kirkpatrick, W9LGQ..*Chief Engineer*

ASCE Elects

The officers for next semester are:

Robert Chase '41.................................*President*
Harry Prince '40.........................*Vice President*
Joseph McIntosh '40.............................*Secretary*
William Bills '41.................................*Treasurer*

WM. GLENN VOIGT — Editor
LESTER H. SEILER — Business Manager
HENRY P. EVANS — Faculty Advisor

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ENGINEER'S DIARY . . .

(*Continued from Page 4*)

emergency for the pilot to control the plane manually until it is safe to land or until the automatic pilot is repaired. But they told me this rarely happens.

"The small privately owned planes are autogiros. They were experimental jobs back in the old days. These planes use only the rotors for support and have no wings. The front wheels are very ruggedly constructed, and the rear wheel is the same size as the two front ones. The plane without the rotor loks very much like the cars I have been seeing, in fact, some planes serve also as cars. Most people store their rotors at the airport unless they are going to be switching often from air to land, in which case they use a different rotor which can be carried on the plane and folded out of the way when not in use. This rotor is very light and quite a bit slower than the regular rotor, which is used only for straight flying.

"My clothes, which the doctors ordered for me, came this morning. They are odd looking but very comfortable and bright. Clothes which are in direct contact with the body are made of a material which seems to be a cellulose product—at least it looks and has a texture like rayon. The outer garments are made of glass cloth and rayon and are very strong. They are fireproof, too.

"I am very tired tonight. I think I'll go to bed early. I have trouble in breathing comfortably. I guess the excitement is too strong for me. I hope to go to the oil fields tomorrow to see them flush out the old oil reservoirs to recover the oil which was not removed when the fields were originally operated. They have described the process to me, and it seems to work like the Frash process for the extraction of sulfur from underground beds. They use a solvent which has a very low surface tension and takes the oil into solution quite readily. In some fields the oil sand is actually mined and the rock treated with solvents to remove the oil.

"Breathing is becoming much more difficult. I hope—"

* * *

We all regret John's death. His heart, weakened by the abnormally long rest, found the sudden return to active use too much.

And then there was the butcher who backed into the meat grinder and got a little behind in his orders.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.

Of The Illinois Technograph published eight times a year (Sept., Oct., Nov., Dec., Jan., Feb., April, and May) at Urbana, Illinois for October, 1939.

State of Illinois
County of Champaign } ss.

Before me, a notary public in and for the State and County aforesaid, personally appeared Lester Hermann Seiler, who, having been duly sworn according to law, deposes and says that he is the business manager of The Illinois Technograph and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management and the circulation, etc., of the aforesaid publication, for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations.

That the names and addresses of the publisher, editor, and business manager are: Publisher, Illini Publishing Company, University Station, Urbana, Illinois:

Editor, William Glenn Voigt, Champaign, Illinois.
Business Manager, Lester Hermann Seiler, Champaign, Illinois.

That the owner is the Illini Publishing Company, a noncommercial organization, whose directors are W. E. Britton, F. H. Turner, F. S. Siebert, A. R. Knight, Harold G. Nelson, Loren B. Felt, Richard Nelson, and Dorothy Chapin.

LESTER H. SEILER, Business Manager.

Sworn to and subscribed before me this 5th day of October, 1939.
(SEAL)

ALICE SMITH, Notary Public.

• THE ILLINI TRAIL •

By Elwyn King and Gerald Homann

To find new uses for arc (electric) welding, the James F. Lincoln Arc Welding Foundation of Cleveland recently sponsored a $200,000 award program, in which three of the 382 prize winners are Illini: Adolph V. Bulaw '35, Charles A. Davis Jr. '32, and Paul A. Smith '11.

Arc welding in which the parts to be joined are heated to fusion by an electric arc by the passage of a large current through the junction, is already widely used for joining steel rails, steel tubing, etc. The Lincoln foundation winners have, however, found other applications which can save industry at least $1,600,000. Arc welding has already effected great savings—Fords would cost $2,000 more if not arc welded.

—'36—

Leslie Silverman, M. E., is working for his Doctorate at Harvard University. After leaving Illinois, he studied at Rutgers, where he received his M. S. in Mechanical Engineering. His major field is Industrial Hygiene.

—'15—

Clyde F. Weingartner, graduate in Architectural Engineering in 1915, spent the first two years after his graduation working for the I. C. Railroad. When the United States entered the War, Weingartner enlisted in the Corps of Engineers. He attained the rank of lieutenant and served for two years. In 1919, forsaking his earlier line of work, Clyde entered the real estate business with his father in Rockford, and since then, has handled real estate, loans, and insurance. He married Miss Dorothy Fuller, also of Rockford, in 1920, and now has three children, Phillip, Ann, and Jean. Phillip, now a senior in high school, may be seen here at Illinois soon.

—'37—

The National Carbon Co. of Cleveland, Ohio employs Bruce K. Shonneger, M. E., as an Industrial Engineer. His work is cost estimating, time and motion study, and rate setting.

—'39—

We are wondering if Sid Berman ever fulfilled his threat of drinking three design classes under their boards in one afternoon. At present Mr. Berman is working in the Soils Testing Laboratory for the Chicago Subway and Traction Department. Before he graduated in February, 1939, Sid budgeted his time between the *Technograph*, amateur photography, and the student chapter of the American Society of Civil Engineers. He was president of this group his last semester. The construction of the new Chicago subways is occupying all of Sid's time right now.

Tom Chapman knew what he wanted to do before he came to Illinois, and now he is doing it. After graduation in 1939, he went to work for the Carter Oil Company as a Petroleum Engineer Trainee. At present he is in Tulsa, Oklahoma. At school Chapman held all the offices (at different times) of the student chapter of the American Society of Civil Engineers. In addition, he was a Tau Beta Pi man. (As this magazine goes to print we learn that Tom has recently been transferred to South America.)

—'32—

Charles A. Davis, M. E. ('32), an engineer for the Caterpillar Tractor Company at Peoria since graduation, has re-designed the track roller frames of Caterpillar tractors so that the maximum economy in arc welding is gained. By his plan a 48 per cent saving could be effected.

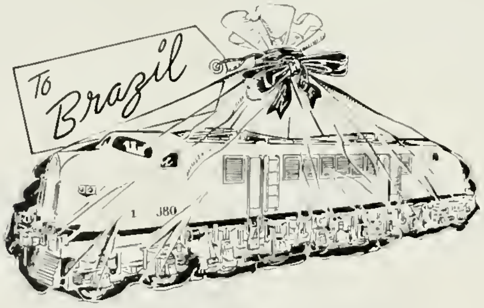
G-E Campus News

EXTRA-SPECIAL DELIVERY

TO most people, the mailman is a fellow who rings the doorbell or toots a whistle or stops at roadside boxes. But to Rear Admiral Byrd and his expedition the mailman is a chap thousands of miles away.

The Admiral's mail, you see, is delivered by one of General Electric's world-famous short-wave stations at Schenectady, just as was done for the two previous Byrd expeditions. The letters are read from WGEO every other Friday, 11 to 11:45 p.m., EST, under the direction of station manager Eugene S. Darlington, Oregon State ex-Test man, and John R. Sheehan, Union '25, program manager.

A General Electric all-wave receiver on both the *Bear of Oakland* and the *North Star*, the party's ships, are the actual mailboxes. They will later be installed at the expedition's two camps. WGEO's mailman invites friends and relatives to send messages to the Byrd Antarctic Mailbag, General Electric, Schenectady, N. Y., for transmission to the expedition. Fifty words is the maximum.



PRIZE PACKAGE

FAME is nothing new to Brazil. She is not only the world's leading coffee grower, but also the largest state in South America, being 250,000 square miles bigger than continental United States.

Fame also is nothing new to General Electric's transportation department, headed by Guy W. Wilson, Penn State '23 and ex-Test man. In all parts of the nation, the products of this G-E division can be seen in operation. Therefore, what is more natural than for these two parties to get together? They have — frequently. Their latest bit of co-operation is represented by four G-E direct-current locomotives, the world's most powerful, scheduled for delivery this month to the Paulista Railroad in Brazil. These 185-ton locomotives have a continuous rating of 4200 horsepower and a maximum speed of 93 miles per hour.

NAUTICAL MOTOR

DIFFERENT though the sailing ships of a century ago were from the express liners of today, the two have many things in common. Among their points of similarity is a need for emergency pumps, for water may sometime get where it doesn't belong because of a collision or other accident.

A far cry from the hand-operated pumps of old is the equipment which will be part of the S. S. *America*, the United States Lines' new 723-foot superliner, the largest ever built in American yards. Mounted 80 feet below the liner's boat deck, a G-E 40-horsepower motor will drive an Aldrich pump capable of emptying 900 gallons of flood water per minute. The motor and pump will empty all compartments through a system of piping reaching all parts of the ship. Other G-E equipment on the *America* includes 150 auxiliary motors and controls for such equipment as winches, refrigeration machines, and steering apparatus.

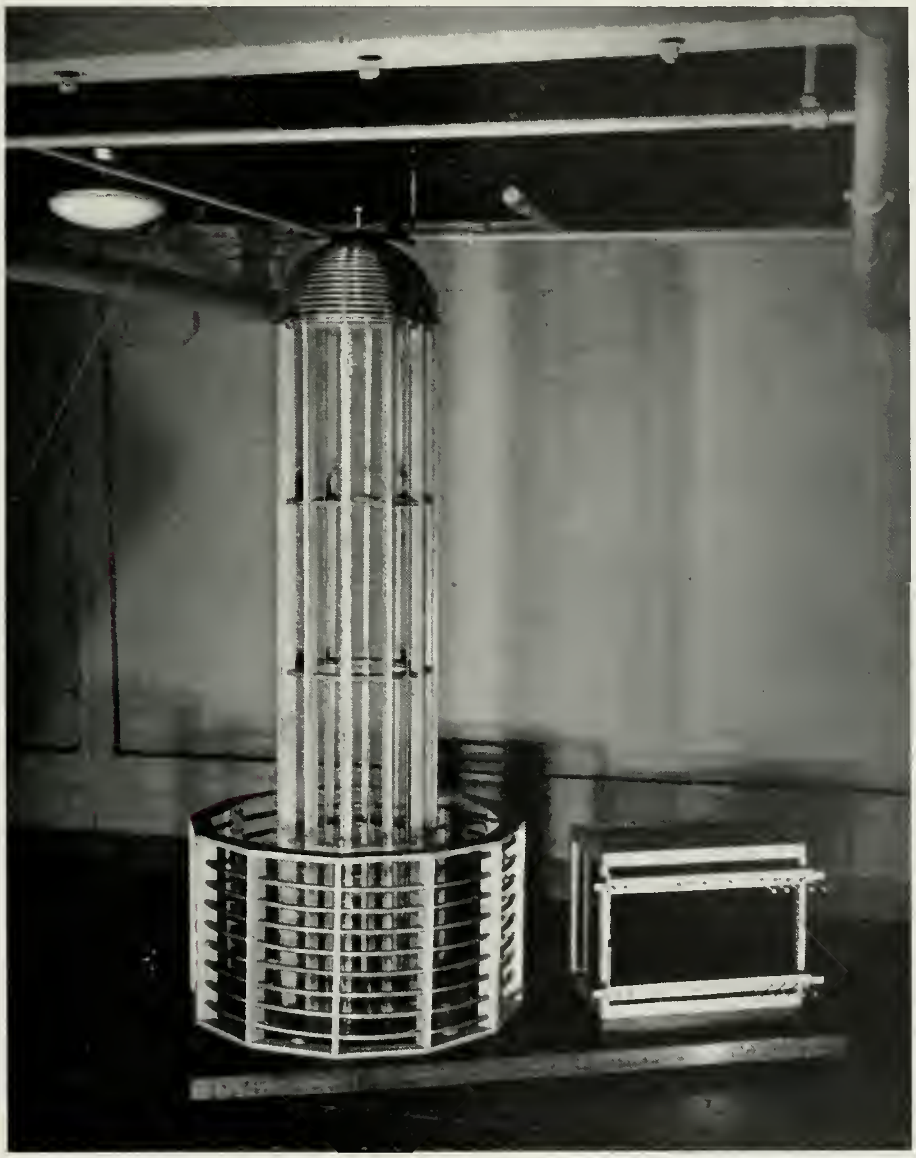
These applications are typical of the thousands of uses to which General Electric motors have been successfully applied. And an important reason for this success is the vast amount of motor-test data contributed by the young engineering college graduates on the G-E Test Course.

GENERAL ELECTRIC

90-209C

THE TECHNOGRAPH

UNIVERSITY *of* ILLINOIS



FEBRUARY, 1940

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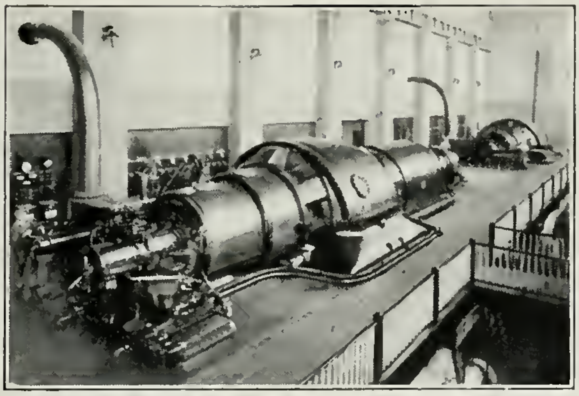
MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED



The theme of the February issue is the forthcoming Electrical Engineering show. Our cover is a picture of the giant Tesla Coil constructed for one of the exhibits.

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THE ILLINOIS

TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

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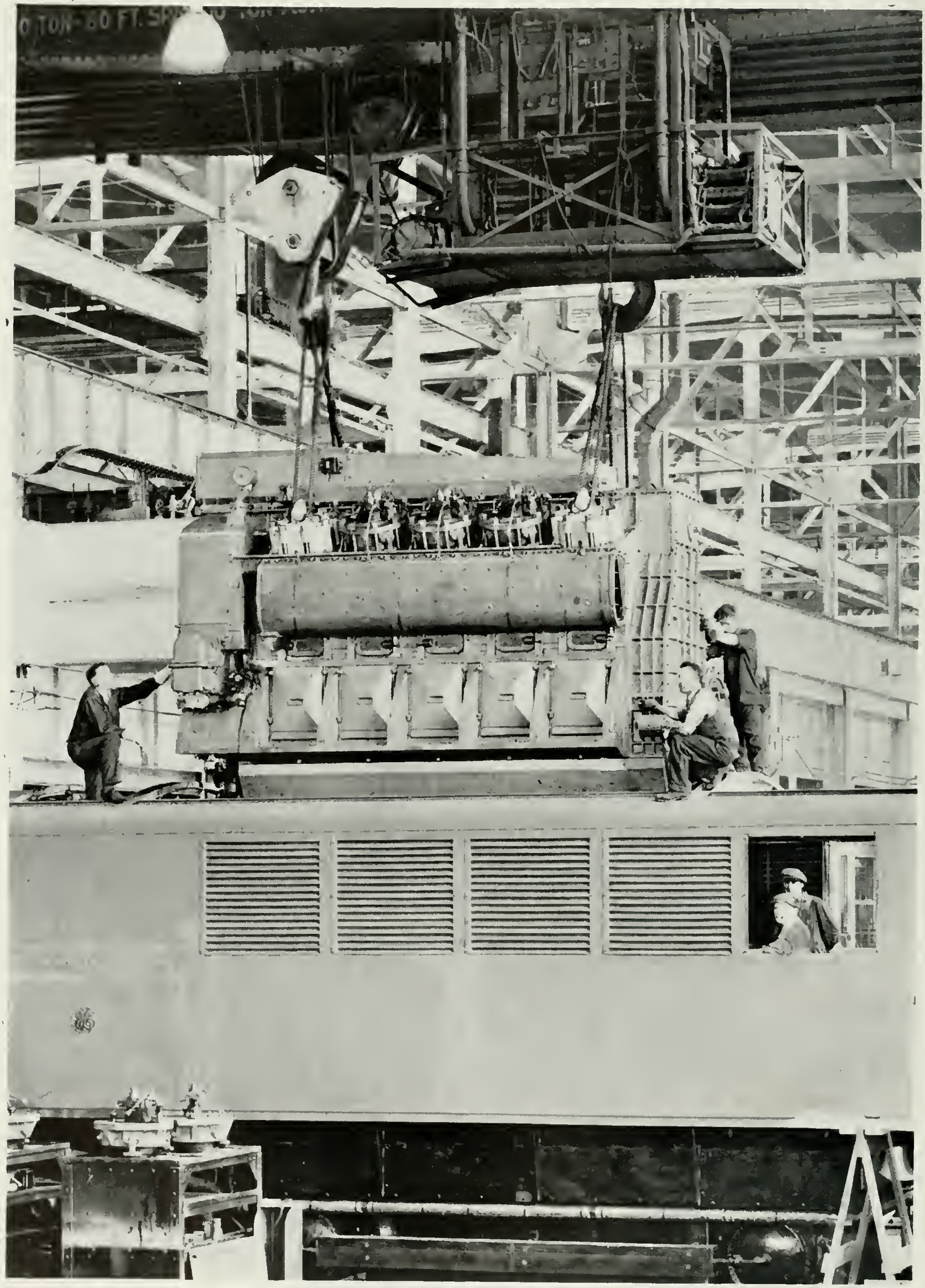
Volume LIV Number 6



Our Electrical Engineers *become* Showmen

By Tom Shedd '40

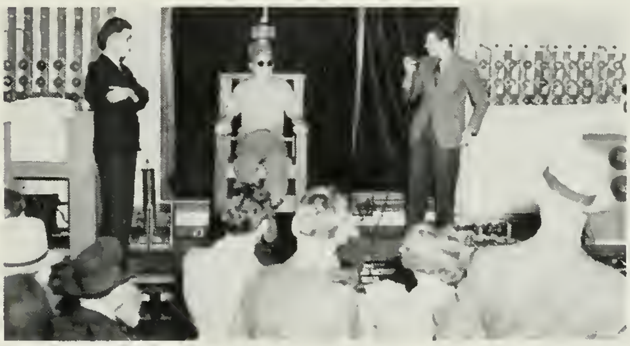
At last! Here it is, fellows, all the dope on the biggest engineering event of the year — the 1940 ELECTRICAL SHOW. According to Chairman Bob Sinks '40, the show this year will be the biggest and best in history, and if past shows are any indication, that means it's really going to be good! Over 80 exhibits have been definitely promised by the Electrical students alone. And on top of that there will be dozens of stunts put on by Physics and Railway students.

You will certainly want to put the Electrical Show on your "must" list, so why not take a hurried preview of some of the more important features of this huge show? When you enter the portals of the E. E. lab, you will be surprised to hear a bell ring. But don't be alarmed. Your fiery personality has not rung a fire alarm. It's merely the photo-electric counter ringing up another customer. Everyone who enters is registered automatically in this way. There are many other applications of the versatile photo-electric cell in use at the show. For instance, that drinking fountain on your right as you enter will operate automatically when you bend down to take a swig. Then there is the automatic door. Approach within a few feet of it and it opens—without your even touching it. This device is used in many ways, particularly in buildings such as restaurants and railway stations. And the photo-cell is also used on a device to time automobiles. The police merely set the instrument at the side of the road; it automatically records the speed of every passing car. You just don't have a chance these days.

A good-sized show could be staged showing photo-cell applications alone. But that's just a beginning at this colossal exposition! For example, have you ever witnessed an electrocution? You've never been to Sing Sing? Well, here's a chance to see what you've been missing all these years. At the 1940 Electrical Show, a genuine electric chair will be on exhibition and in daily use! See the victim strapped into the chair, and watch him writhe in agony as thousands of volts are sent through his body! It's a sight you'll not soon forget, but what makes it even more unusual is that the victim will come through this terrible experience unharmed—well almost, anyway.

You won't want to miss the demonstration of perpetual motion, either. It's not possible, you say? Who said so? Some stuffy old Physics instructor, eh? Well, don't take his word for it. Some of the perpetual motion machines of other years may have been, er, slightly on the doubtful side, but they've got the real McCoy at the 1940 Electrical Show, and you can see for yourself that it's no fake. Chairman Sinks states the secret of this amazing invention, one of the greatest of the century, will not be revealed in advance of the show.

Then, too, there is the ever-flowing wine bottle. This astounding invention never goes dry. Just think of the many advantages and economies possible with the general adoption of this latest product of student scientists. It can be applied to any form of beverage, too — every man should have one for his basement. The management has not yet decided whether free drinks will be given away at this demonstration. They fear that that "would draw all the customers from the other fine exhibits at the show."

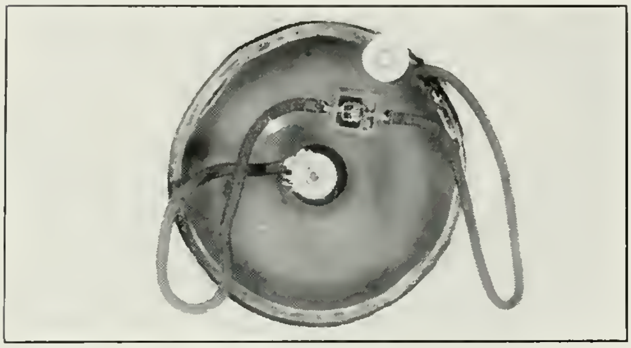


The "Hot Seat"

Poor old Isaac Newton would certainly turn over in his grave if he saw the way his laws of gravitation are being booted around at the show this year. For instance, take a look at the floating dishpan. It's just an ordinary dishpan, such as you and I have slaved away over many a time, but, wonder of wonders, it floats in the air without any means of support! You don't believe it? Well, all the boys ask is that you take a look. In addition, there is the demonstration of water flowing uphill. Even the government hasn't been able to duplicate this one yet. This is no ballyhooed circus sideshow, either. The whole works are right out in plain sight, in order that you may see how the laws of gravitation can be defied at will.

Don't fail to stop in at the illumination lab in the course of your ramblings through the show. Here, in one of the most completely equipped laboratories of its kind in the country, will be given interesting demonstration lectures with astonishing lighting effects. See a statue change its facial expression as in real life, and watch an automobile, apparently nothing more than a painted image, appear to move at high speed. Notice also how the lecturer changes a picture whenever he wishes, without even touching it. It's all done with lights!

The Tesla coil will be another important feature of the 1940 Electrical Show. This good-sized piece of apparatus, which has been under construction by students for well over a year, will be the source of a very



Tom Thumb Motor

high voltage discharge of man-made lightning. It'll probably scare you to death, but never mind — you'll get used to it.

If you begin to get tired after walking around after a while, trot over to 215 E. E. lab. In this room will be demonstrated the new Novachord, an electrical piano, one of the latest applications of electricity to the art of music. Stop in any time your dogs begin to bark, and listen to the skilled operator play your favorite tunes on this novel instrument.

And don't forget the radio lab upstairs, either. A number of interesting pieces of apparatus will be on exhibition: transmitters, receivers, and other interesting devices. Television will play an important role in the show this year, if present plans go through. The boys expect to have on hand an example of the latest type of television transmitter, as well as a receiver. You will have an opportunity to see how your friends look through the medium of television. Synton, honorary radio society, will hold a "ham forum" during the show. All ham radio operators will certainly want to be on hand. Maybe you've heard these radio nuts "Calling CQ" on your home radios; here's a chance to find out just how they do it.

Many commercial exhibitors will have demonstrations at the show, although the great majority of the features will be entirely the creations of students. One commercial exhibit will be the interesting "voice mirror." Speak your piece into an ordinary telephone transmitter; then listen while your own voice is returned to you. For the first time, you may hear yourself as others hear you. Another interesting display will be the "flip-flop discs." Watch the little discs jump from one surface to another, back and forth apparently without the aid of any outside forces. You'll get a big kick out of it, as well as from trying to match wits with the new cashier's cage. If you were a bank robber, this would certainly get your goat, if anything would. Reach in for the money, and you won't get it—but you will get plenty of fireworks! Don't miss also the working model of an automatic garage door. Drive up in your car and the door automatically opens. It's that ubiquitous photocell again, folks!

To disprove the old contention that dead men tell no tales, a gruesome talking skull will be on exhibition. It'll tell you anything you want to know, and probably some things you don't want known, too. And you needn't try to find out who's doing the ghost-talking because there isn't anybody.

When the student in charge of the circular saw, which is actually cutting wood but not moving, tells you to keep your finger away from the blade, he really means it! It's just an illusion produced by the stroboscope, a light device which may be used to make rapidly moving objects appear to be standing still, and in fact actually to move backwards. There are several other stroboscopic devices at the show, they will give you some idea of the importance of this new tool to the modern experimenter.

One of the most popular features of the Electrical Show year after year has been the kiss-o-meter, which is making a return engagement this year. You will want to make use of it, particularly if you have your girl friend with you. It will tell you just where you rate in this business of sex-appeal. If you don't get a rating of at least B, you'd better take a course in charm. And by all means bring your girl friend if you can. She will enjoy the show as much as you will.

Well, you've had a brief glimpse of only a few of the interesting exhibits to be seen at the 1940 Electrical Show. The show has been given biennially ever since

Bill Tracy built the largest and smallest exhibits—the tiny motor and the tesla coil.

1907. The first show was certainly a far cry from the huge spectacle to be presented this year on March 28, 29, and 30. Then the show occupied only a few rooms; this year three buildings will be jammed full of exhibits. Profits from the show, after expenses have been paid, are placed in a loan fund for deserving electrical engineers. The fund has grown from year to year and now amounts to over five thousand dollars. The show is staged entirely by students who have to carry their regular class program in addition to working, sometimes for months, on their displays. The show will be well worth your time, so let's see you all at the E. E. lab on March 28, 29, and 30!

The New Waco 1940
—*Courtesy Aviation Magazine*

It's here to STAY . . .

By George Guirl '42

On December 17, 1903, a biplane carrying a sixteen horsepower motor and Orville Wright "raised itself into the air in full flight, sailed forward without reduction of speed, and finally landed at a point as high as that which it started." Eleven years following that first flight, men were fighting in planes, in sixteen years they had flown the oceans, and in twenty-six years they had flown to both poles of the earth. Today, transport planes fully loaded make flights between Chicago and New York in less than three hours. Yet with all of these major advancements in aviation, critics still maintain that air travel is doomed and will never amount to anything.

Standard arguments against the ultimate usage of planes are those of high costs, inefficiency, and passenger comfort. Costs may be considered down one-third comparable to the original cost of the Wright's first plane. Engine costs are down tremendously, from $25 per horsepower to six and seven dollars, as are general construction costs. Operating costs for fuel alone are between two and three cents per ton-mile of useful load, which is better than that of a great many trucks. No one knows what operating costs in general will be until ultimate development is attained and then not until standardization steps forward.

That argument of inefficiency — look how the propellor roars and beats the air! Bulkiness is retarding advancement! The air propellor is not merely a device with which to slice and cut the air for the airplane to enter, but a device which converts mechanical energy into longitudinal thrust at an 80% to 90% efficiency. You many say that an 80% efficiency at sea level is much less at 15,000 feet. In the rarified atmosphere of those altitudes, the propellor must cut a wider swath in the air to do the same amount of work. So, "no sooner said than done," the variable pitch propellor was successfully adopted. New low-winged flying ships have decreased their weight by 50%, the weight per horsepower in the engine being of major importance. These all steel, well constructed ships are built in all sizes, ranging from a single seater to the giant flying boats which carry from thirty to forty passengers easily.

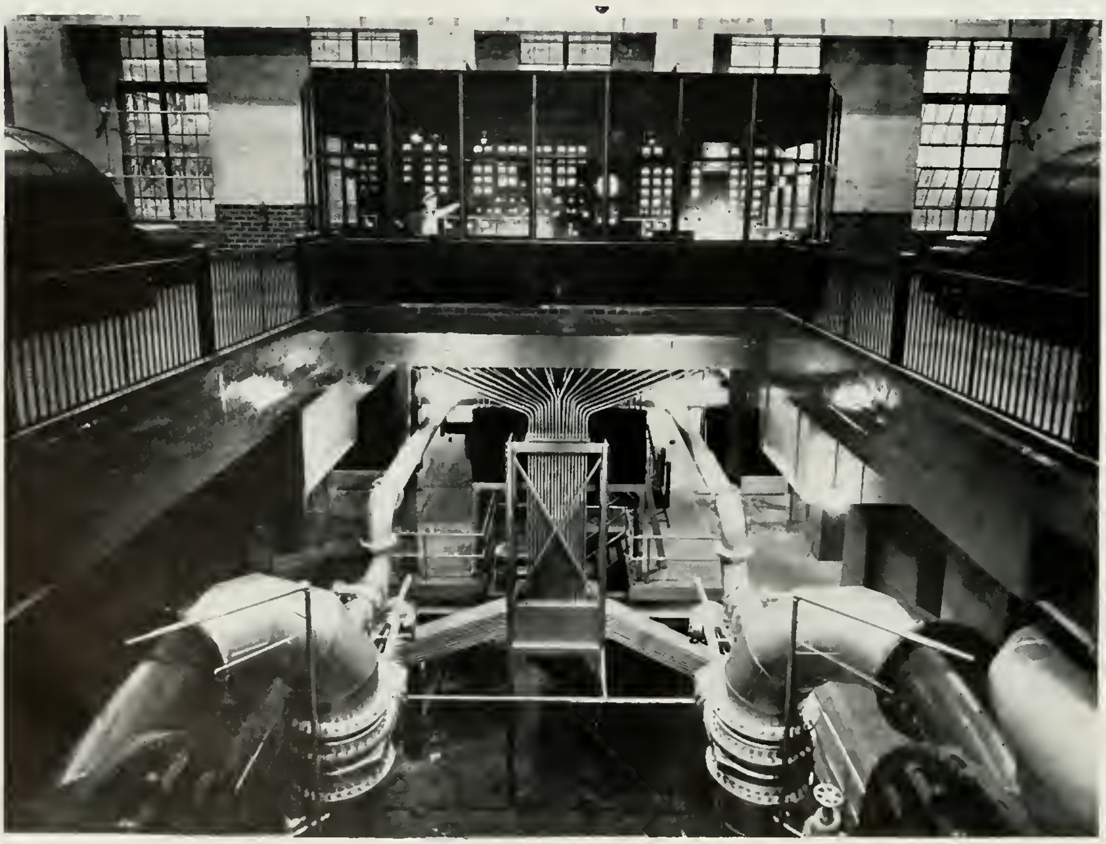
You may ask, if you are any sort of pessimist at all, how ships are to fly at higher altitudes where there is little or no air to support the wings and allow the engines to function properly. As for the support of the ship, higher speeds will sufficiently accomplish this, but we cannot attain these higher speeds with a poorly functioning motor. So that the motor could have the proper proportions of air in the correct composition, an ingenious development was made — the "supercharger" which is now standard equipment on modern planes.

Passenger comfort in most instances is becoming of prime importance. Physiologically, altitudes of 10,000 feet are distressing to most people, above 15,000 feet, universally so. Man must have near sea level conditions or be frightfully uncomfortable. Sealing the cabins and using a slight portion of the air from the supercharger is the answer to his requirements. Fortunately, the air composition varies but slightly with the altitude, so that by merely increasing the pressure, the problem is solved. Wing loading reaches its highest efficiency in modern planes in that they are loaded up to 28 pounds per square foot of wing area. This is not only an efficiency in wing loading, but it also adds to the passengers comfort by 75%.

Aviation has a great many problems to solve before it is what it should and will be. "Aeronautical engineers have been leaping gazelles compared to the snails in other engineering fields." Most of its personnel have been young, have known little to start with, have had no tradition to overthrow, and little false knowledge to unlearn. How they did go . . . and are still going, higher, higher; faster, faster; farther and farther.

ELECTRICAL ENGINEERI

Lightning Flashes Earthward

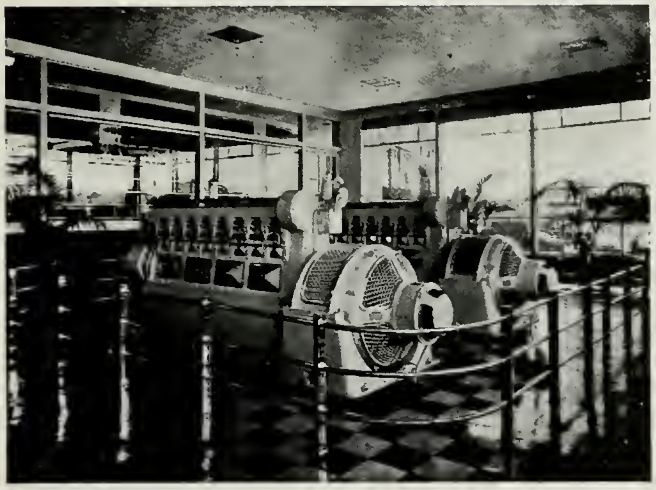


• •

POWER is generated at new Bryce E. Morrow near Kalamazoo, Michi At the left is the encl control room between 35,000 - kw. hydrogen - co generators and portions of conduits and conden Above is the boiler room ing floor.

G . . .

ILLUMINATION of a new automotive plant removes an industrial headache. 250-kw. flourescent luminaries solved the problem. Three tubes of each unit operate on 3-phase power, eliminating flicker.



DIESEL-ELECTRIC power is furnished by compact generators (at left).

BUILD OUTSIDE when your crane is too large to fit inside the building. That's what they did for the gantry-crane erected at Ariel Dam power house in Washington state.

POWER

In Compliment to the 1940 EE Show

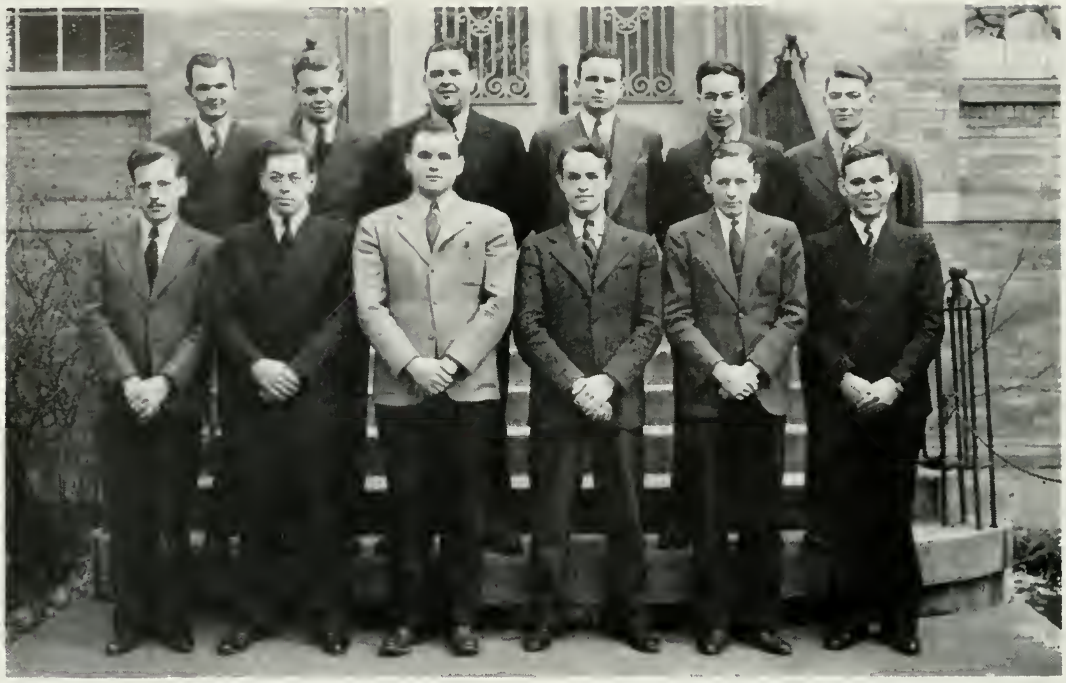
Cuts Courtesy:

Electrical World

American Machinist

The Whiting Corporation

Presenting . . .



The EE Show Committee, left to right, front row: Jim Murphy, Francis Tallmadge, Jack Shnable, Henry Duszak, Frank Linder, Bill Tracy. Second row: Bill Witort, Bob Nelson, Merlin Adams, Bob Sinks, Norman Colby, and Bill Welbourne.

Leonardo da Vinci

The name of Leonardo da Vinci may seem a little out of place here in an engineering magazine. Most people fail to realize that Leonardo was in reality the first engineer. His contributions to science and engineering are more varied and of greater importance than those of any other man in history.

His was the true scientific mind; when Leonardo undertook to solve a problem, he studied all aspects and went to the original source for his information. This method of studying all aspects of a problem led him into many fields; mathematics, physics, geometry, astronomy, cosmography, navigation, anatomy, optics, hydraulics, and many other subjects. In hydraulics, he is called the originator of the science. Leonardo came to be known as an expert in painting, sculptoring, music mechanics, engineering and natural philosophy.

An example of his wide investigation is that undertaken when he was commissioned to make a statue for one of the Sforzas. Leonardo spent several years in studying the casting of bronze before even beginning a statue. In 1494 when he was called in as a consultant on the improvement of the waterways of Lamellina, da Vinci began a study of storms, lightning, and mountain structure. As soon as he was commissioned to paint his famous "Last Supper," da Vinci began a study of pigments. His picture was painted in tempera, the elements of which have yet to be discovered.

The famous cathedral of Milan was completed by Leonardo, who was given the difficult task of finishing the construction which had been halted for some years. He has records of vast plans for the moving of the poppistry of St. John in Lorence to the opposite side of the city. While serving as military engineer to Duke Caesar Borgia, he mapped nearly half of northern Italy in minute detail. In the early fifteen hundreds da Vinci traveled in France, where he designed the wonderful circular staircase at Blois and drew the plans for the castle at Amboise. There are also numerous records of canals and harbors which he designed.

It is thought by engineers who have made a study of his notes, that da Vinci would have perfected the airplane if he had had some motivating power such as petrol. His study of flight is the first and one of the most complete on record. He was the first to discover the laws of perspective and the relation of shade and shadow. In fact, da Vinci's discoveries taxed the intelligence of men for hundreds of years afterwards in trying to understand them.

An interesting thing about his notes is that he wrote

(Continued on Page 12)

Your ears are our business

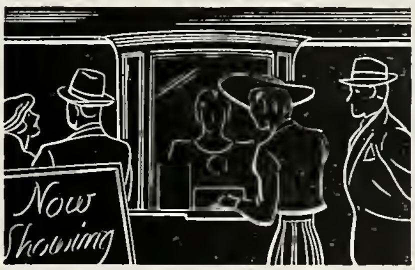
Western Electric makes—for the nation's ears—the telephones and the vast array of equipment necessary to provide Bell telephone service. Moreover, out of the telephone have come many other products which widen the hearing range of your ears—adding to public safety, convenience and pleasure. Here are some of these, made with the skill gained in seventy years' experience.

THE AUDIPHONE—based on techniques developed in Bell Telephone Laboratories—is helping many thousands with impaired hearing to hear clearly again. The Ortho-Technic model represents the most recent forward step in hearing aids.

RADIO BROADCASTING is also an outgrowth of work in Bell Telephone Laboratories. More than 200 of this country's leading stations now use Western Electric equipment to put your favorite programs on the air.

THE FLYING TELEPHONE, which helps make possible today's splendid airline service, is the air-minded member of the family. All the major airlines and many private flyers now keep an ear to the ground with Western Electric equipment.

TALKING PICTURES, too, came out of telephone research. The principal producers and thousands of theatres use Western Electric sound apparatus for recording and reproducing pictures that entertain and instruct millions.



PUBLIC ADDRESS equipment, which widens the hearing circle at large gatherings, is another young brother of your telephone. It serves many purposes in hotels, schools, hospitals, auditoriums, stadiums, airports and amusement parks.

POLICE RADIO—pioneered by the makers of your Bell telephone—is one of the law's most powerful weapons. Today Western Electric equipment is helping to increase arrests and decrease crimes—giving added protection to 45 million people.

Western Electric *... made your* ***BELL TELEPHONE***

DEPARTMENTAL NOTES

Newly elected, second-semester officers of the student societies are as follows:

A. I. E. E.

Spalding Robb '40........*President*
Donald Nelson '41........*Vice President*
Frank Thoma '40........*Secretary*
Leo Rosenman '40........*Treasurer*
Ralph Kuehn '41........*Publicity Chairman*

Mineral Industries Society

Joe Waisman '40........*President*
Joe Lange '40........*Vice President*
Harry Czyzewski '40........*Secretary*
John Daly '40½........*Treasurer*

Railway Club

Tom Shedd '40........*President*
George Adams '40........*Vice President*
Dick Rayer '41........*Secretary*
Tom De Wan, Graduate........*Treasurer*
Kirk Taylor '41........*Publicity Chairman*

Society of General Engineers

Bill Shive '40........*President*
Joe La Mantia '40........*Vice President*
Don Koehler '41........*Secretary*
Bob Owen '41½........*Treasurer*

(Continued from Page 10)

them backwards and upside down. For this reason, and others, they were lost for several hundred years after his death, and the knowledge he had acquired had to be re-acquired. Leonardo knew in 1515 the facts that Galileo, Bacon, Newton, and Harvey were to discover years later.

Leonardo was Watt's precursor in the discovery of the steam engine. He was the first to commence studies on problems that still puzzle scientists today. Leonardo's one fault was his intense curiosity. He wore himself out in his studies.

Officers carried over from last semester are as follows:

A. I. Ch. E.

Don Hanson '40........*President*
James Anderson '40........*Vice President*
John Weedman '40........*Secretary-Treasurer*

A. S. C. E.

Bob Chase '40........*President*
Harry Prince '40........*Vice President*
Joe McIntosh '40........*Secretary*
Bill Bills '41........*Treasurer*

A. S. M. E.

Keith Carter '40........*President*
Ed Wanderer '40........*Vice President*
Tom Jackson '40........*Secretary*
Paul Smith '40........*Treasurer*
Victor Frysinger '41,
O. W. Garver '41,
Pat Malloy '42........*Publicity Committee*

Illini Engineers

Tom McCrackin '40........*President*
Val Cichowski '40........*Vice President*
Bob Sinks '40........*Corresponding Secretary*
Joe Waisman '40........*Recording Secretary*
Bob Roose '40........*Treasurer*

How's Your Osculation?

By James Freek

No longer will go unchallenged the vain boast, "Clark Gable has nothing on me! My kisses leave 'em dizzy." If you think that you excell at the art of osculation, try out the effects of your kiss on the Kissometer! If you can register a high score, you will probably win greater favor with the fairer sex.

The theory of the Kissometer is very interesting. A lucky couple sit facing each other, each gripping a copper tube. They embrace, kissing on the lips, and the intensity of their kiss is registered on a dial. Of course the experiment is purely scientific, but some practice with a co-operative partner is recommended before the actual trial. If, however, the experimenter wishes to test his sex appeal, a stranger is recommended as a partner. If the needle swings clear around, you have "it," friend.

The Kissometer consists simply of a bridge circuit containing a galvanometer and a battery of low voltage. The ends of two wires, one from the cell and the other from the galvanometer, are each attached to a piece of copper or brass tubing. When these tubes are pressed tightly together the circuit is closed and the galvanometer is set to read 100%.

The current in the circuit when the couple are kissing is $I = \frac{E}{R+R_b}$ where E is the e.m.f. of the battery, R a high resistance in series with the galvanometer, and R_b the resistance of the couples' bodies. When the circuit is closed by contact of the two tubes alone, the current in the circuit is given mainly by $I = \frac{E}{R}$. And for this value the galvanometer is set to read 100%. The closer the contact of the couples, the smaller R_b becomes and consequently the current approaches $\frac{E}{R}$ and the dial thus reads closer to 100%.

No matter how enthusiastic the couple may be their kiss can never be perfect, that is, from the scientific standpoint. Their score can be increased, however, by moistening their lips and taking a tight grip on the copper terminals.

The first Kissometer was developed here at the University of Illinois by red Ames E. E. '38 for the 1938 E. E. Show. Since then many reproductions of the Kissometer have been made at other universities.

Rumors that the Kissometer will make its major debut at the fair next summer as an added attraction have been circulated.

Just That — And No More!

We should be careful to get out of an experience only the wisdom that is in it — and stop there; lest we be like the cat that sits down on the hot stove-lid. She will never sit down on a hot stove-lid again — and that is well; but also she will never sit down on a cold one any more.

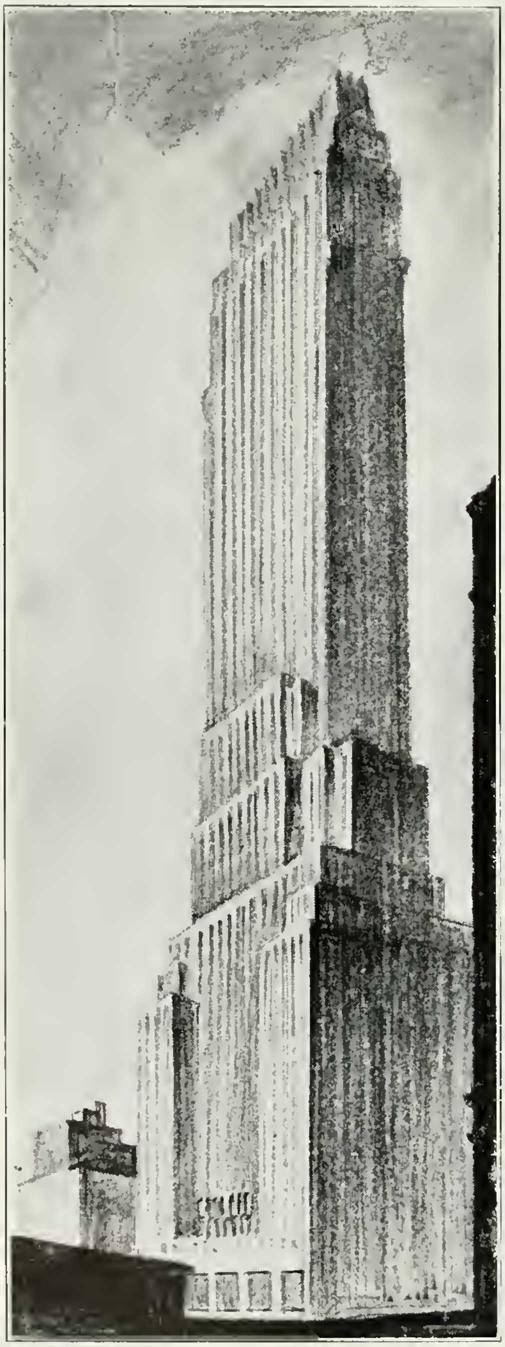
—Mark Twain

Rockefeller Center

By Don Stevens

Last of the fourteen buildings comprising Rockefeller Center is now under construction in New York City.

The Rockefeller fortune was dented to the extent of about $100,000,000 to put the Center in concrete form. When completed it will have 5,114,000 square feet of floor space. Eighty-nine per cent of the present floor space was rented last fall, and if this percentage is continued, the present financial dent will become a bulge.



Excavation began in July 1931. Since that date there has been erected the 70-story R. C. A. Building, a six-floor parking garage for 800 cars, and a unified group of office buildings from which hundreds of large corporations control their respective businesses.

Glass and marble foyers and halls, high speed express elevators, heroic bronze statues, costly trees and exclusive shops near the entrances, distinctive lighting effects and countless other marvels of man's ingenuity fill their allotted spaces in the Rockefeller Center.

College students and other youths find a paradise in the Rainbow Room and Rainbow Grill, gaily colored products of designing genius. Both show the results of sound management. Center Theater and Radio City Music Hall are among the large scale enterprises housed in the Center. This arcbitectural and engineering monument is now becoming a sound commercial enterprise, and from present indications, Rockefeller Center is proving to be a successful experiment.

TECHNOCRACKS

Gwendolyn: "I had a date with a general last night."
Madeline: "Major general?"
Gwendolyn: "Not yet."

* * * *

"Mother is the necessity of invention," said the co-ed as she crawled in the window at 3 a. m.

* * * *

A wealthy, elderly bachelor advertised for a wife to share his estate in return for bearing him an heir. Four years passed and the villagers decided the woman had misrepresented herself. When questioned she replied, "The old man is indeed heir-minded; but he is far from being heir-conditioned."

—The Hexagon

* * * *

Molly: "I was up till four every night during my vacation."

Polly: "That's nothing, I went to bed with the milkman every morning during mine."

* * * *

Greatly agitated, a woman carrying an infant dashed into a drug store: "My baby has swallowed a bullet," she cried. "What shall I do?"

"Give him some castor oil, and be sure and don't point him at anyone."

* * * *

Conscience is what makes a girl tell her mother something she knows darn well she's going to find out.

* * * *

Dear Pete (Kurlak):

I just read in the paper that students who don't smoke make better grades than those who do.

Dad.

Dear Dad:

I have thought about it, but truthfully I would rather make a "B" and have the enjoyment of smoking; in fact, I would rather smoke and drink and make a "C." Moreover, I would rather smoke and drink and neck and make a "D." Pete.

Dear Pete:

I'll break your neck if you flunk anything.

Dad.

* * * *

Why is it that none of the motorists put out then hands to signal for turns?

This is a college town, and young men ain't octopusses.

THE ILLINI TRAIL

By Gerald Homann

'05

Edmund B. Wheeler, electrical engineering graduate of the Class of 1905, is now employed by the Bell Telephone Laboratories, Inc., of New York City. He is a member of the technical staff in charge of various types of telephone development work, including insulated wires and telephone office cables, lamps and photometry, and air cleaning and conditioning apparatus.

'20

Joseph C. Albright, a mechanical engineering graduate of the Class of 1920, is now the Vice President and Eastern District Manager of the Marley Co. of Kansas City, Kansas. The Marley Co., is a manufacturer of atmospheric weather cooling equipment. Mr. Albright married Miss Hazel Wartman in 1924 and now has one son, John David Albright.

'20

R. L. Sweigert, mechanical engineering graduate of 1920, chose teaching as his work and now is known as Prof. Sweigert. Prof. Sweigert studied in the University of Iowa after leaving Illinois, receiving both his M. A. and his Ph. D. degrees from that university. He soon began his present work as a member of the staff of the Georgia School of Technology. It was in this institution that he received his rank of Professor of Mechanical Engineering, serving both as the Director of Freshman Engineers and Consultant in Mechanical Engineering. Prof. Sweigert has been the author of numerous articles published in technical and educational journals, among the most recent of these being a series of articles on Gas and Diesel engines which appeared in the Southern Power Journal.

Prof. Sweigert is a member of the National Committee for Engineering Education, and a Fellow of the American Association for the Advancement of Science. Prof. Sweigert married Miss Edna Powers in 1921 and now has two sons, R. L. Jr., and Milton, eight and four years old, respectively.

'29

A. R. Nieman, civil engineering graduate of 1929, has recently been promoted to Assistant General Superintendent of Grand Coulee Dam in direct charge of all construction for the contractor, Consolidated Builders, Incorporated. This dam is being constructed across the Columbia River in Central Washington by the United States. It is second only to the Boulder Dam in height, among the dams of the world, and contains three times the volume of concrete of Boulder Dam. The schedule calls for completion late in 1941.

W. G. Kahl, civil engineering graduate of 1936, is working directly under Mr. Nieman as Assistant Engineer, on construction estimates, plans, and costs.

'30

Carl J. Scheve, a 1930 graduate of the Department of Architecture, is now a Lieutenant, Junior Grade, in the United States Navy. He is a member of the Civil Engineer Corps and has supervision of building construction. In February, 1939, Mr. Scheve married Miss Rosalie Di Fiore in Hawaii. They now reside in Norfolk, Virginia.

'31

F. Stewart Brown, who graduated in Civil Engineering in 1931, is now in charge of the design section of the U. S. Engineers Office, Boston, Massachusetts.

H
1940
3

THE TECHNOGRAPH

UNIVERSITY *of* ILLINOIS

South Cross Member of 200-inch Telescope. *(See page 6)*

APRIL, 1940

20 cents

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

THE ILLINOIS TECHNOGRAPH

Published Eight Times Yearly by the Students of the College of Engineering, University of Illinois

Volume LIV | APRIL, 1940 | Number 7

Writers, editors, salesmen, artists, typists—all are needed by the *Technograph.* Not a single freshman is on the present staff. Perhaps you have been just "putting it off," but we hope you will seize this opportunity and apply for a position on the staff *now.* As a certain Oriental might have said, "Job on Techstaff lead somewhere—no lead, nothing follow —better follow to 213 Engineering Hall and be somewhere."

MEMBERS OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Chairman, Prof. H. C. Richardson, University of Minnesota, Minneapolis

Arkansas Engineer, Colorado Engineer, Cornell Engineer, Illinois Technograph, Iowa Engineer, Iowa Transit, Kansas Engineer, Kansas State Engineer, Marquette Engineer, Michigan Technic, Minnesota Techno-Log, Nebraska Blue Print, North Dakota State Engineer, Ohio State Engineer, Oregon State Technical Record, Pennsylvania Triangle, Purdue Engineer, New York University Quadrangle, Rose Technic, Tech Engineering News, Villanova Engineer, Washington State Engineer, Wayne Engineer, Wisconsin Engineer.

Published eight times during the year (September, October, November, December, January, February, April, and May) by The Illini Publishing Company. Entered as second class matter, October 30, 1921, at the post office of Urbana, Illinois. Office 213 Engineering Hall, Urbana, Illinois. Subscriptions, $1.00 per year. Single copy 20 cents.

To the Council of the

"ILLINI ENGINEERS"

•

"—to unite the engineering students, faculty, and alumni of the University of Illinois and through this union to promote interest in the welfare and traditions of the College of Engineering." That was the stated object of the society known as the "Illini Engineers." Last September, the Society's Council was inspired and great plans were afoot. All agreed that the engineers should cast aside their differences and stand together "unified." Meetings were held; there was much talk. How grand it was that all agreed!

But now it is April and the last meeting of the Council was held in November, five months ago. Not even consideration of a St. Pat's Ball was enough to cause the Council to convene. For the first time in years, St. Pat's Ball remained only a thought. What was the matter, Council members? Was it too much work? Did you give up? In September, many plans and much talk; in April, no plans, *not even talk.* Has the "Illini Engineers" failed? If so, why?

Really now, we want to know what went wrong. The *Technograph* will print replies in the May issue. Write your "post mortem" in less than two hundred words and bring it to 213 Engineering Hall before 8:00 a. m., April 15.

Perhaps by heeding your advice, the Class of '41 can make the "Illini Engineers" function as the forceful unit you planned.—R. T.

Sorry

The proper title of the recent engineering exhibit is not the E. E. Show, as incorrectly stated in the February *Technograph,* but the Electrical Show. A number of students not registered in Electrical Engineering, notably those in Engineering Physics, contribute much time and effort to the Electrical Show.

—Courtesy *Architectural Forum*

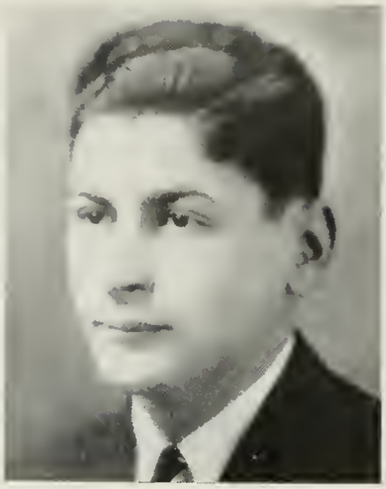
Anyone would like this New York City town house *(See "Beauty"—page 8)*

AGE HARDENING

Reduced from a Prize-Winning Essay on a Modern Science

•

By Joe Waisman, Met. '40



Not so long ago the production of metals was a distinct art. Desirable metallic products were a result not of an understanding of the mechanism of manufacture but of the skill and experience of the individual producer. Today the picture is radically different. Metallurgy is taking its place with the exact sciences. The development of metallurgical theory has aided not only in understanding the structure of metals and in improving production methods, but is also making possible the design of new alloys with certain desired physical or chemical properties for specific uses.

One of the most outstanding developments in the science of alloys has been in the design and use of those which are said to "age harden." The age hardening alloys known today—from age hardened iron to low-weight, high-strength duralumin alloys—have a wide range of industrial applications.

The phenomenon of age hardening was first reported by Wilm in Germany during the year 1911. He annealed and quenched an alloy of aluminum containing a few per cent copper and less than one per cent magnesium. He found that if he then allowed the alloy to "age" at room temperature or a slightly elevated temperature, it would become progressively harder and stronger. The alloy used by Wilm is of approximately the same composition as our modern duralumin. From time to time new age hardening alloys were discovered, but for a long period no explanation of the observed changes in properties was advanced.

The development of the theory of age hardening is an excellent example of the practical value of generalizations. Before Merica, Waltenberg, and Scott proposed their "Critical Dispersion Theory" for age hardening in 1919, only a few age hardening alloys were known. It was generally accepted that these alloys were "gifts of God" and exceptional cases. Although the original "Critical Dispersion Theory" has since been found to be inadequate to explain fully the phenomena observed, it nevertheless made possible certain generalizations leading to the systematic discovery of new age hardening alloys.

Merica and his co-workers found that alloys which age hardened were the type forming a solid solution of limited concentration and that the solubility of the dissolved constituent decreased with decreasing temperature. They also found that in the alloys they had studied, under the conditions they had studied them, the properties of density and electrical resistivity showed the variations to be expected if precipitation of the solute were actually taking place. Their conclusions were that age hardening was due in some way to the precipitation of a hardening constituent, and that maximum hardness was obtained in an alloy only when the particles were present in a "critical dispersion." This explanation seemed even more acceptable after Jeffries and Archer proposed their "Slip Interference Theory" for hardening. Before discussing this theory of hardening, it might be well to define hardness.

The property "hardness" is commonly defined as the ability of a substance to resist deformation. Deformation of metals occurs mainly by intra-crystalline slip along atomic planes called "slip planes." Since ductile materials fail by a general yielding of the metallic grains causing excessive deformation and "necking down," the strength of a metal would supposedly be some function of its hardness and resistance to deformation. Generally speaking, the greater the resistance of a metal to slip, the greater its hardness and strength will be. The "Slip Interference Theory" explains the hardening effect of precipitated particles as being due to the keying action of these particles along the slip planes. According to this theory, the hardness of an alloy would increase progressively during precipitation until complete precipitation had taken place. Further aging would cause the particles to coalesce with an increase in particle size and a decrease in the number of particles. The highest hardness is to be expected when a maximum *number* of particles is present — at the stage immediately preceding appreciable coalescence. Maximum hardness is thus obtained when the precipitated particles are present in a particle size corresponding to a critical dispersion such that the particles give greatest interference with slip along the atomic planes.

In general, age hardening occurs in alloy systems in which the solubility of the hardening particle decreases with decreasing temperature. With this type of alloy it is possible to secure a supersaturated solid solution by rapidly cooling an alloy of the proper composition from an elevated temperature. Spontaneous precipitation is opposed by the rigidity of the metallic crystal lattice. Since the metal is more rigid at lower temperatures, aging would be expected to take place, and actually does take place less rapidly at lower than at higher temperatures.

The precipitation theory of age hardening which has just been described, attempted to give a clear and concise picture of the phenomenon, but like so many all-inclusive concepts, the explanation was later found to be over simplified. For example, if precipitation of the solute

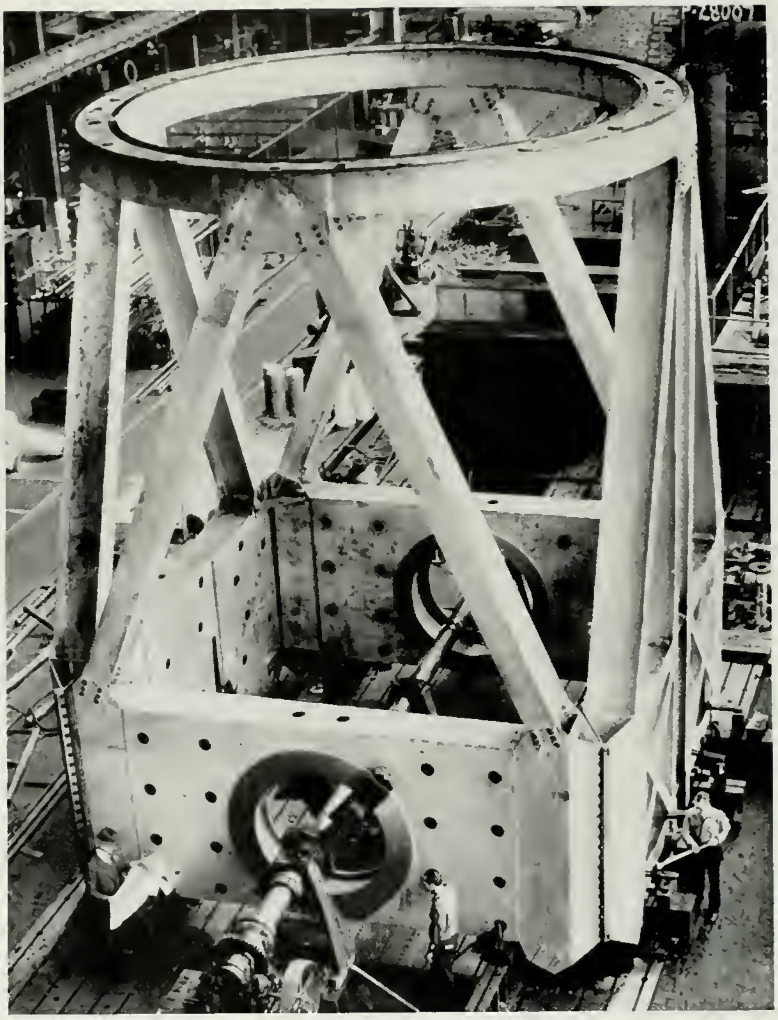
(Continued on Page 12)

200 INCHES

. . . And Every Inch Is Telescope

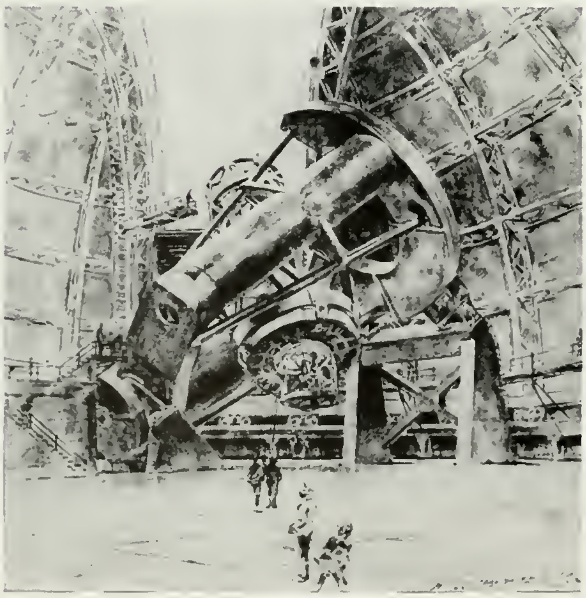
by

George B. Richards, E.E. '42



Partial assembly of tube for boring

Illustrations through courtesy of *Metals and Alloys*



Left—Fig. 1, Artist's conception of completed telescope

Scheduled to be completed this fall, the new 200-inch telescope at Mt. Palomar, California, has furnished headaches for engineers in many fields. The extraordinary size of this instrument, together with the extreme accuracy required, provided problems quite unlike anything previously attempted. The observatory site itself had to be carefully chosen. It had to be high above the surrounding country, far from the bright lights of cities, and yet readily accessible by roads of gradual slope, for tons of equipment had to be brought in by motor trucks.

The construction of the building which is to house the telescope was no small job. The height, from the ground to the top of the dome, is 135 feet or about 11 stories. The dome must rotate to allow the telescope to point in any direction. To prevent irregular expansion of the telescope due to uneven temperatures, the dome had to be insulated. It was desirable to have a material which was not only a good insulator, but which would give a pleasing architectural effect as well. Aluminum foil was selected, and the inside of the dome is lined with layers of the foil having dead air spaces between them. Because of its metallic luster, the foil is a poor radiator and absorber, but a good reflector. For this reason there will be very little heat transfer between the telescope and the dome.

The purpose of this insulation is not to keep the heat in, as is usually desired, but rather to keep the heat out,

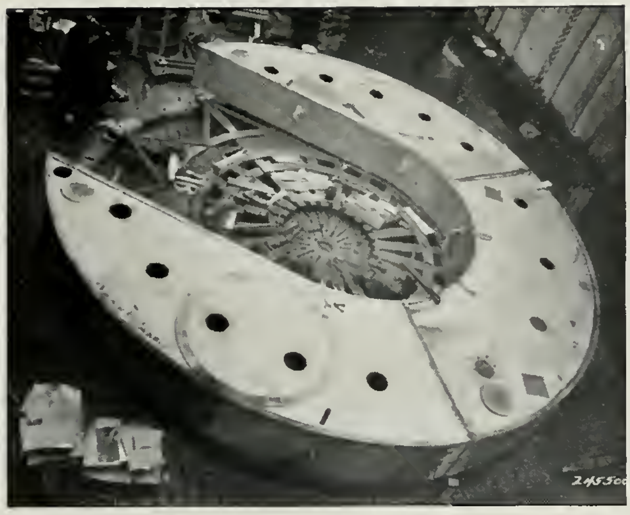


Fig. 2, Horseshoe bearing of special design

since the slot in the dome must be open at night, the observatory is to be kept at night air temperature all day while the slot is closed. Were this not done, the sudden opening would result in an inrush of cool night air which would probably cause uneven contraction and the loss of much valuable observation time, while waiting for the telescope to "cool off." For this reason, the temperature in the dome is never to be allowed to vary more than five degrees from the temperature of night air, while that of the air immediately about the 200-inch mirror is to be kept within one degree of night air temperature. Variations in humidity are also to be kept at a minimum.

The telescope is the yoke type, as is the 100-inch telescope at Mt. Wilson observatory, at present the largest operating telescope in the world. In this type of telescope, the tube is pivoted on a yoke, as shown in the artist's drawing, Fig. 1. The differences between the two telescopes, however, are many. The diameter of the mirror of the new telescope is twice that of the Mt. Wilson telescope mirror and is the largest glass casting ever poured. The total weight of the new instrument is more than eight times as great as that of the Mt. Wilson telescope.

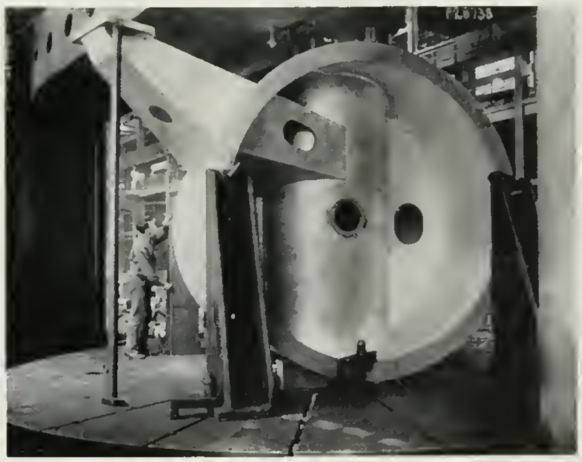
Yoke construction prevented the telescope at Mt. Wilson from observing the southern horizon and from observing near the north celestial pole. To eliminate this disadvantage in the new telescope, a large horseshoe shaped bearing, 46 feet in diameter, and with a 22-foot slot in it was designed. As shown in Fig. 2, the slot terminates in a circle, concentric with the bearing surface and having a diameter equal to the width of the slot. The use of this slotted bearing makes it possible to observe from two and one-half degrees above the south horizon to two degrees below the north celestial pole.

Machining of this horseshoe bearing was one of the major operations in the fabrication of the instrument. When Westinghouse Electric and Manufacturing Company undertook the operation, they had to lay special tracks around their 18-foot boring mill to accommodate the 46-foot diameter of the bearing. The tolerances agreed upon by the manufacturer and the California Institute of Technology, owner of the telescope, were that the top should not be more than .005 inch concave, convex, or conical, and that the bearing surface on the outer diameter should be within .005 inch of being square with the top. When the job was finished, the bearing surface was found to be round to within .0002 inch and free of tool marks. The surface was straight to within .0015 inch for 53 inches across the bearing. The surface was finished first with an Aloxite wheel, then with an Alundum wheel, and finally with a muslin buffer. One pass across the surface with a one-half inch feed and a .0001 inch depth cut with the grinder required about eight hours.

Because the telescope was designed to last for at least 100 years, great care was taken to relieve all stresses in the metal by careful annealing. Since the parts were assembled by welding, many of the parts were annealed two or three times. For this purpose, a special annealing furnace, capable of holding all but the largest piece, was constructed. While the furnace was in operation, continuous autographic reports were taken from at least four positions within the furnace by thermocouples in contact with the metal.

The annealing was performed in a double cycle. First the metal was heated slowly to between 1150 and 1200 degrees Fahrenheit. It was then held at this point for three hours for the first inch of thickness and one hour for each additional inch of thickness, and then cooled slowly to 600 degrees Fahrenheit. The entire cycle was then repeated. The second time, however, the metal was cooled slowly to 300 degrees and then withdrawn from the furnace.

If the telescope were mounted on roller or ball bearings, the torque required to rotate the polar axis in right ascension would be about 22,000 lb.-ft. Obviously, such a torque could cause severe bending in the structural members and the amount of energy necessary to operate the telescope would be enormous. In the larger of the



West center yoke section

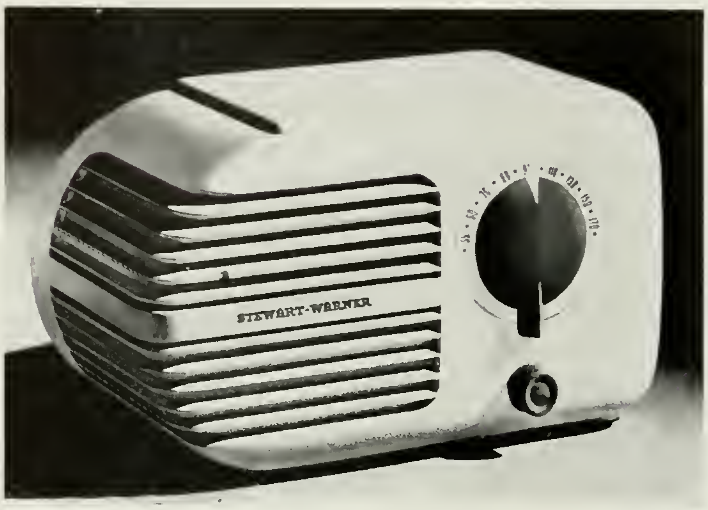
previously designed telescopes this problem was solved by floating the telescope in mercury, but the unusual size of the new telescope made this procedure impractical. It was finally decided to mount the telescope on three oil pads. These pads, made of metal, have the oil pumped into them at very high pressure, so that the telescope actually floats in oil. The coefficient of friction of the oil pads is approximately 2.6×10^{-6}.

Although welding was used almost entirely in the assembly, and the telescope was probably made possible by welding, no welding is planned in the final assembly at the observatory. The chief reason for this is that there is danger of setting up strains in the metal which cannot be annealed after the telescope is assembled. The telescope will therefore be assembled with bolts.

Thus is engineering, a practical science, contributing to the advancement of astronomy, an absolute science. Together they are pushing back the borders of the unknown. In this one great step they will increase the known universe to eight times its present size.

BEAUTY . . .

Just to disprove the idea t
engineers can do nothing
work a slide rule, we present t
pages of Beauty in Engineer



PLASTICS supply beauty on large and small scales as is seen in the radio above and the interior columns on the right.

RAILROADS are gaining beauty and increasing profits by the use of modern coach interiors as in the smart observation lounge car at left.

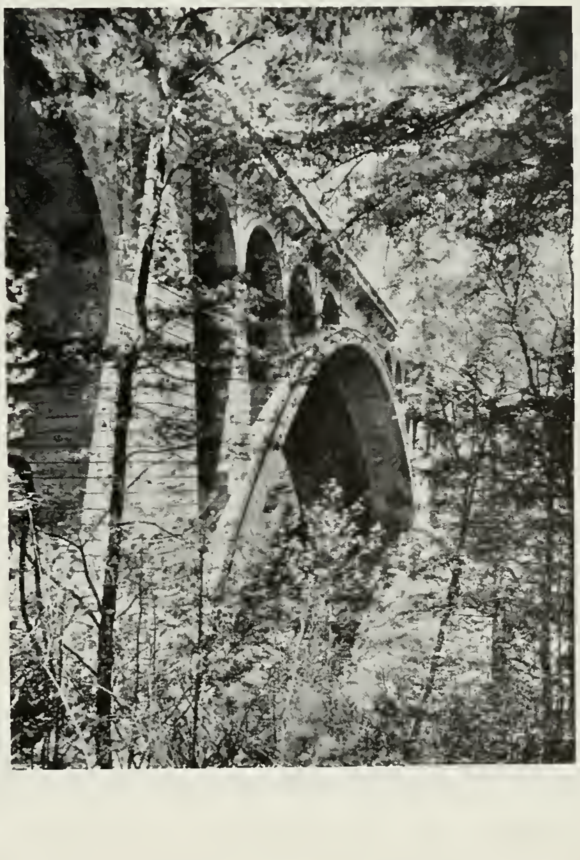
CUTS COURTESY

•

Engineering News Record
Machine Design
Industrial and Engineering Chemistry
Railway Electrical Engineering

BRIDGES spell "beauty" when designed in the modern manner. The railway bridge (above) and highway bridge (lower right) introduce the aesthetic into engineering.

BUILDINGS bring beauty to progressive cities when properly engineered, as was the new coliseum in Indianapolis. (Below).



NEWS BRIEFS

Joe LaMantia to Head General Engineers

Due to the resignation of Bill Shive, Joe LaMantia '40 has accepted the presidency of the general engineers. Bill was past vice-president, and as yet no new vice-president has been elected.

Railway Club Plans Trip

The railway engineers are planning an inspection trip to the Danville railroad shops during April.

The model railroad, track brake, and demonstration of the electric test car which many of us saw at the E. E. show were presented by members of the club.

An invitation is extended to all who are interested in any phase of railroading to attend Railway Club meetings in 105 T. B.

'Catskinning'

Every junior M. E. who visited the Caterpillar Tractor plant at Peoria, February 22, knows why "catskinning" is tough. On this inspection tour the M. E.'s were given the opportunity to see and discuss every important step in the manufacture of the tractors. Production processes and production machines were the main subjects of the inspection, which occupied the entire day. On the assembly line they watched the growth of tractors from a multitude of individual parts to the mighty "cats" used in construction work.

Lieutenant Lothrop to Leave Illinois

Lieutenant R. B. Lothrop of the military engineers will leave Illinois in June for service in the Philippines. Lieutenant Lothrop is well known on the engineering campus. He has served as faculty adviser of Scabbard and Blade, military honorary, and as assistant coach of the rifle team since his arrival at Illinois in 1936. Good luck, Lieutenant!

AMERICAN SOCIETY OF CIVIL ENGINEERS FOUNDED 1852

Mrs. Wood Speaks Before A. S. C. E.

In the space of a lifetime, engineers have made marvelous inventions, developed the airplane, the automobile, the movie, and interior lighting. Process after process has been developed to a high degree, but the problems of "social engineering" have been sadly neglected. Surely the engineers should be inspired to end the unscientific form of social and health education we have today. Such was the challenge given to the civil engineers at their March 13 meeting by Mrs. Margaret Wells Wood.

"The most important problems of life and society," says Mrs. Wood, "are the ones which need most the scientific development which the engineer has given other fields. That is why I speak of Social Engineering."

At the close of her talk, Mrs. Wood answered questions concerning the individual social problems of those present.

Age Hardening . . .

(Continued from Page 5)

actually takes place during the age hardening of an alloy, certain changes in properties are to be expected. In the case of duralumin, precipitation should be accompanied by a drop in electrical resistivity, an expansion, and a change in the inter-atomic distance of the aluminum matrix.

These changes actually did occur in most of the alloy systems known at the time of the publication of Merica's original theory. It was not long, however, before experimental evidence supposedly inconsistent with a simple precipitation theory of age hardening was discovered. The contradictory evidence was explained by introducing the concept of a "two-stage" hardening process. During the first stage, diffusion of the dissolved atoms into groups or "knots" takes place, and during the second stage, actual precipitation of particles from these highly supersaturated areas occurs. This theory explained many of the conflicting data. According to the simple precipitation theory, an increase in hardness would be expected with increased aging time until a maximum hardness is reached. Further aging, causing coalescence of these particles, would cause a decrease in hardness. Thus if a hardness versus aging time graph were plotted, the curve should be in the form of a hill or peak. If a similar curve were drawn for a two-stage hardening process, it would consist of two hardness peaks. Later workers have shown that hardening can occur in even three stages, and hardness versus time graphs have been presented showing the presence of three hardness peaks. The past decade has seen a great many conflicting points of view presented, and there has been lack of agreement as to the actual mechanism of age hardening.

Many of the arguments which arose from time to time concerning the validity of observed hardness peaks were due to the fact that in most of the experimental data available, the scattering of points on properties versus aging-time graphs was sufficient to cast doubt on the actual presence of these maxima.

The conventional method was to give a solution treatment followed by a quench to several specimens of a given alloy. The specimens were then aged isothermally, each at a different temperature, and tests were made at certain time intervals. The data were presented in the form of time-hardness or time-strength curves for aging at different temperatures.

It is conceivable that if the different aging stages were in some way produced in a single specimen, the

(Continued on Page 14)

study of the variation of hardness and microstructure during the aging might be made more coherent. With this object in mind, the writer designed an experiment in which a single bar of commercial duralumin was given a solution treatment and aged in a temperature gradient for two hours. The bar was then examined for hardness variation and change in microstructure. During aging, the hot end of the bar was maintained at 380° C and the cold end at 83° C. The temperature at each point of the bar during aging was measured, and after the aging treatment was complete, the variation of hardness along its length was measured. The scale used was the Rockwell "B." The hardness variation is shown in Fig. 1.

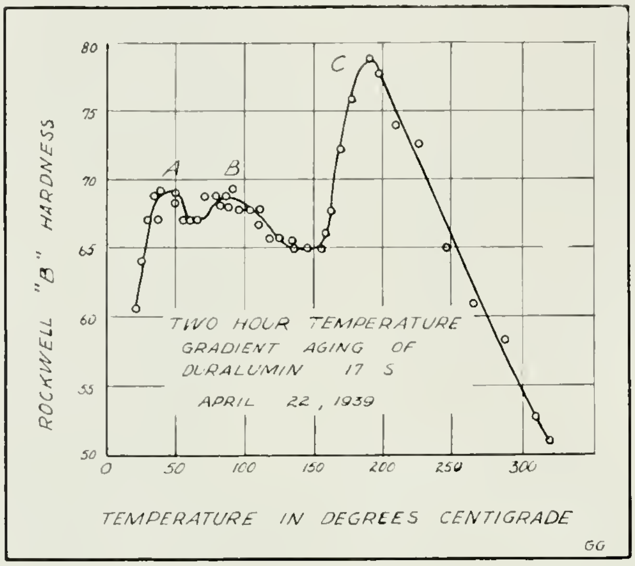


Fig. 1

There are very definitely three hardness peaks present in this temperature gradient aging. This is seemingly consistent with the theory of three hardening stages in commercial duralumin.

The past few years have seen a tremendous amount of research on the principles of age hardening, but a final understanding of the process is still far in the future. The new developments in theory, however, have been very valuable in giving us a more coherent picture of the mechanism of age hardening and in making possible practical extrapolation in the development of new alloys. Thus the theory has served the ultimate end of all theory — it has enabled man to improve nature by better understanding it.

Good Intentions

Quoted from a mimeographed explanation of the computation period is the following: "It is not intended that the computation period shall in any way be a hinderance to the student." Gee! and I thought they did it on purpose.

We hear of a student in business statistics who ruined a mechanical calculator. He divided a number by zero and burned out the bearings.

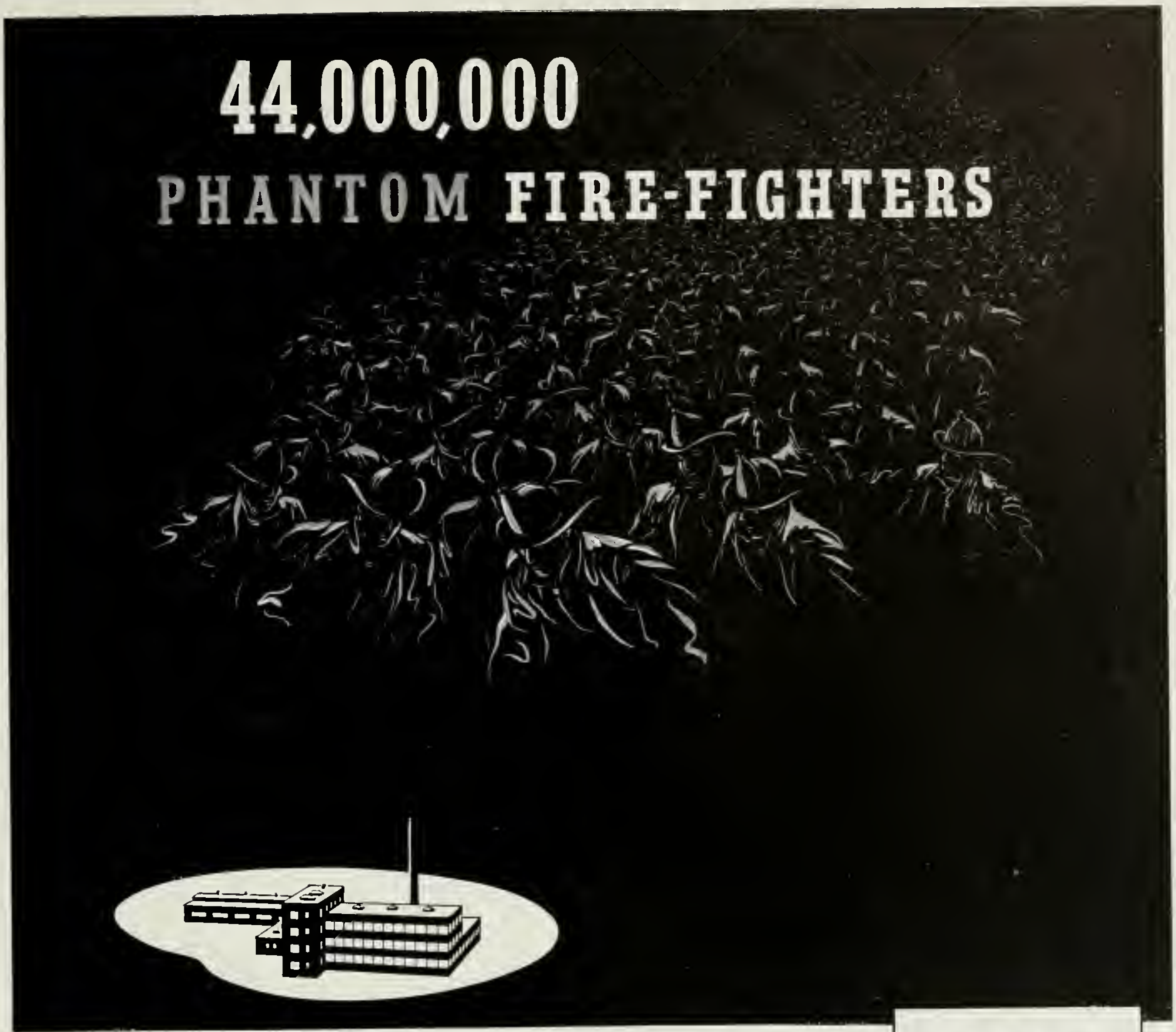
* * *

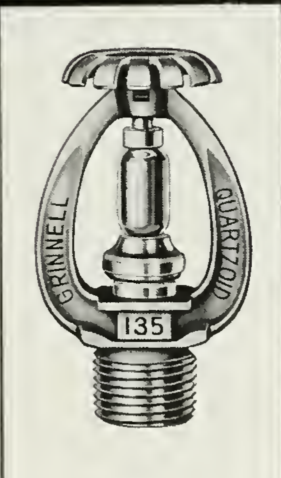
Said the broom to the dustpan, "What do you hear from the mop?"

* * *

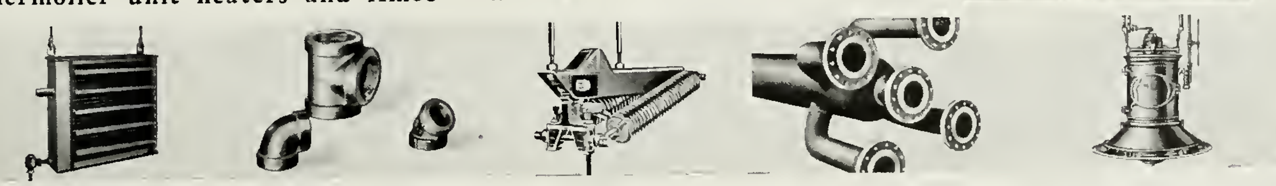
Prof (during exam): "Are you cheating?"

Student: "No sir. I was only telling him his nose was dripping on my paper."





Automatic Sprinklers



Thermolier Unit Heaters | Pipe Fittings | Pipe Hangers | Prefabricated Piping | Amco Industrial Humidifiers

G-E Campus News

4400 TIMES HIS OWN WEIGHT

A MAN could lift four 100-ton freight cars if he were proportionately as strong as a new Alnico magnet assembly recently developed in the General Electric Research Laboratory.

The greatly increased strength of the new magnet is due to a special mounting, which permits the magnetic flux to pass through many air gaps instead of the usual two in bridging from pole to pole. This makes possible a more efficient utilization of the magnetic energy. In recent laboratory tests a magnet weighing only one quarter of an ounce was able to support 69 pounds—about 4400 times its own weight. This new development, although not yet commercially available, broadens the field of permanent magnet applications.

TWO OUT OF TWENTY

IN his selection of the 20 outstanding men and women of 1939, Durward Howes, editor of "America's Young Men," honored two General Electric leaders: Philip D. Reed and Katharine B. Blodgett.

Mr. Reed has been with General Electric since 1926. He received his engineering degree from Wisconsin in 1921 and his law degree from Fordham University three years later. In 1937 he became the assistant of Gerard Swope, President of General Electric. Mr. Reed is now Chairman of the Board of Directors.

Miss Blodgett was graduated from Bryn Mawr in 1917, received her M.S. degree from the University of Chicago, and spent the next six years in the General Electric Research Laboratory in Schenectady. In 1924 and 1925 Dr. Blodgett studied at the Cavendish Laboratory in Cambridge, England, where she received the degree of Doctor of Philosophy. Returning to the G-E Research Laboratory, she has since been engaged in the study of molecular films.

2,000,000 HORSES

EVEN in its heyday the Wild West would hardly have tried stopping a stampede of 2,000,000 horses. Yet the job of stopping 2,000,000 horsepower of electric energy has been assigned to the General Electric breakers installed at Boulder Dam, and they do the job in 1/20 of a second. And the relays which trip these breakers are even more versatile, for it takes them only 1/200 of a second to locate trouble and trip the proper breaker.

The power developed at Boulder Dam is carried to Los Angeles at 287,000 volts—the highest voltage in the world in regular service. Two transmission lines, running side by side, are used to span the 380 miles. To protect these lines required the development of circuit breakers capable of interrupting one and a half million kilowatts of power.

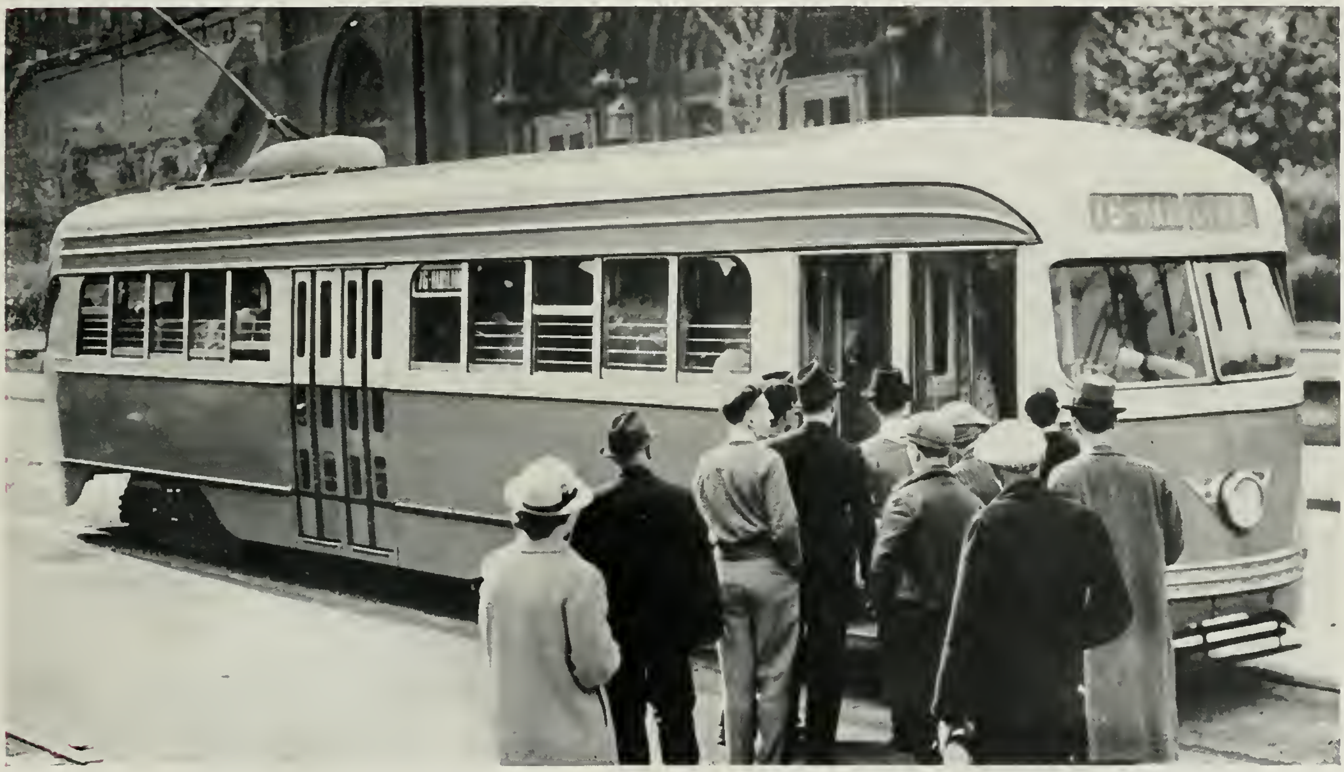
Student engineers, recent college graduates taking the G-E Test Course, had the responsibility of testing these circuit breakers in the Philadelphia Works of General Electric.

GENERAL ELECTRIC

963-10C

THE TECHNOGRAPH

UNIVERSITY *of* ILLINOIS



—Courtesy *Mass Transportation*

Street Car or Trackless Trolley for City Transit? (See Page 4)

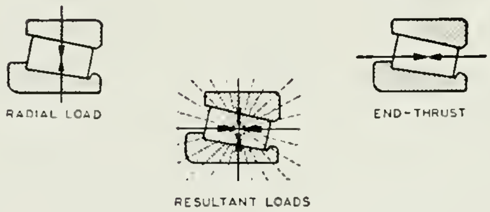
MAY, 1940

20 cents

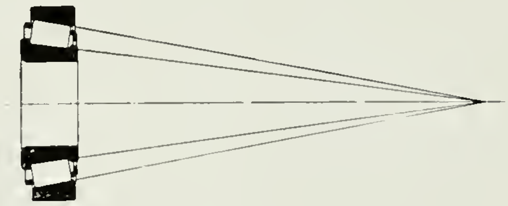
MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

HERE'S WHY THE TIMKEN BEARING SUCCESSFULLY MEETS EVERY MODERN BEARING REQUIREMENT . . .

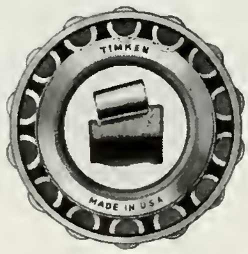
The fundamental characteristics of the TIMKEN Bearing, arising from inherent features of its design, make this bearing eminently suitable for every bearing application in every kind of mechanical equipment. In your future years as an engineer, bearing selection will be one of your many important responsibilities. The more you learn about bearings now, the easier your task will be.



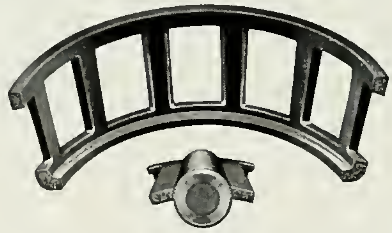
The most important feature of the TIMKEN Bearing is its basic tapered principle, introduced by Timken in 1898 and never superseded. This enables the bearing to carry all types of loads—radial, thrust or both together in any combination —without auxiliary supports of any kind, (such as thrust plates or thrust washers).



To assure true rolling motion and thus provide maximum anti-friction efficiency in operation, the bearing is so designed that lines projected along the tapered surfaces of the rolls and races meet at a common apex on the axis of the bearing.



Rolls are kept in exact alignment with respect to the races by two area contact of the large roll ends with the undercut rib of the cone (inner race).



A scientifically-designed and accurately-perforated cage keeps the rolls properly spaced around the cone so that each roll carries its proper proportion of the load.

For more than 41 years a constant process of engineering refinement has been going on, resulting in the perfected TIMKEN Bearing of today—a product of one of the world's largest and most famous engineering-manufacturing organizations.

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

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Vol. LIV **Number 8**

MEMBERS OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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THE ILLINOIS

TECHNOGRAPH

Established in 1885

UNIVERSITY OF ILLINOIS

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Council of "Illini Engineers"

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The Editor's Pen

Without qualifying myself, I am offering, in the following sentences some advice on a situation as it appears to me. It comes from a conversation between an old-school German mechanic and his helpers in a large industrial plant. Two of the men were talking sour-grapes about one of the plant "big-shots" and how he got to be boss when old "Germany Joe" said this: "Listen boys, maybe you and I, we see an inch. But the boss, he sees a foot, and his boss sees a yard. But, not only does he see a yard, he sees every foot in that yard and every inch that you and I see. That's why he's the big shot."

We may be able to learn something from that wise advice given by a mechanic who knew his own place and who respected the position of his superior. You and I will have opportunities later on to change jobs and take on new and difficult responsibilities. We will have been taught that diligent effort will get any job done successfully. But don't be too certain about that! A conscientious man with strange problems piling up faster than he can even understand them may cause expensive embarrassment, and whatever good talents he may have had for a different situation will make no difference.

Be sure that you can see an inch before you try to look at the foot. Ambition, if well placed, is good, but be prepared. There is a lot to know about the single inch, and when you're boss, you've twelve of them to look after.

EDITOR

The how and why of present-day modes of urban transportation, their distinguishing characteristics, their advantages and disadvantages and the probable winner.

Trackless Trolley Versus Street Car

By Tom Shedd, Ry.E. '40

Illustrations Courtesy
Mass Transportation
Transit Journal

Twenty-five years ago practically all city transit systems used street cars exclusively. The trolley car reigned supreme, from the dinky single truck "safety" car up to large two-car articulated units. Over 40,000 miles of street railway track and more than 60,000 cars were in use in the United States. Yet today the track mileage and the number of cars in use have been reduced by about one-half; many good-sized communities are entirely without street cars. On all sides may be heard the statement "The trolley car is dead. From now on it's buses for city transportation."

Is the trolley car actually on its way out? What is the true picture of urban transit today? Since street cars reached the height of their popularity some years ago, motor buses have begun to play an increasingly important part in the transit picture; lately trolley buses, or trackless trolleys, have stepped to the fore in supplying cities with more modern transportation.

The self-propelled bus has a very important place on city transit lines where traffic is no longer heavy enough to support the operation of street cars. No investment in overhead construction or track is required for the bus, but its relatively high operating cost and inability to handle efficiently large numbers of rush hour passengers have ruled it out, generally speaking, on heavy traffic lines in large cities. In many smaller communities, however, the self-propelled bus is used exclusively for local transport. In addition to gasoline buses, a number of diesel, diesel-electric, and gas-electric buses are in service throughout the country.

A trolley bus or trackless trolley is, as the name implies, nothing more than an electric car with rubber tires, designed to run directly on the street. Most trolley coaches of modern design look more like buses than street cars however; their most noticeable feature is the two trolley poles and collectors. Two collectors are needed because no running rails are available for the return circuit; the current must be sent back through the extra trolley wire. The motors are controlled by resistances in much the same way as on street cars; compressed air operates the controller as well as the doors and brakes. Acceleration and braking are both performed by means of foot-operated pedals, leaving the motorman's hands free for steering and collecting fares. Operation is simpler than in the case of a bus, since no shifting of gears is necessary. The trolley bus can accelerate at a rate of about 3.8 to 4.0 miles per hour per second. A few years ago the average street car accelerated at 2 to 3 mphps. Acceleration is accomplished much more smoothly than it is in the case of a conventional street car, since the controller has more "steps" than the street car controller—usually about three times as many.

Street cars have been constantly improved ever since the electric railway became practical, but it was not until 1935 that the modern car used in Chicago and other large cities made its appearance. This car was developed following a conference of street railway presidents who were interested in producing a really good car. The so-called Presidents' Conference Committee or PCC car is being built in considerable numbers; there are now 1,100 of these ultra-modern cars in service in the United States. The PCC is a far cry from the conventional car; it utilizes rubber insulation to reduce noise to a minimum; it has luxurious upholstered seats and an improved ventilating system. It can accelerate at about 4.5 miles per hour per second and brake at a comparable rate; three different types of brakes are used in sequence to stop the car. Operation is astonishingly quiet. The PCC car makes less noise than the average automobile and only slightly more noise than a trolley bus.

Each type of vehicle has its advantages as well as drawbacks. The trolley bus is very quiet in operation and requires no track. It is thoroughly modern and creates no gas fumes to foul the atmosphere. If necessary, trolley buses, unlike street cars, can pass around a stalled unit. A trolley bus can travel in a region up to 12 feet on either side of the trolley wires. This makes it possible to run around road obstructions and slow-moving traffic. It also permits the trolley bus to load and unload passengers at the curb.

On the other hand, the modern street car is not lacking in advantages for city service. The street car has more capacity than the trolley bus; it is capable of higher speeds with more comfort to the passengers. Furthermore, when safety islands are used, the street car causes less interference to other traffic than a curb loading vehicle. The street car has large aisles and is not subject to jolting due to rough pavement. This makes it easier for passengers to ride standing up. The street car is also less subject to accidents than the trackless trolley, because its exact position on the street is known at all times. Automobile drivers do not attempt to force it off the road with disastrous results. On heavily traveled streets, the trolley car can make better time than a trolley bus because it is not subject to delays in pulling away from the curb.

What determines whether a trolley bus or a street car shall be used on a given line? For a time the trolley bus was considered the best solution to the problem of providing modern transportation. However, present practice is to select a type of vehicle for a given run only after a number of factors have been considered. A trolley bus line requires considerably less investment in right of way equipment than a street car system. While the trolley bus overhead wire construction is more expensive, there is no track to build and maintain. On the other hand, more trolley buses will be needed to handle a given traffic, since the trolley bus is smaller and operates on a somewhat slower schedule than the modern street car. In addition there is the important question of which type of vehicle the public will prefer. There are no reliable data on this point as yet, but some indications are that the trolley bus is getting an even more

(Continued on Page 12)

No More Privacy Than an Atom . . .

. . . is virtually true since research started in atom shattering. Lyle Schaffer gives a brief history of atomic disintegration, describes the cyclotron and linear accelerator here at Illinois, and discusses present means for studying atomic structures.

By Lyle Schaffer, M.E. '41

Until thirty years ago, the study of physic dealt with bodies which we can see, and whose properties and actions can be observed with the eye. The chemist, however, was already interested in the combinations of atoms to form molecules, and in the 1890s the electron was discovered. It was found to be the same in all atoms, and to possess a negative charge. For ten or fifteen years, physicists speculated upon the combinations and relations of the negative and positive charges forming the atom.

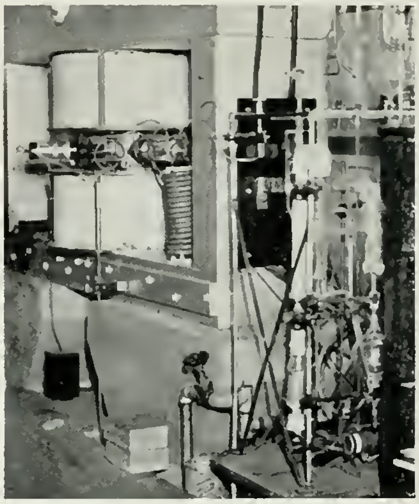
Then just before the World War, Rutherford discovered the nucleus of the atom and found that it possessed all the positive charges. Experiments soon following gave very definite information on the structure of the outer part of the atom, and shortly physicists turned their attention to the mystery-shrouded nucleus. Here we find nearly all the weight of the atom, and here lies the battleground of experiments being carried on today in many universities throughout the country. Among these is the University of Illinois, whose physics department is conducting experiments with the cyclotron and linear accelerator tube, the names of which already may be familiar to the reader.

To open the secrets of the inner atom, scientists are trying to shatter nuclei by bombarding them with bullets of alpha particles, protons, neutrons, et cetera. Neutrons have proved one of the most satisfactory because they have mass but no electrical charge, and hence are more likely to pass, unaffected by electrical influences, into the nucleus of the atom. One problem then is how to secure these neutrons and how to give them the velocity necessary to penetrate the atom.

Today there are two sources of neutrons available. The first and until recently the only one, necessitates the use of radium and beryllium. Radium as it decomposes gives up, among other things, alpha particles, which are the nuclei of helium atoms. The alpha particles acting on beryllium results in the formation of carbon and neutrons. One milligram of radium is necessary to produce 27,000 neutrons per second. The physics department has but 200 miligrams of radium.

The second method of producing neutrons employs the method of high-speed deuteron bombardment. Deuterons, which are heavy-hydrogen or deuterium atoms stripped of their planetary electron, produce neutrons when bombarding deuterium, beryllium, or lithium targets. The latter two are better at high potentials, while the first, deuterium, is best at lower potentials. Deuterium is heavy-hydrogen, that is, hydrogen with an atomic number of one, but a mass of two. Instead of heavy-hydrogen it is often more practicable to use heavy ice, that is, ice composed of oxygen and heavy-hydrogen.

Two methods are being used by the physics department to accelerate deuteron particles for bombardment. One employs the cyclotron and the other the linear accelerator tube. The cyclotron is a hollow cylinder composed of two flat semicircular shells resembling hollow "D's". The two halves are insulated and charged oppositely by high frequency alternating potentials, and the assembly is placed in a strong magnetic field. The deuteron particles, shot into the center of the cyclotron, are drawn by the alternating charges from one shell to the other while rotating in a circle under the influence of the magnetic field. Starting at the center of the hollow cyclotron, as the particles gain speed, they travel in successively larger circles, until having reached the inside surface of the cylindrical shell, they escape through an opening with tremendous velocity.



Illinois Cyclotron.

Built by Professor Kruger and Dr. Green of the Physics Department

The second accelerating method uses the linear accelerator tube. It is composed of several short, insulated tubes placed end to end and charged to potentials which increase successively from one end to the other. The deuteron particles are formed at the end of high positive potential by an electric arc in deuterium. Possessing a positive charge of their own, these deuterons are repelled toward the end of low potential, where having attained great speed, they impinge upon a target of heavy ice and form neutrons. With a power source of 230 kilovolts, 200 microamperes of deuterons may be generated. These in turn are capable of producing 270,000,000 neutrons per second. That is, for neutron production this system is as good as ten or more grams of radium. The neutron particles emerging from the bombardment have a velocity equal to that possessed by electron particles accelerated through a potential difference of two and one-half million volts. Their path is guided by shields of cadmium, lead, paraffin, et cetera, and are in turn ready to bombard other atoms. These neutrons may be slowed down to the velocity of hydrogen at room temperature by being passed through hydrogeneous materials. Their effects are much different at this lower velocity.

By this atomic bombardment, physicists hope to throw off the veil of mystery which still partly surrounds the depths of the tiny atom. Valuable results of these experiments such as the production of artificial radioactivity, already have been realized, and there are promising possibilities of their application in the field of medicine.

Production of glass, an ancient art, has been transformed to a modern science. Although its origin is clouded from antiquity we are certain that glass was known to the Egyptians six thousand years ago. The Romans improved the quality of glassware, but their ware was very crude by modern standards, practically all forms having the green cast characteristic of iron salts and similar impurities. It has remained for colonial period artisans to introduce soda and potash to remove such undesirable colors and find better silica sand deposits from which to produce glass. Twentieth century research has completed the transformation from an art to a science and the years ahead may see a combination of science and art to produce even better ware.

Don Stevens explains the manufacture of glass from the standpoint of production, discusses several types of glass and their developments, and points out differences in their qualities and the numerous products made from each.

An Art Becomes a Science . . .

By Donald K. Stevens, Cer.E. '42

The term "glass" is generally applied to any hard, brittle amorphous substance produced by the fusion of silica with an alkali, such as potash or soda, and another base, as lime or lead oxide. The structure of glass is not definite, but may be considered as a super-cooled liquid. Transparency is a common but not requisite quality of a glass.

Colors are introduced to glass through the dispersion of oxides or coloidal metal such as gold. The colors produced in this manner include blue or green from copper oxides, blue from cobalt oxide, ruby and orange from selenium, purple or black from MnO_2, and red, purple, or blue from gold. Opacity and milky colors are obtained by adding feldspar, SnO_2, CaF_2 in small quantities.

So many different compositions are used in glass manufacture we will not discuss them at length here. It is sufficient to note that a wide variety of properties are obtained by varying the chemical analysis. Window and bottle glass is usually a soft glass containing mixed calcium and sodium silicates. A harder glass is obtained by substituting potassium for sodium. Lead replacing a part of the calcium will produce a brilliant flint glass from which lenses and dishes are made. The addition of boron compounds, as in the case of pyrex glass, produces borosilicates having low coefficients of thermal expansion. Current research is past the elementary stage in determining the effect of given elements on properties. In fact, the resulting properties may be predicted rather accurately by the glass technologist without previous test.

It is in the manufacturing processes that most of the engineering work is done, the technique belonging to the ceramic chemist. Raw materials of controlled purity are mixed according to formula, together with cullet (previous crude glass fusion) in large tanks of average area 300 sq. ft. and depth 3 ft. In these large tanks or furnaces the batch is brought to the fusion point and thoroughly mixed in either a single-heat or a continuous charge system, thus making the glass. The old method of making glass was to use small pots for the melting process, but this is used only in optical glass production and similar exacting problems today. The larger tank is more consistent with modern high-speed production. An interesting application of the recently introduced continuous-feed tank is the production of safety glass for automobiles.

Commercial plate glass for a number of years had been made by the same slow, time and money-consuming process involving small batch preparation. When the demands of the automobile industry forced prices for plate glass up sharply in 1921 the search was intensified for a less expensive, mass-production, *continuous* method of making finished glass. As a result the Ford Process was developed.

Glass from automatic gas-fired furnaces is fed through refractory troughs to two heated rolls, which in turn spread a uniform ribbon of glass onto an endless chain of contiguous flat-topped cars. These cars then pass at a regulated speed through the *annealing* lehrs, where controlled cooling of the glass is closely regulated. It is interesting to note that provision is made for the glass to come out from the lehr at a slower speed than that at which it entered, to compensate for the shrinkage on cooling.

Grinding and polishing laps complete the transformation from crude glass to final plates. Abrasives used include carborundum, garnet, and rouge. Operating almost completely automatically, the plant turns out tens of thousands of square feet of glass in normal production days (24 hours). Recent improvements in this process include combination surfacers which grind and polish both top and bottom of the glass sheets at the same time insuring uniformity and parallelism in surfaces of the final product.

Safety glass is made by pressing layers of glass together with a resin in the center. Heat and pressure applied produce a satisfactory bond, and when properly protected along the edges, the glass preserves its clearness and uniplanar appearance indefinitely.

Plate glass is not the only product to benefit from the continuous process. Bottle machines and electric light bulb or radio tube machines are ingenious devices now being fed from continuous tanks. With such devices we produce many thousands of units better and more rapidly than we could have produced a dozen by hand a few years ago.

Today the blowing process, which has been highly developed in the past, is used only in making the highly ornate and individualized stemware and other tableware. Cut glass and etched work are responsible for much that glitters on the banquet table. A lead glass is used for most of this ware because of its high luster. The glass is dipped from a pot on a hollow metal tube. By twisting, rolling, and blowing the molten glass the master craftsman can create art glassware, but this requires time. Time is money, so the short-cuts of molding and pressing by machine are used in manufac-

(Continued on Page 14)

Electrical Logging . . .

Underground electrical survey service is offered by independent companies to the drilling branch of the petroleum industry.

By Wayne Moore, M.E. '41½

In the old days of the oil fields when a roughneck earned his name and field workers were distinguishable by their missing fingers, the geologist and production engineer had to rely upon drill cuttings and cores of the formations penetrated for information pertaining to the completion of the well, probable water conditions in the producing formation, and control of the produced gas-oil ratio. Today, thanks to the tireless work of a group of men who combined their various professions to form a new profession, geophysics, the drilling branch of the petroleum industry has a new service which removes much of the guess work from the completion problems listed above—the electrical logging process.

Several companies offer electrical logging services, but they all operate upon the same general principle. Two important characteristics of the subsurface rock formations are usually recorded, namely, the resistivity of the beds and their porosity.

It is quite apparent that if the subsurface rocks were dry, the resistance would be infinitely large. These rocks are not dry however, but they are filled to a certain degree with water having various amounts of salts dissolved in it; the salt concentration depending upon the soluble minerals the water has come in contact with. It is also evident that the very dense beds such as shale, clay, granite, and marble would contain very little water in comparison with the more porous sand, conglomerate, and limestone beds. Thus it is seen that the conductivity of the rocks depends upon the amount of water they contain and the concentration of an electrolyte in this water. Thus the resistivity, the reciprocal of the conductivity, will vary from one formation to the next as the above conditions vary. In measuring this resistance, the drilling fluid used in modern rotary drill is necessary since it serves as a conductor from the rocks penetrated to the electrodes which are lowered into the well. The basic principle of the measuring process is carried out as follows. An electrode is lowered into the hole and then connected to one terminal of a battery, the other terminal being grounded to the earth —usually the surface casing. Around this electrode which is lowered into the well are equipotential surfaces which are spherically shaped. Two other electrodes, connected together across a potentiometer, are lowered into the hole. These two electrodes are separated from each other, one above the other, and are lowered at a distance away from the electrode which carries the initial potential, equal to ten to twenty times the diameter of the well. These two measuring electrodes measure the drop in potential in the distance between them, which is equal to the drop in all directions from the source-of-potential electrode over the same distance. This resistance is measured, and recorded at the surface on coordinate paper, in ohms $M^2:M$, where M represents one meter. These three electrodes, and their insulated cables, are woven into one large cable which is carried on a truck.

In determining the porosity of the subsurface rocks, the phenomenon known as electrofiltration is used. When an electrolyte flows through a pervious dielectric, an electromotive force is set up between the sides of the dielectric which are in the direction of the flow; the side of ingress being negative with respect to the side of egress. This electromotive force is proportional to the resistivity of the liquid, the pressure of the liquid, and a constant factor depending upon the porous medium, and is inversely proportional to the viscosity of the liquid. This force may also be expressed: $E=CQR$, where:

E is the electromotive force,
C is a constant depending upon the porous medium,
Q is the quantity of fluid which flows through, and
R is the resistivity of the fluid.

From this it is seen that this electromotive force is a close indication of the porosity of the porous medium under consideration. In the rotary-drilled oil well there is sufficient drilling fluid in the hole to produce pressures in excess of the hydrostatic pressures within the rock formations, and thus a slight filtration of the drilling fluid into the formations takes place. This is not a minor effect, for differences as large as 100 to 200 milli-volts may be observed within a few feet or even inches.

In measuring this potential difference an impolarizable electrode is lowered, on the tri-cable used for resistivity, into the well. This electrode is connected through a potentiometer to another impolarizable electrode which is embedded in the ground and whose potential is considered to be zero. These impolarizable electrodes are electrodes which are not affected by chemical electromotive forces set up by the contact of a metal with the water in the hole and the moisture in the earth. These usually consist of a metal electrode inside a porous cup filled with a concentrated solution of the salt of this metal. The porosity is thus measured in milli-volts, and it is recorded on the same coordinate sheet that the resistivity is and the depths are plotted on the same scale. Thus one side of the strip gives the resistivity of a given bed while the other side shows an index of its porosity.

Oil occurs in the more porous formations since there must be space in which to accumulate. Now oil is not just a poor conductor, it is an insulator; so that an oil-bearing horizon should show both high porosity and high resistivity on the electrical log of a well, salt water formations would show high porosity and low resistivity, and an impervious bed would show up with high resistivity but with low porosity. This is the exact way that they do show up. In rotary drilling it is easy to drill through an oil sand without noticing it at the surface, and many of the modern operators will run an electrical logging survey when there is any doubt as to the probable location of any oil sands before they will abandon a well. It is obvious that these surveys must be made before the casing is run into the well.

Another use which has been found for the electrical surveys is the determining of the exact depth at which to land the casing, the parts of the sand to be shot with nitroglycerin or to be acidized, and the probable amount of shot or charge that is needed. Gas, oil, and water tend to accumulate from the top of the sand to the bottom in the order mentioned. The best engineering practice is to produce the maximum amount of oil with the minimum amount of gas and water, these two afford-

(Continued on Page 14)

The Council Speaks

The all-engineering society, "Illini Engineers," began enthusiastically in September, but ceased activity after a few months. An editorial in the April TECHNOGRAPH *asked the question "What about the 'Illini Engineer'?" Interest demonstrated in the following replies from council members of the once-active organization indicates perhaps that an all-engineering society still is possible.*

Hypocritical Organization

The world likes a winner. For that reason there are many men in our midst who claim to be winners. They radiate what is termed optimism, a thing that is like a new front on an old building. They are in our classrooms and in our organizations. These men have one characteristic: if when they fail, they admit defeat, we dislike them; so they cover up and carry on, head high.

Time-consuming obstacles have given our engineering campus hypocritical organizations, *one* of which is the Illini Engineers. The human inertia in this case was too great for student leaders to combat. Here, the task, after undertaken, required much more than an ordinary amount of work because the men had no authoritative power behind them. The faculty was kind, but it did not lend enough prestige to carry the plan through. Without the faculty shoulder, some students might have been capable of corralling their fellow men into a grand organization of Illini Engineers, but they would be risking graduation . . . and the world does not like a loser, it likes a winner. Thus we have what is called taking the path of least resistance.

In the future there will be attempts to inaugurate an honor system in this college, a St. Pat's Ball will be planned, a new Engineering Council will be started, but, in my estimation, they will all fail to be of a worthy consequence due to the tremendous voluntary sacrifice required of the students.

WM. GLENN VOIGT, *Editor*

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Non-Existent—Start Anew

In reply to your editorial, "To the Council of the Illini Engineers," in the *Technograph* of April, 1940, the "Illini Engineers" does not exist at present! It is true that there was an attempt made to organize the engineers on our campus. The officers of the departmental organizations met and much talking and planning was done. There were four of us who acted as a committee and devoted much time and effort to "start the ball rolling." However, our proposals were not unanimously accepted. The work done by the committee was rejected by a certain *few* individuals. The committee did a good job, and thought nothing of the time spent, but it likewise felt that its work should have been considered by the few. After all, we could not go on forever making plans and forever producing negative results. We wanted to see the organization "Illini Engineers" started!

At this time, we on the committee were pressed for time. Our own individual organizations began to suffer because we were unable to devote much needed time to them. So, after more talk, we had to stick by our own guns. We could not see both ships go down. The student departmental organizations after all will take a great part in the "Illini Engineers" and without question will be the nucleus of such an organization.

It seems to me that the council members should bury their differences and get started again. The foundation should be laid for the "Illini Engineers." This foundation should be simple but solid. Money is secondary to the existance of such an organization. What is more pertinent? The sincere cooperation of all concerned!

The main purpose of the organization is to unite the engineers and thus make the students involved feel that they are an organization and not individuals. To insure its existence, such an organization must be approved and backed by all concerned. There is no other way out!

My advice is to meet again and "start the ball rolling." We who are familiar with the problem in hand surely can yet save what is left and show our successors what is expected of them.

VAL J. CICHOWSKI
President: Student Branch of the American Ceramic Society

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No Definite Need

Before any organization can be built up, there must be a real reason for that organization. Although the "Illini Engineers" might function in a number of different ways, there is still no clear cut outstanding need. Organized first as a means to aid the *Technograph*, and then gradually expanding until it was to supervise all functions on the engineering campus, it was left without a purpose.

Student societies have long fulfilled the need for professional activity of the students. The "Illini Engineers" was to encompass all this, and to put the individual society on the block. The plan to have the student join the "Illini Engineers" for $1.75 instead of the usual $.50 fee for his own society jeopardized the membership of each society until after the second day of registration when it was cut out.

As for St. Pat's Ball, why was the debt of $191 incurred from last year? It was because of a lack of student interest. The engineering campus is too large and too diversified as to group interests to get that close together.

Whether the deciding reason why the council did not take steps last fall was that they felt that the students would not support the plan or whether they had their own organization work to do is debatable. It was easy then, as it will be in the future for some few to paint a rosy future for the "Illini Engineers." The completion of the task will be left to another group, notably the presidents of the individual societies. However, they have work of their own to do!

ROBERT M. SINKS, *E.E. '40*

Replies Continued . . .

Students Suspicious of Purpose

As a member of the Council of the "Illini Engineers," I can only admit that the Council failed in its purpose.

In attempting to analyze the situation I cannot lay my finger on any one definite reason for failure. I think really that the "Illini Engineers" needed someone with a rare bit of leadership and energy and a true interest in the organization—someone who could put actual life into the group. Perhaps that person will still come along to save the society. This I do know though, the engineering student body was highly suspicious of the purpose of the "Illini Engineers." After all, the success of the group depends upon the students themselves and not upon the members of the Council. Any attempt to weld a group into one body will receive resistance when no one knows what he is going into. Systematic advertising of the aims and benefits of the organization reaching every student should be made in order to put those affected in a receptive mood.

Donald F. Lyons

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Failure Due to Superiority Complex

In reply to your editorial in the April issue of the *Illinois Technograph* concerning the "Illini Engineers," I write in the capacity of Treasurer of the so-called organization and in behalf of the A.S.M.E. Student Branch. The Mechanical Engineers were the only ones to oppose the original constitution of the "Illini Engineers" when it tried to replace the old Engineering Council in the spring of 1939. We didn't feel it was fair to the students to expect them to pay $4.75 for membership into the "Illini Engineers" and the Student Branch of the A.S.M.E., as our Student Chapter dues are $3.00 per year. This original constitution stated that the dues be $1.75 per year. The student, in turn, would be given a year's subscription to the *Illinois Technograph*. We will leave the question for you to answer as to who was behind the original constitution.

We admit that there are definite advantages of organizing all the engineers into one unit, but is that the right approach?

A revised constitution was proposed and it severed all connections with the *Illinois Technograph* and made the dues $.25 per year. We agreed to ratify it under those conditions because this enabled more students to become members of the "Illini Engineers" as well as their own Student Branch Society. Officers were elected in the spring to carry on the work of organization in the fall of 1939.

Fall came. All the presidents and faculty advisers of the Student Branch Societies met and decided to put out publicity to every engineer explaining what the "Illini Engineers" was and what was intended to be done. An all-engineering smoker and two large meetings that were to be held in the Auditorium were the main points for the first semester.

The publicity was prepared and submitted to the president to be mimeographed and passed out in the classes. Time passed and no publicity appeared. We have not seen the publicity or had any kind of a meeting since that time.

This whole affair is an example of not being united from the start. Until each of the branches of engineering drops its superiority complex, the idea of an all-engineering society will not be established. If it is going to be a "Unit Organization," we must agree on a central idea and then work together!

Robert W. Roose

Advertising Program Muffed

My position on the "Illini Engineers" Council was purely unofficial, although I did serve on a committee with another student and a faculty man. Our job was to compose the advertising material and decide on some method of arrangement of this material for the serial sheets which were to be printed and distributed on Engineering Campus. This work was completed and turned over to the chairman of the Council.

Since that time I have had no word concerning the plans of the Council, and the only information I have been able to get came through unofficial sources in the way of conversation on the question of the "Illini Engineers."

K. Pfundstein

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Questionable Purpose

Perhaps it is not improper, after reading all the replies, that I attempt the delicate task of summing up, and in effect, reply to my own editorial. All the replies except one mention a person or group as a contributor to the downfall of the society. Leaders, council, students, faculty, the *Technograph*—all are suggested. I believe it is considerably more probable however, that some idea or some method was at fault.

The main criticism of the organization of the society has been that the presidents of the student branch organizations were too busy with their own work to contribute time and effort as the council of an all-engineering group. Perhaps this difficulty would be removed if the council were composed of the vice presidents of the departmental societies or of specially elected delegates, both of whom might afford to spend more time in outside work.

But it remains to be answered whether or not the society has a commendable purpose. As stated, the purpose is to unify the engineers, and through unity to promote interest in the welfare of the College. It is implied that the welfare is to be improved, and this improved welfare is actually the main purpose of the organization. Thus the main purpose of the society is only implied, whereas the method, unification, is stated definitely and offers a catchword—*unity!* But as Bob Sinks and Bob Roose observe, is unity the best method for improving the welfare of the College?

A more reasonable stated purpose might be to conduct the functions which do not fall to any one society—St. Pat's Ball, Open House, all-engineering and inter-departmental contests, and so forth. But if the main purpose of the society is to make the students involved feel that they are an organization and not individuals, please count me out. The value of such a feeling is at least extremely questionable.—R.T.

PI TO THIRTY PLACES

One j aime a faire apprendre un nombre utill aux sages.

Immortel Archimide, artiste, ingenieur.

Qui de ton jugement peut priser la voleur?

Pour moi ton probleme eut de parelis avantages.

This verse in French will give pi to thirty places. Count the number of letters in each word and write the numbers in the order of the poem; i. e., 3. 141592653-589793238462643383279.

George Gamertsfelder
Physics Dept.

* * *

Canvasser: "You pay a small deposit; then you make no payments for six months."

Lady of the house: "Who told you about us?"

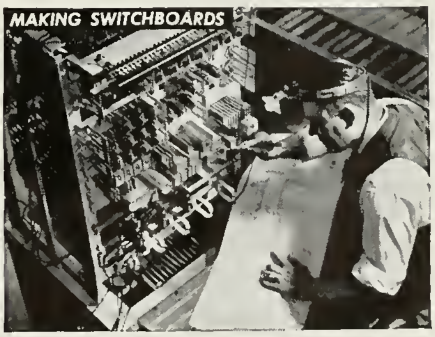
Your voice . . . with CARE

When you send your voice by telephone, it arrives in perfect shape

Back of the good service which your Bell Telephone Company gives you is the equipment you use. This is Western Electric's responsibility, as it has been for nearly sixty years.

It is a many-sided activity which calls for experience in management, extensive resources in manufacturing, purchasing and distributing, a large staff of engineers and technicians and thousands of skilled men and women trained in the making of no less than 43,000 items of telephone apparatus.

Thus Western Electric helps your telephone company to handle "Your Voice with Care" and to provide a service which is the best and most economical in the world.



Western Electric

. . . made your
BELL TELEPHONE

Trackless Trolley . . .

(Continued from Page 5)

favorable public reception than the modern street car. Local conditions, as for example the character of the rush hour period, may be an important factor to consider. Two different lines having the same average traffic density may require different vehicles if one line has heavier traffic at the rush hour.

Experiments with trackless trolleys were begun only a short time after the electric railway had become a practical reality. The first trolley bus seems to have been the one built in 1899 by Siemens and Halske, of Berlin. Other experimental trolley coaches were built from that time until the first modern ones were installed in Salt Lake City, in 1928. The early trolley coaches did not have the benefits resulting from automotive research. They ran on hard tires, had crude bodies and heavy electrical equipment, and were generally unsatisfactory.

The trolley buses installed in 1928 were the first ones to utilize the latest developments in automotive body design; they ran on pneumatic tires and were equipped with light-weight motors. Since 1928 a large number of trolley bus installations have been made. Kenosha, Wisconsin, replaced all its street cars and motor bus systems with trolley buses in 1932. Shreveport, Louisiana, has recently retired its last street car, while in Providence, Rhode Island, trolley buses are gradually replacing all street cars. In large cities such as Chicago, trolley buses are being used with great success on lines with medium traffic density.

Large fleets of modern PCC street cars are operating today in Chicago, Brooklyn, Los Angeles, Pittsburgh, Toronto, Washington, and other cities. Many more cars are being built; so far, however, the number of new cars in comparison with old cars still running is small. The new cars have met with enthusiastic public reception wherever they have been installed.

Perhaps the only completely modern transportation system in any large city is to be found in Indianapolis. The Indianapolis Railways recently installed modern street cars, trolley buses, and motor buses on all its lines. The greatest increase of traffic after the installation of the new equipment occurred on the trolley bus lines; while the motor bus lines showed the least increase.

Is the trolley car doomed? In the smaller cities, yes. In large cities it will probably continue to play an important part in local transit for many years. In all cities, large and small, transit engineers are installing the type of vehicle which is most suited for each line, so that efficient and economical transportation will result, to the benefit of both the riding public and the transit companies.

LOGGING . . . *(Continued from Page 8)*

ing the pressure which will force the oil out of the well and thus save pumping costs. By running a temperature survey in connection with the previously mentioned survey it is possible to determine the portion of the sand which contains gas, since the escaping gas acts as a refrigerant and cools the formations and the mud at that point. The porosity-resistivity curves will show the oil-water contact since the resistivity curve will drop when the water is reached. Thus by having a temperature-resistivity-porosity survey made, the operator is able to set his casing below the gas level so that only oil will be produced, he is able to plug off the parts of the sand which bears water, and he is given information which will enable him to shoot only the most impervious parts of the oil sand, thus saving time and money, rather than resorting to chance and experimentation with their resulting waste. Thus through the fusion of three professions came a new one with a future that is new, namely geophysics; and just as new alloys create new uses for themselves merely by their existence, so has geophysics created new problems for itself and has solved these consistently from day to day.

GLASS . . . *(Continued from Page 7)*

turing the ten-cent variety of tableware. Both types of glass find demand and both are important to the modern world.

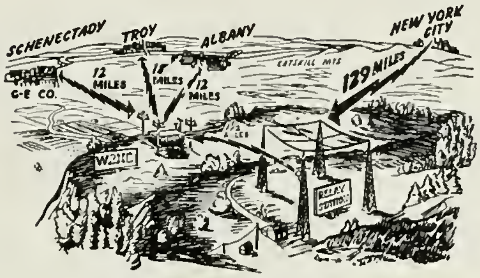
Special glasses are created for special purposes. The particular glass developed by a University of Illinois graduate for use in glass fabrics is an example of special-purpose glass. New composition formulae for glass products are continually streaming from the laboratory. In industry we find glass used for reaction kettles, stills, mixers, evaporators, storage tanks, electrical insulators, fiberglass tape, building blocks, grinder guards, insulating wool, and even nuts and bolts.

Much of the ceramist's contribution to science is in the field of glass. Optical glass is an interesting example. At the time of the first World War all of our optical glass was imported, but when that supply was cut off a notable group of American ceramists were faced with the difficult problem of supplying flawless, crystal-clear optical glass for binoculars, microscopes, and camera lenses. Fortunately these experts soon solved the problem sufficiently to avert a military crisis, and subsequent experiments have added greatly to the knowledge available in the United States. Only one company manufactures optical glass in this country, but that company makes many varied types and could produce any types for which a demand would develop.

Polaroid, the laminated glass impregnated with organic crystals, is filling a need for an inexpensive polarizing medium. Store fronts of heavy glass are rapidly dotting Main street in Everytown, glass wool is insulating new homes, and glass chairs and tables made their presence known at the world's fairs last summer.

Where will the glass industry lead us? To what new applications will ceramists apply this adaptable substance? Your guess is as good as mine, but we may be certain that glass has just begun to demonstrate its usefulness. If this is the age of speed, aluminum, and radio, then this is just as surely an Era of Glass! An ancient art *has* become a science.

G-E Campus News



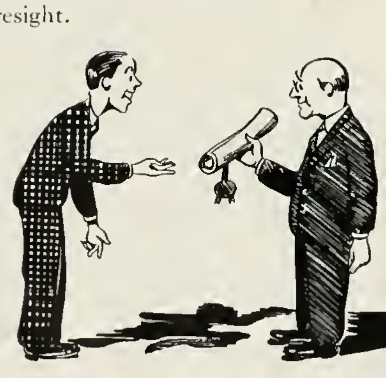
NETWORK TELEVISION

GENERAL ELECTRIC engineers passed another milestone on the road to large-scale telecasting when they recently demonstrated to the Federal Communications Commission the feasibility of network television.

Until a short time ago it was not thought possible to transmit television farther than the horizon. Recently, however, General Electric put into operation its new relay station, picking up programs originating in New York City — 129 miles away, more than a mile below the line of sight. The New York programs are then retelecast over General Electric's Schenectady television station W2XB to homes in the Schenectady-Albany-Troy area.

FOR OUTSTANDING ACHIEVEMENT

GRADUATES from seven colleges, five of them also graduates of General Electric's famous Test course, were among the 22 G-E employees who were given Charles A. Coffin Foundation Awards this year for accomplishments which reflected outstanding initiative, perseverance, courage, and foresight.



James R. Alexander, Jr., U. N. C. '24, received recognition for perfecting equipment (developed by Arthur W. Burns, who also received a Coffin award for his work) using an "electric eye" to control temperatures in cement manufacture; Florian A. Arnold, Purdue '25, for designing automatic welding machines used in making fractional-horsepower motor stators; William S. Bachman, Cornell '32, for improving tone reproduction in broadcast receivers; James E. Beggs, Purdue '31, for developing a loop antenna for radio receivers; Eugene W. Boehne, Texas A & M '26, and Leonard J. Linde, South Dakota State '29, for developing a high-current circuit breaker which does not use oil as an insulating medium; Kenneth K. Bowman, Kansas State '26, M. A. Edwards, Kansas State '28, and Francis Mohler, V. P. I. '26, for developing Amplidyne controls for high-powered motors; Adolph F. Dickerson, Texas A & M '10, for lighting the Golden Gate International Exposition; and Simon H. Weaver, Purdue '03, for developing a heat stabilizing treatment for steam turbine shafts.

PHOTOGRAPHING LIGHTNING

PHOTOGRAPHING lightning is almost like trying to turn around and face yourself. By the time you've turned around, you're not there any more. But while nobody has yet been able to look himself in the eye, General Electric scientists have photographed lightning and recorded the wave shape of lightning strokes.

With a high-speed cathode-ray oscillograph and a high-speed camera installed in the tower of the Empire State Building in New York City, Dr. Karl B. McEachron, a former G-E Test man, directs the study of the characteristics of lightning. The lightning stroke itself "pulls the trigger" and puts the complicated mechanism into operation in one-millionth of a second.

Records obtained in this way help General Electric engineers to build electrical equipment that laughs at lightning — keeps the lights on and the factories running when thunderstorms come.

GENERAL ELECTRIC

953-2C