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WISCONSIN ENGINEER

April, 1946

MBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Straight talk about your after-college job

No. 4. An Engineer's Job Should Be Exciting To Him

WHEN A MAN finds his work exciting, he will be stimulated to do his *best* work.

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If you like variety and enjoy meeting a perpetual challenge of doing the job better, you will find much to attract you to the Timken Roller Bearing Company.

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■ As an engineer for the bearing division of this company, you might one day be working on problems which would take you 25,000 feet in the air. And the next week, you might work 5,000 feet underground. In rapid succession, your job might shift from bearings for a machine tool, to bearings for an automobile, a farm tractor, a drilling rig, a locomotive or any product which has revolving wheels, or shafts.

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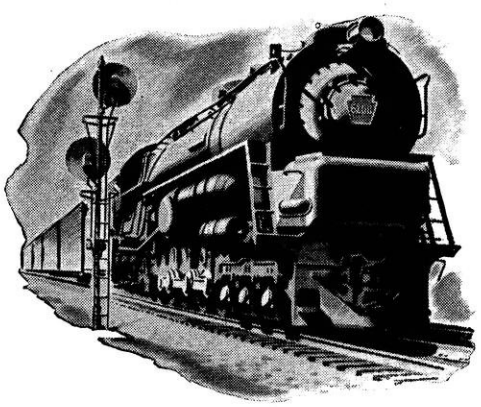
This spectacular accomplishment heralded the major electrification of railroads the world over.



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une in: JOHN CHARLES THOMAS—*Sunday, 2:30 pm, EST, NBC* • TED MALONE—*Monday through Friday, 11:45 am, EST, American Network*

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NEW FM - noiseless as the inside of a vacuum tube!

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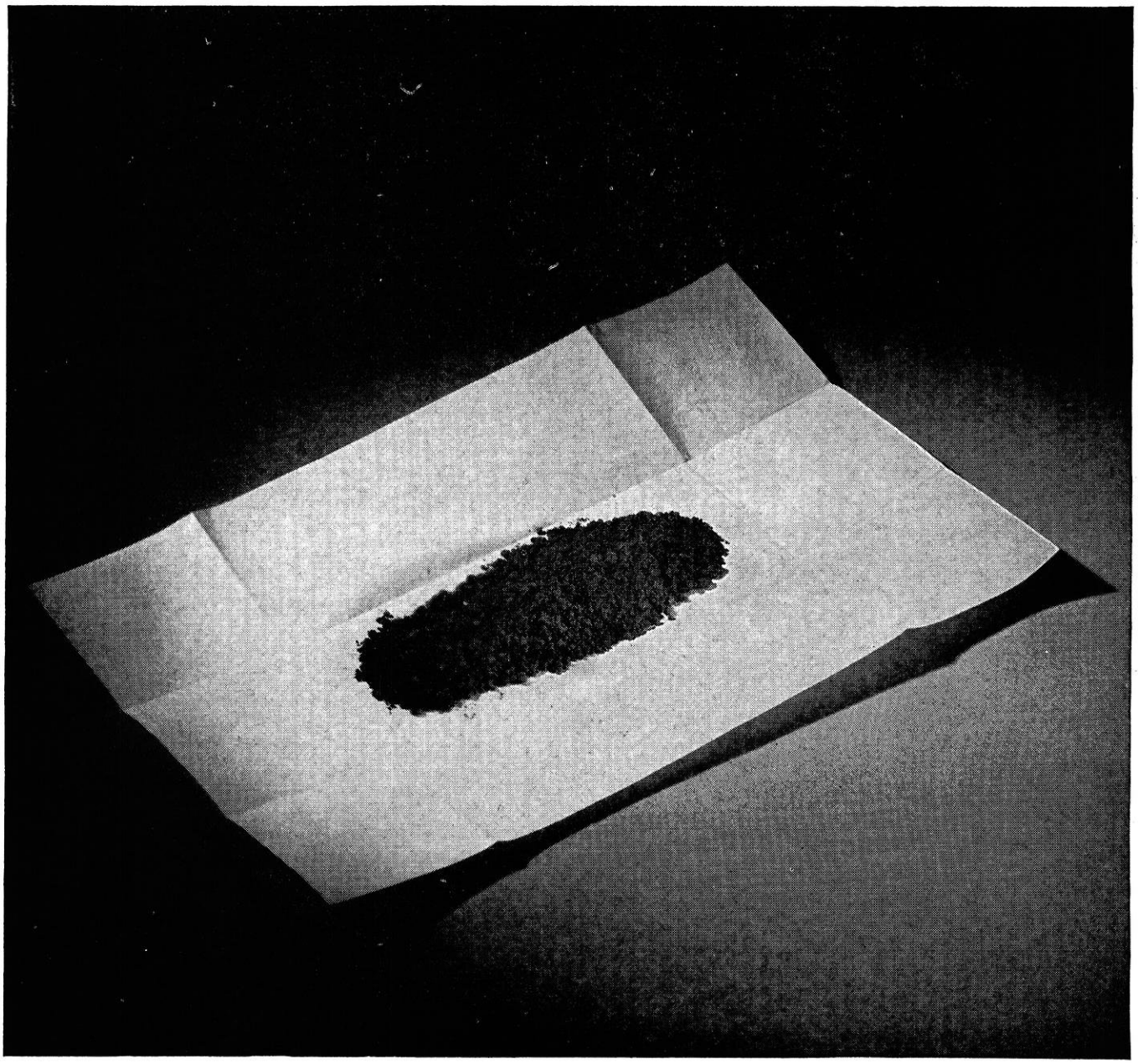
Moreover, through this new RCA development, FM receivers can be made at a cost comparable to that of standard-band broadcast receivers. FM is no longer expensive! "Better things at lower cost" is one of the purposes of RCA Laboratories — where similar research is constantly going into *all* RCA products.

And when you buy anything bearing the RCA Victor name — from a television receiver to a radio tube replacement—you know you are getting one of the finest instruments of its kind that science has yet achieved.

Radio Corporation of America, RCA Building, Radio City, New York 20. Listen to The RCA Victor Show, Sundays, 4:30 P.M., Eastern Standard Time, over the NBC Network.

Stuart William Seeley, Manager of the Industry Service Laboratory, RCA Laboratories Division, perfected this new FM circuit. It not only operates equally effectively with strong or weak stations, but lowers the cost of receivers by eliminating additional tubes and parts that were formerly considered necessary in Frequency Modulation receivers.

RADIO CORPORATION of AMERICA



Headache powder for industrialists

SEE this powder?

When formed under heat and pressure, it becomes *the hardest metal made by man,* CARBOLOY CEMENTED CARBIDE.

And Carboloy is doing more to help relieve production headaches in metal-working industries *than any other single factor in existence today.*

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This amazing metal *commonly triples the output of both machines and men.*

Carboloy is considered by authorities to be *one of the ten most important industrial developments of the past decade.* For example, it is being used in ever-increasing amounts to wear-proof parts subject to extreme abrasion.

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There's plenty here you can't see

YOUR TRAIN RIDE of the future may be a more delightful experience because of something you can't see in this picture.

The thing you can't see is the customary gap between the ends of the rails. You can't see it because it isn't there. For the rails, instead of being bolted together, are welded together into lengths of solid metal sometimes a mile long.

This is done by pressure-welding . . . by forcing the rails together at their ends in the heat of oxy-acetylene flames until they become a single, continuous piece, uniform in appearance, structure, and strength.

Pressure-welded track is being used increasingly by railroads because it cuts maintenance costs and provides a smoother, quieter ride for passengers.

Pressure-welding also is used by many other industries. Some use pressure-welding for the construction of overland pipe lines . . . some for the fabrication of machinery parts . . . some for making oil-well tools . . . and some are using pressure-welding to make airplane and automobile parts.

Pressure-welding is a research development of The Linde Air Products Company and The Oxweld Railroad Service Company, Units of UCC.

If you are a bit technically minded or just want to know more about this subject, write for booklet P-4 on Oxy-Acetylene Pressure-Welding.

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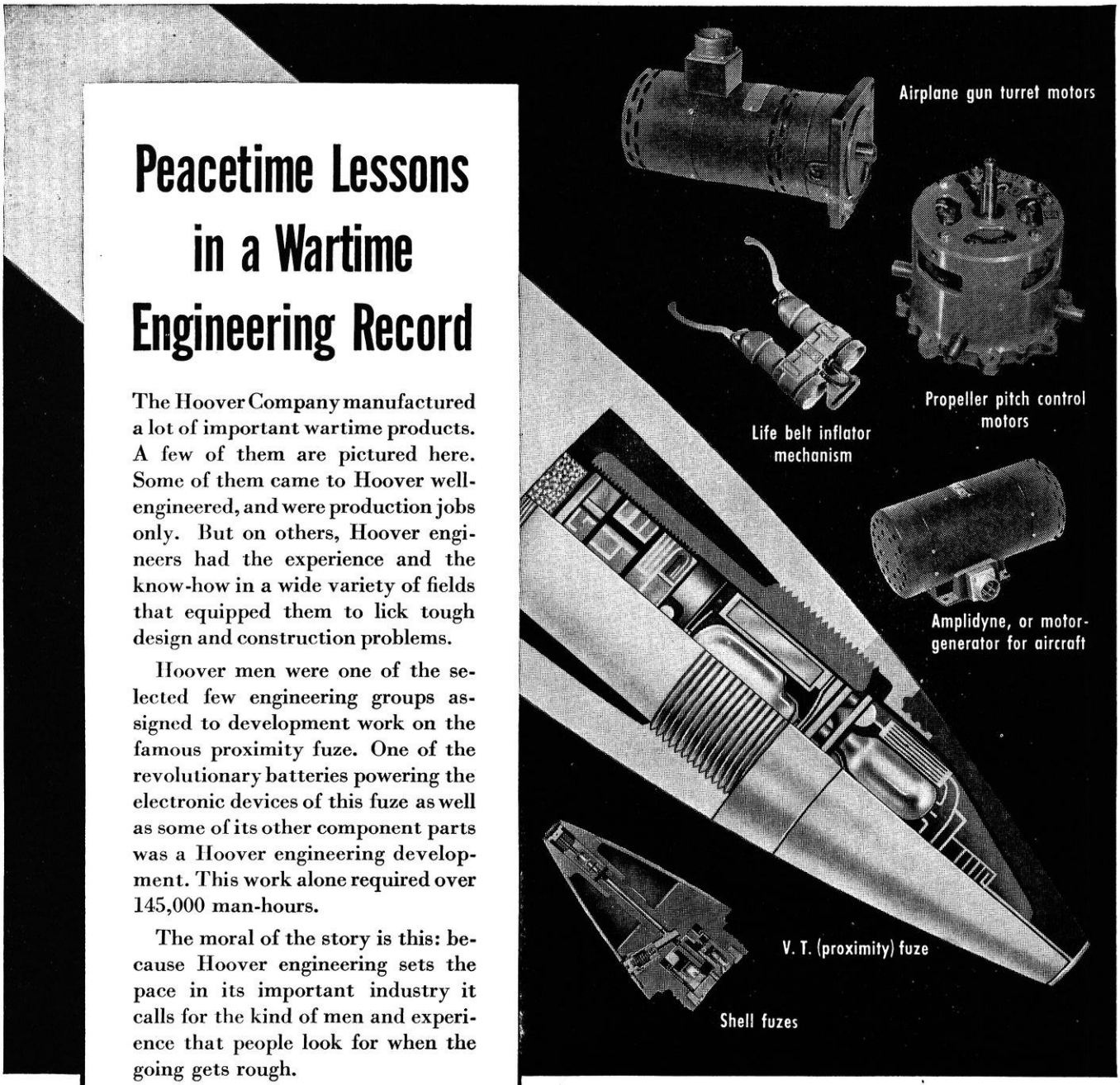
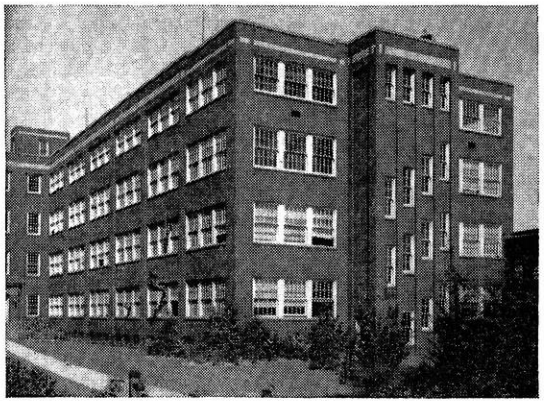
Peacetime Lessons in a Wartime Engineering Record

The Hoover Company manufactured a lot of important wartime products. A few of them are pictured here. Some of them came to Hoover well-engineered, and were production jobs only. But on others, Hoover engineers had the experience and the know-how in a wide variety of fields that equipped them to lick tough design and construction problems.

Hoover men were one of the selected few engineering groups assigned to development work on the famous proximity fuze. One of the revolutionary batteries powering the electronic devices of this fuze as well as some of its other component parts was a Hoover engineering development. This work alone required over 145,000 man-hours.

The moral of the story is this: because Hoover engineering sets the pace in its important industry it calls for the kind of men and experience that people look for when the going gets rough.





This modern four-story brick building, totaling 60,000 square feet of floor space and containing up-to-date laboratory equipment, is the Hoover Engineering Department.

The Hoover Cleaner is "born" in the development engineering division, where teamworking skilled designers, inventors and engineers plan tomorrow's electric cleaners.

The laboratory division studies and tests, rejects or recommends each component part of each new product "to be."

Mechanical engineers measure noise and vibration, design fan systems, study cleaning methods and solve power transmission problems in developing new designs.

Electrical engineers develop and test motors, wiring, switches, lamps, etc., designing the right power plant and electrical accessories for a Hoover.

Product engineers solve manufacturing problems, set up standards, see that Hoover quality is maintained.

THE HOOVER COMPANY • *North Canton, Ohio*

WISCONSIN ENGINEER

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In This Issue . . .

COVER:

Curtiss SB2C Helldiver maneuvering over a carrier. Note the deckedge elevator jutting from the carrier's midsection by which planes can be shuttled between hangar and flight deck with dispatch.

—Courtesy Westinghouse

7 OUT OF EVERY 10 SPOONFULS OF ICE CREAM YOU EAT ARE YORK-FROZEN!

Through all the years of its spectacular growth America's ice cream industry has called upon "Headquarters for Mechanical Cooling." Today, *seven out of every ten quarts of ice cream produced* are frozen by York refrigeration.

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York's leadership and experience are available to all who wish to improve quality and widen distribution through production efficiencies. York is prepared to give expert engineering counsel and provide the *right* equipment to do the job.

York Corporation, York, Pennsylvania.

YORK *Refrigeration and Air Conditioning*

HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885

York refrigeration air conditioning

ENGINEERS GAIN EXPERIENCE DURING WAR

—Gene Daniels e'46

ENGINEERING experience that was gained at some four thousand army posts scattered all over the world going to have a great peace time value. It was gained hrough the maintenance, operation, and repair of the rmy posts and will be especially valuable along lines of ivil engineering and city planning, as well as sanitation nd construction.

Direct supervision of all water and sewage facilities or the army lay in the hands of Professor Kessler, of he civil engineering department here at Wisconsin. He as the first University faculty member to be called o a defense task in Washington during World War II. He began his work in June, 1941 under the office of the uartermaster general, later through an act of Congress nder the Corps of Engineers.

"The first and most pressing problem that always onfronted us," said Professor Kessler, "was the operaon of the disposal plants at hundreds of camps. Those lready started before Pearl Harbor had been designed y good engineers—but they had been hurriedly built nd many did not have the proper idea of how efficient lants should be constructed; they had never been needed n such a scale before, and the design units for Army urposes were unknown."

Lack of trained sanitary engineers, presented a major roblem. Engineering problems also presented themselves, hich now have given the men who dealt with them the nowledge and experience that is of such value. Often en had to be found and trained to operate a plant in hirty days. Plumbers and electricians seemed to be ound easily, but the sanitary engineers had to be found nd trained.

Professor Kessler then set up a training program which ncluded courses for civilians and engineering officers, et up at a number of schools throughout the nation, makng use of all the training facilities that were available. Within two months after its inauguration, good engineers and operators were on their way to Army posts.

After December 7th, Kessler was transferred to the Corps of Engineers and placed in charge of the procurement and delivery of chlorine for sanitation purposes at the Army Camps, a necessity for disinfecting water, sewage, and dish water as an epidemic preventative.

The portable hypochlorite trailers which the Corps of Engineers designed to sterilize elevated water tanks and water mains for the posts was also used to protect persons affected by the Ohio Flood from epidemics. It worked so well that sanitation companies are now using the same principle. The apparatus is mounted on a trailer and forces a chlorine solution into the water system with practically no moving parts.

Of importance to cities was the work of the Corps of Engineers in conditioning water at 300 army posts so that boiler scale was absolutely inhibited and corrosion was effectively controlled. As an example of this method, the cost of repair on corrosion and scale-damaged water heaters was reduced from $385 per day to $15 at Camp Phillips, Kansas. This system is in use at Truax Field and they haven't had a water heater cleaned or repaired for 18 months.

Another development was that of several good grease traps. They paid for themselves in the saving of grease in about a year. The traps collected some ten tons of grease a day—all of vital need in the manufacture of ammunition.

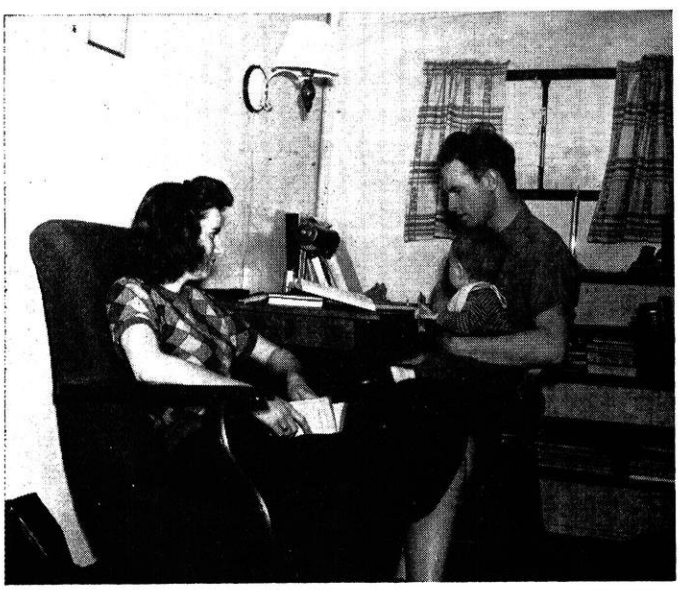
Professor Kessler is still a consultant for the Corps of Engineers but has returned to his work at the University, and is conducting research on scale and corrosion, as well as improving the Madison water system. "We will carry on fundamental research along those lines here at the University," he said.

The work of the Corps of Engineers is estimated to have saved the nation around eight million dollars in scale and corrosion replacement costs.

But not only was the work of the Corps of Engineers of tremendous importance in the winning of the war, but it is being carried on during the peacetime as well. Some of the work is being continued here at the University of Wisconsin.

CAMP RANDALL MODEL

"A VILLAGE within a city" — such is Camp Randall trailer camp, a small village within the city of Madison. This University housing project was started in the fall of 1945 to provide living quarters for some of the returning veterans and their families. Officials of the University foresaw an extreme housing shortage when veterans would return to Madison and begin classes, and such has proved to be the case. Camp Randall is just one of the results. There is also a University housing project at Truax Field and another at Badger Village which once housed workers at the Badger Ordnance Works. The trailers as seen from Randall Avenue are divided into two camps, the Camp Randall and Camp Monroe.



Mr. Phillip Johnson and Family

At present one hundred families are living in Camp Randall and one hundred five in the trailers comprising Monroe Trailer Camp. About one-fourth of the trailers of Camp Randall are three room, renting for $32.50 per month. The others are the smaller two room trailers which rent for $25 per month.

Living in one of the smaller trailers is Mr. and Mrs. Quentin Kuenzli. Mr. Kuenzli is a commerce student and will graduate in about a year and one-half. Mrs. Kuenzli is quite enthused about their home and thinks that although it wasn't too ideal in the winter, the fall and spring is exceptionally nice and now it is much like camping out. Although at first glance there might seem to be very little room, there is not much missing. At one end of the trailer is a day couch which will open up and form a double bed. It is possible to close a slide door and make two rooms. Thus Mr. and Mrs. Kuenzli have bee able to entertain overnight guests several times.

There is also a small stove and oven. At my visit, Mrs Kuenzli had a roast on the stove and if it tasted as goo as it smelled, it must have been wonderful. A small o burner is also in the room which gives off enough hea to keep the trailer warm even during the coldest day of the winter. Oil, ice, water, and electricity are all fur nished for the veterans and their wives and families wh live here. One of the disadvantages though is the lac of running water. This must be carried in. There is laundry and bathhouse to accommodate every few fam lies—plenty of hot water is always available in th laundry.

Mrs. Kuenzli is also very enthused about the prospect of a small garden this spring. Small gardens can be put i near their trailers and she plans on brightening the ap pearance of their home with some flowers and perhap a few vegetables.

Mr. and Mrs. Mark Smith and their son Matt live in three room trailer. Mrs. Smith seconded everything sai by Mrs. Kuenzli about living here in Camp Randal While Mrs. Smith has her hands full during the da knitting and taking care of Matt, Mr. Smith is takin up engineering. He is a CE I, having started in the No vember semester.

Mr. and Mrs. Merlin Eggens

These three room trailers are quite a bit larger tha the others, being furnished with a couch, which will ope

COMMUNITY

—June Hartnell e'46

nto a double bed, a double bed, a table and four chairs, nd a desk. The Smiths had put up curtains which would ive Matt a little room of his own.

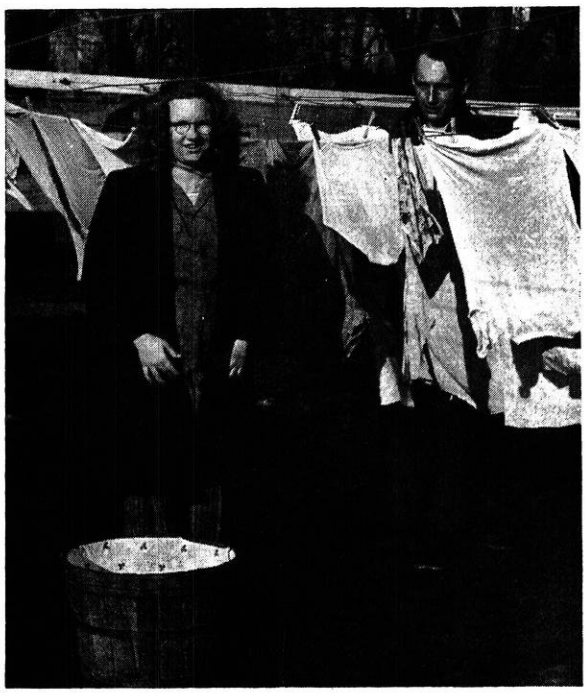
Linda and John Schelreep

Of course, Camp Randall has its own government. At present Mr. Fischer is the mayor. The elections take place every semester, and the office can be held by the same man for only two terms. There is also a council, one councilman being elected from each block. The council meets every two weeks and at that time if there are any complaints or suggestions, they are dealt with at that time.

One of the most noticeable things about this small community is its friendliness. They are young couples, who get along with each other. And still they aren't left out of the social life of the University. Girls from the YWCA stayed with the children of all couples who wished to go to the Prom. Now they themselves are planning a formal dance of their own which will be held on April 20th.

Of course these trailers are not meant for permanent homes. The University has done what it can in the face of difficulties to provide housing facilities for the returning men. It has had to restrict the enrollment, but has done its best to provide room for as many men as possible. One means of alleviating the housing situation was the purchase of these trailers which now comprise Camp Randall and Monroe Trailer Park.

Camp Randall trailer camp is a fine community. It's got lots of spirit! The men who are staying there with



Mr. and Mrs. Robert Tibikan

their wives and families are especially desirous of securing an education and to many of them who could not find a place to stay in Madison, this project has been a miracle they did not expect to find.

Returning Home

ENGINEERING ON THE FLAT-TOPS

—D. F. Doeller e'47

THE Navy has recently issued information concerning a development on her carriers which shows again how the engineering brain-power of this country contributed to the victory.

Before the war we all knew that carriers delivered their planes to flight and hangar decks by means of huge elevators placed in the center of the ship, one forward, one aft. Most of us did not know the disadvantages of these elevators. There were some. For instance, when planes were being prepared for taking off, they became bunched up around the elevator openings. The same thing happened when they landed. The deck crews couldn't handle them rapidly enough with the existing lift system. The result of the crowding was restricted use of the flight deck. Another disadvantage lay in the fact that any damage to the elevator, either immobilizing it or leaving a huge 40 foot square hole in the center of the deck, would cause the entire flight operation to be discontinued.

Shortcomings Realized

The Navy knew these facts and realized that something would have to be done to improve the speed and dependability of operation. Accordingly, in December, 1940, the Navy asked E. M. Bouton, manager of engineering for the Westinghouse Elevator Division, to design a new elevator to replace the conventional type. Three months later the designs were ready.

They presented an entirely new idea. The plane transfer is accomplished by means of a deck-edge elevator, one which operates outside the hull and opposite the superstructure. The planes are towed off the flight deck onto the platform, lowered to the level of the hangar deck, and towed in through a 60x20 foot hole in the side plating. This opening closed by sliding doors. The lift platform is 34x60 feet and will carry two light or one heavy craft. To allow the mammoth ship to navigate the Panama Canal, the platform is mounted so it can be folded up along the side of the ship. Heavy, special-steel rollers on the inboard edge of the platform run in two vertical guide rails which are attached to the framework of the ship. Power is applied by eight 1⅛ inch steel cables running through various block and tackle arrangements to either end of a huge hydraulic piston and cylinder assembly. Oil is led to the cylinder from two compression tanks where it is kept at 850 pounds per square inch by two 150 h.p. electric motors operating variable-stroke pumps. Three hundreds pounds is the maximum power drain at any time on the ship's electrical system. Use of oil under pressure enables the elevator to make one complete round trip on stored energy in case of damage in the middle of a trip.

Elevators Radicalized

The designs were approved and put into the plans for the U.S.S. Essex, then building at Newport News. Shortly after Pearl Harbor the Navy advanced the date of launching. At the same time the designers learned from Navy experience under battle conditions that carriers operating in heavy seas at high speed frequently heeled over so far that a deck-edge elevator would be submerged. The impact and the drag would create terrific stresses on the broad, flat structural members provided for in the design. Also, there would be great up and down stresses as the platform was first slapped onto the water, then lifted against the weight of the tons of water as the ship heeled over in the opposite direction. So the designs were done over. This time they called for the use of pipe—pipe of special-alloy steel. The joints were welded and ground smooth. All this was to reduce drag as the elevator slid through the water.

Battle Proven

The advanced launching date set by the Navy was December 30, 1942. Redesign and reconstruction raced against time; by December 28, 1942, the elevator was completely installed and ready for use. Navy tests proved the new idea acceptable in every respect, and no further changes were made. To this development has been given much credit for the increased speed of plane handling that was so necessary in the latter part of the war as our carrier task groups ventured deep into enemy waters. This same type elevator is being installed on the new, giant Midway class carriers.

Engineering Societies

—Milly Smith m'46

A. I. Ch. E.

The following officers were elected for the spring term: President, Raymond Meisekothen; Vice President, Treasurer, Robert Moll; Secretary, Glen Stenman. Walter Thomas was appointed program chairman.

Plans for a membership drive and the April program were discussed.

Refreshments of beer and pretzels were served.

—R. J. Meisekothen

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MINING CLUB

After the war years of inactivity the Mining Club has been reorganized with a vengeance. The membership includes all the students in the department and has been well represented at the meetings.

The first meeting was devoted to the reorganization. Officers elected were: President, Jim Jude; Vice-President, Ralph Hoefs; Secretary-Treasurer, Robb Warren; and faculty sponsor, Phil Rosenthal.

A short afternoon business meeting was held in February for the purpose of electing Polygon Board representatives and the club's candidate for St. Pat of 1946. Don Paynter and Ralph Watson were elected to Polygon Board and Bob Dustrude was elected the St. Pat candidate.

The March meeting featured a review of the present iron ore situation by Dr. S. A. Tyler of the Geology Department. He emphasized the fact that much of the supply of high grade iron ore was sadly depleted during the war, forcing producers to use the more expensive low grade deposits. Mr. Barker informed the club that Mr. Brewster, General Superintendent of Wisconsin Steel Co., had been appointed club sponsor by the executive board of the AIME. It was voted that Mr. Brewster be invited to address the club at its April meeting as part of the freshman orientation program.

—Ralph Watson

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A. S. C. E.

The March 12, 1946 meeting of the American Society of Civil Engineers was held primarily to elect officers for the present semester. New officers are: President, Ray McVeigh; Vice-President, Harland Skatrud; Secretary, Edward Rein; Treasurer, Donald Frazier; Polygon Board, Edwin Rein.

The St. Pat's campaign was discussed and a smoker for all civil engineering students was planned for the near future.

—Edward Rein

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TAU BETA PI

The main business of the February meeting of Tau Beta Pi was the election of new officers. The results of the balloting showed: President, William Sherman; Vice-President, Warren Ferris; Corresponding Secretary, Edwin Fischer; Recording Secretary, David Doeller; Cataloger, Richard Laubenheimer. The men will serve for the remainder of this term.

Wisconsin Alpha is proud to claim the membership of Warren Stewart, November, 1945, who was recently honored by the University of Wisconsin as the high-point student of the fall term. We claim, also, Ensign Douglas Kerr, February, 1946, whose outstanding record of 3.0 throughout his college career merits highest praise.

—David F. Doller

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PI TAU SIGMA

Election of officers was held at the last meeting of the Pi Tau Sigma, honorary mechanical engineering fraternity. The following were elected: George Hlavka, President; Donald Hyzer, vice president; Robt. Neitzel, secretary. Dan Allison will continue as treasurer for another term.

—R. E. Neitzel, Secretary

•

Officers of A. I. E. E. for the present semester are: Chairman, Neil Lockwood; Vice-Chairman, Howard Jordan; Secretary-Treasurer, John Drnek; Polygon Board, Joe Vanko. The A. I. E. E. candidate for St. Pat was Ed Ansel.

The smoker of March 14 was held in the "Old Madison" in the Memorial Union. Professor Tracy gave a short explanation of AIEE. Boxing coach DeWitt Portal gave an interesting summary of the development of boxing as a recognized sport at Wisconsin and other major universities. His "Casey at the Bat"—complete with bat—was well done. Pictures of the Penn State bout

(continued on page 20)

LORAN

—Roger W. Robbins e'42

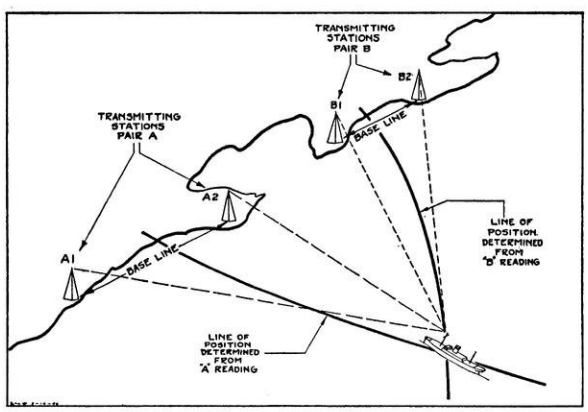
IN THE past navigators have depended upon dead reckoning, celestial calculations and radio direction finding methods for determining geographical positions at sea. While radar makes such methods unnecessary as long as charted above-water objects are within the limited operating range of the radar set, it does not fulfill the navigator's requirements when no "targets" are available and when nothing except the sea surrounds the vessel for miles in all directions. It is under these conditions and particularly when foul weather renders celestial navigation impossible that a dependable long range navigational device is most needed—a device by means of which the navigator can at any time quickly and accurately ascertain the vessel's geographical position. During the war LORAN (LOng Range radio Aid to Navigation) was designed and developed to serve this purpose.

Loran consists of a vast network of radio stations, electronically timed, which establish an infinite number of lines of position over the major oceanic shipping lanes of the world. To date the American, British, and Canadian governments are operating more than 60 loran stations, the operating ranges of which blanket over three-tenths of the earth's surface and provide positioning accuracy to within a few thousand feet. Furthermore, it is expected that various other nations will cooperate by providing new service in those areas which they control.

These loran transmitting stations operate on frequency bands just above the broadcast band, 1950, 1850, and 1750 kilocycles, and are synchronized in pairs. The "master" station of each pair transmits pulses of approximately 80 microseconds. These pulses serve two purposes: (1) to synchronize each pulse of its twin, the "slave" station; (2) to "trigger" the "stop watch" receiver aboard ship. The "slave" station, upon receipt of a pulse from the "master" station and after waiting for a predetermined time which is necessary to establish correct loran synchronization, transmits its own pulse.

Since these radio pulses travel through space at uniform speed (186,000 miles per second), by measuring the time interval between reception of pulses at a point within the operating range of the pair, it is possible to establish what is called a "line of position"; that is, an imaginary line on the surface of the earth at every point of which the time interval between receipt of that pair of signals is exactly the same. The loran receiver, used by the mariner, is designed to measure the time interval. Having this time interval, the navigator can consult a loran chart which shows the various "lines of position" drawn on a navigational chart of the particular area in which the vessel is operating, and he can select whichever "line of position" corresponds to the recorded time interval.

In order to determine at what point on the selected "line of position" the vessel is located, the navigator must select with his loran receiver other pulsed signals trans-



mitted by another pair of loran transmitters, record the time interval, consult the loran chart to obtain the "line of position", and mark that point on the chart at which the "lines of position" of the two loran pairs intersect. That point is the position of the vessel.

Fundamental to the successful application of the loran system is the method employed by the receiver to identify each pair of transmitting stations. In any particular region serviced by loran, each pair of stations has its own specific repetition or recurrence rate; that is, there is a certain interval of time between each pulse transmission which can be measured by the receiver. The operator of the loran receiver aboard ship has a key to these pulse rates, so that, on his loran chart, he can locate the pair of stations to which his receiver is tuned.

The features which make loran a highly regarded supplement to the art of navigation are inherent in the technology of the system itself. Since radio signals travel through space at the constant speed of light, the loran system stems from a firm and proven scientific principle

(continued on page 26)

"Oscar" Attends St. Pat's Dance

CELEBRANTS trampled each others' toes with vigor at the most successful St. Pat's dance in many years. March 16 was the date, Great Hall was the place, Peggy King provided music, and St. Pat was the hero, not to mention "Oscar," the engineers' mascot. Attendance skyrocketed at the eleventh hour to over 500 as Polygon

Board again broke tradition by inviting all students, even the lawyers!

A green and white color scheme was set off by a large shamrock formed of the St. Pat buttons we know so well. Ed Rein claims it took him nearly all afternoon to pin up the hundreds of buttons used. Girls, he should be handy around the house now! Most intriguing was a huge figure covered completely by a white shroud. No one could guess what it represented until at a signal the curtain was whisked away—there stood our long lost "Oscar!" Not being a very loquacious type of steam man he wouldn't say where he'd been so long but the very large and very red nose he sported was evidence enough that not all his time had been spent in studying the Criminal Code.

During intermission the one and only Mr. Leonard Rall, as M. C., treated the crowd to his vivid description of law and lawyers. Who would have suspected there were so many jokes in the University catalogue? He also announced the winner of the St. Pat contest; but not before heckling the boys a bit concerning their ingenious methods of selling their quota of buttons and tickets. ME Art Schmitt received the cup amid tremendous applause. Mr. Rall then turned his searching eye and sharp wit on the various beards of assorted shapes and colors presented by their blushing owners, the candidates in the beard growing contest. He next called up the judges, Badger Beauties, Kay Markward and Mary Lou Peyla, and that Irishman they kicked out of Ireland, Roundy Coughlin, alias the Sage of Mendota. Roundy wouldn't be satisfied with anything less than a green beard but since none was available he relented and agreed that Bob Dustrude's red one should certainly be first. Bob, Ed Ansell, and Bill McCoy each received a five dollar merchandise certificate from the Co-op, Brown's, and the Student Book Store.

Preface and Patter

—K. Hoelzel e'48

PREFACE:

Now that the month of March is over and the engineers have again put the lawyers in their place for the year, we'll start concentrating on our studies . . . it says here. But spring is here and that's when a young man's fancy turns to the thoughts of playing marbles . . . or something just as invigorating.

We're glad to see so many entering and re-entering veterans in the "engine school." By next fall everything will be back to normal. It'll seem strange to start and finish school with the L. S.

PATTER:

It's a pity to have girls in Mr. Leonard Rall's Econ classes. All the fellas have to miss the best of his jokes. Once in awhile he slips, though.

To the freshmen who have instructor-student Art Schmitt for mechanical drawing and buy he and his girl, Gig, beer: It won't work.

Ex-gob "Bucky" Kohnen has a rough schedule this term . . . no afternoon classes in the M. E. building . . . and it's too far to walk from the Union to the B. T. So he'll have to drink 3.2 for awhile and like it.

Electronic Navigation

—R. V. Meisekothen ch'46

A COUPLE of pencil points of light on a fluorescent screen, measuring time in millionths of a second, have given airplanes and surface ships, for the first time in the history of navigation, a means of plotting their positions almost instantaneously. This is an improvement over the Air Position Indicator described in a previous article, because it gives the ground position of the plane directly, whereas the air position indicator determines only the position of the plane in the air mass. A navigator fast with his fingers can find out where he is in less than 30 seconds.

This war-born system is called "Loran", (LOng RAnge Navigation). It is in the radar family of war miracles.

One of the most tightly held secrets of the war, loran consists of a vast network of radio stations which in effect spread into space on electric stop watch accurate to a millionth of a second. By means of a little box, which aboard airplanes weighs only 35 pounds and should cost about $500 in peacetime production, dancing green lights on a cathode ray tube read by the navigator allow him to place the location of his craft with as great accuracy as is provided by celestial navigation based on the stars or sun.

Secret Weapon

First put into actual operation late in 1942, loran was one of the secret weapons in fighting German submarines in the Atlantic. Later, as the war was carried to other parts of the globe, loran went to the fighting fronts in the air and on the sea with its radio impulses extending over enemy-held territory in order that bombers and ships alike might navigate safely.

Now 70 loran stations spray their signals over three-tenths of the earth's surface.

Loran is not radar, but it does use radio. By comparing two radio signals from stations separated by about 400 miles, a navigator can locate exactly the position of the craft on the sea or in the air. Simple charts or tables are used.

The determination of position is based upon very accurate measurement of the difference in the time of arrival of signals from two radio stations operating on a frequency just above the broadcast band. The part of the radio spectrum used is that formerly used by amateurs. Signals of the two transmitting stations are precisely synchronized.

The loran receiver determines with great accuracy the difference in the time at which the two signals from the loran transmitting stations are received. Curves are printed on a navigation chart showing the loran lines of position for various time differences. These sweep around the transmitting station's location in the form of hyperboles.

Since the areas of frequent travel by ships and planes are blanketed by the loran signals from several transmitters, the navigator can determine three or four or more such lines of position. Where these lines cross gives the point known as a "fix" which represents on the navigating chart just where the craft is located.

In the daytime loran can be relied upon for 700 miles from the transmitting station, while at night, thanks to the reflections of the signals in the 160-meter band by the ionosphere, reliable determinations of position can be made at twice the maximum daytime range of the transmitters.

Used on B-29s

The B-29s that bombed Japan, including the areas of the atomic bombs, were guided on their missions by loran. Altogether about $100,000,000 was spent on loran equipment and installations, but most of this expenditure can be considered an investment for use in building up a world navigation system for sea and air.

Only the most severe electrical storms which create a large amount of static will make loran unusable, and accurate positions can be determined even under conditions when other radio signals cannot be deciphered.

In speed of use and accuracy loran is called far superior to any other system of navigation—celestial, radio triangulation, radio beam, and even other adaptations of radar. It is far and away better, of course, than such devices as dead reckoning. But it has its drawbacks.

High Cost

Loran is very expensive. It took $100,000,000 to get it developed and installed. To operate a station cost approximately $100,000 a year and about $8,000,000 would be the world cost of providing this essential and superior navigation aid. In addition trained personnel is required to maintain the ground stations.

Along with radar, loran promises to be one of the most important applications of electronics to safety on the sea and in the air. Not only does it provide continuous safe navigation, but permits greater payloads through lower fuel reserve by aircraft.

Bits in The News —

WRITERS ! !

The American Welding Society has announced the A. F. Davis Undergraduate Welding Award. This award will consist of four cash prizes given annually to authors and publications for the best and second best articles on welding published in undergraduate magazines or papers during the preceding year. Any undergraduate of a college or university or institute of technology in the United States or Canada is eligible, but the paper must appear in an undergraduate publication. The awards are as follows: $200 to the author of the best paper and $200 to the publication, $150 to the author of the second best paper and $150 to the publication it appeared in.

The subject matter of the paper may be on any phase of any type of welding or its application to design and construction.

It must be published in the interval between July 1st of one year and July 1st of the succeeding year. Awards are given each year at the fall meeting of the American Welding Society.

•

HAS JOHNNY GOT THE MEASLES?

New germicidal lamps, which bring ultraviolet benefit indoors are now being used to combat diseases,—disease that is caused by such germs as give Johnny the measles. Such lamps are finding their place in home, school, and industry, and even in the chicken coop!

These lamps duplicate the germ-killing ultraviolet energy of the sunshine and outdoors. Organisms ranging from old spores and yeast cells to pathogenic germs and viruses are killed by the lamps lethal radiation, created by an electric current passing through mercury vapor at low pressure.

•

THE DEAF CAN LEARN TO TALK

Dr. Ralph Potter of the Bell Telephone Laboratories will some day be able to use the telephone and enjoy radio programs by seeing the sounds of speech, music, and the like without using an interpreter.

Several devices for translating sound into visible, easily understood patterns have been developed. As yet the experiments are in the experimental stage, but it seems reasonable to believe that soon a deaf person will be able to carry on a telephone conversation, the speech patterns from the party at the other end appearing on a moving drum of phosphorescent material.

•

LARGEST TURBINE-GENERATOR OF THE WORLD

A 100,000 kw turbine generator is the largest of its type in the world. It will operate at 3600 rpm, is 77 feet long, and 17 feet in maximum width at the floorline. The shaft length will be 75 feet. At present this turbine-generator is under construction at the General Electric Company.

Steam will enter the turbine at 1250 psi and at a temperature of 1000 degrees F. It will pass through a series of bucket wheels, push against some 4000 blade-like projections known as "buckets" (which will rotate at a speed greater than 1300 fps) and cause the turbine rotor to rotate at its high speed, thus driving the generator.

•

INTERESTING—

The work that is contained in one kilowatt-hour of electricity is equal to the energy of 1,000 Garand or Springfield rifle cartridges, or equal to a man climbing to the top of the Washington monument 35 times.

—Science Digest

•

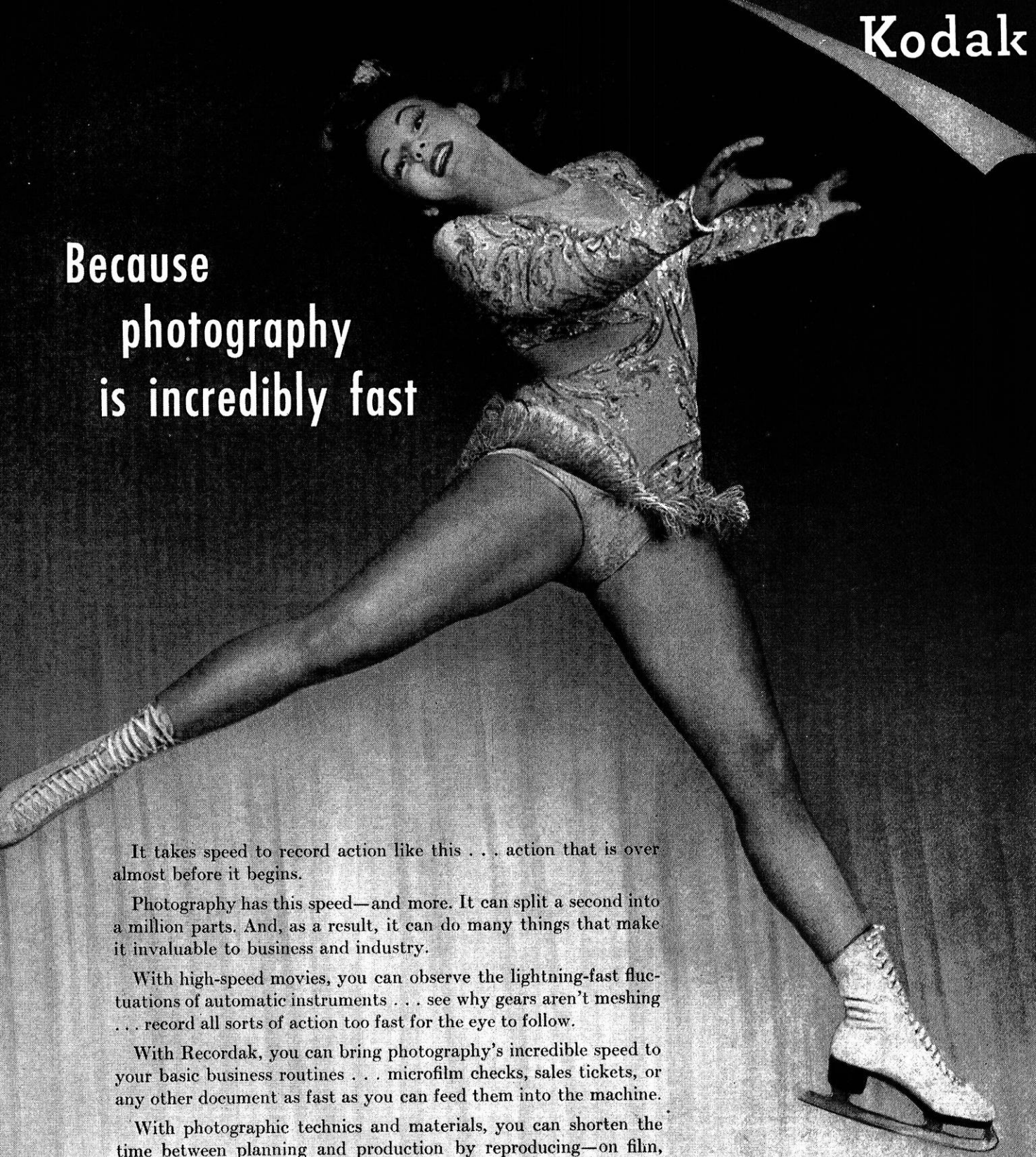
IMPROVED PHONO RECORDS

Although in the future, phonograph records may be magnetized wires instead of discs, improvement has continued on the discs. A plastic material, which has recently been announced makes these discs practically indestructible. It can be bent around corners, but springs back into shape; dropping and other mistreatment that ordinarily results in broken records, is reported to have no effect on these new plastic records.

•

DDT FOR DOG SOAP

The use of DDT for dog soap is promising to eliminate fleas. It has already been shown that DDT used for treating clothing has given the clothing an insect-banning power even after several washings.



Because photography is incredibly fast

It takes speed to record action like this . . . action that is over almost before it begins.

Photography has this speed—and more. It can split a second into a million parts. And, as a result, it can do many things that make it invaluable to business and industry.

With high-speed movies, you can observe the lightning-fast fluctuations of automatic instruments . . . see why gears aren't meshing . . . record all sorts of action too fast for the eye to follow.

With Recordak, you can bring photography's incredible speed to your basic business routines . . . microfilm checks, sales tickets, or any other document as fast as you can feed them into the machine.

With photographic technics and materials, you can shorten the time between planning and production by reproducing—on film, paper, or on the fabrication material itself—even the most complex drawings, charts, and layouts in a matter of minutes.

Stop here . . . and you only scratch the surface of what modern functional photography can do for plant and office operations. But go one step further... send for our new booklet, "Functional Photography"... and you'll really begin to get some idea of its present-day usefulness. This booklet is free. Write for it.

EASTMAN KODAK COMPANY, Rochester 4, New York

ADVANCING BUSINESS AND INDUSTRIAL TECHNICS— **Functional Photography**

ENGINEERING SOCIETIES

(continued from page 13)

were shown. Refreshments were served.

The following evening Mr. J. A. Travillo, assistant secretary of Underwriters' Laboratories, Inc., gave an address on "Functions of the Underwriters' Laboratories of Interest to Electrical Engineers" at the Madison section meeting.

Doctor Leedy of Armour Research Foundation gave a talk on wire recorders at the previous Madison section meeting on February 26th. The recorder and slides showed the amazing ruggedness and fidelity in wire recorders which should make them invaluable supplements to present means of recording.

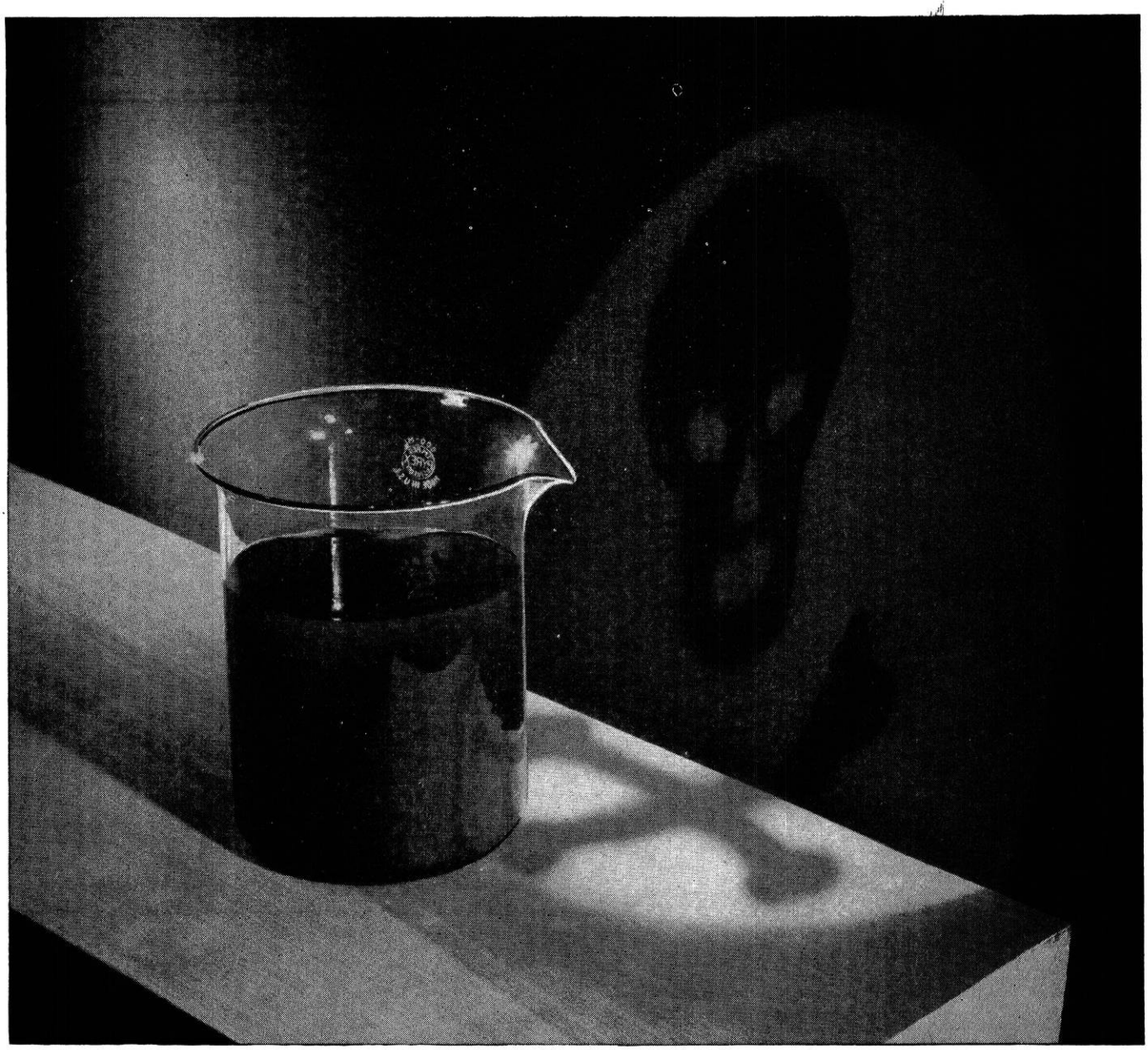
—John L. Drnek

POLYGON BOARD

With only one holdover from last semester, Polygon Board started to carry out the plans laid out for the St. Pat's Dance. The officers for the new semester are: President, Ray McVeigh, C. E. 4; Secretary, Neal Lockwood, E. E. 4; and Treasurer, Jack Roeber, Ch. E. 4. Jack was the only member from the previous semester. The rest of the members of the board are Edward Hillery — M. E. 2, Don Hyzer—M. E. 4, Joe Vanko—E. E. 4, Ray Meisekothen—Ch. E. 4, Ed Rein—C. E. 3, Don Paynter—M. & M. E. 3, and Ralph Watson—M. & M. E. 4.

The big business of the month was the St. Pat's dance and contest. The dance was held March 16, 1946, from 9 to 12 in Great Hall of the Memorial Union. To draw out the engineers, the music was furnished by Peggy King's all girl orchestra. Unlike previous St. Pat dances, it was open to all students, including lawyers. This year, prewar traditions of a beard growing contest, St. Pat's buttons, and the crowning of St. Pat were revived.

—Neal Lockwood, E.E. 4, Secretary



WHAT KIND OF POISON IS THIS?

SOME POISONS ARE KILLERS. Others are preservatives. Creosote is one of the "others" . . . a protective agent which preserves timber against the attacks of decay, termites, and marine borers. Those destructive agents cause millions of dollars worth of damage every year . . . but when wood is pressure-treated with creosote, it becomes toxic to them.

Koppers pressure-treats about 50,000 carloads of lumber and other forest products every year. Its creosote treatments baffle decay, termites, and water worms. Other specialized treatments make wood resistant to acid and abrasion, as well as to decay and fire.

The result is that wooden structures of all kinds . . . bridges, farm buildings, railroad ties, telephone poles . . . all last more than three times as long as they used to. And this, in turn, helps to conserve America's invaluable forests.

Wood preserving is only one Koppers activity. Koppers also makes paving and roofing materials, designs and builds coke ovens, manufactures piston rings, couplings, chemicals from coal and engages in many other activities. That's why Koppers is known as "the industry that serves all industry." Koppers Company, Inc., Pittsburgh 19, Pa.

The industry that serves all industry . . . KOPPERS

Short Circuits

—Dick Papke m'47

Golf is a game in which a ball 1½ inches in diameter is placed on another ball 8,000 miles in diameter. The object is to hit the small ball and not the large one.

•

Personnel Director: "Do you have references?"

Applicant: "Sure, here's the letter—To whom it may concern: John Doe worked for us one week and we're satisfied."

•

—Successful Engineer—

"Could you give me a raise of salary Sir? Three other companies are after me."

"What companies?"

"Gas, electric and telephone, sir."

•

"Hear about the tragedy?"

"What was it?"

"Engel stuck his head into the Red Dog Saloon and hollered 'fire'."

"Well?"

"They did."

First Lawyer: "Why is your hand all bandaged up?"

Second (Naturally): "I put my hand in a horse's mouth to find out how many teeth he had; and the horse bit me to see how many fingers I had."

•

"Give me a cigarette, Joe"

"I thought you had quit smoking."

"Well, I got to the first stage; I've quit buying."

•

A soldier who had just returned from an attack with a German helmet slung over his shoulder.

"I had to kill a hundred Germans for this," he announced.

"Why," asked his buddies.

"Had to get the right size," he answered.

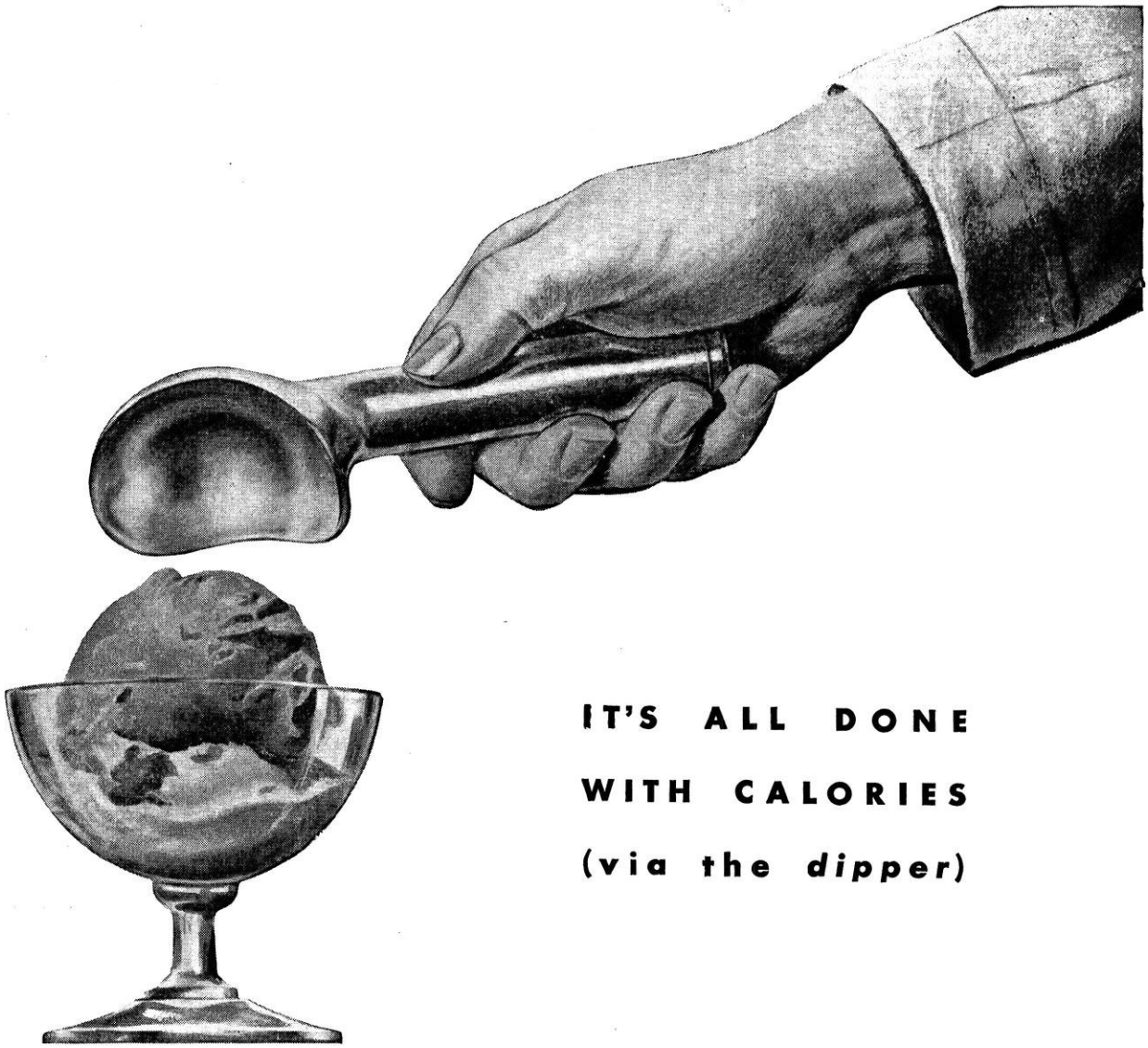
•

"Sir, I have neither pencil nor paper."

"What would you think of a soldier who went to battle without rifle or ammunition?"

"I would think he was an officer, sir."

(continued on page 26)



IT'S ALL DONE WITH CALORIES (via the *dipper*)

There's been an endless parade of mechanisms to eject ice cream from dippers.

But somebody noodled... "Why not make a dipper with no moving parts?" Make it so that calories of heat from the user's hand shoot right down the handle to the cup. Then the ice cream will drop out easily.

That called for a material that transfers heat fast. So the dipper was made of Alcoa Aluminum, and the hollow handle filled with liquid. And, by golly, it worked . . . perfectly. The dipper sells.

No "Einstein" at work here . . . just plain American ingenuity of the kind graduated every year from our colleges and universities. Imagination plus engineering . . . or "Imagineering" as we like to call it at Alcoa . . . did the trick.

This is just one example of invention and adaptation of things *aluminum* . . . of men with ideas working them out in this versatile metal. Men who do this often draw upon the greatest fund of aluminum knowledge in the world . . . Alcoa's. ALUMINUM COMPANY OF AMERICA, Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

SHORT CIRCUITS . . .

(continued from page 24)

Voice from the rear seat of the Cab: "Hey, driver, what's the idea of stopping here?"

Driver: "Thought I heard someone say 'stop' ".

Voice from the rear seat: "Drive on, she isn't talking to you."

•

A soldier asked his colonel for leave to go home to help his wife with the spring house cleaning.

"I don't like to refuse you," said the colonel, "but I've just received a letter from your wife saying that you are of no use around the house."

The soldier replied: "Colonel, there are two persons in this regiment who handle the truth loosely, and I'm one of them. I'm not married."

•

"What makes you think your boy friend is conceited?"

"He joined the Navy to let the world see him."

•

An old planter and one of his faithful workers were discussing the hereafter.

"Sam", said the boss, "if you die first, I want you to come back and tell me what it's like over there. If I die first, I'll come back and tell you what it's like.

"Dat suits me fine, sah," replied the old Negro, "but effen you die fust, Ah wants you to promise me you'll come back in de daytime."

LORAN . . .

(continued from page 14)

in which reliability is inherent. Under most conditions of severe weather, atmospheric electrical disturbances obscure the loran only for a few seconds at a time, so that the navigator is able to obtain usable data during the time interval between disturbances. Atmospheric conditions do not affect the accuracy of the system. However, they have been known to render the system useless, but usually only for a short period of time—several hours, perhaps.

Loran fixes are readily obtainable at long distances from the transmitting stations, the daytime dependable range being 750 nautical miles. At night, of course, the dependable range is increased to nearly double the daytime range.

As far as operation of the receiver is concerned, it is quite simple, and navigators may be trained in loran technique in a few days of study and practice. Experienced operators usually require from 2 to 3 minutes to establish a loran fix.

Loran, by improving the efficiency of long-range navigation, permits savings in fuel and savings in running time between ports which will pay the cost of the loran receiver and installation in a short period of time. Furthermore, safety at sea is greatly increased through loran, and, in case of disaster, rescue operations are direct and prompt. Little time is lost in locating a vessel in distress when its loran position has been sent out by radio through international distress channels. This increase in safety at sea will probably be reflected in reduced insurance premiums as peacetime application of loran becomes widespread.

Policeman: "How did the accident happen?"

Motorist: "My wife fell asleep in the back seat."

•

"Angel face, say hello to your Aunt."

"I hate choo. I hate choo. I hate choo."

"Baby dumpling, that's not nice. Say hello to your Auntie."

"I hate choo. I hate choo. I hate choo."

"Please, snookums, for mamma's sake, say hello."

"I hate choo. I hate choo. I hate choo."

"Listen, plug ugly, say hello to your aunt before mamma knocks whatever teeth you've got down your little throat."

"Why, hello, auntie dear, when did you arrive?"

•

Professor (rapping for attention): "Order, please!"
Student (from back of room) "I'll have a beer."

•

When money talks—it usually says goodbye.

•

Law student—one who talks in high gear and thinks in low.

Du Pont Digest

Items of Interest to Students of Chemistry, Engineering, Physics, and Biology

NYLON—PRODUCT OF PURE RESEARCH

NYLON exists today because of curiosity—the curiosity of a group of Du Pont chemists who wanted to know more about polymerization, that strange process by which small molecules of a chemical unite to form larger molecules with entirely new and different chemical properties.

Du Pont chemists began a study of polymerization in 1928. They experimented with dibasic acids and within two years had succeeded in forming polyesters with molecular weights up to 25,000. In the spring of 1930, on removing one of these "superpolymers" from the molecular still, one of the chemists noted that it could be drawn out into a thin strand, like taffy candy. But, unlike taffy, it was not brittle when cooled. In fact, the cooled strand could be further drawn out to several times its former length and when so drawn became not only stronger but elastic!

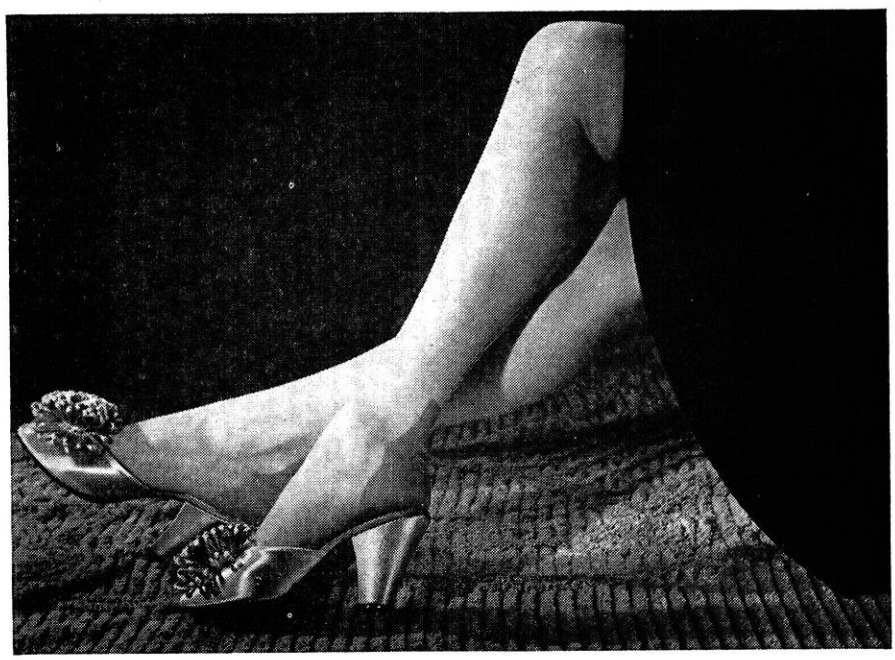
This original ester polymer had a low melting point and was sensitive to water. Nevertheless, it suggested that some related type of polymer might produce fibers which would be of practical use in textiles.

Numerous superpolymers were synthesized and tested. Finally, in 1935, a polyamide was prepared. From it, the first nylon filaments were made—by forcing the molten polymer through a hypodermic needle!

Nylon Polymer Developed

Further experimental work resulted in the development of a polymer that possessed the desired characteristics. This material was later christened nylon.

But the job was not yet done. Research chemists—particularly physical chemists—and chemical engineers were called upon to devise practical methods for making the polymer and for spinning and drawing it into high-quality yarn. Mechanical engineers were given the task of designing plant equipment to carry out the processes. Organic chemists were required to develop new dyeing agents and to find a size to make knitting possible. At one time or another more than 230 research men, engineers and marketing specialists worked on the giant task of converting this child of chemical curiosity into a marketable product.



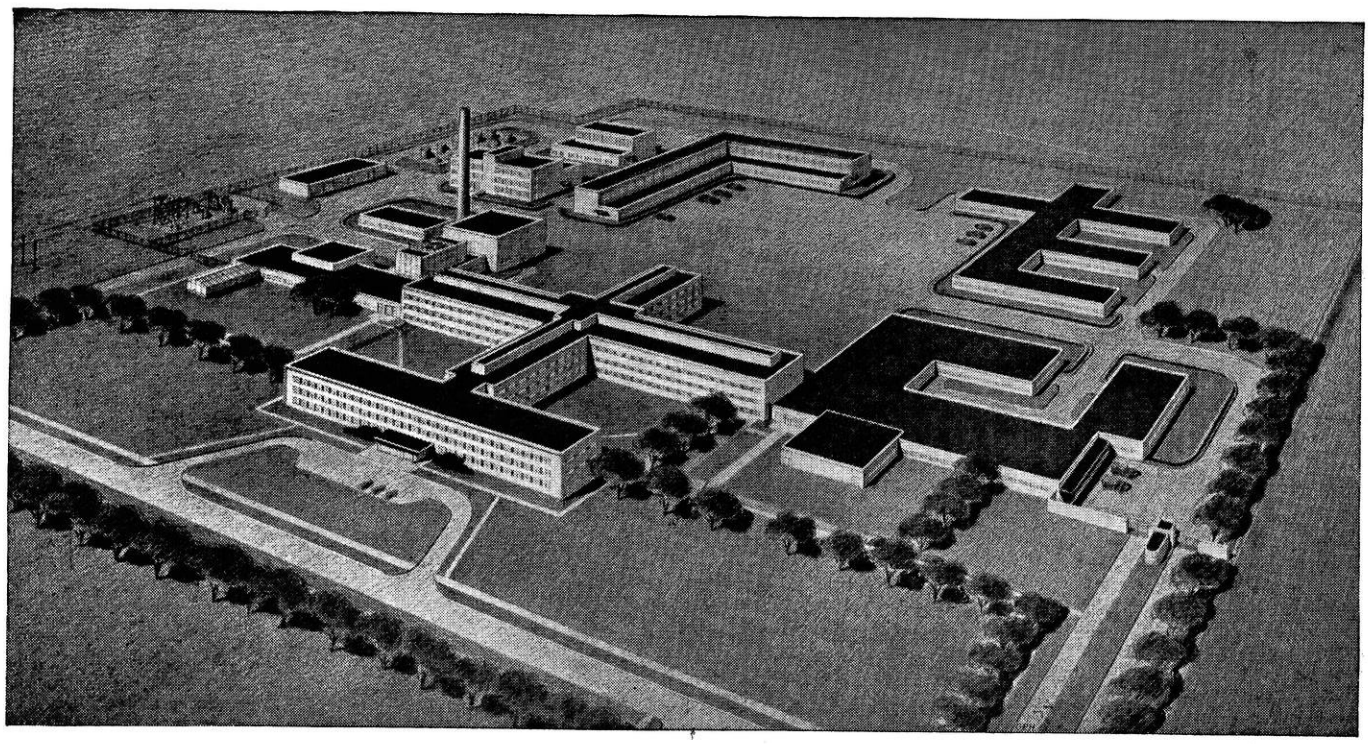
RESEARCH LOWERS PRICE OF SYNTHETIC UREA

Lower prices, as well as new processes, can result from intensive research. Take synthetic urea, for example. In 1930, urea sold for about 80¢ a pound. Great promise was held for this compound as an industrial chemical for fertilizer and plastic use—if an inexpensive manufacturing process could be found.

By methods then in use, ammonia and carbon dioxide were heated to about 150°C., forming urea and water in equilibrium with the unconverted original compounds. The yield of urea was approximately 43%.

Research by Du Pont chemists and engineers showed that, by adjusting the proportions of the reactants, raising the temperature and increasing the pressure, conversion could be improved materially. But the corrosive mixture resulting quickly chewed up the best grades of steel available.

Long investigation by metallurgists, chemists and chemical engineers finally produced an autoclave in which the operation could be carried on a production basis. Today, Du Pont is able to sell synthetic urea for less than 4¢ a pound. Men of Du Pont take pride in the fact that their work has made it possible to reduce the price of urea from the "drug" class to a level where it can be used as a fertilizer by the farmer.



Great new research laboratories being built by Standard Oil (INDIANA)

will provide every modern facility for about 1200 research workers

War activities revealed hitherto undreamed-of possibilities that lie in petroleum... found many new products that can be made from it... widened the entire horizon of organic chemistry.

So, the Standard Oil Company (Indiana) started building these new research laboratories at Hammond, Indiana, near the famous Whiting refinery. Here the Company's able scientists will work their magic... taking hydrocarbons apart and putting them together... turning aliphatics into aromatics... developing amazing new methods for carrying out chemical reactions.

From these laboratories will come fuels for new cars and new diesels, for gas turbines, for jet-propelled planes. There will appear new lubricants, insecticides, cutting oils—and an increasing number of new chemicals and plastics.

Some of the scientists will work with flasks and beakers, some will operate pilot plants. Others will carry out complicated chemical analyses electronically by the flick of a switch. Still others will design huge new refinery units, or help run these towering steel giants. Chemical engineers with a flair for economics will watch crude supplies, costs, markets. They will decide when, if ever, the Company ought to start making gasoline from natural gas or from coal.

All this and more will go on in these new research laboratories.

STANDARD OIL COMPANY (INDIANA)