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WISCONSIN ENGINEER

February, 1946

1846—GEORGE WESTINGHOUSE CENTENNIAL—1946

And suddenly—a wonderland of light...

It was an unforgettable sight that greeted the crowds at the Chicago Columbian Exposition, back in May, 1893.

For suddenly 250,000 incandescent lamps—more than there were in *all* the rest of *America* at that time—blazed in the night. They transformed the World's Fair Grounds into a gleaming wonderland of light.

George Westinghouse had done it again. Overcoming tremendous obstacles, he had accomplished the "impossible" . . . *in one short year.*

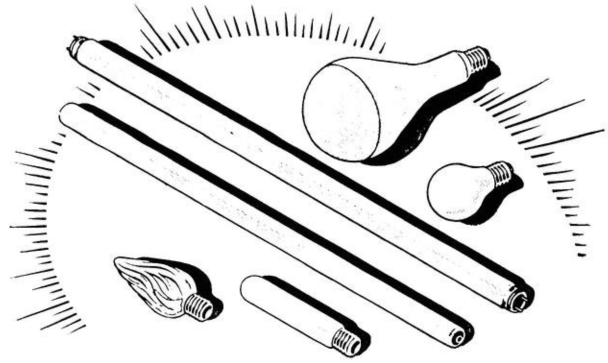
Using an entirely new principle, this great inventor-engineer had developed a completely *new type* of incandescent lamp—the famous "stopper lamp." And he had equipped a new glass factory to turn them out by the hundreds of thousands!

Here again, George Westinghouse in this historical light demonstration proved the vision and ability of a great engineer.

The lighting of the Columbian Exposition was a brilliant spectacle—and an important one, for it launched for all time the new age of electric lighting.

Westinghouse

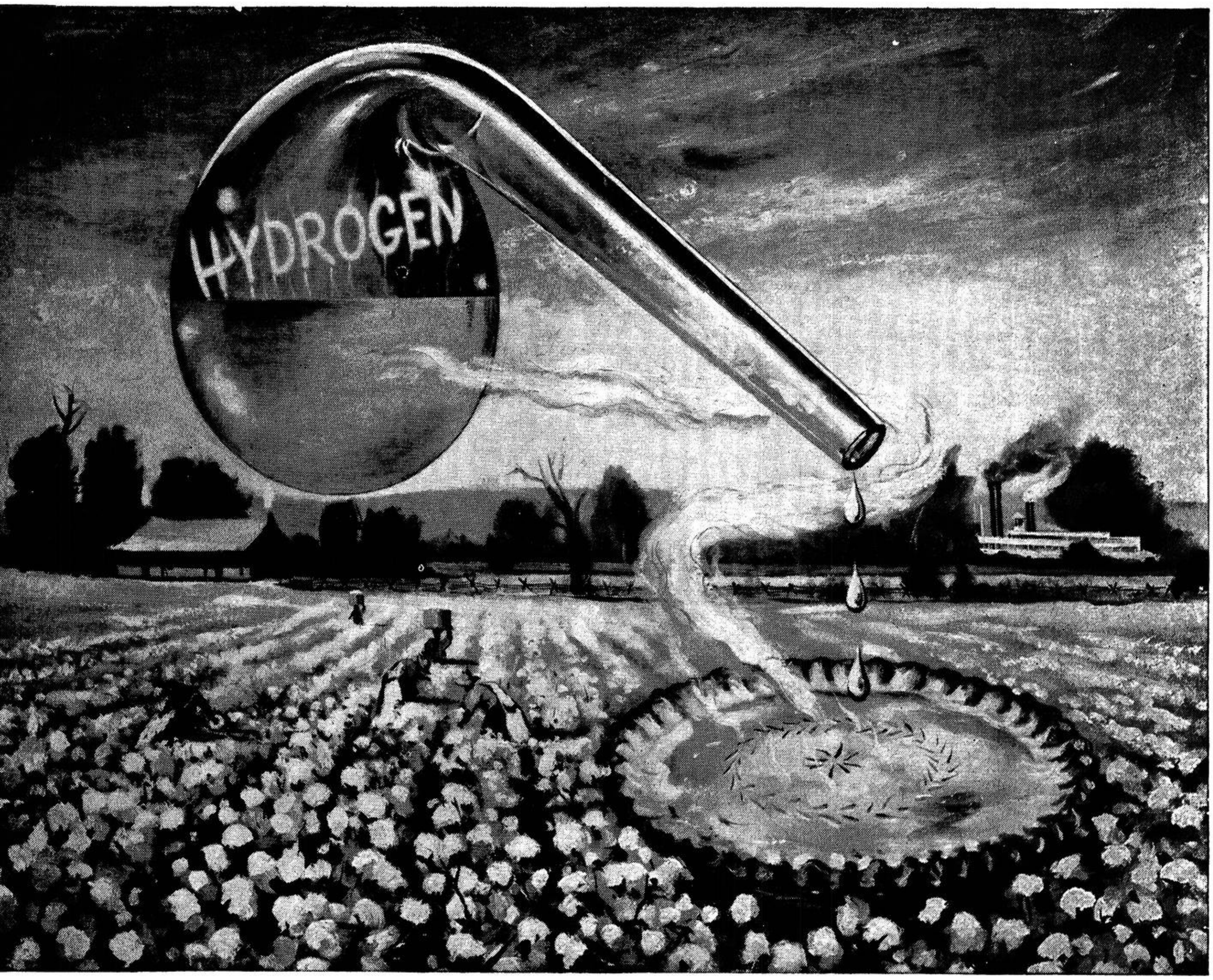
PLANTS IN 25 CITIES — OFFICES EVERYWHERE

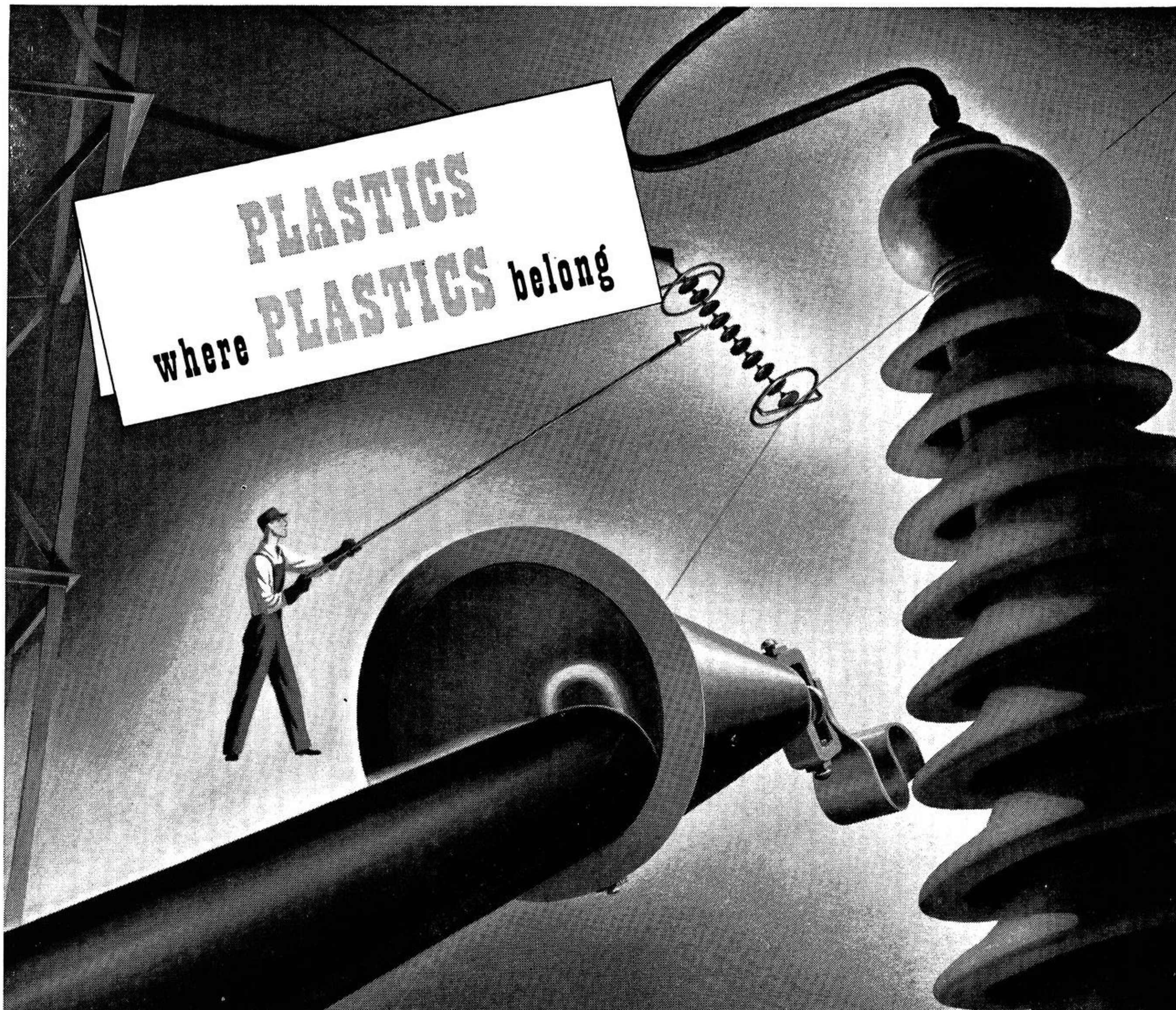


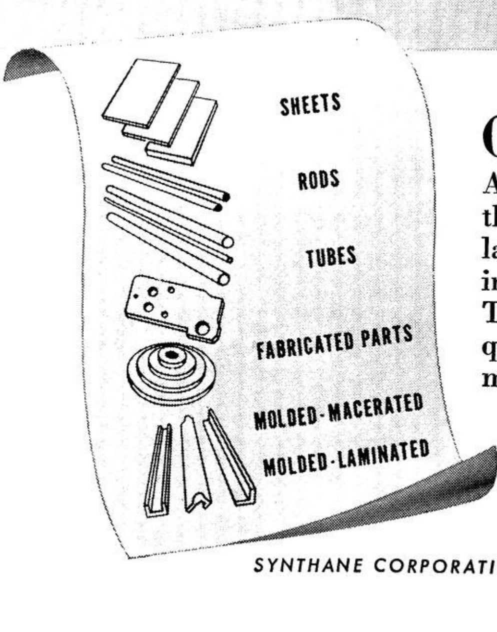
TODAY *—the Westinghouse Electric Corporation, one of many companies founded by this great inventor, makes incandescent lamps in all sizes, from tiny "grain of wheat" surgical lamps to high-power flood lights . . . fluorescent lamps that glow without flicker . . . high-intensity mercury lamps for industrial use . . . Sterilamps* that kill air-borne bacteria. In all, over 10,000 different types of lamps are made, each the result of skilled engineering—and over half a century of diversified experience.*

*Registered Trademark

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


HYDROGEN


PLASTICS
where PLASTICS belong


SHEETS
RODS
TUBES
FABRICATED PARTS
MOLDED-MACERATED
MOLDED-LAMINATED

WISCONSIN ENGINEER

Founded 1896

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In This Issue . . .

COVER:

WEB FOR RADAR—*The size and location of radar antennas vary with the job they must perform. On airplanes they are usually slung under the wing, are small, compact, and sometimes streamlined with a shell-like plastic covering. On warships they are mounted near the crow's nest atop the ship and resemble a large bed-spring. Some antennas are truck-mounted or portable; still others must be located atop high towers to overcome land obstructions.*
—*Courtesy Westinghouse*

FRONTISPIECE:

LABORATORY ICICLES —*In the 20-below-zero temperature of this refrigerated "igloo," a circuit breaker is being prepared for a high voltage test. In this Westinghouse laboratory, the only one of its kind in the country, all types of large electric switches are tested to make sure their insulation and lubricating oils will function properly in the sub-zero weather of the northern climates. Refrigeration is accomplished by continually recirculating the inside air through coils of ammonia vapor.* —*Courtesy Westinghouse*

UNSELFISH TEAMWORK OF SCIENTISTS, ENGINEERS, CONSTRUCTION WORKERS & OPERATORS PRODUCED

The Atomic Bomb

by Col. Franklin T. Matthias, c'30

Colonel Matthias

Colonel Matthias was graduated from the University of Wisconsin in 1930 with a B.S. in civil engineering.

At one time Colonel Matthias was editor of the Transit, official publication of Chi Epsilon, national honorary civil engineering fraternity.

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Cuts courtesy TRANSIT

TINY particles, sub-microscopic, evident only through their effects and reactions, variously grouped into :oms of elements, each held in its proper position in the ıfinitesimal stellar spaces of the atomic structure by forces f electricity and movement; these are the building mateals used by the team of scientists, designers, engineers nd operators to fashion the atomic bomb. It is a curious nomaly that, to utilize effectively some of the potential nergy of these small particles, so small that they cannot e seen by even the most powerful microscopes, the largest roduction plants in the world were required. The sucss of the team in making the atomic bomb available to ontribute to the earlier defeat of Japan is a tribute to ach of the several thousand individuals who participated nd to the effectiveness of cooperation on a large scale.

The exciting story of atomic power really starts in odern times, with the theoretical and mathematical udies of Einstein and his famous relativity theory. The quivalence of mass and energy was propounded by him, nd physicists all over the world began to study the means y which the conversion of mass to energy could be accomlished. An outgrowth was a new concept of physical atter and the eventual science of nuclear physics, a scince which is concerned with the particles that make up e atom.

Threads of knowledge began to flow through the interational channels of scientific information, echoes of exeriments made in England, in Germany, in France, in aly reverberated between research centers all over the world. Atom smashing became a scholastic commonplace, but in all of the experiments and with all of the cyclatrons and other atom bombarding mechanisms, tremendously more applied power was needed to propel atomic bullets than was realized when an occasional hit released energy from a few atoms.

The discovery of "uranium fission" changed everything in the picture. Dr. Lise Meitner, a woman physicist in the Kaiser-Wilhelm Institute in Berlin found that the bombardment of uranium by neutrons, sub atomic particles having no electrical charge to restrain them from reaching the nucleus of the uranium atom, was causing uranium atoms to break into atoms of different elements with a liberation of energy. Dr. Meitner was exiled from Germany as a "Non-Aryan" in the middle of her discovery. She went to Denmark, confirmed the experiment, analyzed the significance and through her scientific associations, this most important discovery reached America in January, 1939. Further study followed and in March, 1939, the possibilities of using atomic energy as a military weapon was outlined to our government. A committee of scientists, assigned the task of exploring the possibilities further, carried on with studies at an accelerated pace and turned over the project and their results to the Office of Scientific Research and Development which continued the work.

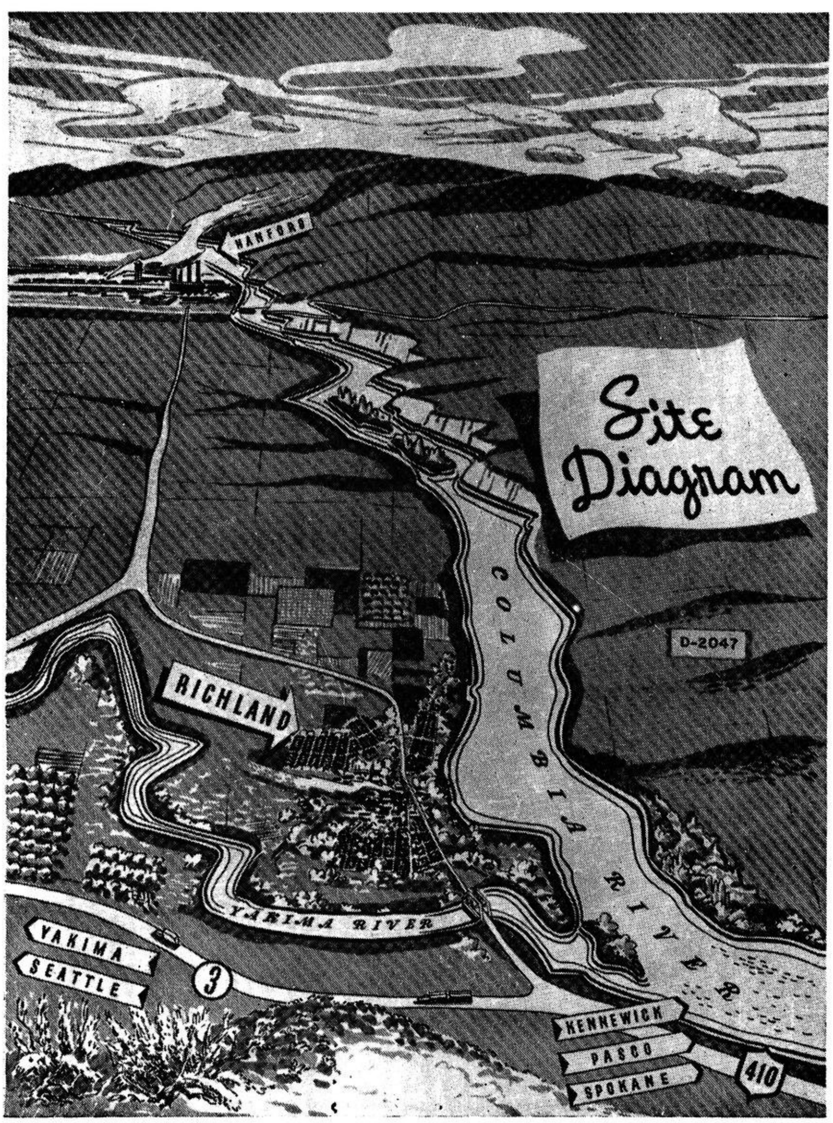
In June, 1942, the General Policy Committee selected by the President in late 1941 to supervise the program recommended that the atomic bomb project be greatly expanded and placed under the direction of the War Department. This was done and Major General Leslie R. Groves of the Corps of Engineers was given complete control. It was under his direction that the atomic bomb team worked secretly to develop the enormous program of scientific research, to design and construct the physical plants, make the active product, to design, build and deliver the bomb, —all in the space of three years.

Initially the active ingredient of the atomic bomb was to be a rare isotope of uranium with an atomic number of 235. The discovery that a new element could be derived by transmutation of uranium with the same capacity for atomic fission as the isotope opened up another possibility and offered some additional insurance to success. The atomic bomb's use and effect is the evidence of success of both methods.

The Manhattan Engineer District was organized in the Corps of Engineers to activate the Atomic Bomb Program. Everything pertaining to the project was handled with the greatest degree of secrecy that could be attained. No one in the entire project was given any more informa tion than was required to intelligently perform his or he job. The result was that the Atomic Bomb project fre quently has been called "the best kept secret of the war."

Colonel Kenneth D. Nichols, 37 years old, and fifth i the Class of 1929 at West Point, succeeded Brig. Genera J. C. Marshall as District Engineer of the Manhatta District early in the program and as such, has been respon sible to Major General Groves for the prosecution o development, construction and operation of the vas Atomic Bomb Program. His headquarters are at Oa Ridge, Tenn., and he has maintained direct personal super vision over the 90 square mile plant area at that location.

Three major plants have been built for the productio of the Atomic Bomb—one near Clinton, Tenn., one a Richland, Wash., and one near Santa Fe, N. M. In addi tion, development and design contract work has bee carried on in twenty-two universities and in industria plants, mines and laboratories in all parts of this countr and in Canada.



The plant at Richland, Wash., calle the Hanford Engineer Works, has bee the responsibility of the writer since its in ception in December, 1942. At that tim only a matter of days after it was decide to go ahead with the Hanford plant an process, and after the E. I. du Pont de Ne mours & Company, Inc., had with som reluctance, accepted the contract for th design, construction and operation of th plant, site investigations were made and i January, 1943, the 631 square mile sit near Richland, Wash., was selected.

Construction of the six major plan areas was started in March, 1943, the firs work concentrated on subsurface investi gation, site preparation, planning of con struction plant and methods, provision o service railroads and highways and con struction of a camp for workers at Han ford. At the same time, design and con struction was started for the village o Richland, twenty-five miles from Han ford, to house the operators of the fin ished plant.

The plant areas were separated from four to eight miles for safety and securit reasons. Around these widely separate plant areas there is a protective strip from four to ten miles wide which is completel controlled and in which no people ar permitted except those whose project du ties require their presence. The operatin village is located about twenty-five mile from the nearest plant area to insure n hazard to operating personnel.

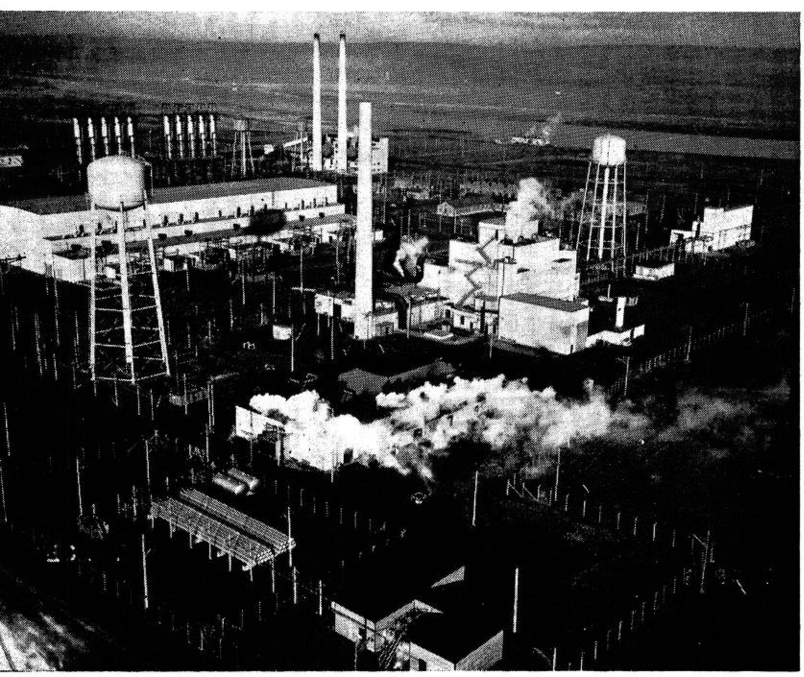
The construction of the $350,000,00

nford Engineer Works presented problems without precedent. The isolation of e site, the great distances between plant eas and service facilities, the race to get e plant into operation at the earliest possible time which demanded that construction proceed in advance of complete design, the unparalleled high quality and ecision workmanship required on large le mass construction, the complexity of uipment and controls, the extreme secy and rigid requirements of military urity all contributed to make the job ficult. Excavation totalled 25,000,000 bic yards, 780,000 cubic yards of conte were placed in the hundreds of ldings erected, 345 miles of roads and) miles of railroad were built, over 000 railroad carloads of material were ivered for construction, not including ncrete aggregates which were produced the site.

Air view of part of the Hanford Construction Camp. The Construction Administration Building is in the foreground. Picture is taken towards the southeast.

The construction forces reached a peak 45,000 people in June, 1944. Most of m were housed in barracks and privately owned trailers at Hanford Camp. The Hand Camp grew from nothing in March, 1942, to a popuon of 51,000 people in June, 1944, and back down to hing in February, 1945. At its peak, Hanford was a tling, bustling city with stores, theaters, baseball gues, home talent shows, and with all the color and itement of frontier life. The trailer camp, with its 00 trailer families, was organized into a regular city. ools were operated on two shifts, boy and girl scout troops were active. An atmosphere of urgence pervaded the camp, yet few of the workers had any idea of the purpose of the plant they were rushing to construct.

It is difficult to capture in words the spirit of the workers in the camp, it had to be seen and felt. They were part of the team, they did their job and they did it well. They came from all the States in the Union, from Canada, and Alaska. They lived, some of them for almost two years, away from their families, away from all that was familiar to them; they lived with the dust storms and the heat and the long worked hours and the long bus rides from camp to the p'ant areas. They had faith that they were doing an important job without knowing what it was. Now they are scattered again all over the country and for years to come can feel that they were individually an essential part in a most significant step in human progress.



Air view of one of the major plant areas. The Columbia River shows in the background.

The story of the Hanford Engineer Works and the Atomic Bomb Program is not a story of buildings and concrete and steel; it is fundamentally a story of men and women. It is a story of unselfish devotion, of patriotism and cooperation. It is a story of the thousands of scientists who worked anonymously, faithfully and together, a story of designers who performed the almost impossible task of translating the mathematics and experiments of the scientists into production units without the normal opportunity to

(please turn to page 26)

FIRST PRIZE TAU BETA PI ESSAY

Induction Heating With Alternating Current

—*Manuel Siskel*

ONE of the many engineering processes which was rapidly developed under the impetus of wartime research is the use of electromagnetic induction for generating heat within a piece of metal. Induction heating has been used for sometime in the induction type electric furnace for melting metal, but controlled heating such as is needed for heat treatment of steel has been made practical only recently.

The main source of heat in an induction process is the flow of eddy currents in the metal, producing the well-known "I^2R" heating effect. These eddy currents are produced by encircling the object with a coil of wire through which an alternating current is flowing. The changing flux through the coil and metal causes the currents, and consequently the heat, to be generated. When low frequencies are used to heat magnetic materials, the hysteresis effects cause a large part of the initial heating, but as soon as the Curie point (temperature at which metal loses magnetic properties — about 1420 F. for steel) is reached, the continued heating is due to eddy currents only. When higher frequencies are used, the hysteresis effect is unimportant since eddy current heating is proportional to the square of the frequency while hysteresis heating is proportional to the first power of the frequency.

One of the great advantages of induction heating over furnace heating is due to the phenomena known as the skin effect—induced currents due to high frequencies tend to flow through the outermost parts of the cross-section of the metal. The depth of the current is inversely proportional to the square root of the frequency and directly proportional to the square root of the power consumed. Continued application of power increases the depth of heating because the current tends to flow through the lower resistance of inner layers of unheated metal. The depth is also increased by the normal conduction of heat in the metal. It can be seen that the exact depth of heating may be regulated by controlling the power, frequency, and time. Low power, low frequency, and a moderate time interval are used for uniform heating while high power, high frequency, and a very short time interval are used for very shallow surface heating.

There are three types of induction heating equipment which are in general use at present. They are the rota converter, the spark gap converter, and the vacuum tu oscillator.

In the low frequency range (300-12,000 cycles), rota converters are used. They have easily variable freque cies, large power output, and conveniently low operati voltages. Their size also makes them easily portab Above all, they are the most economical method of ge erating this range of frequencies.

Although vacuum tube oscillators are used to some tent for generating frequencies in the 100 KC to 500 K range, the most commonly used method is the spark g converter. In this device an oscillatory circuit is complet through a bank of spark gaps and the load coil is coupl to this oscillatory circuit. It is a relatively inexpensive vice and will give good performance over a wide range frequencies. Vacuum tube oscillators are more expensi but have the advantage of excellent frequency stabil which may be necessary for certain types of work.

For frequencies above 500 KC, vacuum tube oscillato are used exclusively. These high frequencies are used or for special applications since increasing the frequen above 500 KC gives very little increase in the shallown of heating.

Many uses have been found for this type of heating, b its field of application has yet to be fully expanded. It h several very definite advantages over the older metho It makes possible a uniformity of product which can nev be obtained with furnace heating; highly localized heati can be produced conveniently; the equipment usually occ pies much less space; and these advantages may be c tained at a lower over-all cost than is possible with conve tional external heating equipment.

References:

Metal Progress—October, 1944.

Electronics—April and June, 1944.

Exams: "Those little annoyances you can't do with a get along without."

DETECTION MADE POSSIBLE *by* Radar

—R. H. Simonds, Jr. e'46

ONE OF the most outstanding developments of the war, surpassed only by the atomic bomb, was the pid advancement made in the science of radiolocation—dar. The basic principles of radar were apparently de-loped independently by U. S., British, French, and Ger-an scientists during the 1930's. First used in detection surface objects in the near distance under poor visi-ity conditions and in electronic altimeters, the advent war hastened the development of radar's range and rsatility, until it now provides a means of long range tection of air-borne as well as surface objects, accuracy fire control, and identification of distant or unrecog-zable aircraft and ships.

At the outbreak of war between England and Germany, e Nazis were months ahead of the British in radar de-lopment. As early as 1939 the Germans had several pes of ground reporting stations in operation along their rders. This unbalance was partially rectified with the try of the U. S. into the war, when American and Brit-scientists pooled their resources and technical knowl-ge to collaborate on the development of Allied radar uipment. Allied equipment was built by skilled work-—not by slave labor. Allied equipment was better ilt, of better parts and was much more accurate in eration. The Germans fell hopelessly behind in the ld of radar research in 1942-43. It was during this riod that they drafted many of their experienced tech-cians, experimenters and scientists to fill suddenly "va-ted" positions in the combat branches of the army. It s the belief of the German general staff that they had fficient technical equipment to win the war and that rther radar research was useless.

The detection and location of objects is accomplished means of radio frequency pulses of energy which are nsmitted in narrow beams in any given direction. The . pulses travel at the speed of light until they strike object or surface, and the energy is reflected in various rections from the object. Some of this reflected energy urns to the radar set in the form of r.f. pulses known echoes. The time taken for the pulse to go out to the ject and back to the radar set is extremely short, being the order of micro-seconds. Since an accurate measure-nt of this time fraction is one of the most important nsiderations for the successful operation of radar, a thode ray tube is used. The time required for the pulse go out and return is displayed on a linear time basis d is translated instantaneously into terms of distance, either yards or miles, depending on the calibration of the set. After the echoes have had time to return the set sends out another pulse and the process is repeated. The duration of the pulse is extremely short, usually from 1 to 10 micro-seconds. The length of the pulse determines the minimum range of the set. For if the pulse lasts too long an echo from a nearby target will return to the set before the last portion of the transmitted r.f. pulse leaves the transmitter.

The maximum range of the set is determined by the length of time between pulses or the pulse recurrence frequency. This maximum range may be only several thousand yards or a hundred miles or more. The set must not pulse again until all echoes within the maximum range have had time to return. To illustrate how the pulse recurrence frequency is determined let's consider a set that is designed to detect and locate targets within a maximum range of 75 miles.

$$\text{1 radar cycle} = \frac{\text{Range of set in miles}}{\frac{1}{2} \times \text{velocity of radio waves}} = \frac{75}{\frac{1}{2} \times 186{,}000} = 0.000806 \text{ second (approx.)}$$

This result—.000806 second—is the time required for one complete cycle of operations of a radar set with a maximum range of 75 miles. Dividing this fraction into unity we can determine the frequency at which pulses may be transmitted by the set.

$$\text{pulse recurrence frequency} = \frac{1}{0.000806} = 1240$$

Thus for a maximum range of 75 miles the set may pulse 1240 times a second with no interference from returning echoes. In other words, about 806 microseconds must elapse between the start of one cycle and the start of the next cycle.

In practice this pulse recurrence frequency ranges from 250 to about 5,000 pulses per second.

The radar transmitter is actually radiating for only a very small portion of the time required for one cycle. The length of the pulse is determined by the minimum range as already explained. The duration of this pulse ranges from 1 to 10 microseconds.

Automatic Navigation

—R. J. Meisekothen

IT IS called the "Air Position Indicator." Designed and made by Bendix Aviation Corp., it "tracks" the course that an airplane flies, including any number of turns in the violent maneuvers of combat, and gives almost instantaneously the air position of the plane at any time.

This navigation aid, the fruit of long experimentation inspired by war urgency, has been one of the closely guarded secrets behind the success of the B-29 Superfortress raids on Tokyo and other important Japanese key centers.

The indicator, which is a light, compact gadget that occupies space no larger than a quart milk bottle on a plane's instrument panel, is described as revolutionary in that it performs automatically and instantaneously many laborious time consuming calculations that formerly were the task of a navigator.

In long-range, multiple crew aircraft, the navigator's problem is complicated by the necessity of integrating information, not by dead reckoning alone, but also by celestial, radio, and pilotage methods. With the modern high speed bombers, the navigator's time for each calculation is limited and any interruption of his duties to assist other crew members or to man a gun station might disrupt the continuity of his position plot. On most combat missions, the practice of changing course frequently to confuse the enemy, further complicates the over-all navigation problem. Before the A.P.I., as it is called, was developed, in order to determine his air position accurately, it was necessary for the navigator to read compass headings, altitude readings, and air speed readings every fifteen minutes, average them, and plot his course on a mercator chart. With the A.P.I. the air position is determined instantaneously at any time. It is particularly valuable to fighter planes, which are manned only by a pilot, who has other things to do besides keeping track of where he is at any given moment. For high altitude travel, where temperature and pressure vary considerably, the mechanism automatically compensates for the changes as they occur, thereby preventing a gradual accumulation of errors which in the course of a long flight might combine to cause disaster. The instrument is as effective on the sea as in the air.

At the start of a flight the latitude and longitude of the point of departure are set manually on the instrument. After this, at any time during the flight if the navigator desires to know his air position he has merely to read the two indicating counters. This reading is called the air position, which is the position the plane would be at if there were "no wind" conditions. The air position can be quickly converted to ground position by applying a wir vector representing the direction and distance that the a mass which the plane is flying through has moved sin the last position figures were set into the A.P.I.

Perhaps someday the magic of science will reveal a instrument which can determine the wind vector and gi a direct reading of the ground position. This would r place the navigator completely and save him from calc lations which ordinarily require hours with charts, bas navigational text books, star sighting sextants, chronom ters, drift meters, and brain work.

This A.P.I. mechanical brain is highly complicated. Tl earth is round, not flat. The area over which an airplar flies is not laid out in neat squares, but, instead in ima inary trapezoids created by parallels of latitude and co verging meridians of longitude. To do its problems ar come out with the answer, the indicator must work trigonometry.

Essentially, this is what the Air Position Indicator doe

It breaks down air speed—the pace at which an airplar moves through the air into air pressure, altitude, and ter perature.

It takes those three elements and translates them in time and air distance.

It translates time, air distance, and direction into tern of latitude and longitude.

The mechanical details are a closely guarded secret b here are some of the basic principles involved:

The direction signals from a remote electra-magnet compass are amplified and received by a rotor in the cor puter, which drives a set of gears which properly positic a built-in system of ball cages. The ball cages integrate tl latitude and longitude components from the nautical a miles traveled and the direction of flight of the aircraf The nautical miles traveled is determined by a shaft whic is driven at a speed proportional to the true air speed the aircraft, as measured by means of a pilot tube. Int gration of the shaft revolutions with the compass headin is accomplished by a unique combination of friction driv consisting of balls driven between discs and rollers. A sir ilar integration system is employed to provide connectic for meridian convergence. There are nearly 500 close finished parts in the computing device and eleven separa gear trains.

The maximum overall error of the air position dete mined by the A.P.I. is 5%. This is a more accurate a position than a highly trained navigator can determir using methods which are much more tedious and boring.

News Bits

'OUR HOT DOGS, HAMBURGERS, GRILLED :HEESE SANDWICHES—BY ELECTRONICS:

During the war, everyone was thinking of new uses for lectronics and the equipment developed. Here's some-ning most of you forgot. Now it's hot dogs, hamburgers, rilled cheese sandwiches, heated by radio waves — and eally something the public will soon be able to buy and ot merely a laboratory stunt. The electronic tubes used re a direct outgrowth of radar.

With only a drop of a dime and the push of a button, ngineers of General Electric working with the Automatic Canteen Company of America, are able to get hot dogs, amburgers, or grilled cheese sandwiches from an elec-onic canteen machine. First units are expected to be in roduction early in January.

In appearance this machine resembles a cigarette or soft rink machine, excepting it is some larger. It plugs nto a regular 110 volt outlet and has a decorative front oor with mirror, with a push-button arrangement for our choice of food; also a glass window behind which is ne electronic unit and coil so the customer can see his ood getting the heat—by radio; below this is a glass door ompartment into which the hot dog or sandwich drops eady to be eaten.

Inside the machine are individual trays on which the rankfurters, cheese and hamburgers are placed, wrapped buns and enclosed in sanitary containers. All have been reviously cooked in a sanitary kitchen and inserted in the achine, but untouched by human hands.

To operate, one drops in a dime and pushes the selec-on button. This trips one of the trays and one of the rapped sandwiches, visible to the customer, falls into the ectronic oscillator coil. As it falls into place, high fre-uency radio waves are brought into play, the sandwich is eated to the proper temperature and falls into the glass oor compartment ready to unwrap and eat.

The oscillator used to heat the sandwiches is operated y two high-frequency power oscillator tubes. The right requency had to be found as some would heat the frank-urter but burn the roll, others would burn both, or heat ne roll and not the frankfurter. To cut down radiated eat the oscillator unit is cooled by a blower. Polystyrene, special plastic used in radar and other high-frequency ork, is used in the oscillator unit to cut down loss of the ectronic energy.

CHEMICAL CATALYSTS STUDIED BY WISCONSIN ENGINEERS:

Under the direction of K. M. Watson and O. A. Hougen, both University of Wisconsin professors of the chemical engineering department, research into the nature of chemical catalysts is being conducted. It has been found that the entire range of industrial catalysts is based on a few fundamentals and this work is expected to enable scientists to avoid use of rule-of-thumb methods and to predict in advance how each plant will function before it is constructed.

These scientists, in the work they have done, and plan to do, are trying to discern the underlying principles that control operations of catalysts and synthesis types, with the object in mind of predicting the performance of proposed plants—with the purpose of obtaining optimum design and lowest possible cost. It is work that will be of importance to the nation's synthetic industries.

•

FLUORESCENTS MAKE PROGRESS:

As with young devices, the fluorescent lamp continues to see many developments along that line.

New lamps are long and slimmer. Four lengths—five-eighths and one-inch in diameter are standard, from 3½ to 8 feet long. The electrodes are designed for instant starting on high voltage.

Fluorescent lamps decline about 15 per cent in efficiency in the first hundred hours, and then at a much slower rate for the remainder of the lamp life. This initial decline is blamed to the low wavelength (mostly 1850A) radiation of the mercury-vapor discharge. This short radiation has a damaging effect on the ability of phosphorus to convert invisible to visible light.

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WIDESPREAD INTEREST IN WOOD RESEARCH:

Recent distribution of a brochure, "The Forest Industries Blaze New Trails," has resulted in a swamp of inquiries about wood research projects from 160 manufacturers in the most varied fields. These inquiries came from the furniture industry, manufacturers of toys, pencils, sinks, musical instruments, chemicals, buttons, implements, wallpaper, etc.

CAMPUS HI-LITES

—Jane Strosina c'46

Milly Smith m'46

POLYGON

With the All-Engineering Smoker a thing of the past, the Polygon Board is now working on the celebration of St. Pat's day. The keystone will be a St. Pat's dance on Saturday night, March 16, in Great Hall at the Union. Now that the war's over, Polygon is sponsoring a return to all the post-war customs of a St. Pat's elections, a beard-growing contest, the sale of St. Pat's buttons, etc., as well as the traditional dance. Only the "old-timers" among the students on campus now can remember the all-out celebrations of the past, but Polygon is gunning for a complete return to those institutions established by precedence before the war.

Since the AIME has re-organized, the Polygon Board has two M&M's as temporary members until the end of the semester when elections will be held by all five societies for Polygon representatives. As a result, next semester Polygon will have 10 representatives instead of 8 as at present. This will be a decided aid to the Board.

—J. G. Slater

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PI TAU SIGMA

The new members of Pi Tau Sigma are: Herbert Adler, Don Hyzer, Robert Neitzel, Al Pahnke, Marvin Stamp, Ira Ward, and Paul Tausche —congratulations, fellows. The formal initiation January 9 was followed by a banquet at the Heidelberg Hofbrau. The speaker, Dr. W. B. Sarles, assistant to President Fred, discussed "Government Finance of Research." Good ol' Pat Hyland was M.C. and kept things quite lively as usual.

A dance was held January 26 at Black Hawk Lodge. Mr. Leonard Rall was our chaperon (??). Needless to say, everyone had a fine time —even the chaperon!

—D. J. Sakols

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M.E.S.W.

The January 15, 1946 meeting of the Mechanical Engineering Society of Wisconsin was called to order by President George Hlavka at 7:25 p.m. in the Top Flight Room of the Memorial Union.

The visitors were introduced to the group. They were Mr. Coles, Chief Engineer of Madison Kipp Co., Mr. Lapley of the Madison Division of Allis - Chalmers; Mr. Schudt, Student Chairman of the Milwaukee Section of S.A.E.; Mr. Dahlund, Chairman of the Rock River Valley Section of A.S.M.E.; and Mrs. Glazebrook, Lindau, and Dodge of the Hydraulic Department of Fairbanks-Morse, and the speaker for the evening's daughter, Miss Roberts, and her friend.

The speaker for the evening, Mr. Roberts, manager of the Hydraulic Division of Allis-Chalmers, was introduced to the group by President Hlavka. His subject was "Recent Developments in Modern Hydraulic Power Plants." Mr. Roberts explained the three types of hydraulic turbines, the impulse, the reaction, and the propeller types. He showed slides and explained the structure, the operation, and the installation of the turbines at the various plants and answered the questions of the group through his talk. Refreshments were served and a movie on the Tennessee Valley Association was shown. The meeting was ad journed at 9:45 p.m.

—M. Smith

•

TAU BETA PI

The initiation banquet of Ta Beta Pi was held January 16 at th Capital Hotel. Toastmaster for th evening was Professor L. F. Va Hagan. Captain Hurff, command ing officer of the NROTC unit a the University of Wisconsin, was th principal speaker of the evening. H spoke on the battle of Leyte Gul Winners of the awards for the bes theme and best plaque were M. Si kel and D. F. Doeller, respectively.

On January 19, Tau Beta Pi hel an initiation dance at the Woman' Club.

—R. H. Simonds

•

ETA KAPPA NU

Eta Kappa Nu, the honorary ele trical fraternity, had its initiatio and banquet Wednesday, Januar 23. The banquet was held at th Wooden Bowl. Leonard Rall, wel

known econ instructor, was the gues speaker: "The Place of the Eng neer in the Post-War World."

The new initiates are Harold Pe terson, Donald Green, Harry Sta lings, Ken Foster, James Hage Archie Shaefer, Frederick Her

(continued on page 21)

Testing For Hardness —

—Wayland P. Smith

WITH THE outbreak of World War II a tremendous step-up in production was required. However, with the increase in quantity there was a need for quality-control. Our men not only needed a large amount of equipment, but a large amount of good, well-constructed equipment. Faulty parts would mean only untimely failures and perhaps the loss of a man's life. One of the methods brought into full swing to provide quality-control was hardness testing.

Hardness testing certainly isn't new. It is probably one of the oldest methods of testing materials. Mainly, hardness testing is restricted to metals in commercial testing, although it is adaptable to other engineering materials. There are various means of hardness testing due to the fact that it eludes exact definition. The fundamental idea that hardness can be measured by the resistance to indention is the basis of most of the instruments used today in quality-control. The indenter is usually a ball or a plain or truncated cone or pyramid made of hard steel or diamond and impressed by a measurable static load.

The practicability of this system is very evident. The equipment required is relatively inexpensive, when compared with other elaborate testing devices such as tensile testing machines. The test itself is very simple, which makes the training of operators a matter of hours, although interpretation of results requires much experience in some cases. Another asset is the small damage done to the part in the test. On most parts the test can be made on a section where the small indention has no effect. The part can be used as satisfactorily as one that has not been tested.

The most common types of tests run on metal parts in the United States are the Brinnell, Rockwell, and Shore-Scleroscope tests. For very hard or very thin parts the Vickers, Monotron, and Rockwell superficial have been used to increasing advantage.

In the Brinnell method a steel ball is pressed into the part being tested. The customary load for ferrous metals is 3000 kilograms with a 10mm. ball and for non-ferrous metals 500kg. The principal method of supplying the load is by a small hydraulic pump. The Brinnell hardness number is the pressure per unit area exerted by the ball.

$$\text{Brinnell Hardness no.} = \frac{\text{load on ball}}{\text{indented area}}$$

In ordinary shop practice, however, the diameter of the impression is measured by a microscope to the nearest 0.01mm. Then, referring to a table such as given by ASTM specification EIO, the Brinnell number may be obtained. There are two primary faults with the Brinnell method. It is not adaptable to the harder metals because of the tendency of the steel ball to be deformed. Also, it is unsatisfactory in testing thin sections or case hardened parts because the penetration is too deep.

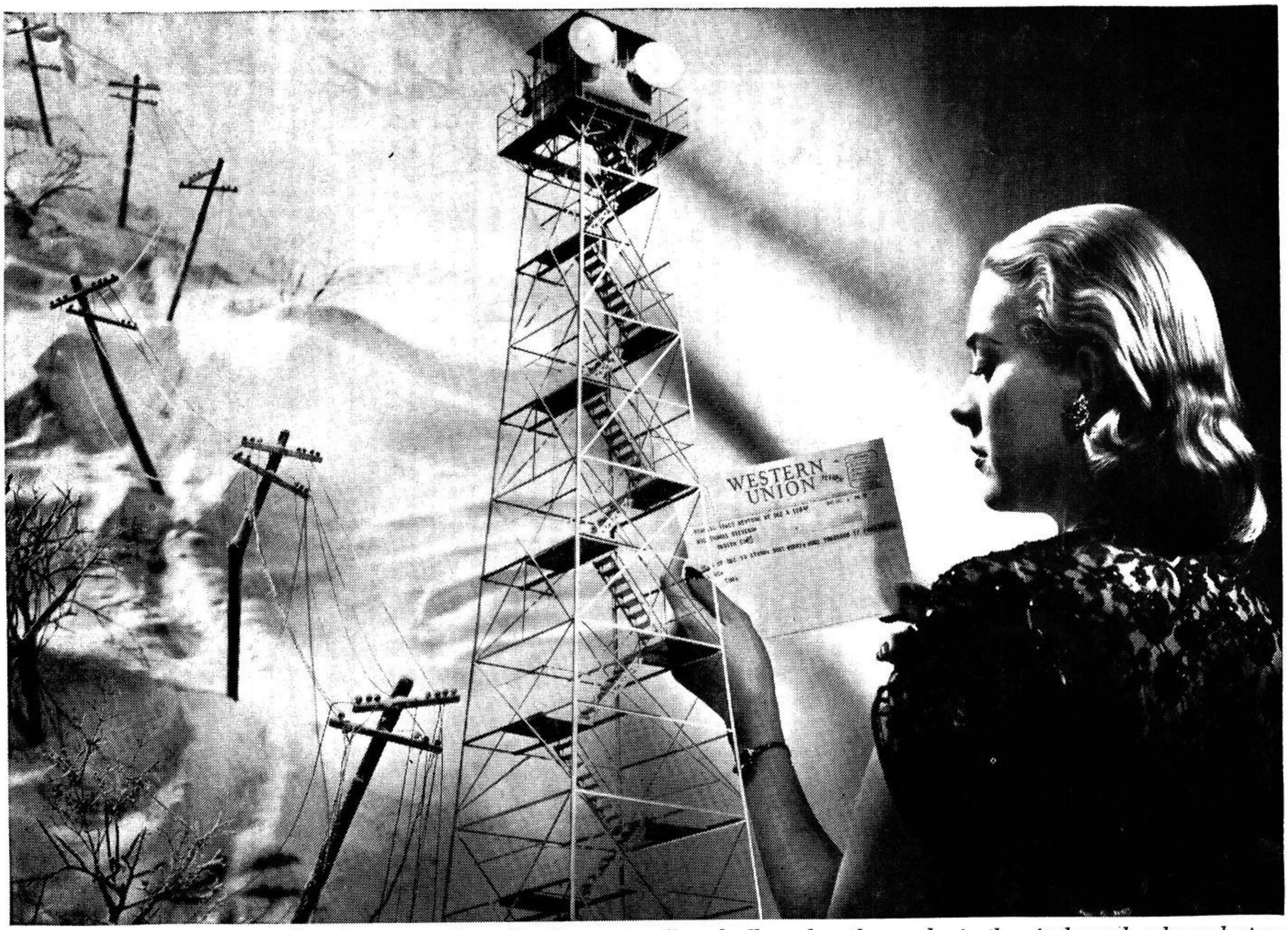
In principle, the Vickers machine is very similar to the Brinnell machine. The primary difference is in the indenter, which is a square-based diamond pyramid. The load can be varied from 5kg. to 120kg. in 5kg. steps. Thus the machine gives accurate readings on parts as thin as 0.006 inches and is capable of testing the harder metals. The Vickers number is obtained in the same way as the Brinnell; the diagonal of the square impression being measured and referred to the table for a value.

The Rockwell machine is similar to the Brinnell, only the indenters and loads are smaller. A small primary load is first put on the indenters (which may be a steel ball or diamond "Brale") to sink it slightly below the surface and thus eliminate the surface irregularities, which might cause errors. The secondary load is then applied and, by means of a dial connected by sensitive levers to the indenter, the relative hardness number can be read directly from the proper scale on the dial. By using the depth of impression as an index to hardness the relative hardness can be determined much more rapidly than by the diameter method. The speed of the operation and the smaller indention makes this tester particularly applicable to quality-control.

The Rockwell superficial tester is a specialization of the ordinary Rockwell tester. The loads applied are all very low and consequently the indention is extremely shallow. The tester is used wholly for testing thin sections like razor blades or parts having a very low case-depth.

The Monotron is another machine that is well-suited to

(continued on page 27)



Radio relay towers, about 50 miles apart, will gradually replace thousands of miles of telegraph poles and wires.

Now, telegrams "leapfrog" storms through RCA Radio Relay

With the radio relay system, developed by RCA, Western Union will be able to send telegraph messages between principal cities without poles and wires.

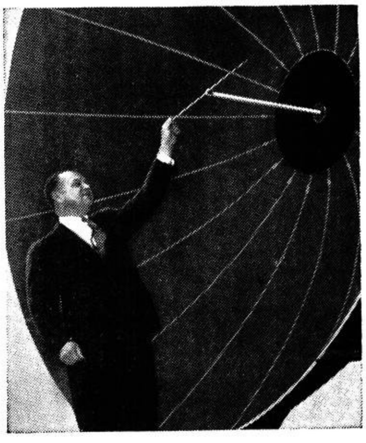
"Wires down due to storm" will no longer disrupt communications. For this new system can transmit telegrams and radiophotos by invisible electric microwaves. These beams span distances up to fifty miles between towers and are completely unaffected by even the angriest storms.

When large numbers of communications circuits are required, these automatic radio relay systems are more efficient than the pole and wire system . . . are less costly to build and maintain. They'll be particularly useful, too, in areas such as China and South America where distances are great and long-line services have not been developed.

This revolutionary stride in communications was made possible by research in RCA Laboratories—the same "make it better" research that goes into *all* RCA products.

And when you buy an RCA Victor radio or television set or a Victrola* radio-phonograph, you enjoy a unique pride of ownership. For you know, if it's an RCA it is one of the finest instruments of its kind that science has achieved.

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



Research in microwaves and electron tubes at RCA Laboratories led to the development by the RCA Victor Division of this automatic radio relay system. Here is a close-up view of a microwave reflector. This system holds great promise of linking television stations into networks, as well as relaying other forms of electric communications.

RADIO CORPORATION of AMERICA

*Victrola, T. M. Reg. U. S. Pat. Off.

Alumni Notes

—*Joe Teskoski m'46*

Mining and Metallurgicals

EASTWOOD, L. W., Dr., m&m'29, is assistant supervisor in the Process Metallurgy Department at Batell Memorial Institute. Prior to this he was Vice-President of the Maryland Sanitary Company in Baltimore, Maryland.

YARNE, JOHN, m&m'37, formerly with the Muskegan Piston Ring Company, is now associated with the Chain Belt Company of Milwaukee.

ZAMBROW, JOHN, m&m'41, is working in the welding department of Batell Memorial Institute. Prior to this he was employed by the Kearny Trecker Corporation.

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Mechanicals

HOPPE, ALFORD G., m'17, is assistant mechanical engineer for the Chicago, Milwaukee, St. Paul and Pacific Railroad.

ROBERTS, J. FRANK, m'18, chief engineer of the Hydraulic Division of Allis Chalmers recently visited Madison to address the MESW.

DREWRY, N. K., m'22, is assistant chief engineer of Power Plant for the Wisconsin Electric Power Company of Milwaukee. On February 11, he visited Madison to address the M.E. 12N class. His speech was entitled "The Economics of High Pressure Steam." In 1931, Mr. Drewry won the Junior award in ASME.

BESSERDICH, ARNOLD C., m'25, has been appointed state power-plant engineer for Wisconsin, succeeding John C. White who retired.

FYFE, CLAYTON, m'29, is employed by the Raytheon Manufacturing Company of Waltham, Massachusetts.

BREIBY, NORMAN, m'30, is with the Oscar Mayer Packing Company at Madison.

SMITH, ROGER K., m'35, entered the Iowa State College in 1938 as an instructor of mechanical drawing. Since 1942 he has concentrated on thermodynamics, and heating and ventilating. In 1944, he was made assistant professor. Prior to this he was in charge of the engineering department of the Taylor Manufacturing Corporation in Milwaukee.

ROWE, CARL B., m'37, has been employed by Pratt and Whitney as their service representative. Since the close of the war he has been working in the advanced power plant design group on a confidential project.

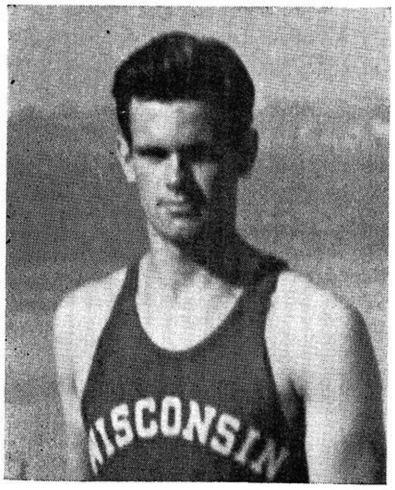
WALLACE, NORMAN B., m'38, is with the Oscar Mayer Packing Company in Madison.

WEIDNER, RALPH B., Lt. jg, USNR, m'42, expects to receive his discharge sometime in June.

HEFFERNON, CULVER ALBERT, m'42, has been employed as a development engineer by the Linde Air Products Company of Newark, N. J. His work consists of designs and tests of machines and equipment incidental to the oxy-acetyline processes of cutting, welding, brazing, and soldering.

CERUTTI, BERNARD C., m'43, has been employed with the Dodge Chicago Plant as a technical assistant in the carburetor laboratory of the engine test department.

REA, GEORGE A., m'43, is at present in the navy awaiting discharge. He has served as a radio and radio technician.



George Rea

Prior to the navy he was employed by Douglas Aircraft as a design engineer.

SMITH, JAMES W., m'44, has been employed by the Goodyear Aircraft Corporation as an engineer in the test section of the wheel and brake division. He has been supervising a series of experimental brake tests in the government laboratory at Wright Field.

•

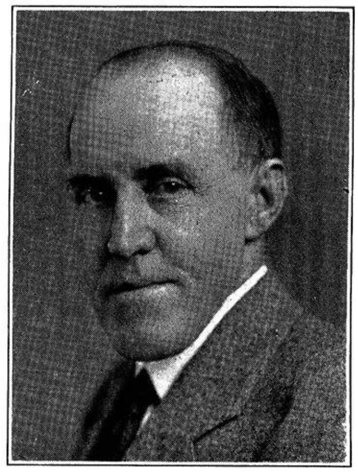
Civils

LAURGAARD, OLAF, c'03, CE'14, died June 23, 1945, at San Francisco, where he was resident engineer for the Maritime Commission at the Bethlehem Shipyard at Alemeda. He is survived by his wife, Goldie May, by his son, Glenn, Wis. c'35, and by a daughter, Helen.

Laurgaard was born in Norway on February 21, 1880. His parents came to this country when he was five months old and settled in La Crosse, where Olaf grew up.

His professional career included long periods of service with the U. S. Reclamation Service, many years as city engineer of Portland, Oregon, and several years with the Tennessee Valley Authority. Under his direction as city engineer, Portland carried out a vast program of public work that received much attention in the technical press.

As a member of the Oregon legislature in 1917, he prepared, introduced, and secured passage of several important bills, including the irrigation code and the highway code. He was a member of the City Charter Revision Committee, president of the Northwest Society of Highway Engineers, president of the Oregon chapter of the American Association of Engineers and national vice-president



Olaf Laurgaard

of the same organization, and president of the National Council of State Boards of Engineering Examiners.

WALRAVEN, PETER, c'21, is with the Social Security Board as assistant regional director of Region Six, with headquarters at Chicago.

TRIER, ROBERT J., c'25, is district road engineer for the U. S. Indian Service, with headquarters in Minneapolis.

KNECHTGES, OSWALD J., c'29, is in the engineering department of Oscar Mayer & Co. at Madison.

POLK, WILLIAM H., c'37, formerly on the engineering staff of the Milwaukee Road, is sales engineer with the Pittsburgh Plate Glass Co. in Milwaukee.

VOELKER, RAY F., c'37, is back from the Pacific theater of war, where he served as lieutenant in the Sea Bees, and is now engineer for the Universal Construction Co. of Milwaukee.

SCOVILL, NORMAN D., c'38, is in the engineering department of Oscar Mayer & Co. at Madison.

KLEMA, ROY L., c'39, assistant professor of civil engineering at the University of Idaho, has resigned to enter

(continued on page 25)

Short Circuits

—*Dick Papke m'48*

Ken Burmeister ch'47

"So you met your wife at a dance? Wasn't that romantic?"

"No. Embarrassing. I thought she was at home taking care of the kids."

•

The hand that rocks the cradle is the one that used to turn out the parlor light.

•

Sailor: "Waiter, bring me a glass of tomato juice for a pickup."

Waiter: "Yes, sir, and what will you have for yourself?"

•

A burlesque show is where actresses assume everybody in the audience is from Missouri.

•

Gently he took his wife's dainty little hand in his—and twisted it until she dropped the knife.

•

"My car's out of gas. What'll I do now?"

"How should I know. I've never been out with you before."

•

He: "You look shorter in that bathing suit."

She: "Yeah, but it makes men look longer."

•

"Look," cried the professor, "there goes one of my pupils," as his glass eye rolled down the aisle.

•

The Rathskeller: "Join me in a glass of lemonade?"

"Sure. You get in first, and I'll see if there's room left."

•

Prof: "Spell 'straight'."

Co-ed: "S-t-r-a-i-g-h-t."

Prof: "What does it mean?"

Sweet young thing: "Without soda."

•

Two mosquitoes once lit on the features
Of two fair and peroxided creatures;
When asked by what right,
They replied we're not tight,
We're seeing the game from the bleachers.

Chi-O Active on phone: "I'm asking for more electricity over here, do you understand?"

Electrician: "Certainly, ma'am; more power to you."

•

Growled the hotel clerk irritably over the phone: "Well, what's eating you?"

"That's what I'd like to know," yelled the guest in 108.

•

That's Hanford, he overdoes everything.

•

A German guard in Denmark was getting tired of his job, "Ach," he says, "I vish de var wass ofer."

"And," remarked the Dane who was standing nearby, "what would you do if the war was over?"

"Vy," said the German, "I'd take a bicycle trip through greater Ghermany."

"Oh, yes?" retorted the Dane, "and what would you do in the afternoon?"

•

Interviewer (to applicant for position): "Have you any references?"

Applicant: "Sure, here's one: 'To whom it may concern. Mr. Jones worked for us one week and we're satisfied'."

•

I wish I were a kangaroo
Despite his funny stances.
I'd have a place to put the junk
My girl hands me at dances.

(continued on page 28)

:AMPUS HI-LITES . . .

(continued from page 14)

:arlyle Fay, John Drnek, and David)oeller.

—John Teuscher

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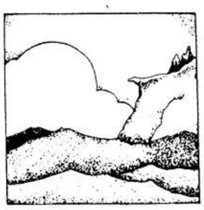
MINING CLUB

The first meeting was called to rder on December 14, 1945, by act- ng chairman Jim Judi. The chief usiness was to reorganize and elect fficers.



The following were elected: Presi- lent, Jim Judi; Vice President, Ralph Hoefs; Secretary - Treasurer, Robb Warren.

Phil Rosenthal was appointed fac- lty advisor. Bill Fuller and Dave Bryan were appointed head chiefs. George Barker brought up A.I.M.E. pplications, and said he would ex- plain it again at a later date.

It was suggested that we get a nemorial photo of the late Profes- sor Joe Oesterle.

On January 10, the Mining Club held a supper. At this meeting Don

Painter was elected junior represen- tative, and Carl Krecklow was elect- ed senior representative to Polygon Board. The motion was passed that geology majors be allowed to join the Mining Club.

—R. A. Warren

The Polar Planimeter

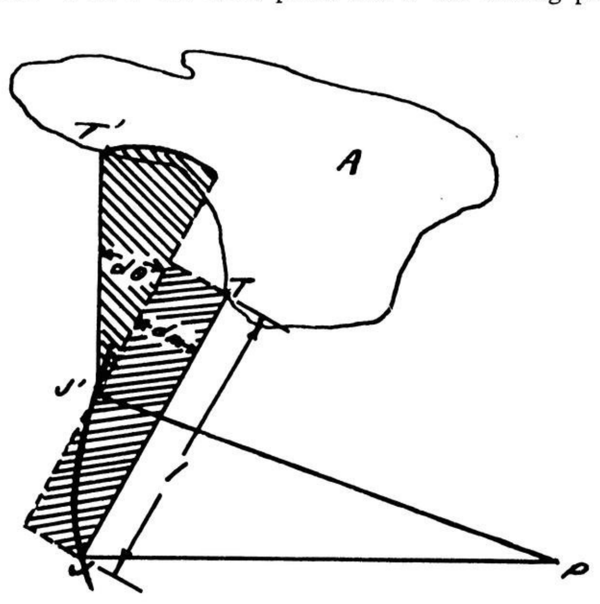
—*Alfred B. Yard*

THE polar planimeter is a device for measuring the area of a flat surface enclosed by a regular or irregular line. It was invented in 1850 by Amsler of Shaffhauser, Germany, as an improvement over a previous invention in 1827 by a fellow German, Oppenhoffer. The instrument was manufactured by the firm of Amsler-Laffon in 1854 and first placed on exhibition at Paris in 1867.

The machine consists of a tracer arm and a pole arm. The pole arm is attached to the tracer arm by a pin joint whereby there is unhindered co-planar motion. This pin joint is adjustable along the length of the tracer arm by a sliding bracket and clamp screw. At the extended end of the pole arm there is a sharp pin whereby the arm is securely located and held stationary during operation. At the end of the tracing arm there is another point. This is the tracing point which is guided around the boundary of the area being measured. On the tracer arm is mounted a freely rotating drum whose axle is parallel to that of the tracer arm and which is in contact with the surface to be measured. This drum is usually geared to another graduated disc upon which is mounted a vernier scale. With this arrangement the movements of the drum can be read to four place accuracy.

The principle of the instrument is best explained by an example:

Given the area A as shown in the diagram and a planimeter. With P the fixed point and T the tracing point.



Let T move along the boundary of the area to T^1. Th movement of the tracing point may be broken into thre motions; motion along the axis of the tracing arm, transla tion (dm), and rotation about the point J ($d\theta$).

The first motion, that along the axis of the tracing arm can have no effect on the reading of the drum, since the axis of the drum is coincidental with that of the tracing arm. Any motion in this direction will merely slide the drum along the paper. This motion can then be disregarded, since it has no effect on the reading of the drum.

The motion of translation will sweep out an area equal to 1, then length of the tracing arm (JT), times dm, the increment of translation. Therefore the area of translation is $1 \ell\, dm$.

The area swept out by rotation of the tracer arm about the pin joint (J) is $\frac{1}{2}(1)^2 \ell\, d\theta$. The total area swept out must then be the sum of these two areas, i.e., $A = 1 \ell\, dm + \frac{1}{2}(1)^2 \ell\, d\theta$. After the tracing point has traced the complete path about the area the increment of angular motion ($d\theta$) is zero thereby making $\frac{1}{2}(1)^2 \ell\, d\theta$ zero. Therefore, the final formula for the area swept out is $A = 1 \ell\, dm$.

Since 1, the length of the arm, is known and the $\ell\, dm$ is read from the drum, the area has been determined. 1 being a constant in this equation it can be set at any convenient value along the tracer arm so as to make the drum read directly in the units desired, square inches for example.

In engineering practice this type of planimeter is used to determine the mep of an indicator card. This mep can be found in two ways. The first way is to find the area of the card in the usual way and then divide this value by the length of the card. This will give the average height of the diagram in units corresponding to those of the area. For example, inches height for square inches area. With the average height in inches known, the mep can be determined by multiplying by the constant of the indicator spring used.

The alternate method is that of setting the length of the tracing arm equal to the length of the diagram and

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It's Not As Crazy As It Seems

—Edwin F. Fischer

WITH the capture of Germany's V-2 bomb came the long sought after answer in rocket power—that of power control.

The secret so long unknown is seemingly simple, in that we meet it every day as common hair bleach and disinfectant, in the forms of hydrogen peroxide and potassium permanganate. These chemicals prevent the V-2 from blowing up in the launchers' faces, and also give it brisance, or extra power and speed. Ordinarily, one might be led to believe that the hydrogen peroxide and potassium permanganate would do more towards causing an explosion of the unstable mixture of alcohol and liquid air used in the V-2 than holding it down, as it were, being strong oxidizers. Their use, however, insures a uniform rate of combustion, and removes the danger from flashing or internal ignition. Their capacity in this use is that of a catalyst, controlling without entering into the reaction.

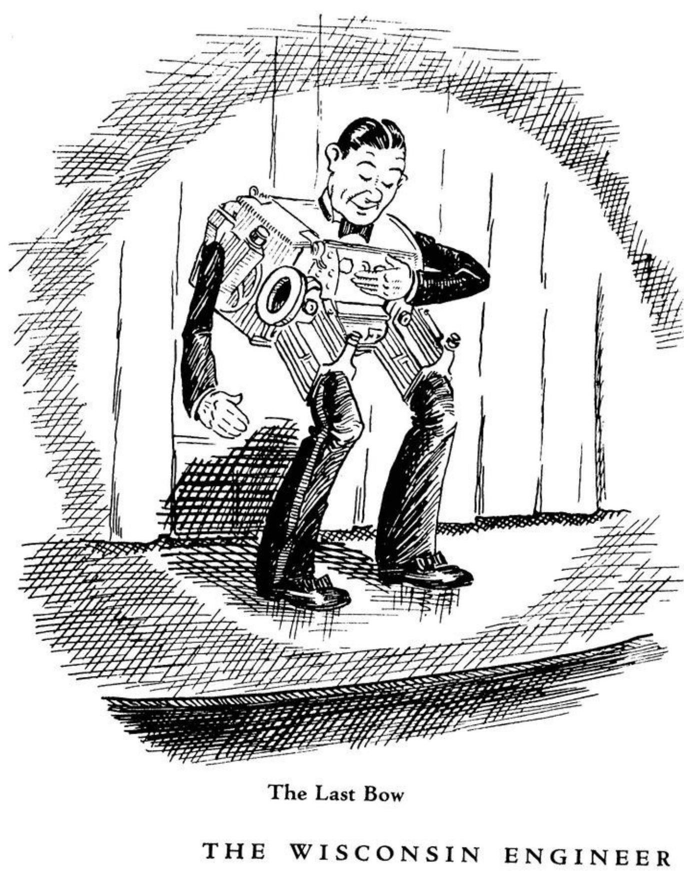
In certain respects, this may well be classified as one of the most important discoveries of the year with respect to commercial developments of the near future. Up to now, the use of rockets for transportation has been highly impractical for the reason that "safe" fuels were not powerful enough, or in other words, feasible fuels would far exceed weight limitations in meeting power requirements. For example, to propel a 12 ton bomb from Germany to America with conventional fuels, the fuel consumption would amount to 55,000 pounds for the 17 hour flight required. However, fuels such as pentolite, a nitrated alcohol, with an explosive force in the neighborhood of one and one-quarter times that of T.N.T., may now be used, greatly reducing these weight specifications.

It is now conceivable to have individual railroad cars propelled by rocket charges and transoceanic mail service by rocket, for already engineers are working on an automobile propelled by rockets in the rear, while other rockets are located in the front to be used as brakes.

Just as there will be a wide variety of fuels used for propellant purposes, there will similarly be many varied power plants used, but they may be classed in five general groups: thermal-jet engines, continuous and intermittent duct type engines, and those using wet and dry fuels.

In main, the propulsion would be of the same principle of that used in the 46 foot, 15 ton V-2 bomb. In this rocket the highly explosive propellant mixture of alcoho and liquid air is ignited and ejected through jet tubes a the rear set at a 45° angle. This installation causes a spinning effect of the exhaust gases such that they literally chew their way through the atmosphere, much as a screw would through wood, and as a result, the V-2 is forced forward at a rate faster than sound to altitudes estimated at 60 miles above the earth. With such terrifically high speeds it becomes necessary to cool the outer shell of the rocket to prevent its excessive heating due to air friction which might well cause detonation of the rocket's explosive charge, if not the destruction of the rocket's shell itself. Consequently the alcohol is circulated through an outer jacket to serve as a coolant as well as a fuel.

So once again, as oft times before repeated, the war has brought about new developments which have brought the realm of the seemingly fantastic but a few short years away—home by rocket in a wink? It's not as crazy as it seems!



The Last Bow

ALUMNI NOTES . . .

(continued from page 18)

artnership with T. M. Walsh. The new rm will engage in surveying, with offices at 1709 W. 8th St., Los Angeles 14, Calif.

SAXER, EDWIN L., c'39, 2nd Lt. USA ir Force, has accepted a position on the eaching staff of the University of Toledo, beginning the second semester.

MILLER, MALCOLM A., c'40, a lieuenant in the Sea Bees, is on terminal eave and expects to return to Kansas City where he will be with the contracting firm of J. C. Pritchard & Co.

JOINER, ROBERT G., c'42, has acepted a position with the W. J. Camn Co. of Newark, Ohio. The head of he firm, "Bill" Camlin, is a Wisconsin ivil graduate of the class of 1918 and uring his student days was business nanager of the **Wisconsin Engineer.**

GRIBBLE, RALPH, c'43, who served n Europe a lieutenant in the 374th Enineers, is now assistant to the superinendent of maintenance at the plant of Oscar Mayer & Co. at Madison.

WILLIAMS, GEORGE A., c'43, went verseas in December as a first lieutenant, Co. C, 313 Engineer Con. Bn., APO 88, New York.

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Chemicals

GREENRIDGE, C. T., ch'26, was reently placed in charge of all service departments at the Batell Memorial Instiute and formerly was assistant superisor of process metallurgy research.

DARROW, WENDELL L., ch'40, was a recent visitor in Madison on his way to Reedsburg for Christmas vacation. Since February, 1941 he has been working for T.V.A. and has been stationed at Wilson Dam near Florence, Florida. He is employed in the Process Development Section.

DONAHUE, JEROME T., ch'42, enlisted in the Air Force and was commissioned April, 1943. He has been stationed in Tucson, Ariz.; Carlsbad, N. M.; Hartford, Conn.; Spokane, Wash.; Salt Lake City, Utah; and Chanute Field, Ill., as first lieutenant engineering officer. In June, 1943, he married Marjorie of Milwaukee and on January 29, 1945 became the father of a son.

HOEKSTRA, IRENUS A., ch'43, is with the Niagara Alkali Company in the research department. He has been active in the development of manufacturing processes for "Niagathal," which is used for dyes, pharmaceuticals, synthetic rubber, and insulating materials.

KUSA, JAMES, expects to receive his discharge from the navy in the near future and to be back at the University of Wisconsin the next term to get his degree.

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Electricals

MARSH, JOSEPH, e'44, has received his discharge from the navy and is continuing working at the Naval Ordnance Laboratory in Washington, where he worked while in the navy.

SCHREIBER, ENSIGN OTTO W., e'44, is also at the Naval Research Laboratory in Washington, D.C., as sonar field engineer in the electronic field service group. At present he is working on a long range sound project for air-sea rescue. During the past year he has attended sonar schools at Key West, Florida, and at M.I.T. He has also worked with RCA engineers on sonar on surface ships at New York, worked on sonar gear

Otto Schreiber

for submarines in San Francisco and spent some time in the Bahamas, at Woods Hole, Mass., Oceanographic Institute, at the underwater sound laboratory in New London, Conn., working on the present project.

SHAW, JOHN, e'44, is working on aircraft radar at the Naval Research Laboratory.

ATOMIC BOMB . . .

(continued from page 9)

check physically step by step from the laboratory to production. It is a story of the construction workers and the operators who converted the work of the designer into a finished product and brought confusion to our enemies.

It is a glowing story of how our country can mobilize leadership and workers to heights of cooperative achievement when the motive is sufficient. It was a vast program but it was done and this large job was done in a manner typical of the engineering approach. The big job is nothing more than a lot of smaller jobs, but no part, no small job, no detail can be neglected. It took imagination, it took organization, it took courage, it took faith and it took hard detail work.

* * *

Editor's Note: Guiding hand at the Hanford Atomic-Bomb project, Col. Franklin T. Matthias, 37-year-old soldier scientist, was discharged at the War Department Personnel Center recently.

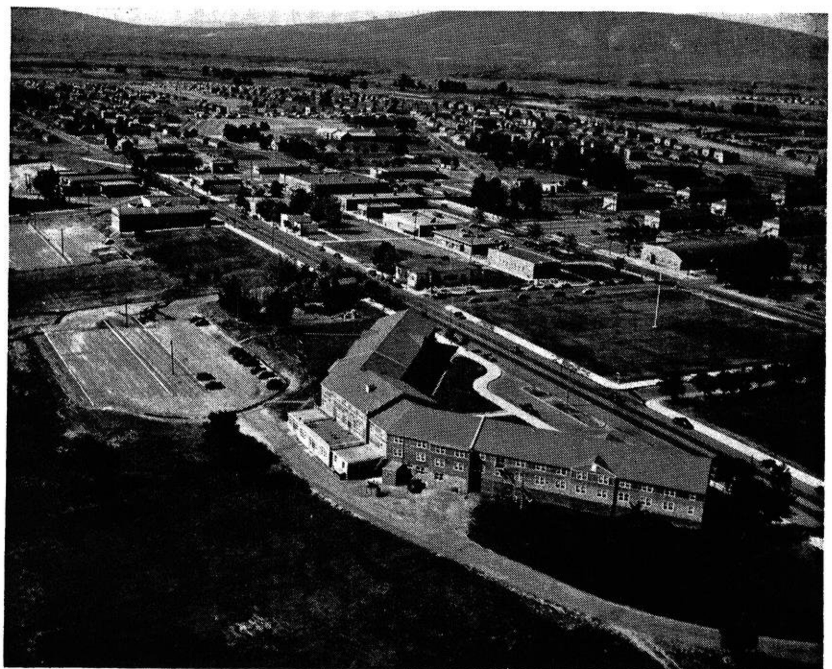
Since early summer of 1942, Col. Matthias was in charge of the Hanford project, and for his meritorious work was awarded the Distinguished Service Medal on the 15th of November, 1945. The citation follows:

CITATION FOR DISTINGUISHED SERVICE MEDAL

Colonel Franklin T. Matthias, Corps of Engineers, a Area Engineer, Hanford Engineer Works, Manhattan En gineer District, from February, 1943, to August, 1945, per formed distinguished services in connection with a projec of unparalleled importance, the development of the Ato mic Bomb. He bore the responsibility for the expeditiou construction of plant areas and housing facilities necessar to this undertaking. His success in procuring the neces sary manpower, his tact and diplomacy in establishin harmonious relationships between management and labor his ability in formulating and administering sound securit and secrecy restrictions, and his resourcefulness in sur mounting unforeseen obstacles even beyond those inheren in construction projects were decisive factors in the pro duction of the basic materials used in the Atomic Bomb Through superior organizing ability, mature judgment initiative and untiring effort, Colonel Matthias contributed in a notable manner to the success of the Atomic Bomb project.

(Award made on October 20, 1945, when the du Pon Company was awarded the Army-Navy "E" for excellenc in operation of Hanford Engineer Works.)

Col. Matthias is starting 115 days of terminal leave, and at the end of this month expects to be on his way to Brazil. He has accepted an offer to become project man ager of a hydroelectric program in that country.



Air view of the south section of Richland. This was originally a village of 431 population.

Here At The "U"

A Bid For Us

JUST what do you do with your spare time? In reply to that, there could be answers ranging from studying very night until the wee hours or drinking with the gang t the Cabin or seeing Mary. But is it something that in en years you can look back on and smile and be proud of? And what about extra-curricular activities? Or don't you ave any?

College students could perhaps be divided into three lasses: those who study all the time; those who study, out yet find time for other activities; those who don't study t all, try to do lots of things, but really accomplish nothng.

For each group hundreds of reasons could be pointed out why the student needs extra-curricular activities. It nas been repeatedly stressed that the person who does his vork, yet finds time for other worthwhile things in the end gets ahead. The person who studies all the time is usually a dull type of stooge and the one who spends all his evenings out on a binge in ten years will wind up as a permanent fixture in some bar.

The University of Wisconsin has different activities—no matter your interest. And if you like working on a magazine there's the WISCONSIN ENGINEER. It's a magazine put out by the Engineering School students—that means a few carry the responsibility and put it out—yet it is a reflection on the entire College of Engineering.

If you are interested in writing or in the business end of a magazine, drop in to see us. The writing of technical articles is always of advantage to the engineer whatever his work after school may be. Whether he be a research man, a designer, a sales engineer—the ability to express yourself in writing is an asset. And the knowledge of how a magazine is run and financed is a detail that can always be applied. And then there's just the plain idea of being able to take responsibility and ride that out to everyone's satisfaction—especially your own.

How about it?

—J. H.

POLAR PLANIMETER . . .

(continued from page 22)

then reading the mean height of the card directly from the drum. If A = 1 l dm and the length of the arm is set equal to the length of the card, instead of reading 1 l dm, l dm is read directly. These, then, are the two principle methods of determining the mep with the polar planimeter.

The polar planimeter as explained here is a very useful and accurate instrument much used by engineers. The accuracy is of the order of 99%.

TESTING FOR HARDNESS . . .

(continued from page 16)

testing thin sections. This machine differs from the others in that a variable load is used to produce a given depth of penetration (usually 0.0018 inches). It is quite rapid in operation, but tends to be inaccurate.

The Shore-Scleroscope is a dynamic-hardness test that gives a hardness number dependent upon the height of the rebound of a small pointed hammer falling from a height of 10 inches within a glass tube. The relative hardness in this test depends upon the deformation of the material and the resilience of the hammer. On hardened parts the indentions are so small that they do not seriously impair the finished surface.

Because of the ease and low expense with which hardness tests can be made, this method of quality-control should increase in the post-war period. It offers an economical method of keeping top-notch quality that is within the scope of even very small shops. It provides all manufacturers a means of preventing the output of parts improperly heat treated, and if used effectively can stop production before many of these faulty parts are completely machined.

References:

The Mechanical Testing of Metals and Alloys by P. F. Foster.

Testing and Inspection of Engineering Materials by Davis, Troxell, and Wiskocil.

A.S.M. Handbook, 1939 edition.

SHORT CIRCUITS . . .

(continued from page 20)

To those who still don't know what the word osculate means, we offer the following data:

To kiss is to osculate. To oscillate is to sway back and forth. To sway back and forth is to swing. To swing is to hang. So what's the use of kissing a girl if you have to hang for it!

•

Draftee: "—then the bullet struck my head, went careening into space—"

Gal friend: "How awful! Did they get it out?"

•

The Perfect Boy

Does not skip classes;
Does all his home work cheerfully;
Is not girl crazy;
Doesn't come home late;
Does not exist.

•

"I guess I'll cut in on this dance," said the surgeon, as he chloroformed the St. Vitus patient.

•

Here
now is
a little
triangle!!
The idea is
not really new
but yet amazing,
despite the fact it
is old there's a lack
of sex and no humor, al-
most everyone will finish
reading this.

•

History quiz: "Were you copying his answer?"

"No, sir, I was only looking to see if he had mine right."

•

She: "M-m-m-m-m-m! That popcorn has a heavenly smell."

Piker: "Hasn't it? I'll drive a little closer."

•

College days
Have their delights
But they can't compare
With college nights!

Sophomore: "Did you ever take chloroform?"

Freshman: "No. Who teaches it?"

•

Boy: "May I kiss you? May I please kiss you? Say, ar you deaf?"

Girl: "No, are you paralyzed?"

•

Co-ed: "Could I try on that suit in the window?"

Fresh Clerk: "Sure, but we'd much rather have you use the dressing room."

•

You ought to laugh at these jokes, your grandfather did.

•

a dansa,
A data,
Perchanca,
Out lata,
A classa,
A quizza,
No passa,
Gee whizza!

•

Judge: "You, what's your name, your job, and what are you charged with?"

Brute: "My name is Sparks, I'm an electrician, and I'm charged with battery."

Judge: "Give this man a dry cell."

•

Zeke: "I wish I had a nickel for every girl I've kissed."

Pearl: "What would you do? Buy a pack of gum?"

•

Grocer: "A thief entered my store last night and took everything but a box of soap."

Cop: "Why, the dirty crook!"

He Should Be Told!
(To be continued next issue)