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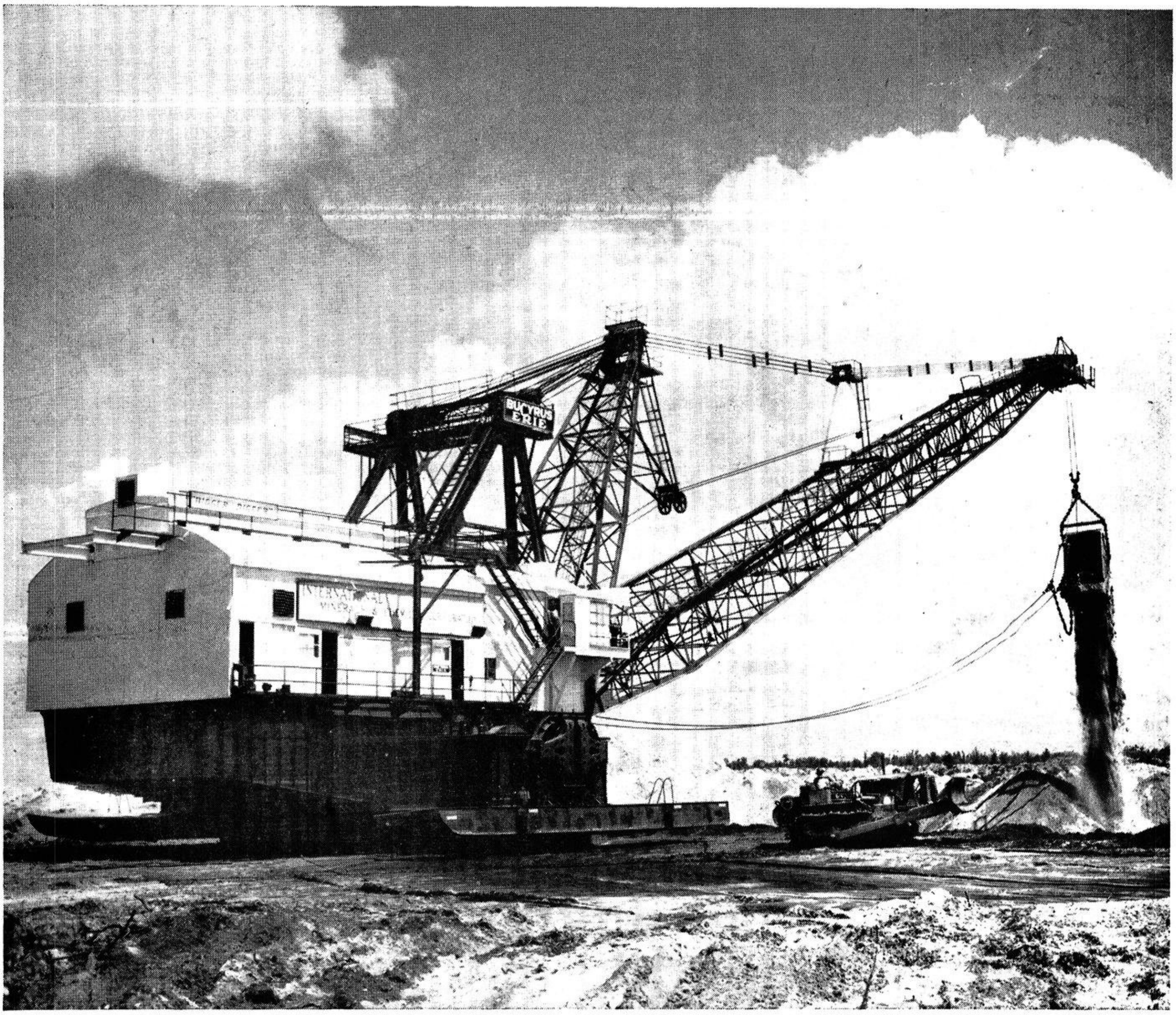

November, 1947

the WISCONSIN ENGINEER

"—mountains are leveled and oceans bounded by the slender force of human beings" —SAMUEL JOHNSON

Why communications get better all the time

YOUR VOICE girdles the globe in one-seventh of a second.

It travels at 186,000 miles per second—the speed of light—thanks to the telephone and radio. And by television, so do the pictures of any event as it occurs.

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The answer: Greater knowledge of electronic waves and better materials to harness them. For example, the vacuum tube—heart of radio or television—depends upon the greatest possible absence of air or other gases—a high vacuum. Most of the air is pumped out before the tube is sealed. Then a tiny bit of barium, called a *"barium getter"* is flashed inside of it by electricity. This captures the remaining air and gives a nearly perfect vacuum.

Unending research and engineering have also provided finer plastics for insulation, purer graphite and carbon for electronic devices . . . and a host of other basic materials that help shave the speed of communications to the tiniest splinter of a second.

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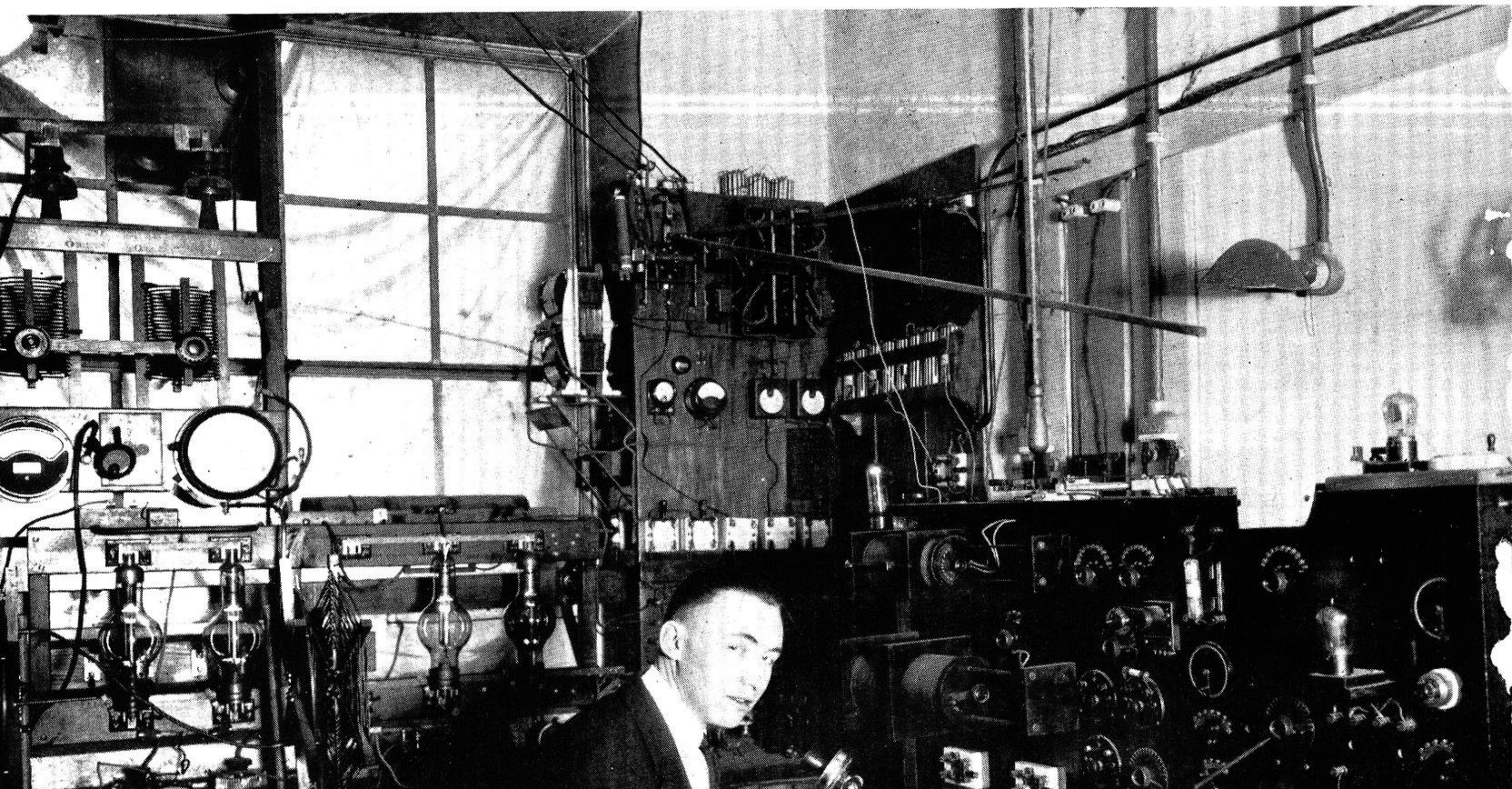
In This Issue . . .

COVER:

This high-capacity dragline helps mine more than 41,000 tons of phosphate rock per day at Peace Valley, Florida.

—*Photograph courtesy "Oilways"*

WHA . . .



WHA's equipment in 1920 located in the basement of Sterling Hall. Burton Miller, e'26, PhD'29, chief engineer at the time, now a sound technician for Warner Brothers in Hollywood.

"The Oldest Station In The Nation"

by J. Vasilion e'48

—Photographs by H. Wahlin m'49

IN SLIGHTLY less than four decades, the art of broadcasting aural information and entertainment by radio has emerged from a crude beginning of noisy spark-gap transmitters to level of high perfection now attained in Frequency Modulation broadcasting. Having shared and contributed a good deal to its development, WHA, owned by the state of Wisconsin and operated by the university in Madison, today holds the honor of being the oldest broadcasting station in the nation.

During the one or two years around 1915, the first experimental broadcasts were carried on consisting of daily weather reports to an audience made up mostly of radio experimenters. As early as 1909, wireless communication was held with other experimental stations, but this was not considered broadcast service. It did, however, mark the beginning of interest in radio experimentation on the campus. Professor Terry of the Physics department became interested in the future of radio communication and organized a small group of interested students to help construct a more powerful station. The result of this effort was a transmitter in 1915 consisting of a 5 kilowatt spark operating on wave lengths of 475 and 750 meters. Call letters W9XM were assigned to the station. The primary drawback of this station was the fact that only telegraphic code could be broadcast, limiting the audience to those having an understanding of the code. Two years later, Prof. Terry and his students constructed a telephonic transmitter of advanced design making use of Dr. Deforest's new vacuum tubes. This created many new problems, however, since tubes were not yet available commercially. Even the techniques of tube construction were not known, and so Prof. Terry and his group spent considerable time experimenting with methods of glass blowing and tube evacuation. Many times they worked until the early hours of the morning preparing tubes for the following day's broadcasts only to have them burn out in a few hours or even minutes.

In 1917, music was first broadcast from the university station, but the quality left much to be desired. Hawaiian music was found to sound best, probably because of its metallic twang-like tone. The following year, the Navy department, then in control of radio communication in this country, ordered all experimenters off the air as a wartime measure, but authorized W9XM and a very few others to continue operation. Most experimenters at that time were using spark-gap transmitters capable of causing much interference with Navy communications, but the equipment in use at WHA was of a type which caused practically no interference. This is probably why they were allowed to continue operation, coupled with the fact

George Miller at the FM transmitter controls.

that considerable progress was being made in learning the characteristics of this new type of radio equipment.

1919 marked the year in which the first clear and regularly scheduled broadcasts were received at the Great Lakes Training station. Many "hams" listening to these broadcasts were quite surprised to hear music coming from their headphones in place of telegraphic signals to which they were accustomed. Occasionally, two-way communications with other experimental stations were held to exchange comments on the quality and strength of the signals, and to exchange ideas on technical developments much as the "hams" of today do. The following year a new transmitter having a power output of 500 watts was

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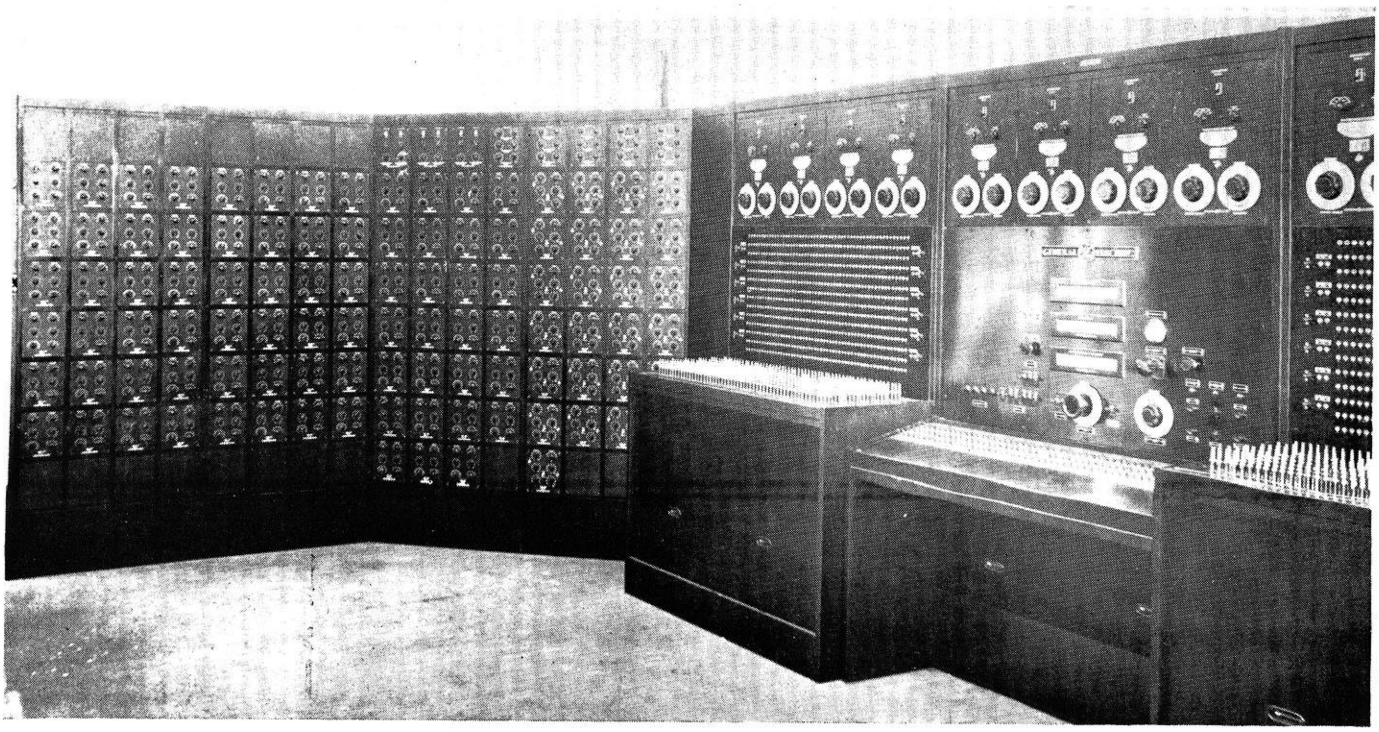
Analytical

THE term "Analytical Engineering" may be defined as the logical consideration of known physical facts and relationships in order that a better understanding of more complex engineering and scientific phenomena may be attained. As thus defined, analytical engineering touches upon every field of engineering and scientific endeavor. It is not restricted to electrical engineering nor to mechanical engineering, although some of the tools used by the analytical engineer are in themselves complex combinations of mechanical and electrical devices.

In progressing towards his goal of better understanding of more complex physical phenomena, the analytical engineer is first faced with the task of representing mathematically the specific system or phenomena under investigation. This, usually, is no small task. In a large number of cases, judicious approximations must be made. The solution of the mathematical equations representing the system is limited in its usefulness to the extent of the validity of these initial approximations and assumptions. Practically always it will be necessary to make assumptions and approximations in representing a complex phenomenon or physical system in order that the time required for solution will not be prohibitive. One of the often encountered tricks of the analytical engineer is that of "linearizing" relationships which are known to be nonlinear. For example, for small oscillations in dynamic systems, such linearizing may be quite permissible and, when employed wisely, will be of considerable value in a preliminary approach to the understanding sought.

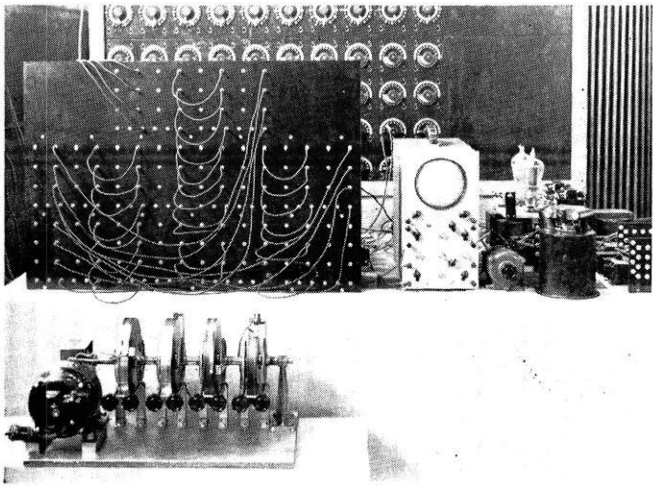
It is well for the analytical engineer to be not so easily satisfied, however. Having made certain assumptions, no matter how reasonable or convenient they might have been, he can only speculate as to how his solution might have differed, and therefore how his understanding might have been affected had he not been driven to make the simplifying and convenient approximations in the interests



The AC network analyzer, applicable to a wide range of power system design and operating problems.

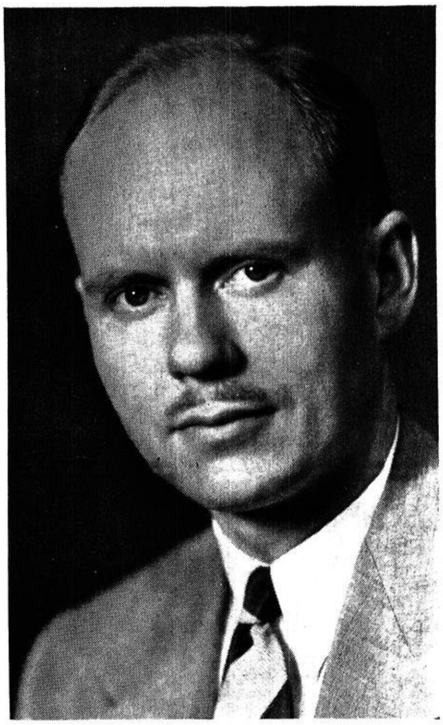
Engineering

by Prof. H. A. Peterson
Chairman, EE Dept.



The transient network analyzer extends the range of engineering problem solution.

Fortunately for the analytical engineer, there are "tools" available which effectively multiply his productive power. In effect, these tools are "seven-league boots" which make it possible to achieve understanding of complex engineer-



H. A. Peterson, e'32, MS'33 (University of Iowa), recently appointed head of the Electrical Engineering department, spent ten years in the Analytical Division of the Central Station Engineering Divisions of General Electric as an Electrical Engineer. Previous to this he spent three years in the Pittsfield Laboratories of General Electric, and one year as graduate research assistant at the University of Iowa.

ing and scientific problems with the expenditure of a reasonable amount of time and manpower. The use of such tools makes it possible to study problems of greatly increased complexity—problems which could not be undertaken otherwise because the amount of time and effort required would simply be too great. To cite an illustration, in one case, it was estimated that the use of a differential analyzer in the solution of a certain problem of evaluating stresses in the Lockheed Constellation plane during landing made it possible to accomplish in ten days what would have required 17 man years without it!

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of saving time. It does not take a very complex physical system involving only linear relationships (or conveniently so assumed) to discourage the initially most enthusiastic slide rule artist.

One may say at this point that in many cases only partial preliminary understanding is all that is required. It is necessary only to try out the system when it is built or assembled to see if its behavior agrees with that predicted from the approximate preliminary analysis. After all, the behavior of the actual system is the truly **complete** solution with no assumptions or approximations. If the system or device is small, much weight must be given to this line of reasoning. It might well be easier and less expensive, for example, to change the size of a small capacitor in some electric control circuit than to change the corresponding numerical value in the set of equations describing the device, and then solving the equations to determine the effect of the change. However, in the case of a large power system, preliminary analysis even though costly and time consuming is essential because after the large elements are built and put together, changes other than those of a minor corrective nature cannot usually be made.

Petroleum Reprieve

by Robert Mitchell m'48

OUR present known petroleum reserves are twenty-one billion barrels. Our consumption is one-and-seven-tenths billion barrels per year. How many years will it last? By simple arithmetic, it will last a little over twelve years—but it is not that simple. Our consumption rate is not constant, and the pumping rate of producing wells cannot be so closely regulated. It will take half a century to bleed much of this oil out of the ground.

In the face of such statistics, oil-men have become very thoughtful. They knew that the Germans had been in a tougher situation in the last war, and had fared rather well in that aspect. They knew that the Germans had prepared for such supply stresses long before the war through research in the Kaiser Wilhelm Institute. They had perfected the "Fischer-Tropsch" process of converting their plentiful coal into a myriad of synthetic hydrocarbons, as well as other more ponderous processes that accomplished the same end result. Why could we not do it?

High Cost

As is usually the case, it was not as simple as it seemed to copy the German industries. The reasons were economic and quality, rather than technical reasons. We knew how they did it, but we also knew that the product was expensive and that their fuels had low cetane and octane numbers. The great amount of Scotch blood coursing in American veins would not permit the purchase of such a low-grade and expensive insurance policy. Before application of synthetic hydrocarbons could be made to our problem, it had to be suited to our economic and quality standards.

Going to the bottom of the problem, petroleum engineers found that the answer to the prohibitive cost of German gasoline (18¢ per gallon as compared to the 6¢ petroleum gasoline in America) lay largely in the cost of the oxygen used in the primary phase. This problem has been most emphatically solved. Oxygen producing plants capable of a two-dollar per ton product are being built at present in large numbers. They are being built close enough to the consumers to permit direct delivery in place of the ponderous cylinder delivery of the seventy-dollar, high-purity oxygen. This took past and subsequent developments in fuel engineering off the calculation sheets and the drawing boards and put them in the field—where they belong.

Quality

Quality was still a problem. The answer must lie in better control of the formation of the synthetic hydrocarbons. The temperature of the reacting constituents was recognized as a factor determining the nature of the reaction. Since the combination itself produced the heat, it became apparent that the heat should be removed from the mass at the point of major reaction. The solution of the problem was a unique development of American engineers. It was not a simple convection or conduction process due to the fact that the catalyst was a solid. In order to visualize the solution, one must form a picture of a finely divided solid which is boiling like a liquid. This solid is the catalyst, well pulverized, which is capable of removing the heat of reaction as fast as it is released. The rate of heat removal can be controlled to give different properties to the product.

The Fischer-Tropsch process can be utilized to produce synthetic petroleum products from natural gas or any rank coal. Coal reserves of all ranks amount to 3.2 trillion tons (known). Natural gas is one of our most plentiful fuels—so plentiful, in fact, that it is often considered a nuisance in the petroleum producing areas. It was estimated in Fortune magazine recently* that 900 million tons of coal would be necessary to replace, through the Fischer-Tropsch process, our yearly consumption of petroleum products. Approximately 300 million tons per year could be used to supply natural gas users with a substitute fuel of high heating value. This latter product would be a by-product of the processed coal as shown in the flow-chart. Obviously, it would be a God-send to many cities now using the low quality heating gases—or which of necessity are using other fuels.

Catalytic Condensation

The much-referred-to Fischer-Tropsch process is the catalytic condensation of hydrogen with carbon-monoxide

*Fortune, March, 1947—page 89.

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NOW--Cheap Oxygen

by Robert Hacker e'49

FOR many years men of science, industrialists, and engineers have been waiting for the time when cheap oxygen would be available for industry. That time has now arrived. Aided by the impetus of the demands of World War II oxygen in unprecedented quantities will now be available at 95 to 97% purity at from $2.75 to $5.21 per ton. This is compared with the $75 to $125 per ton before the war.

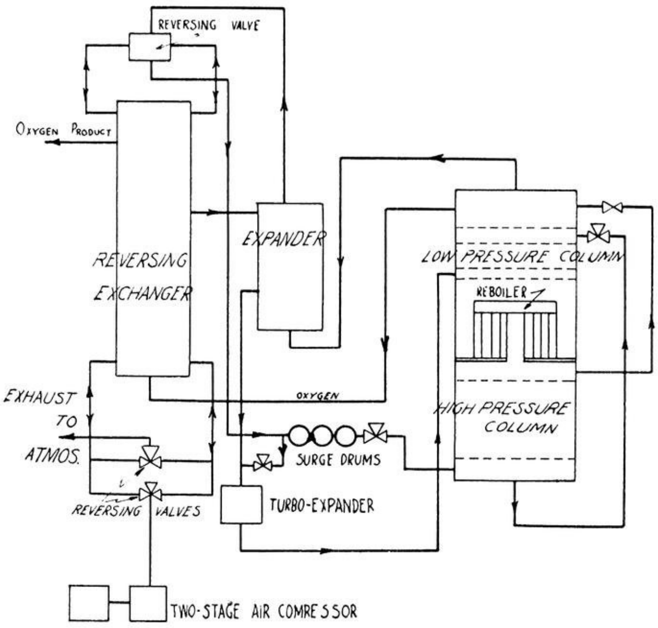
The new process is essentially a German one, but new American ideas have been added to further reduce the cost of the oxygen. Two new plants embodying these new ideas are now being completed. They will raise the American annual consumption to 31 billion cubic feet per year. The largest plant is being constructed at Brownsville, Texas. This plant will have a capacity of 2,000 tons per day compared with the old style plant capacity of 120 tons per day.

There are four essential processes in these new plants. They are compression, heat exchange, refrigeration, and fractionation. Atmospheric air is taken in and filtered and compressed in two stages. The first stage takes it to 30 psig. Then the air is cooled to 100° F. The next stage takes it to 85 psig, and then it is cooled back to 100° F. This mixture is filtered to remove the residual oil and moisture. The oil is removed by activated charcoal pellets.

Heat Exchanger

The compressed air then flows to a multi-annulus reversing exchanger where it is cooled directly by waste nitrogen and oxygen. In principle, the reversing heat exchanger consists of three coaxial tubes. There is one each for air, waste nitrogen and oxygen, and cold pure oxygen. The pure oxygen and waste nitrogen come from the fractionator at extremely low temperatures and are used to cool the fresh fed air by heat exchange. The air is cooled to such a low temperature that the moisture and carbon dioxide are precipitated or frozen out. The pure oxygen that is being used for refrigeration flows continually through the center pipe, but every three minutes the air flow in the other two pipes is reversed. This allows the air to flow through the clean nitrogen pipe, and it also allows the nitrogen to flow over the frozen water and carbon dioxide so that it can re-evaporate them and clean the pipe. This mixture is then exhausted to the atmosphere.

Originally these reversing heat exchangers caused a great deal of trouble. They couldn't be operated for more than 24 hours without plugging up with impurities of frozen water and carbon dioxide. It was established by thermodynamics that for long term operation of reversing exchange the nitrogen at each point could be no more than a few degrees cooler than the fresh air in heat exchange with it. Only if these conditions existed could the impurities be cleaned out on reversal. Under normal conditions a temperature differential of 25° F existed. An American by the name of P. R. Trumpler with the Kellogg Co. conceived and worked out the system whereby this temperature differential could be reversed. Trumpler added a fourth non-reversing passage to the heat exchanger. Through this passage a portion of the fresh



Schematic flow diagram of new oxygen plant.

feed air that had been cooled to near liquification is passed. This additional cooling is used at the cold end of the air passage and it supplies the necessary cooling to reduce the temperature differential to about 8° F. Thus, in effect the air is used twice for heat exchange. Once

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Analytical Engineering

(continued from page 9)

Among the tools that are useful to the analytical engineer might be listed the following:

1. The D.C. Network Analyzer
2. The A.C. Network Analyzer
3. The Transient Network Analyzer
4. The Differential Analyzer
5. Discrete Variable Computing Devices.

The last three analyzers are shown in Figs. 1, 2, and 3. In Table I, types of problems are listed for solution of which each analyzer has been found useful. This is a broad general summary and is intended to portray the scope of usefulness of such devices in many fields.

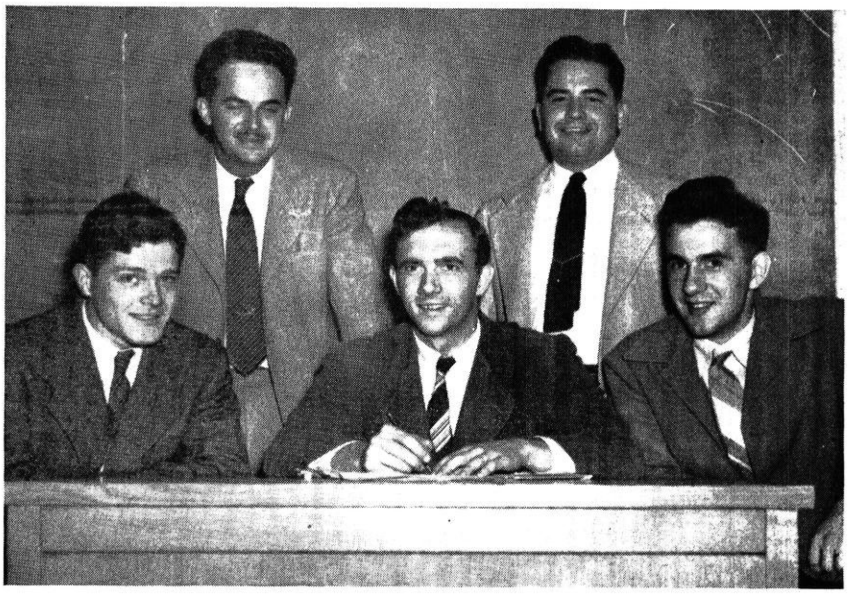
TABLE I

Type of Analyzer	Types of Problems Solved
(1) D-c Network Analyzer	(a) Short-circuit studies (power systems) (b) Flux plotting (c) Compressible fluid subsonic flow (d) Heat flow
(2) A-c Network Analyzer	(a) Short-circuit studies (power systems) (b) Load studies (real and reactive power flow in power systems) (c) Transient and steady-state stability (power systems) (d) Special problems (1) Compressible fluid flow (2) Elastic field problems (3) Elastic structure problems (4) Electromagnetic field equations (5) Schrodinger's equation (6) Vibration problems (7) Hunting problems (8) Rotating electrical machinery
(3) Transient Network Analyzer	(a) Power system overvoltages due to faults and switching (b) Effect of transformer (or other) saturation in producing or limiting system overvoltages (c) Factors affecting the magnitude of transformer inrush currents (d) Effect of transient overvoltages on relay operation (e) Effects of long-time lightning currents in distribution systems (f) Energy dissipated by lightning arresters in discharging switching surges (g) Electronic frequency changer characteristics (h) Internal winding oscillations in power and instrument transformers (i) Mechanical oscillations and vibrations
(4) Differential Analyzer	(a) Transient mechanical problems (b) Compressible fluid flow (c) Rotating electric machinery (d) Nonlinear electric circuit problems (e) Performance of automatic controllers

Item 5, "Discrete Variable Computers," requires some special comment, though necessarily brief indeed. Devices in this classification include punched card machines (such as the International Business Machines) as well as the more complex machines such as those developed during the war at Harvard (the Automatic Sequence Controlled Calculator), the Bell Laboratories Relay Computer, and the ultra-high speed electronic computing machines developed and built by the Moore School of Electrical Engineering in Philadelphia. In general, these larger machines eliminate most of the routine work of calculation and speed up the rate of solution tremendously. Devices of this nature are more flexible than any of the first four mentioned. However, each of these analyzers has its own special field of usefulness. The discrete variable computers add, subtract, multiply and divide, and therefore can handle **any** type of problem since all problems can be reduced to these routine fundamental processes.

The differential analyzer applies to all problems that can be expressed by ordinary differential equations.

It will be impossible to go into detail with respect to any one of these devices in this article. It should be emphasized that no single analyzer is expected to be a universally practical machine for handling all problems. Each supplements the others, with some overlapping it is true. This is desirable, however, because it affords a means in many cases of trying out methods of solution using different analyzers and furnishes a basis for cross-checking results. Cross-checking in this way and with actual known test results and experience furnishes an ideally sound basis for carrying on the work of the analytical engineer.



Top Engineering Honorary, Tau Beta Pi

—Photograph by J. Kroot e'49

Seen among the students and faculty at the University of Wisconsin are those wearing a watch-key shaped like the bent of a trestle. This key is the badge of Tau Beta Pi, the all-engineering honorary society, and signifies that the person has excelled in scholarship and character. The society was founded at Lehigh University on June 15, 1885, by Professor Edward H. Williams, Jr., head of the Mining department at Lehigh at that time. Because of feeling among Phi Beta Kappas against admission of technical students to their society, Professor Williams founded Tau Beta Pi with a determination to give technical students the same chances afforded others by Phi Beta Kappa. The society has grown steadily and now has 79 active chapters and a total membership of over 48,000. The forty-second national convention was held October 9, 10, 11 at New York and was one of the best ever.

Records of the local chapter show that Bernard V. Swenson, a transfer from Illinois Alpha, was the first member of Wisconsin Alpha. The first member to be initiated was Charles F. Burgess, who later became well known as head of Burgess Battery Company. According to the national office, Wisconsin Alpha was the sixth chapter to be formed. It was installed May 5, 1899, and the first meeting was held four days later. Last July the chapter initiated 30 members to increase their total members to 1,403.

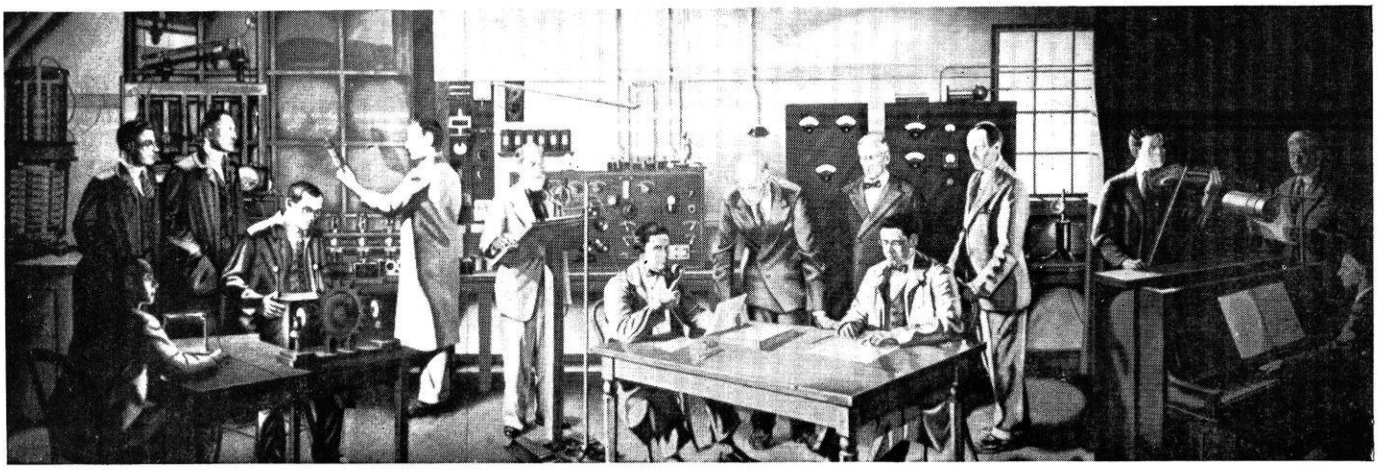
At present Tau Beta Pi is strictly a male society, but to give due credit to female engineers of exceptional ability there has been introduced the Tau Beta Pi Women's Badge. The policy of the society's magazine, "The Bent of Tau Beta Pi," has been to publish a picture and story of each women's badge winner. With the ever increasing number of women in engineering, the number of badge winners has increased so much that some change will have to be made. It is very probable that the question of permitting initiation and full membership to the "slip-stick" queens came up at the national convention. In the event they are granted full membership, their fair faces will probably disappear from "The Bent"—a great loss indeed.

Selection of members is determined by their scholastic ability and character. The grade-point averages required for selection are about 2.75 as a junior and 2.25 as a senior.

The local chapter of Tau Beta Pi is one of the more active honorary societies on the University of Wisconsin campus. Besides the business meetings and initiation each semester, the chapter holds a number of parties and picnics.

Officers elected for this semester as shown in the above photograph are: In the back row, left to right: Carl Leyse, Corresponding secretary, and Frank Kohler, Cataloger. Front row, left to right: Carlyle Fay, Vice-president; Vet Holmes, President; and Alden Pahnke, Recording secretary.

W H A . . . (continued from page 7)



Mural in WHA studios commemorating the men instrumental in its development.

planned and built by the university staff. Directional antennae were placed atop Sterling Hall and the transmitter was installed in the basement. In 1921, basketball games and concerts were being picked up remotely from the Armory and fed to the transmitter in Sterling Hall.

The call letters WHA were granted the state station in 1922, taking it out of the experimental class and placing it into the class of commercial stations. From this point on, more attention was focused on programming, but again trouble developed. At first, some professors refused to speak over the radio because they considered it undignified. Instead, they would write down their comments and have them read by the station announcer. Later, however, their attitude changed and they were quite happy to talk over the radio.

Studio Control Room.
Ernst Engberg, foreground; Arthur Liebs, background.

Up until 1929, the state radio station was under the sponsorship of the Physics department, but after Prof. Terry's death in that year, it was taken over by the Electrical Engineering department. Professors Edward Bennet and Glenn Koehler continued the work done by Prof. Terry, and in 1930 a new state radio voice, WLBL, was added to that of WHA. This was a big step toward the goal set by Prof. Terry of bringing the people of Wisconsin in closer contact with the activities of the state, the university, and its educational facilities through the medium of radio. The station broadcast hours, however, were limited to daylight operation, and so only a relatively small audience could be reached. Power increases of 750 watts and 5000 watts were granted in 1930 and 1936, but this proved to be inadequate in view of the fact that other commercial stations were being stepped up to 10 to 50 kilowatts. From 1932 to 1941, various attempts were made to improve the state radio coverage by combining other stations into a network and securing extended hours of operation, but all were unsuccessful. Finally in 1945, The Wisconsin State Radio Council was created to develop the state radio system. It is composed of eleven members including the governor of the state, the president of the university, and directors of various educational departments in the state. Owing to the fact that Frequency Modulation radio offered superior service, and unlimited hours of operation could easily be secured, the council voted acceptance of a plan calling for seven FM broadcast stations located throughout the state in the form of a network. The first station, WHA-FM, is already in operation here at Radio Hall, and a second, in Delafield, is under construction to serve the Milwaukee area. When completed, this network will be the first state owned network in the nation, bringing to the people of Wisconsin programs of highest caliber through a radio system of advance design.

New Courses

by A. Jones e'49

AS A DIRECT result of recent war with which most of us are all too familiar, industrial technology and planning has made tremendous advances, and the demands made on Engineering personnel have necessarily widened in scope. To meet these demands and to better give the engineering student the broad background of both fundamental and advanced training he needs at the college level, the Engineering school is offering this year over two dozen new required and elective courses, and has created a completely new curriculum in biochemical engineering.

By far the largest number of courses lies in the electrical and mechanical engineering fields, but every department has at least one addition to its program this fall, and more new courses are under consideration for the future. No attempt will be made to enumerate all of the courses offered, nor to explain them in great detail. Complete course lists are available together with enrollment requirements and the faculty members concerned, who can give a more complete picture of the individual courses.

Photogrammetry

A tongue-twister of a new course for the civils is C.E. 119—Photogrammetry, the science of making aerial photography pay. Developed in mapping large areas to scales of 1 to 10,000 or larger, photogrammetry is coming into ever wider use for the compilation of all types of maps, reconnaissance for route locations of highways, airports, pipelines, and power lines, and for forestry and timber cruising. High quality aerial photos furnished data so accurate that exact routing for highways including amount of fill and estimated cost can be made from them without running a survey. Many highway commissions are at present making all their plans on the basis of such photos, and by so doing are able to purchase the necessary property without facing speculative prices. Many cities are now doing a large portion of their development planning solely on the basis of photographs, and have realized increased tax income from property which had never been on the tax rolls. Under ideal conditions aerial photos give an accuracy of building heights of from 1 to 2 feet.

As for the course itself, there is NO fieldwork, and there are NO plane rides. A lecture and two labs fill out the three credit course, and there is some $1,500 worth of new equipment on hand. Complete photos of the Madison and Devil's Lake area are available, and with the aid of these, problems in contouring, map-making, route locations, elevation determinations, and mosaics will be dealt with.

Biochemical Engineering

The chemical engineer who expects to find a home in the food or fermentation industries will find it important to secure supplementary training in biochemistry and bacteriology. To provide for this requirement a special curriculum is now available leading to the degrees of B.S. and M.S. in biochemical engineering. This type of training will be of special value in the food processing industries, in the production of pharmaceuticals, solvents, leather, textiles, beverages, and in the general chemical processing of agricultural products, in all of which a knowledge of bacterial processes is essential to the successful application of engineering principles.

New Electronic Course

Of the many new courses opened for E.E.'s, the largest number are in the 200 series and require a fairly sound background in electrical fundamentals, but there are two new 100 series courses and two required basic courses, E.E. 5 and E.E. 55. Taken concurrently, these last two replace the elective course, E.E. 155, Communications Electronics, and give four lecture credits and two laboratory credits as against the former two and one, respectively. The new courses are designed to provide a general background in fundamental electronics, applicable to both the power and communications fields, including basic theory and basic applications of high-vacuum tubes, gas filled tubes, cathode ray tubes, photo tubes, rectifiers, amplifiers, control circuits, and oscillators. New advanced E.E. Courses deal with such provoking subjects as servomechanisms, advanced communications measurements, and electromagnetic radiation and transmission.

(continued on page 16)

. . . Cheap Oxygen (continued from page 11)

for heat exchange with nitrogen and then with itself. Only about 30% of the air is necessary for this refrigeration. The remaining 70% leaves the heat exchanger and is discharged into a surge drum at approximately –250° F.

The cooled high pressure air then enters the lower section of the fractionation tower below the bottom tray. This section, called the high pressure section, contains 20 trays. It separates the air into an overhead liquid oxygen and a bottom liquid of about 35% oxygen. The nitrogen overhead liquid is subcooled by exchange against the waste nitrogen, and it supplies reflux to the upper section of the fractionator where it is introduced at the top tray. This section contains 40 trays and operates at 10 psig. The enriched oxygen produced from the bottom of the high pressure section is similarly cooled by exchange against waste nitrogen. Then it is introduced into the low pressure column as intermediate reflux. The expanded air is also introduced into the low pressure column at an intermediate point. The low pressure section fractionates the feeds into a waste nitrogen stream removed as an overhead vapor and an oxygen product which is withdrawn from below the bottom tray as a vapor. The reboiler duty is supplied by the condensation of the overhead vapors in the high pressure section, part of which are withdrawn for reflux to the low pressure section, and the balance passed through the high pressure section as internal reflux. The oxygen product passes from the low pressure section of the fractionator directly to the inner annulus of the heat exchanger where its refrigeration is recovered.

In order to produce the 48,000,000 cubic feet/day of oxygen that is the capacity of the new plants, it is necessary to compress 250,000,000 cubic feet of air to 85 psig. In the old style plants reciprocating machinery was used for compression, but for these huge capacities the cost would be prohibitive. Because of the low operation pressure of these plants, it is possible to use centrifugal pumps. The type used have radial intake and axial discharge. Two of these pumps are used in parallel for the two stages of compression. In order to reduce the operation costs these pumps are often driven by a steam turbine driver that is supplied with steam from the process that is using the oxygen. This is especially true when the oxygen is used in the Fischer-Tropsch process for the oxygenation of hydrocarbons.

Because of the low operating temperature of the process, completely effective insulation of the equipment is of vital importance. Also, because of the extreme cold it is necessary to take care in the selection of the materials for the machinery. This special equipment is one of the prime considerations in the cost of the oxygen. Another is the cost of the power necessary. Because of the large amount necessary, one of the cheapest places to operate one of these plants is in conjunction with a plant that gives off large amounts of heat that can be used to produce steam.

At the present time there are six major fields that are using large quantities of this low cost oxygen. These fields are the partial oxidation of hydrocarbons, the gasification of coal, the heavy chemical industry, the iron and steel manufacture, the non-ferrous metal industries, and in mining. Now that oxygen has come of age and should be available in unlimited quantities many more industries should spring forth to take advantage of the unlimited opportunities.

New Courses (continued from page 15)

The M.E.'s have the largest number of new courses opened to them, most of them advanced technical courses such as M.E. 117, Industrial Heat Transfer, the application of rational design to insulation, steam boilers, economizers, refrigeration, etc., or M.E. 118, Gas Turbines and Jet Propulsion, which presents the principles and performance characteristics of gas turbines and related equipment. More emphasis is placed on industrial engineering with M.E. 115, Industrial Plant Design, in which some small product such as an automobile water pump is carried through an entire semester, and all steps leading to its successful production are organized. A market analysis is made, plant facilities are determined and located, equipment selected and balanced, and tool, material, and production control systems are established for the theoretical production item undertaken by the class.

The mechanical engineering department is planning more new courses in industrial engineering, and subjects such as advanced production methods, tool and die engineering, and possibly a course in plastic working of metals are being considered. Rather than offer a separate degree in industrial engineering, the school will enable a student to supplement his basic work with courses valuable to industrial engineering, and thus avoid limiting his scope by over-specialization, which is an often heard criticism of many schools today.

Foundry Education Foundation

Scholarships

by E. Kasum e'48

INITIATING the Foundry Education Foundation activities in promoting interest in the foundry industry among engineering students, four students in the College of Engineering have been named as recipients of the first of a series of five-hundred dollar scholarships. A fifth scholarship is to be awarded in the immediate future.

The following men have been nominated by the faculty committee: Robert F. Kenzler, me'3; Donald P. Schmidt, m&m'4; Norman J. Stickney, m&m'4, and Hugh Donald Stork, m&m'4.

Wisconsin is one of the six engineering schools chosen by the Foundation to participate in its program. The other five schools are: Cornell, Northwestern Institute of Technology, Massachusetts Institute of Technology, Cincinnati University, and the Case Institute of Technology. Selection of the schools was based on their geographical location with respect to the foundry industry, past cooperation with the foundry industry, and willingness to initiate a foundry option.

Candidates' Requirements

Choosing of the candidates is the responsibility of the respective schools as is the actual awarding of the scholarships. The requirements for qualifying are an interest in foundry work as evidenced by courses taken and/or other foundry experiences, willingness to take electives in the foundry option, and all other requirements equal, character and relative grade points. Juniors and Seniors in any department of engineering will be considered. The majority of the scholarships will be awarded to Juniors. For the first year a definite ratio was not set, but for the following two years the schedule is:

2nd year—10 Juniors— 5 Seniors
3rd year—15 Juniors—10 Seniors

Summer Work Experience

Juniors that receive the Foundation scholarships are expected to spend the summer between their Junior and Senior years working for one of the member foundries, under a very closely supervised training program. The latter program has as its aims to give the student engineer a good background of foundry operation. Another impetus to Junior recipients of the award is that provided they merit it, the award can be received a second time.

No Obligations

Mr. Anthony Haswell and Mr. George Dreher, President and Executive Director respectively of the Foundation, stressed the fact that the Foundry Option courses are open to all. That includes the summer work for which the Foundation will act as a placement bureau. Scholarship winners are in no way obliged to work for member foundries upon graduation, though the Foundation will gladly place men in the estimated five to ten thousand openings for graduate engineers in the foundry industry.

The Foundry Education Foundation has evolved out of a committee set up by leaders in the foundry industry to seek a positive method of developing interest in their industry among engineers. Evidence of the widespread need is that the Foundation represents some five-hundred foundries which handle about seventy-five per cent of the nation's four-billion dollar annual output of the foundry industry.

Equipment Grants

Another aspect of the program is equipment grants to the six schools. These grants are to be used according to the various schools' needs to enlarge and improve their foundries. The size and frequency of the grants varies according to the needs of the Colleges, and are determined by the Foundation. Technical advice and assistance in obtaining equipment are being generously extended by the foundry group. Wisconsin's sizable grant will be utilized to equip the new foundry building alongside the Mining and Metallurgy building.

Mr. Haswell and Dreher closed their interview by announcing that the foundation will act as a source of lecturers, which will be readily available, and as a placement bureau. In reference to the latter a recent survey conducted by the Foundation indicates that the industry can readily absorb five-hundred men per year.

Alumni Notes

by J. J. Kunes e'48

L. Hunholz e'47

EE

Older EE grads will remember Dr. **William E. Wickenden,** member of the faculty from 1905 to 1909. He died last September 1st, shortly after his retirement as president of Case Institute of Technology, Cleveland, Ohio. Dr. Wickenden was graduated from Denison University with the degree of Doctor of Science and after a short time at the Mechanics Institute, Rochester, N. Y., served on the faculty here for four years. He then was appointed Assistant Professor of Electrical Engineering at Massachusetts Institute of Technology and in 1914 was appointed Associate Professor. In 1918 he became personnel manager of Western Electric and in 1922 became Assistant Vice-president of American Telephone and Telegraph. In 1929 Dr. Wickenden was made president of the Case Institute of Technology, Cleveland, Ohio, and since then had been very active in the advancement and improvement of education. He served on many AIEE committees, and was president of AIEE for 1945-46. Besides his technical activities, Dr. Wickenden was prominent in Cleveland civic affairs. The degrees bestowed on him are too numerous to list here. He was the author of many articles and papers, and had recently been appointed a representative on the United States committee of the United Nations Educational, Scientific, and Cultural Organization.

Here is a "hill" scholar in the AIEE limelight: Dr. **C. A. Suits** (MA'27) has been appointed chairman of the AIEE committee on research. After leaving Wisconsin, Dr. Suits received the degree of Doctor of Natural Science from the Technische Hochschule, Zurich, Switzerland. He entered the General Electric research laboratories in 1930 and in 1945 was made vice-president and director. He is the author of numerous technical papers and has many inventions to his credit. In 1937 he was the recipient of the Eta Kappa Nu Award.

Dr. **M. DeMerit** (EE'14) attended the instructional class here at the University this summer. He visited the engineering campus and observed new changes in staff, enrollment, instruction, and laboratories.

Raoul D. Smith (EE'47) is working in the research department for Philco, at Philadelphia.

H. W. Grothman (EE'46) is employed as an electrical engineer by the "Northern Indiana Public Service Company," Hammond, Indiana. He was a V-12 trainee here, recently discharged from the service.

J. R. Hafstrom (EE'37) has returned to the campus as Assistant Professor of Electrical Engineering. After receiving his degree here he worked with General Electric for 3 years, becoming a manufacturing engineer in the lamp division. From 1940 to 1942 he was an instructor at Iowa College while working for his master's degree. Since 1942 he has been working for the government. Ex-servicemen attended his Navy radio school at Wahaiwa, on single side-band multi-channel radio equipment. His earliest "ham" activities were as W9TYO in Neenah, Wisconsin, but since then he has operated in many districts, most recently as W4KNK.

G. D. Keppert (EE'46) is employed in the communications field by the Wisconsin Telephone Company at Milwaukee. He is working with fixed land and mobile telephone systems.

Orrin R. Buchanan (EE'31) is a radio engineer at the Naval Research laboratory, Washington, D.C.

R. M. Arms (EE'94) died after a long illness. He had been an inspector for the Alaska Railroad, retired several years ago because of poor health.

F. A. Kartak (EE'09) who retired in 1944 as dean of the Marquette University College of Engineering, died recently. Mr. Kartak had served as research assistant and instructor at Wisconsin until 1913. In 1921 he joined the Marquette faculty and was appointed dean in 1928.

H. W. A. Rusch (EE'15) died after suffering a stroke. He was an engineer with the Wisconsin Power and Light Company for 23 years.

CE

James W. Myers (CE'27), superintendent of the Water Department at Kenosha for many years, has been made assistant manager of the Philadelphia Suburban Water Company, a privately owned utility that serves a large area adjacent to Philadelphia.

Maxwell W. Fischer (CE'28) has been appointed acting maintenance engineer for the Wisconsin Highway Commission.

Alva J. Armstrong (CE'29) resigned from the U. S. Engineers Office at Pittsburgh in July, 1946, to join the staff of the Special Engineering Division of the Panama Canal.

William F. Tubesing (CE'05) died at North Hollywood, Calif., on March 20. He had been a consulting and contracting engineer in Milwaukee for many years.

LeRoy F. Harza (CE'06) is head of the Harza Engineering Co., of Chicago, which has recently been awarded a contract by the government of El Salvador to report upon two proposed hydro-electric projects on the Lempa River, one of the largest streams of the country.

Edward F. Tanghe (CE'14) has been appointed assistant superintendent of Water Works, Milwaukee.

James R. McAteer (CE'18) died February 10, in Madison. He had been employed in the Treasury Department in Milwaukee.

H. Wesley Clark (CE'20), city engineer of Niagara Falls, N. Y., since 1931, retired on April 14. He is president of the United Hotels Company of America, and of the United Office Building.

Clarence A. Willson (CE'21) has been appointed research engineer of the Committee on Reinforced Concrete Research, American Iron and Steel Institute, New York. Previously he was director of the building regulations and construction standards branch of the National Housing Agency.

Earl K. Loverud (CE'23) is general manager of Falls Manufacturing Company, founders and machinists, at Menomonee Falls, Wisconsin.

Frederick F. Hornig (CE'30) has been appointed division engineer for the Milwaukee Road at Mason City, Iowa.

Reginald C. Price (CE'35, MS'46) recently left the Bureau of Reclamation to become special assistant to the Assistant Secretary of the Department of Interior at Washington, D.C.

Leslie J. Deno (CE'37) is assistant general bridge inspector of the Chicago & North Western Railway at Chicago.

Ray F. Voelker (CE'37) is a division engineer with the Standard Oil Company.

Alvin Edelstein (CE'38) is structural designer with Sinclair Refining Company at East Chicago, Indiana.

James P. Michalos (CE'38) who has been teaching structural engineering at Syracuse University, has accepted an associate professorship at Iowa State College.

Gerald G. Fintak (CE'41, MS'46) is hydraulic sales engineer with Allis-Chalmers Company.

(continued on page 30)

The Way We See It . . .

Join Your Society

WITH the advent of each new school year the various engineering societies strive for new members so as to increase their beneficial affect on larger portions of the student body. A very obvious question is, "What have I to gain from joining?"

You get to meet your fellow students out of the classroom. You get acquainted as men and future engineers rather than constantly considering one another as mere entities that sit in prescribed chairs in classrooms. This informal striking up of acquaintanceships and friendships within like-minded groups is a reason in itself worthy of the utmost of consideration.

Then there is the all important supplement to your engineering education. The new research and developments taking place that the classrooms have not time to cover. First, the annual membership fees of the societies cover your subscription to an excellent technical journal, which features discussions by topnotch men in their fields. Second, the organizations invite prominent men in industry to lecture on specific phases of engineering. Third, field trips, usually planned in conjunction with the regional chapters of the organizations, are employed to acquaint members with the workings of industries in the immediate surroundings. These first hand visits are probably the most anticipated activities of the groups.

Here before you, lies an opportunity to learn more about your profession. You have the chance to see, read, and hear about the various phases of your field in which you may have the greatest interest. And if you should choose to be active, which you should, a chance to learn about organization and planning.

Diploma Evaluation

SOME individuals walk across the stage on that great day, grab their diplomas, and shout inside, "I've done it!! I'm an engineer!!" Others merely experience overwhelming relief.

The implications of that bit of sheepskin should be given some consideration. It means primarily that you did not flunk out. Quite a distinction, I suppose, when compared with the ones who tried and did not make it. But don't forget, you have no basis of comparison if that other person did not attempt such preliminary work. You simply cannot grade rutabagas on standards set up for Portland cement.

I am of the opinion that a rutabaga which passes the tests for Portland cement is not much of a rutabaga. Since you are probably as lost as I am by now, let us start over and try to draw a decent conclusion from this data.

Joe is a very good machinist. His pride is just as vital as yours is. It should be. He excels in his field. Any time you try impressing him with your profound knowledge, prepare for poor relations. Further, nothing is so detrimental as that old democratic smile. Sincerity is the keynote to truly cordial relations.

One of the best engineers I know placed his diploma in the bottom of a trunk upon graduation, and it has been there ever since. He is well liked by the men who work for him. His "technique" is simple respect where respect is due. As simple as that. He performs his duties, and it is pleasant for others to perform theirs under him.

This is no introduction by Dale Carnegie. It is simply a plea to you to understand and properly appreciate those who will some day work with and for you. Your degree is a farcical thing if you allow it to become your banner and brass band. It was not meant to be such. It is a mere gesture of completion. It is also a symbol of beginning. Let it be a symbol of your entry into vital work, and of greater understanding of others.

Campus Highlights

by J. Ashenbrucker e'49
R. Pavlat e'48

Enrollment

The enrollment in the College of Engineering totals 3,092 for the fall semester this year, with 506 freshmen, 1,096 sophomores, 836 juniors, 529 seniors, and 125 graduate students. Mechanical Engineering leads the field with 983 students, and Electrical Engineering is second with an enrollment of 924. Chemical Engineering totals 482, Civil Engineering 438, Metallurgical 98, and Mining 42.

Reflecting the end of the war it is interesting to note that the great wave of veteran students is ebbing. Of the 506 freshmen enrolled this fall, 280 are ex-GI's. This is a much more even ratio than the 2,230 vets counted in the upper classes totaling 2,565 students. The Navy had six students under the V-5 program, and 53 NROTC men in the College of Engineering.

Any observations on enrollment would not be complete if we failed to mention the six young ladies in the College of Engineering. Electrical Engineering claims four of these brave beauties, Mechanical Engineering one, and Metallurgy one.

* * *

Magazines Meet

The Wisconsin Engineer was awarded honorable mention by the Engineering College Magazines Association both for alumni coverage and cover makeup at the silver anniversary meeting held this year at Ann Arbor, Michigan, on October 17 and 18. Representatives of the 26 member magazines discussed methods for improving circulation and bookkeeping systems. Five members of the Wisconsin Engineer staff made the trip: Emil Kasum, Robert J. Mitchell, William Gottschalk, Robert St. Clair, and Charles Mitasik. Robert Mitchell served as chairman of the finance committee. Purdue University will be headquarters for next year's meeting.

* * *

Blue Books

University officials have finally signaled the end of last minute searches for a blue book before exams. Renewing a policy dropped in 1939, examination books will be furnished at each exam.

* * *

Profs Meet

Marquette University was host on October 17 and 18 to the north midwest section of the American Society for Engineering Education. Meeting at this time in order to discuss various phases of education were engineering teachers from six midwest colleges. The general program consisted of inspection trips of some 15 Milwaukee plants on Friday followed by a banquet at the Wisconsin Hotel at which Prof. Ben G. Elliott from the University of Wisconsin delivered one of the main addresses, speaking on the Faculty Viewpoint on Engineering College Problems. He was followed by Mr. A. von Wening, Vice-president and Controller of the A. O. Smith Corporation, who spoke on the Place of the Engineer in Industry. Serving as board member on the Executive Committe for the University of Wisconsin was Prof. J. G. Woodburn. Departmental meetings were held on Saturday at which papers were presented by various faculty men. Presenting papers from the University of Wisconsin were Prof. George W. Washa, Prof. Kurt F. Wendt, and Prof. R. J. Harker. Mr. Albert T. Bleck from the Wisconsin State Highway Commission also presented a paper. Representing the University of Wisconsin on the board for next year's meeting will be Prof. Delmar W. Nelson from the M.E. Department.

* * *

Triangle Active

Triangle fraternity swung into the fall semester with hardly a break from summer studies. The fraternity, under the coaching of Nick Weber, has entered teams in every sport in competition for the Badger Bowl. Plans were formulated recently for the National Convention of Triangle to be held in Madison in September, 1948, in conjunction with the 100th anniversary of the University and the 35th anniversary of the Chapter at Wisconsin.

Triangle was host to the Marquette Chapter at a dance and party after the Marquette-Wisconsin game Saturday evening, October 28. Prof. and Mrs. R. J. Harker were chaperons.

Leading Triangle for this year is James R. Price, President; assisted by Henry Preu, Vice-President; Roy DeMeyer, Recording Secretary; Stan Jeselun, Corresponding Secretary; and Ken Maurer, Treasurer.

(continued on page 27)

NUMBER 8 OF A SERIES

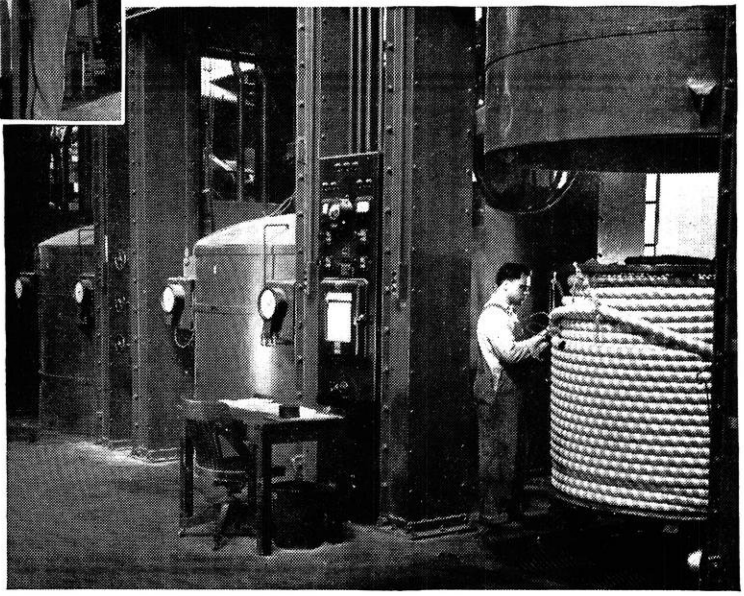
Newsworthy Notes for Engineers

◀ Speedway for new telephones

Here you see the "wind-up" of nearly two miles of overhead conveyor lines designed by Western Electric engineers for their vast new telephone-making shop in Chicago. As finished telephone sets near the end of the assembly and inspection line, an electronic selector unerringly sorts out six different types, directs each type down the right one of the six different chutes for packing and shipping. Not one second is wasted. This conveyor system is capable of handling 20,000 telephones per day.

Faster way to dry cable ▶

Before getting its protective lead sheath, telephone cable must have every bit of moisture removed from pulp insulation and paper covering. To gain greater efficiency than the horizontal steam drying method, which used to take 24 hours, Western Electric engineers designed a battery of cylindrical vacuum ovens which are lowered over reels of cable. Electric current is then passed directly through the wires of the cable, heating it to 270°F. As much as 6 gallons of water is driven out of the insulation in just an hour and a half!



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

Western Electric

A UNIT OF THE BELL SYSTEM SINCE 1882

S-t-a-t-i-c

by Chuck Strasse e'49

Some jokes old,
Some jokes new.
Some jokes borrowed,
All for you.

* * *

What do co-eds like most in a man,
Red hair, blue eyes, or—greenbacks?

* * *

"If I take this castor oil do you think I'll be able to get up in the morning?"

"Yes, long before morning!"

* * *

Did you hear about the girl who ate BB's and her hair grew out in bangs?

* * *

C.E. co-ed to M.E. wolf: "You transit near me."

* * *

"Have you a good head for figures?"

"No, as soon as I see a good figure I lose my head."

* * *

He: "There's something new going around about you."

She: "What?"

He: "My arm."

* * *

Fun is like insurance — the more you get the more it costs.

* * *

Mary with her little skates,
Upon the pond did frisk;
Now wasn't that a silly thing—
Her little (*)?

* * *

Definitions

Sine wave—An ex-navy girl who worked in the recruiting office.

Nothing—A bladeless knife without a handle.

Static—A page in the Wisconsin Engineer written by some moron with a hangover.

* * *

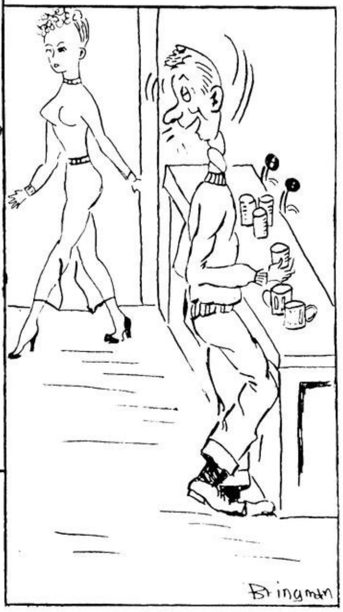
Doctors claim that horse-back riding makes red cheeks.

GOD GAVE MAN FIVE SENSES . . .

FRESHMAN

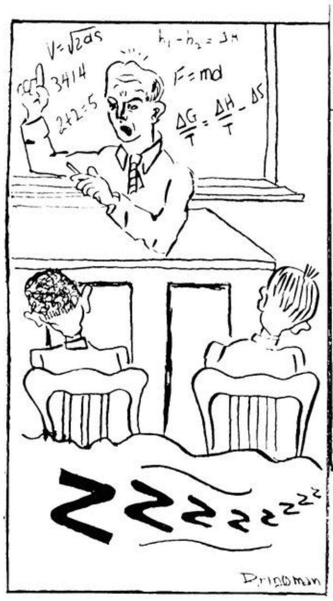
TOUCH AND SMELL

TASTE AND SIGHT



SOPHOMORON

HEARING (TAKE IT OR LEAVE IT ALONE)

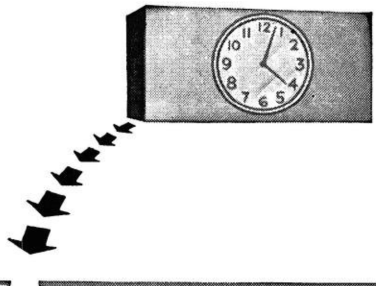


JUNIOR

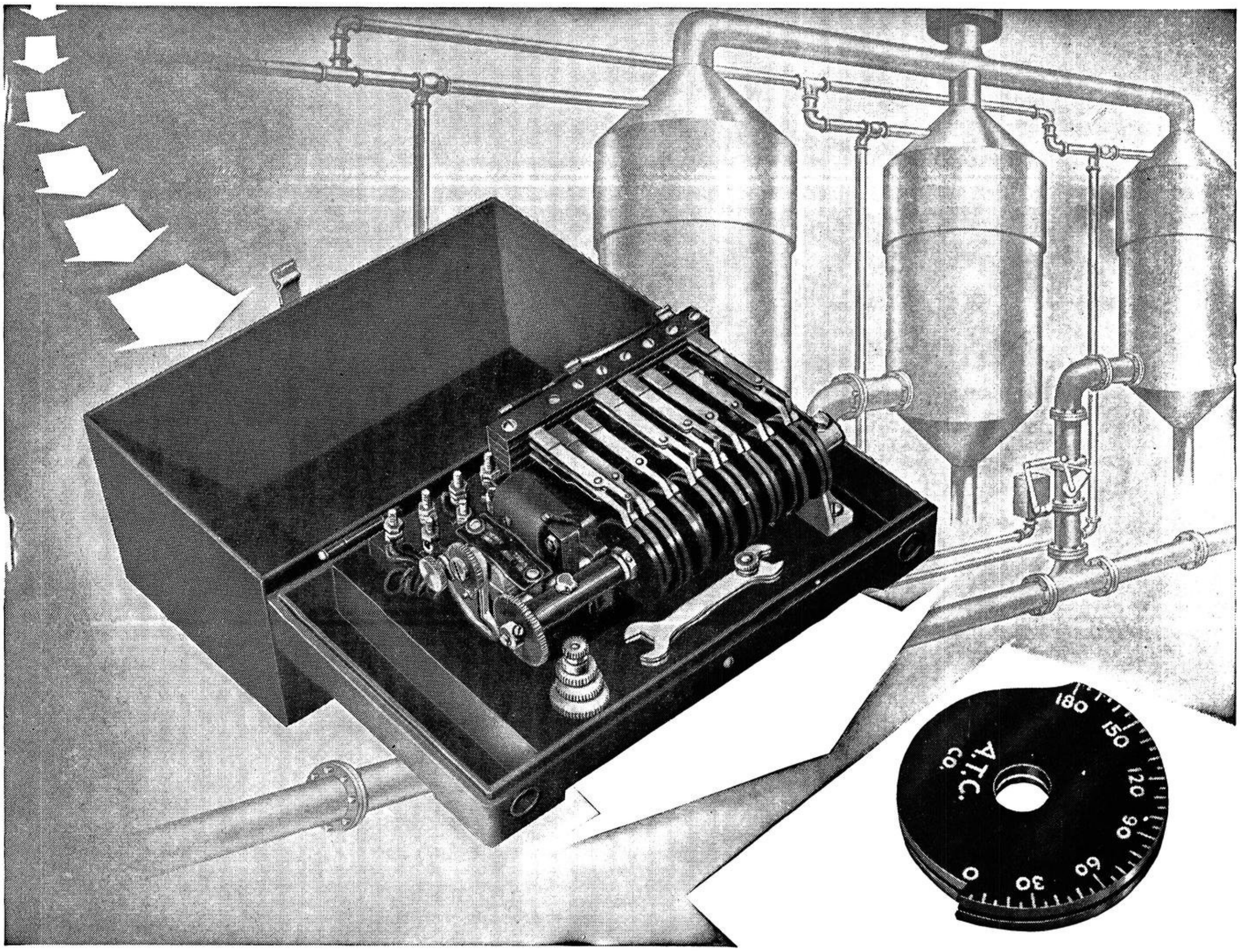
SENIOR

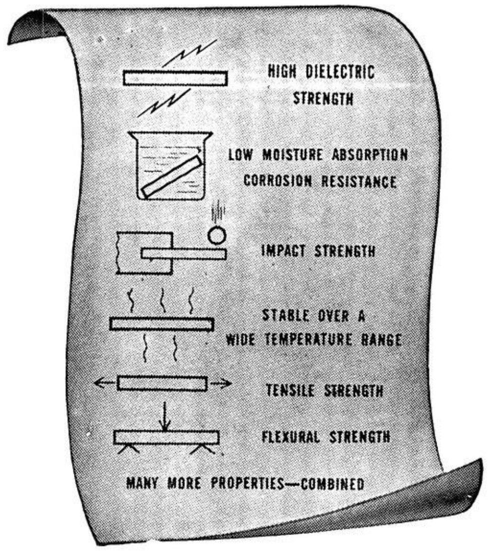
BUT HORSE-SENSE MAKES A HAPPY ENDING

(continued on page 26)



Plastics where plastics belong—
using insulating and printing qualities





OUR TYPE of plastics, Synthane, has a combination of mechanical, chemical, and electrical properties that fit it for a host of useful applications. It is corrosion and moisture resistant, dense, structurally strong, and may be easily worked. An excellent electrical insulator, Synthane is extremely light (about ½ the weight of aluminum).

A good example of the use of laminated plastics is this timing device which uses Synthane for the cams in the timer. Heart of an automatic system, the Cam Timer is designed to control the flow of exhaust gases to a stack.

Aside from its outstanding insulating qualities, letters, numerals, and symbols may be easily and clearly printed on Synthane by our Synthographic process. Synthane Corporation, Oaks, Pennsylvania.

SYNTHANE

S

SYNTHANE TECHNICAL PLASTICS • DESIGN • MATERIALS • FABRICATION • SHEETS • RODS • TUBES • FABRICATED PARTS • MOLDED-MACERATED • MOLDED-LAMINAT

Science Highlights: Lightning

by E. Robinson m'49
E. Zimmerman e'49

Potent:

Lightning originates in wind-tossed clouds. The charge generated is negative, and a positive charge follows along the ground as the cloud is blown along. When the positive and negative charges become strong enough, a relatively small current streams from the cloud to the earth. The return stroke, from earth to cloud, averages 20,000 amperes. It may reach a peak of 200,000 amperes (one-half amp. will light a 60-watt bulb). It is estimated that cloud potentials which start the lightning discharge are higher than 20,000,000 volts.

Peculiar:

St. Elmo's fire, while not a lightning stroke, is a visual discharge resulting from high concentrations of charges in the ground and in the clouds. These discharges are called "corona." Lightning usually follows St. Elmo's fire. An interesting observation of this phenomenon was recounted in a recent letter to the General Electric High-voltage Laboratory, Pittsfield, Mass. It stated that two boys were riding horseback, one ahead of the other, when the boy in the rear noted an unusual glow outlining his companion's head and the rump of his horse. His startled ejaculation caused his friend to turn. On looking back, he observed a similar glow about the other. It is presumed that the boys were elsewhere by the time the lightning struck, since they wrote the letter.

Pernicious:

Another letter received by the Pittsfield laboratory refutes the claim that lightning never strikes twice in the same place. The frustrated author wrote:

"Last summer, I had left my house with all the windows open, doors open, my radio connected, and the lights on.

"On returning I found that lightning had visited us. The radio was wrecked.

"A week ago we were struck again.

"This time, I saw it all. I had disconnected the radio wire from the outside antenna, had taken the radio plug out, turned off all the lights and closed all windows and doors. On entering the kitchen I saw a ball of fire fairly dancing on the porcelain table-top. I was so startled I didn't follow its course from there.

" . . . our new radio was a shambles."

Protection:

High - voltage engineers believe that lightning rods, when properly installed, are extremely efficient. Faulty installation and careless damaging of equipment after installation are mainly responsible for the failure of such a system when approved materials and methods of installation are used.

As for those persons who are in constant terror of Thor's bolts, a lightning expert offers this homely consolation:

"If you hear the thunder, the lightning did not strike you. If you saw the lightning, it missed you. And if it did strike you, you would not have known it."

(continued on page 28)

S-T-A-T-I-C

(continued from page 22)

In the old days when a fellow told a girl a shady story she blushed at it. Nowadays she memorizes it.

* * *

"I've got a chair that goes back to Henry the 8th."

"That's nothing; I've got a radio that goes back to Gimbel's the 10th."

* * *

There once was a lady from St. Paul,
Who wore a newspaper dress to the ball.
The dress, it caught fire
And burned her entire
Front Page, Sport Section and all.

Ham, that is.

A school teacher one day, during the hour for drawing, suggested to her pupils that each draw what he or she would like to be when grown up. At the end of the lesson one little girl showed an empty paper.

"Why," said the teacher, "isn't there anything you would like to be when you grow up?"

"Yes," said the little girl, "I would like to be married but I don't know how to draw it."

* * *

Old mother Hubbard
Went to the cubbard
To get a glass of gin,
But when she got there
The cubbard was bare
And hubby was wiping his chin.

* * *

Speaking of mutual friends:

"Did you hear that John is an artist?"

"He is?"

"Yes, he draws flies."

* * *

A co-ed engineer is one who prefers a slip stick to a lip stick.

(continued on page 36)

Campus Highlights

(continued from page 20)

KHK Picnics

Kappa Eta Kappa, Electrical Engineering fraternity, held a successful picnic on Saturday evening, October 11, when prospective pledges were entertained after the Wisconsin-California game. Prof. and Mrs. J. C. Weber were chaperons, and the affair was rather unique in that there were several family groups present.

* * *

Theta Tau Elects

Harold J. Enlow, junior in chemical engineering, was elected regent of Xi chapter of Theta Tau, professional engineering fraternity, at a recent special meeting.

Lud A. Emelity, West Allis, was elected vice-regent, and James B. Geshay, Racine, was named scribe.

The fraternity announced the names of the following as new initiates: Curtis K. Bentley, Denver, Colo.; Clarence A. Eblen, Neenah; Lud A. Emelity, West Allis; John J. Holden, Madison; James A. Polzer, Two Rivers; John C. Wagner, Racine; Oscar A. Wedel, Baraboo; and Ivan L. Wilson, Ableman.

* * *

Business Lecture

Juniors and seniors were excused from their fourth period classes on October 6th in order to hear a timely talk by Mr. D. W. McLenegan, air conditioning expert from the General Electric Company, who spoke on "The Business Aspects of Engineering." Mr. McLenegan stressed the point that the engineer must be a practical man and foresee public demands and be able to meet these demands as they arise. He also spoke to the AIEE at their meeting on October 7th.

Science Highlights

(continued from page 24)

Traffic Signals for Laboratories

The principle of the proximity fuse, which during the war was a military secret second only to the atomic bomb, is used by General Electric's Research Laboratory to regulate the movement of laboratory personnel in and out of a corridor.

As a person walks along a corridor on the third floor of one of the laboratory buildings, his motion is detected by a microwave transmitting-receiving unit, which operates red and green lights visible to persons leaving offices and workshops along both sides of the passageway.

When a person starts to leave his office he is informed by lights on the opposite corridor wall whether or not the corridor is being used. If the red light is on, he knows he should be cautious in carrying delicate scientific instruments, chemicals, or large objects into the corridor, or avoid barging into someone in the corridor who is similarly occupied.

At one end of the corridor, behind a glass partition, is a microwave unit which transmits five-inch radio waves from a parabolic reflector. As pedestrians approach or go away from this reflector, the radio waves which bounce back cause variations in the current which the transmitter draws from its power supply. Such current changes, which in the proximity fuse caused the shell to explode as it approached a plane, here cause red lights along the corridor to turn on. If persons walking in the corridor stop to chat, lights turn green, which condition always prevails when there is no motion to detect.

The device is so sensitive that it will be activated if a person standing in the corridor so much as waves his hand in the direction of the reflector.

Alumni Notes

(continued from page 18)

CE

Earl J. Beck (CE'44) announces twin sons born July 5. He is with the Harza Engineering Company of Chicago.

Richard E. Schmidt (CE'44) is out of service, after nine months with the Constabulary in Germany, and is now on the engineering staff of Kimberly-Clark Corporation at Neenah.

Jack L. Scholbe (CE'44, MS'47) is with the Chicago Bridge & Iron Company.

William H. Zehrt (CE'44) recently joined the staff of the General Engineering Company at Portage, Wisconsin.

Fred C. Engler (CE'46) is with the Trane Corporation at La Crosse, Wisconsin.

John R. Haggerty (CE'47) was married on July 20 to Jean Catherine Silverness of Horicon, Wisconsin, a Wisconsin graduate. John is on the engineering staff of the City of Flint, Michigan.

N. H. Withey (CE'32) is a Concrete Research Engineer with the Alpha Portland Cement Company of Easton, Pennsylvania.

George J. Heimerl (CE'27) is doing aeronautical structural research at Langley Field, Virginia.

E. R. Shorey (CE'35) is now Production Superintendent for Shell Oil Company in their Graham Division, Graham, Texas.

ChE

Dr. **Allan P. Colburn** (ChE'26, MS'27, PhD'29) recently assumed the newly-created position of Assistant to the President of the University of Delaware and adviser on research. Formerly he was a professor of chemical engineering there.

M&M

C. A. Brooks (MinE'37) is an "Exploitation Engineer" with Shell Oil Company, Inc., at Eagle Lake, Texas.

F. A. Bemis has gone abroad for the greener pastures and is now Superintendent of Mines for the Compania Minera de Oruro, Seccion Calquiri, Oruro Bolivia, S. A. Senior Bemis is a MinE grad of '38.

The Oliver Iron Mining Company has three new Mining Engineers on its staff from Wisconsin. They are **M. M. Hutchinson** (MinE'46) on the Virginia, Minnesota staff, **W. D. Jensen** (MinE '47) on the Hibbing, Minnesota staff, and **V. R. Huff** (MinE'47) with the boys at Coleraine, Minnesota.

The Shell Oil Company is training two MinE grads. They are **D. D. Painter** ('47) at Great Bend, Kansas, and **H. A. Johnson** ('47) at the Black Bayou Division, Louisiana.

P. E. Gage (MS'47) is a trainee in the Aluminum Company of America's sales development and sales engineering division. He will spend four months in training, working a few weeks in each of the Alcoa plants around the country. Then he will be assigned to one of the company divisions.

ME

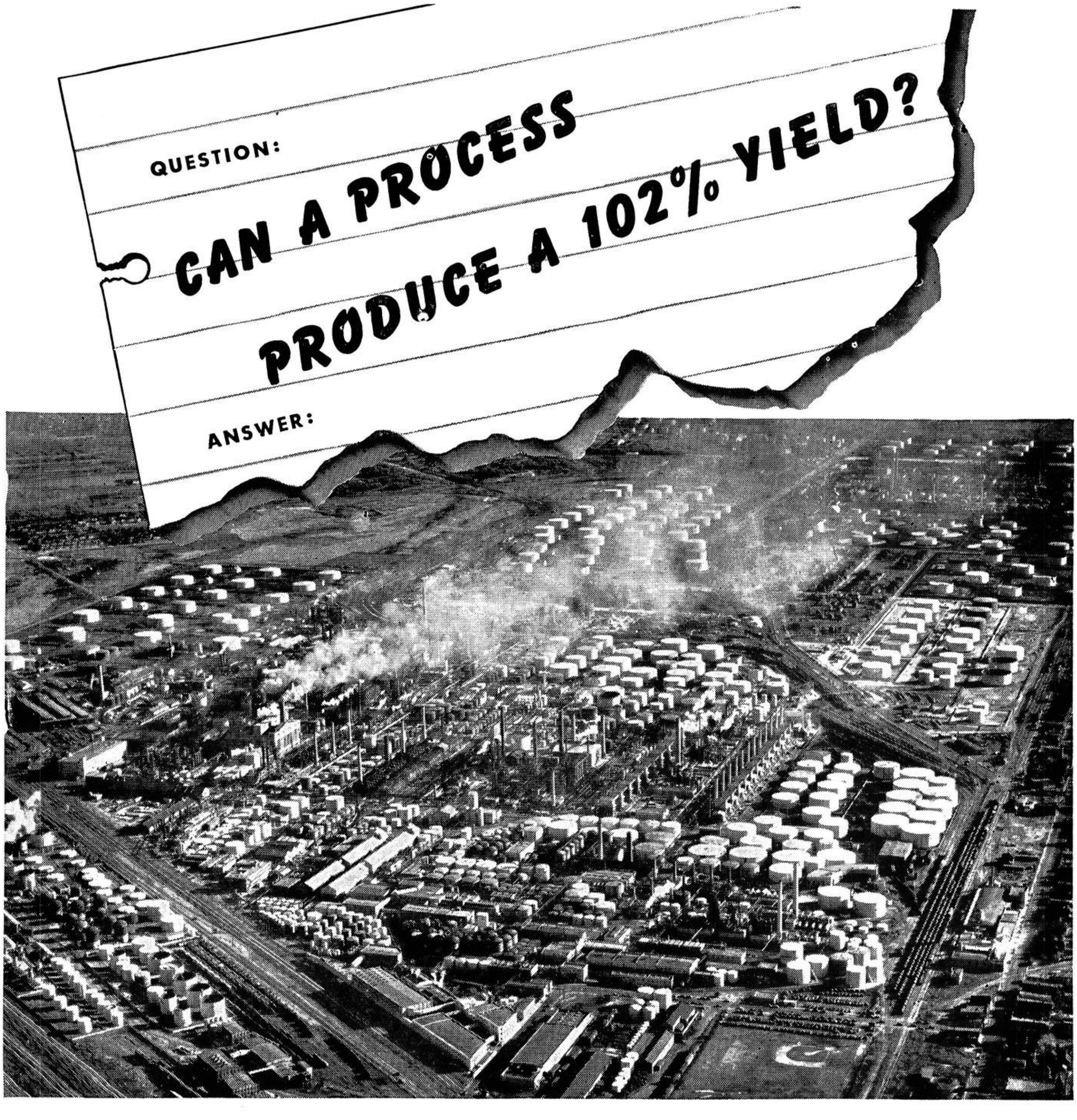
Grover C. Wilson, who taught at the University of Wisconsin for 21 years and who served for 16 years as director of the Heat-Power Laboratory there, has joined the Ethyl Corporation Research Laboratories in Detroit as a coordinator on the Atomic Research staff.

Mr. Wilson, a native of Holstein, Iowa, and an overseas veteran of World War I, comes to the Ethyl Laboratories from the Universal Oil Products Company in Riverside, Illinois.

Grover C. Wilson

The new Ethyl automotive research staff coordinator is a member and former vice-president of the Society of Automotive Engineers and a member of the American Society of Mechanical Engineers. He has contributed several papers on fuel technology. His other memberships include Eta Kappa Nu and Pi Tau Sigma, honorary electrical and mechanical engineering fraternities.

Mr. Wilson graduated from the University of Illinois in 1917 with a B.S. degree, and has been granted M.S. and M.E. degrees by the University of Wisconsin.



YES. Certain manufacturing processes which effect a change in the state of matter from raw to finished product, frequently produce yields such as this.

However, Standard Oil does it daily . . . *without changing the state of matter!*

It happens in the huge Whiting, Indiana, refinery shown above. Certain crackers in this vast 1,100 acre "apparatus" yield 102 volume units of liquid petroleum products for each 100 volume units of crude oil processed. It is the result of cracking heavy, dense hydrocarbons into lighter more valuable ones whose volume is greater than the original charge.

This surprising yield is not considered particularly significant in itself. It is indicative, however, of our constant effort to develop new products and processes and to improve old ones. This is the collective accomplishment of chemists and engineers . . . men who, like you, studied at America's leading colleges of science and engineering.

Standard Oil Company

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STANDARD SERVICE

Petroleum Reprieve (continued from page 10)

to give mixtures of alkanes resembling petroleum. These hydrocarbons can be converted to fatty acids, and ultimately to fats or products of petroleum such as:

Gasoline

Alcohols

Acetone

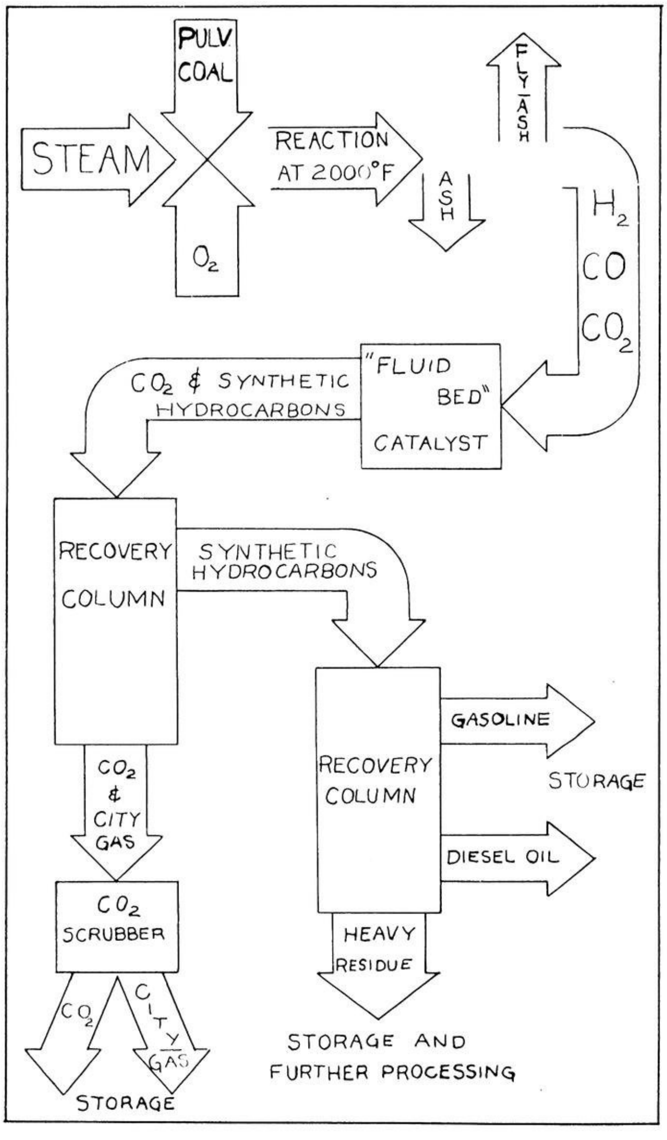
High-heat city gas (including methane)

The carbon-monoxide for the reaction is obtained from the oxidation of coal at about 2000° F. This is the initial use of temperature control of product quality. At temperatures above 1800° F., reaction "a" will predominate, whereas reaction "b" will be most prevalent at lower temperatures:

(a) $C + H_2O = H_2 + CO - 51,100$ BTU

(b) $C + 2H_2O = 2H_2 + CO_2 - 32,180$ BTU

In a similar manner, the Hydrocol process combines these same constituents to give the same end products. The difference between the two lies in the source of the elements. In the Hydrocol process, the carbon and hydrogen are furnished by natural gas, which is largely methane (CH_4) with the significant remainder being ethane (C_2H_6). The chief product of this process is gasoline, though some lubricating oils have been turned out by the Texas Company along with other basic fuels.



Schematic flow of fluids in synthesis process.

Fuel Economics

The ranks of coal (lignite, bituminous, etc.) has little importance in the transmuting industry. Perhaps more important is the location of the deposit with respect to the market. Manufacturers are showing increased interest in fuels that flow through pipes, and which are easily and inexpensively controled in the furnaces. This has been an important factor affecting location for many years. If such fluid fuels can be manufactured at scattered places it will be possible to establish a more intimate and less expensive bond between the raw materials of industry and the source of necessary power. Probable de-centralization of industry will be:

(a) made possible by scattered coal deposits

(b) and will make possible their economical utilization.

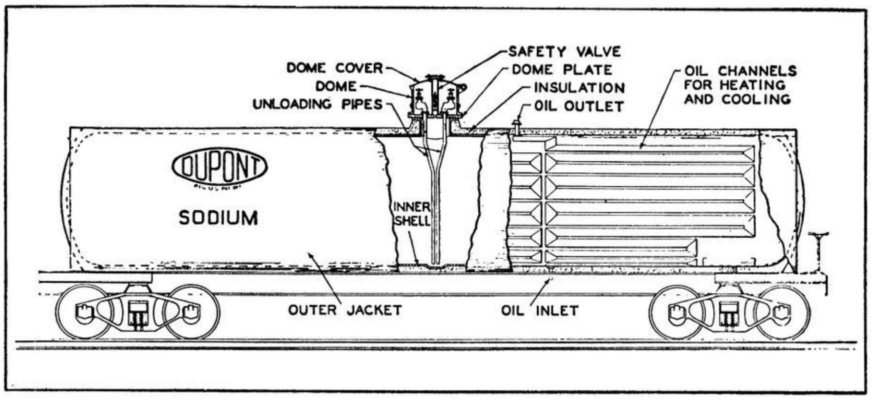
Other advantages of transmuting fuels are that the ash of coal need not be transported to the consumer, atmospheric conditions hardly affect stored fluid fuels, more heating gas will improve dust-laden atmosphere of coal-burning cities, and the advantages of fluid transmission and storage will be available to more consumers.

It should ever be borne in mind that the development of cheaper oxygen producers, and the fluid-bed catalyst reactor, have made possible the practicable planning and actual construction of these synthesis plants. To further cut down expenses, petroleum engineers promise that radical changes in the efficiency of coal mining will be effected when they enter that field. This should be within the next generation.

Du Pont *Digest*

Items of Interest to Students of Science and Engineering

Industrial Organic Applications of Metallic Sodium



Sodium for organic reactions is shipped in 80,000-lb. quantities. It is pumped into the car, solidified by cooling and melted by hot oil for removal.

There would seem to be a considerable gap between the electrolysis of salt to make sodium, and research in the field of organic chemistry. However, at Du Pont as much emphasis is placed on organic research to develop outlets for sodium as on its inorganic uses.

For more than 15 years, intensive work on industrial uses for sodium has been carried on in Du Pont laboratories and plants by chemists, physicists, chemical, mechanical and electrical engineers.

In the organic field, this research has contributed a number of important uses for sodium such as the reduction of fatty esters, particularly of natural glycerides, to alcohols.

$$C_{15}H_{31}\overset{\overset{O}{\|}}{C}\text{-}OR+4Na\xrightarrow[\text{solution}]{\text{alcohol}}C_{15}H_{31}CH_2OH+4RONa$$

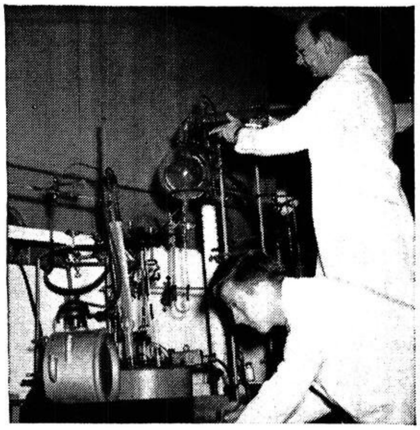
Du Pont organic chemists have found that sodium with selected secondary alcohols, such as methyl amyl alcohol, in the presence of toluene or xylene, eliminates shortcomings of the classical method involving ethyl alcohol and sodium. Practically quantitative yields of the higher molecular weight alcohols are obtained.

This new method is especially useful in preparing unsaturated alcohols not easily made by catalytic hydrogenation. The process can be carried out at atmospheric pressure and compares favorably with catalytic hydrogenation of saturated, higher fatty esters because of the simplicity of operation and equipment.

The discovery of the new reaction conditions has led to the use of millions of pounds of sodium annually for manufacture of long-chain alcohols for wetting and emulsifying agents and synthetic detergents.

Other important processes developed by Du Pont organic research include the use of sodium for reduction of fatty esters to corresponding long-chain acyloins, and reduction of nitriles to primary amines.

Du Pont has also contributed to the development of many other uses for sodium and its simple derivatives, such as in the manufacture of tetraethyllead, used in high-grade motor fuels, dyestuffs synthesis, and descaling of alloy steels. In the form of sodium hydride or sodium alkoxides, sodium is a catalyst for many Claisen condensations, useful in the manufacture of barbiturates, sulfa drugs, vitamins, keto-acids and diketones.



Preparing to carry out an organic condensation reaction involving the use of sodium, R. B. Clark, B.S., West Virginia University '42, and W. J. Hilts, M.S., Syracuse '36.

Questions College Men ask about working with Du Pont

WILL AN ADVANCED DEGREE HELP ME?

For certain types of work, particularly research and development, a higher degree is a distinct advantage and about a third of the men engaged in this work are Ph.D's. However, the majority of our technically trained men are Bachelors or Masters. Every effort is made to recognize a man's training as well as his special experience and aptitudes. Write for a copy of the new booklet, "The Du Pont Company and the College Graduate," 2521 Nemours Building, Wilmington 98, Delaware.

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BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

More facts about Du Pont—**Listen to "Cavalcade of America," Mondays, 8 P.M. EST, on NBC**

Wisconsin Alumni Attend Annual ASM Meeting

The American Society for Metals held its annual meeting in Chicago during the week of October 19-25. On Wednesday, October 22, the Wisconsin alumni attending the meeting held a luncheon in the Palmer House. Dean Withey of the College of Engineering addressed the luncheon group and presented to them up-to-date information regarding the University.

Wisconsin alumni attending the meeting were:

Walter Felber, Inland Steel, Chicago, Ill.

John M. Clark, Snap-on Tools, Kenosha, Wis.

Verle H. Erickson, Snap-on Tools, Kenosha, Wis.

Thomas G. Harvey, Monarch Steel Co., Indianapolis, Ind.

Robert W. Stewart, Allis-Chalmers, Milwaukee, Wis.

Robert E. Lochen, Allis-Chalmers, Milwaukee, Wis.

Norris G. Yonker, International Harvester, Chicago, Ill.

Daniel E. Krause, Gray Iron Research Institute, Columbus, Ohio

Ambrose S. McKloskey—Caterpillar Tractor Co., Peoria, Ill.

Francis C. Albers, Catterpillar Tractor Co., Peoria, Ill.

Curtis Burr, Inland Steel Co., Chicago, Ill.

L. E. Simon, Electro-Motice, LaGrange, Ill.

H. L. Grange, Res. Lebs. Div., G.M.C., Detroit, Mich.

Eli Mullin, Patent Attorney, Chicago, Ill.

R. R. Granger, Titusville Forge, Titusville, Pa.

Robert A. Sharp, Milwaukee Reliance Boiler Works, Milwaukee, Wis.

Harvey W. Kutchera, Stainless Foundry & Engineering Co., Milwaukee, Wis.

David N. Carlson, Stainless Foundry & Engineering Co., Milwaukee, Wis.

Willard E. Grundman, Carnegie, Illinois, Steel Co., Chicago, Ill.

C. J. Greenidge, Battelle Memorial Institute, Columbus, Ohio

J. J. Chyle, A. O. Smith Corp., Milwaukee, Wis.

R. S. Hartenberg, Northwestern Univ., Evanston, Ill.

J. J. Cadwell, Northwestern University, Evanston, Ill.

C. H. Lorig, Battelle Institute, Columbus, Ohio

L. B. Fonda, General Electric Co. (River Works), Lynn, Mass.

R. P. Daykin, Ladish Company, Cudahy, Wis.

J. L. Zambrow, Ohio State University—Engineering Experimental Station, Columbus, Ohio

A. F. Gallistel, Argus Camera Co. (Industrial Division), Minneapolis, Minn.

K. E. Fenrich, Chain Belt, Milwaukee, Wis.

L. F. Porter, Chain Belt, Milwaukee, Wis.

J. H. Eisaman, Carnegie-Illinois Steel Co., Chicago, Ill.

Your enjoyment climbs to new altitudes through radio and television achievements of RCA Laboratories.

S-T-A-T-I-C (continued from page 26)

Judge: "Why did you strike your wife?"

Defendant: "Well, your honor, she's been studying how to develop a magnetic personality, and yesterday she walked by me when I had a hammer in my hand."

* * *

She: "Do you think that you could learn to love me?"

He: "Well, I passed calculus, didn't I?"

* * *

She was only a redcoat's daughter, but she knew Howe!

* * *

Ham: "They ask a lot for the rent of this room, don't they?"

Hock: "Yes, about six times this month."

Hotsy: "How much time did you put in on this rifle?"

Totsy: "An hour, sir, but I just couldn't get those rings out of the barrel."

* * *

As a Light Buildings lecturer stated, a cynic is a place where dishes are washed.

* * *

As the lightning bug said when he flew into the lawnmower: "I am delighted—no end."

* * *

Girl (in book store): "Do you keep 'The Divine Woman'?"

Clerk: "Not on my salary."