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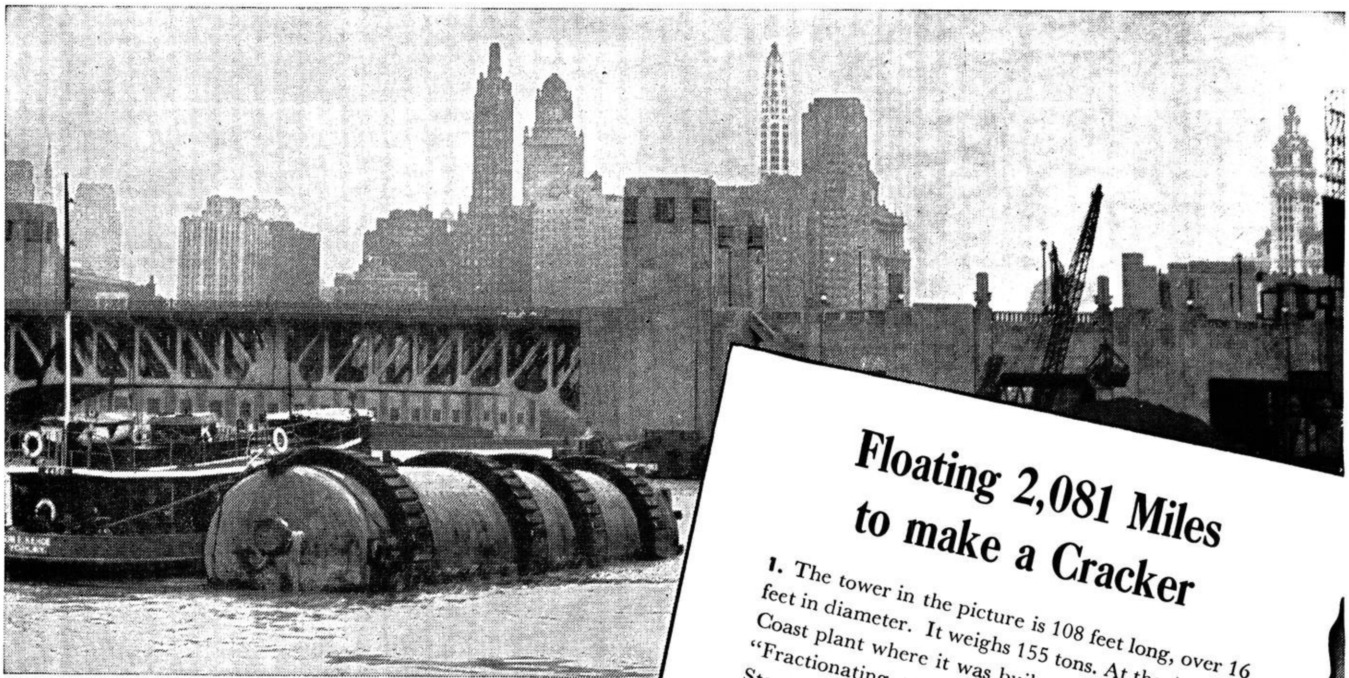
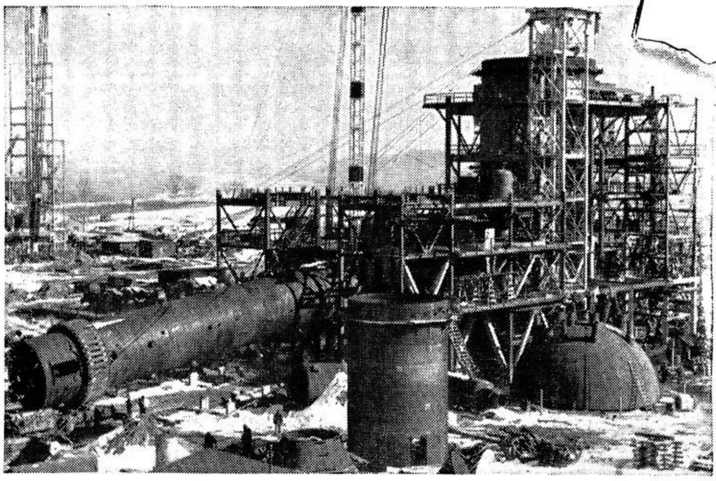
the WISCONSIN ENGINEER

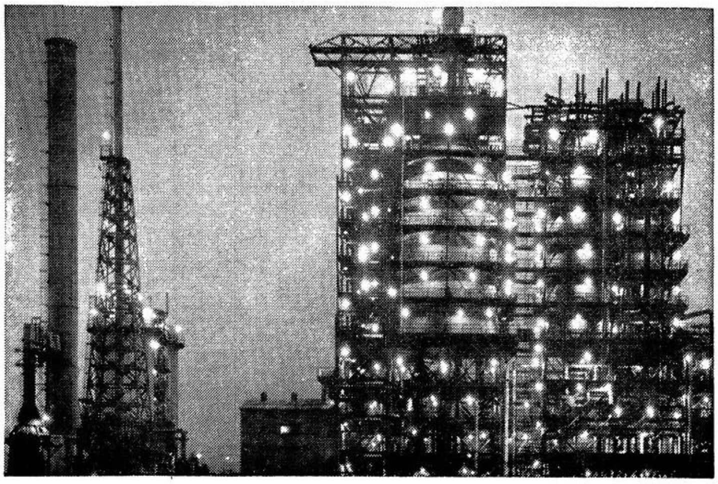


Floating 2,081 Miles to make a Cracker

1. The tower in the picture is 108 feet long, over 16 feet in diameter. It weighs 155 tons. At the Atlantic Coast plant where it was built, the job ticket read, "Fractionating tower for catalytic cracking unit, Standard Oil Company (Indiana)." Too big to be shipped overland, it had to go by water to Standard's refinery at Sugar Creek, Missouri, near Kansas City—a matter of 2,081 miles!



2. The tower was timber-cribbed and floated, towed up New York Harbor and the Hudson River, across New York State by canal. A tug took over the towing job through Lakes Erie, Huron and Michigan, riding out a storm en route. Then the tower was loaded on a barge to complete its journey via the Illinois, Mississippi and Missouri Rivers. This winter at Sugar Creek, the cat cracker of which this tower is part goes on stream, joining similar units already operating at other Standard refineries. It has a charging capacity of 25,000 barrels a day!



3. Like our Burton Stills in 1913 and continuous units of 1932, catalytic crackers are milestones in petroleum progress. Today at Standard, the industry's ablest engineers and research men are developing new . . . and better processes and products. Men of the same type are coming from leading colleges of science and engineering to start work at Standard. Here they find unexcelled technical facilities for research and design. If you want a career with splendid opportunities to advance and make real contributions, you should get to know Standard better.

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In This Issue . . .

COVER:

A peaceful view of the Wisconsin Union Terrace facing Lake Mendota.
—*Photograph by Art Rezin*

FRONTISPIECE:

Riggers installing a lightning rod atop a pole extending sixty feet above the topmost pinnacle of the 1250 foot Empire State Building.
—*Cut courtesy General Electric*

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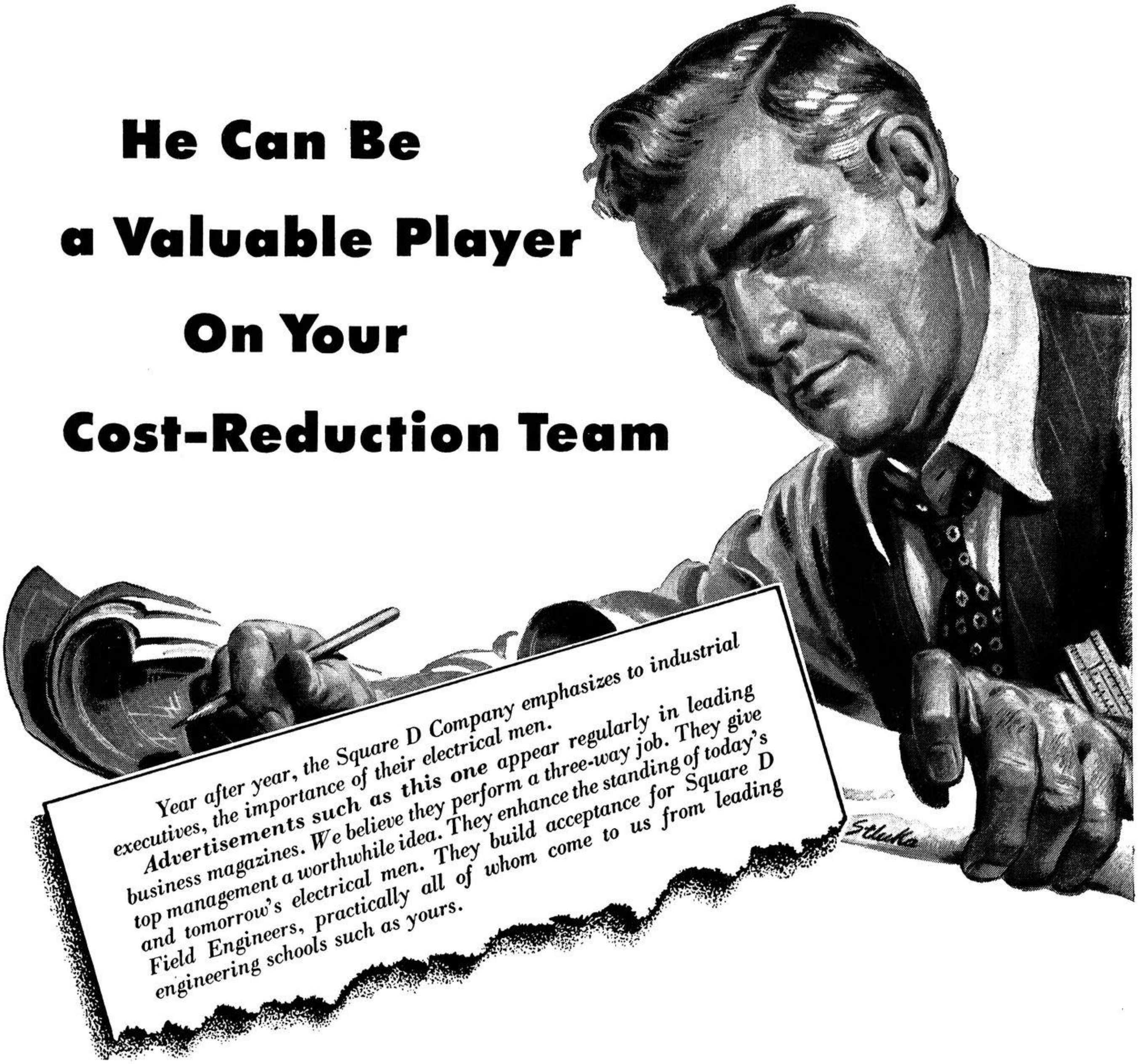

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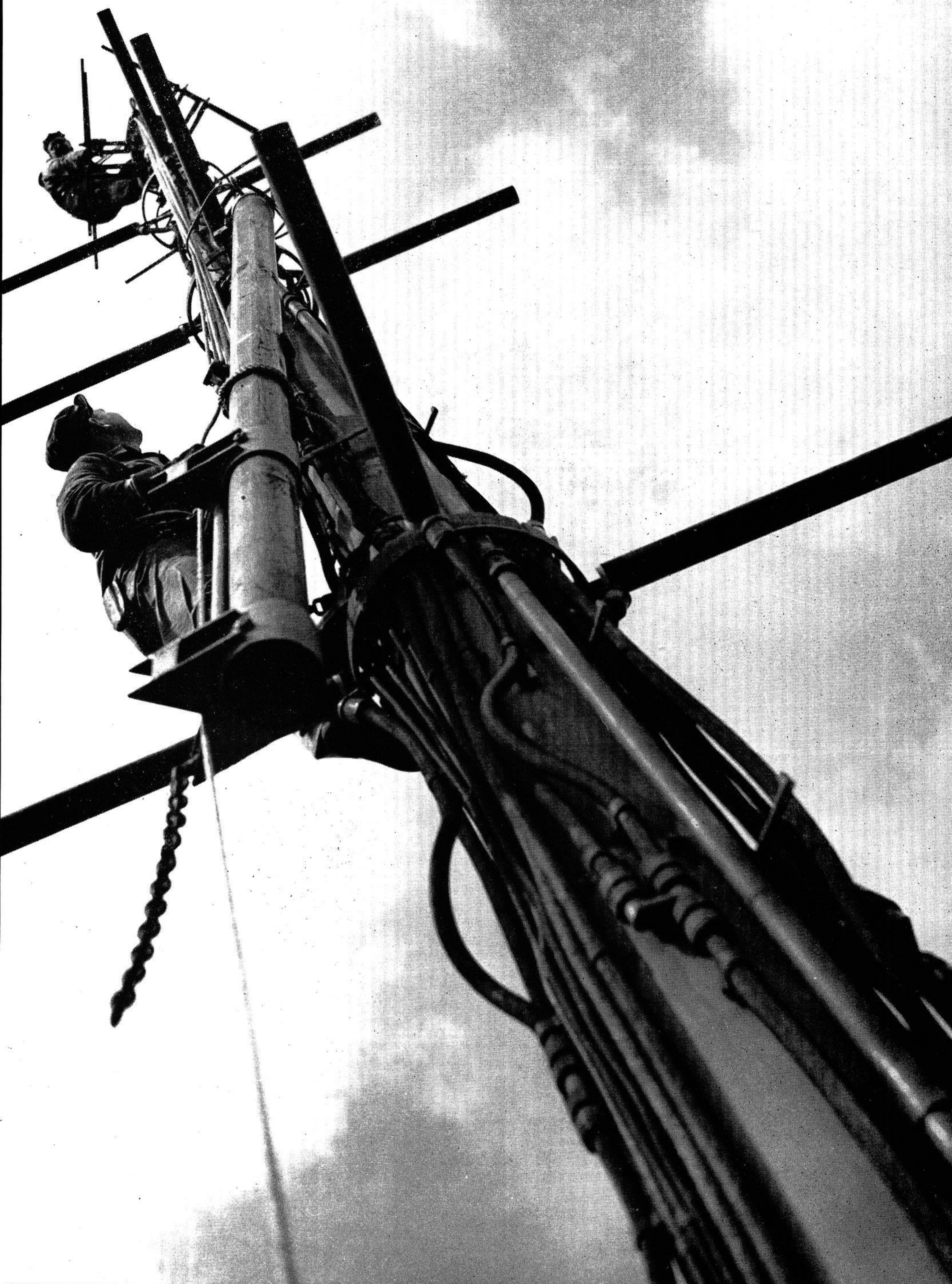


Dean Withey Welcomes

FOR the faculty I bid you a hearty welcome on your entrance to this college. You are among those fortunate representatives of our modern society who have been given the privilege of commencing a college course. May you continue to strive to be worthy of the great educational opportunity provided for you through the bounty of our State and Nation. We hope your presence in this college is the result of a well-considered study of your own aptitudes and desires as well as a careful consideration of the opportunities in the field you are entering. With the many openings now presented to trained engineering graduates, it behooves you to ponder well these matters before you proceed with your education. If you are doubtful concerning your choice of curriculum, you should take counsel with any one, or all, of the following: Professor Shiels, the chairman of the department in which you have entered, the Dean. Professor Drake and staff are available to those desiring aptitude tests and information on methods of study. You may also find helpful information in "Engineering As a Career", sponsored by E.C.P.D., available at either of the College administrative offices, "The Engineering Profession", by Hoover and Fish, in the Engineering Library, and "Career In Engineering", by L. O. Stewart, on sale at the University Co-op.

Not only did the events during World War II emphasize the importance of good engineering and the vital part played by the engineers in all the branches of the armed forces, but they also brought to the attention of both industrialists and the public the value of the application of sound engineering principles to the peacetime economy of our times. As a result of the war experiences and the many scientific advances which have been made, it appears that the peacetime demand for engineering graduates will continue to be greater than it has ever been.

At present there is an abnormal demand for young engineers due to the limited number graduated during the war years and the accumulated needs of employers. Therefore the salaries paid inexperienced graduates are far above those prevalent prior to the war.* Whereas the salaries offered engineering graduates will doubtless be decreased as the need becomes more nearly satisfied, the present trends indicate that the financial status of the man who is qualified in technical engineering fields will continue to improve.

Various estimates have been made of the magnitude and the time required to eradicate the shortage of engineering graduates. The validity of such estimates are affected first by the demand, which will be more general than in the pre-war years, but which is closely related to economic conditions; second, by the capacity of the colleges to process returning veterans through the upper years of the engineering curricula; and third, by the sustained interest of veterans, some of whom are pursuing their courses un-

Dean Withey

* For an analysis of salaries paid engineers, see "Report on Economic Status Survey", Civil Engineering, August 1947, P. 1.

der discouraging circumstances. Furthermore, the advances in the applications of the physical sciences to the problems of modern industry have become so great that good engineering is no longer a luxury to be afforded by large corporations only; it is a necessity wherever industrial competition exists. On account of these conditions it is very difficult to estimate just when the supply of young graduates will equal the demand. However, from the data available, it appears that the shortage of graduates with Bachelor's degrees will continue through 1948 and perhaps through 1950. The shortage of graduates with higher degrees will last over a longer time, perhaps until 1955 on account of the longer training period required for Master's and Doctor's.

The records of our own graduates as well as the evidence from much broader surveys show that many competent engineering graduates achieve success in occupations other than those of a highly technical nature. Many graduates ultimately climb to administrative positions of the greatest responsibility. The need of a broad training for those planning to become professional engineers, for those who wish to develop into executives, or for those planning commercial pursuits is well recognized. Therefore you are strongly urged to plan wisely the length of your course and your choice of electives so that you may be well fortified to cope with the problems of tomorrow. With that aim consider well the advantages to be obtained by spending five or more years in your college training program.

Realizing that statistics clearly show the marked advantage that college trained men have over those not so fortunate, we of the faculty strongly advocate that you give your very best efforts to the mastery of your studies. The engineering curricula contain many difficult courses of mathematical and scientific nature. The credit loading is heavy. These are conditions necessary to a proper grounding in the fundamentals underlying our great profession. Strive to make good grades. They are indices of ability which are given much weight in the estimates of prospective employers.

In closing, may I urge every one of you to cultivate that most valuable asset, **your personality,** in order to make yourself a most acceptable member of society worthy of the sacrifices incurred to provide your educational opportunities. To that end select with care your associates, your clubs and technical societies. Your college friendships should provide a potent means of enlarging and supplementing the benefits derived in the classroom.

Science Highlights

PHOTOGRAPHING ATOMS

Special photographic plates are being used by scientists to picture actual atomic fission and to study action of highly charged nuclear particles. The plates, recognized as valuable new tools for research in nuclear physics, are known as "nuclear track" plates from their special use in recording the paths of the particles.

Characteristics of the new plates are markedly different from those of ordinary photographic materials. The plates are super-sensitive to the electrical charges carried by atomic particles. At the same time they are relatively insensitive to light — which affects ordinary film — and to x-rays.

The silver grains in the emulsions of the nuclear track plates are unusually close-packed. It is these silver grains, suspended in the gelatine emulsion, that are particularly sensitive to the charged nuclear particles.

When a highly charged particle speeds into the emulsion, a dotted line of affected silver grains is produced. These silver grains, when the plate is developed, make an identifiable track. This is the path of the nuclear particle through the emulsion.

From the length and curvature of the track and the grain-spacing along it, information is obtained of the particle's speed, energy, and other characteristics. Thus the particle can be identified as a proton, alpha particle, or heavily charged nucleus.

UNUSUAL, ACCURATE TIMEPIECE

A free-swinging pendulum takes the place of the usual plug, spring or electric motor in the Barr Electric Clock, and allows this "perpetual-motion" unit to give accurate time with no apparent source of direct power. This is possible through an ingenious adaptation of Newton's Law of Gravity.

After the Barr clock is "wound" by setting the pendulum in motion, accurate time depends on the momentum and arc of the pendulum. When the work of turning the gears decreases this arc to a certain point, the trigger is automatically lifted. This releases a weight which nudges the pendulum and restores its momentum.

As this happens, a battery-operated electromagnet raises the weight to its normal position, hooks it to the trigger and prepares it for the next cycle.

The electromagnet is activated about three times a minute. But since the contact is closed for only a second each time, little electricity is used. This is why a set of little batteries usually lasts more than a year.

Barr engineers specified Nilvar, an alloy containing 35½ per cent nickel, for the free-swinging pendulum. This Driver-Harris alloy was selected because its low coefficient of expansion eliminates the danger of inaccuracy due to temperature change. The Barr clock is a product of Barr Manufacturing Company, Weedsport, New York.

Engineering Opportunities

Introducing a Series of Articles

THE situation of a senior engineer about to be graduated is well expressed by the cover picture on a brochure left in the placement office recently by one of the larger manufacturing firms. A capped and gowned figure, with diploma in hand, is shown about to step onto a large jig-saw puzzle, each section of which is labelled with some phase of engineering or related - engineering work. Shown on this particular sketch were (1) Engineering, (2) Manufacturing, (3) Design, (4) Research, and (5) Business.

Actually an engineer can readily enter any one of these fields, though these five by no means cover the full range of work open to the engineering graduate.

The jig-saw analogy is perfectly practical even if carried farther. True, any single engineer can enter any of a given number of phases of work, but consider also the many variables which affect the eventual placing of that man in any single field. The evaluation of these "variables" is somewhat analogous to the odd shape of each of the puzzle parts. For example, the requirements for success in each field differ radically with respect to the temperament of a person, to the personality required, to individual capabilities, to the ability to solve large general problems or definitely stated problems, to interest in highly technical problems extending to semi or even non-technical problems, to the ability to work with people and other requirements of the work itself. Many more variables could be mentioned, such as the type of company the man is entering, the character of its organization, and its operating and personnel policies.

It can be noted, however, that every placement problem resolves into two sets of factors, (1) those concerned with the individual, and (2) those concerned with the company. Combine these two sets of variables and you have the jig saw puzzle idea pretty well explained.

The engineering student is faced with a broad range of opportunities. Before he leaves school it will be of considerable advantage for him to find out as much as he can concerning these various fields. He should first attempt to narrow his original area of interest down to those channels which most appeal to him and then to work toward placement in one of those selected channels.

The series of explanatory articles to be featured by **The Wisconsin Engineer** is an attempt to define some of these areas of opportunity. During the coming months typical fields will be discussed to acquaint student engineers with various phases of engineering. It is suggested that students individually study the fields they may wish to enter by reading as much as possible the technical magazines in the Engineering library so as to gain a "talking acquaintance" with the various fields, by talking freely and asking questions of practicing engineers and instructors, by getting first-hand experience from field trips or part time work, by selecting electives in those fields of interest, and by making use of available interest and vocational tests on the campus.

For example, a student can learn a tremendous amount about design by regular perusal of (1) Machine Design, (2) Product Engineering, (3) Mechanical Engineering and a number of other current publications. The student may find no specific articles in any six-month period regarding the duties of a design engineer, but he will begin to build a conception of what types of problems the design engineer handles. The advertising in the first two of these magazines is directed mainly at design engineers and one can quite readily begin to picture the design engineer's field. The same is true of the industrial, research, development, sales, and other engineering fields normally open to the engineer.

In trying to define his interests, to progress gradually in any given path, the average student may often be swayed by individuals or immediate considerations of concerns visiting the campus. Interviewees often exhibit "chameleon-like" tendencies from day to day as evidenced by past experience. On any one day the largest percentage of men may be interested in manufacturing administration, on a successive day some interviewing representative converts the largest percentage of interest over to sales, on still a third day the same group are "all-out" for design or development work. While this is an exaggeration to a certain extent, it merits some consideration and arises from two sources. The first is a lack of sincere and continuing interest in any one or two fields of work through insufficient knowledge about those fields; the second is an obtaining of vague or doubtful information about each field as it comes along.

(continued on page 28)

Industrial

INDUSTRIAL engineering as a term has had only loose definition in past years. As a result of this it has tended to become a catch-all expression designed to apply to almost any type of technical industrial work which couldn't otherwise be catalogued as sales, product design or research work.

Certain engineers in the field somewhat frown upon the word industrial engineer and assign his work to one field, namely time and motion study work and the setting of production time standards. Actually many so-called industrial engineers enter this field because it is a challenging one and a strong need exists for men to enter this phase of industrial work. However, the industrial engineer is normally trained to handle a far broader range of work than this single field of establishing rates on production operations.

Essentially the real work of an industrial engineer involves a knowledge of several fields:

1. Internal plant procedures such as production planning and control.
2. Manufacturing processes.
3. Tooling.
4. Plant layout.
5. Motion and time study.
6. Personnel administration problems, such as wage determination, job evaluations, labor relations, etc.
7. Internal plant organization.

The industrial engineer is normally associated with industrial firms in one of two ways; namely, (a) As a consultant called in to study and advise upon problems within this general scope of manufacturing procedure, or (b) As a full time staff employee of a particular concern. The latter of these two groups is by far the larger since increasing numbers of firms are coming to the handling of their own internal industrial problems. Only the work of this group will be mentioned here.

The industrial engineer employed by the enterprise is usually in a staff department, that is in a department whose primary function is to advise or to plan rather than to administer or supervise. Some of the different types of work to which this individual can be assigned are as follows:

He may commonly be assigned to the time and motion study department where his work will involve the improvement of factory methods, of simplification of processes, of detailed motion analysis and simplification of specific operations. He may be assigned to the setting of time standards on production operations, or to the synthesizing of production time standards for future use. Thus he may be concerned with anything involving finding a better or more economical method of doing the job, regardless of whether it means study of motions or methods, reducing that job to a standard practice, and setting a fair production standard or cost on that job. His work as a member of time study department takes him into various parts of the plant, bringing him into contact with a large variety of operations and production problems. It is quite common for men with this broad time study background to step naturally over into production supervision work.

The industrial engineer can work as a member of the production planning and control office where each new order as it comes through is broken down into individual phases of planning such as (1) Establishing the process of "routing" of the part through the plant, (2) Deciding on economic lot sizes and equipment to be used, (3) Specification and design of tooling required, and (4) Preparation of paperwork and control procedures such as scheduling and machine loading. The industrial engineer can easily fit into this planning phase of production. He may be assigned specific production problems such as the economic selection of a new piece of production equipment or determining the advantages and costs of a proposed new type of production line. He may be assigned the simplification of internal plant procedures, paperwork, or similar problems. In this capacity the industrial engineer functions as a free lance specialist trying to improve operating procedures or to find an answer to a particular management problem.

The industrial engineer may function as a member of a plant layout group studying problems involving arrangement of production floors and equipment, of stores and stock facilities or the planning and setting up of production lines or departments. One of the most interesting fields of work in this capacity is that involving the study

Engineering

by Professor R. L. Dagget, MS'39

of material handling problems, the relative economy of different types of handling equipment, the comparison of mechanical systems to hand or conveyor systems in the operation of the plant. The plant layout group may be involved in the planning of a complete new plant or the simple rearrangement of an existing department though it is the **plant engineering** group which actually handles the **installation** of such facilities once they have been planned. Such plant layout studies may involve any period of time from several days to several months' time, and new studies are constantly put on the agenda so that the average plant of any size is carrying on this work all of the time. From this work comes recommendations, specific layouts and proposals for management's use in operating the plant.

The industrial engineer may work in some phase of personnel administration work involving job evaluation studies to determine equitable rates of pay for various jobs within the organization. He may be instrumental in setting up suitable merit rating systems for judgment of employee performance in a specific job or take part in the impartial study of wage problems. Adjudication of labor troubles, study of personnel safety or similar problems, and training of employees in new jobs may rightfully be assigned to him too.

The industrial engineer is a technically trained specialist free to work on these problems or on similar problems of plant management. It is very logical for such men to eventually enter some phase of administrative work or actual production supervision since they have worked in the area of many of the daily problems of manufacturing; of processes, of layout, of tools, of time standards, of personnel problems of training, of economics of production.

It very naturally follows that the man expecting to enter industrial engineering work should direct his attention toward these fields of interest, selecting those electives which will broaden his training toward this field. Although no industrial engineering option now exists, many courses are now offered which fit admirably into training toward this particular field. Some of these courses might be mentioned, namely:

Industrial Organization Principles
Time and Motion Study
Industrial Inspection Methods
Industrial Plant Design
Production Planning
Accounting Principles
Labor Problems

R. L. DAGGETT, m'38, MS'39, has spent many years in positions which qualify him for authority in this article. Five years were spent with RCA of Camden, New Jersey, as development engineer. Another one-and-a-half years were spent in consulting and development work with Electronics Processes Corp. and Blessing Associates of New York City. Following one more year with Ideal Industries, Sycamore, Ill., as senior design engineer he returned to Wisconsin as Assistant Professor in mechanical engineering. He has been on the campus for one year.

Personnel Management
Job Evaluation
Commercial Law

In addition, considerable opportunity exists for independent study in fields of special interest and in the future added courses will undoubtedly be offered to further broaden the scope.

Water Levels of Lake Erie

by Sherman Moore c'02

—Reprint from "Shore and Beach"

THE St. Lawrence River is one of the great rivers of the world, with a length of more than 1,700 miles, draining an area of some 300,000 square miles. It is unique among rivers of comparable size in its remarkable uniformity of flow and small range in stage. While the net water supply varies from more than 800,000 c.f.s. per month to less than zero, the flow at Ogdensburg shows a monthly variation of less than 150,000 c.f.s. This is due to the Great Lakes, lying near the head waters with an area of about 95,000 square miles, which act as great storage reservoirs, absorbing the fluctuation in the supply with a variation in level of only about five feet.

The upper lakes are old, possibly some sixty million years. They were here before the Glacial Period, and probably came into existence, although not in their present form, in the great-orogeny which began in late Mesozoic time and continued into the first part of the Tertiary. Lake Erie, on the other hand, is comparatively young, probably less than 25,000 years. There is no evidence of the lake before the Glacial Period, although possibly there was a small lake occupying the extreme easterly end of the basin. Lake Erie is the only one of the Great Lakes whose bottom does not extend below sea-level. Its average depth is but 58 feet, its maximum depth only 210 feet.

The source of the water supplied to the Great Lakes is the precipitation on their drainage basins. Much of that falling on the land areas is used by growing vegetation but approximately one half of it finds its way ultimately into the lakes. There a considerable proportion is lost by evaporation. But little is known as to the evaporation from the lake surfaces, but it seems to be approximately equal to the mean annual rainfall.

Of the total net supply of water to the St. Lawrence River at Ogdensburg, approximately 29 per cent comes from Lake Superior, 19 per cent from Lake Michigan, 27 per cent from Lake Huron, 9 per cent from Lake Erie, and 16 per cent from Lake Ontario. The local supply to the Erie basin is only about 12 per cent of the total supply to that lake, and if the supply it receives from the lakes above were cut off, its level would fall some fifteen feet.

As the supply of water to the Lakes comes from the precipitation, the lake stages reflect the variation in the rainfall, but the relationship between the two is obscured by other factors. A year of heavy precipitation following a dry period has but little effect upon lake levels, the water to a large extent being absorbed in filling the small lakes and swamps and in building up the ground water level. Ordinarily several years of large precipitation are needed to create high lake stages. It has been found that rains occurring in the spring have much more effect upon lake levels than do those in late summer. The effect of precipitation by snow is not predictable.

As it has been fairly well established that there is a relationship between rainfall and the sunspot cycle, a cycle of about 10½ years should be traceable in lake levels. Many attempts to demonstrate such a cycle have been made, but no satisfactory relationship has been shown. In 1929 the stages of the lakes were unusually high. In accordance with the sun spot cycle high water should have occurred again in 1939 or 1940, but it did not occur until 1943. The lakes were high in 1918, 1908, 1886, and 1876 as they should have been, but 1897 was not high and 1865-66 were actually low. Of eight sun spot cycles covered by the record, five check and three fail. This can not be considered conclusive.

Lake levels are subject to a seasonal fluctuation which is directly connected with the variation in supply to the lake. Minimum stages usually occur in February, the supply for two or three preceding months having been stored as snow, and the flow of the tributary streams having been reduced by ice. With the spring break-up the levels rise, reaching a maximum in mid-summer. The outflow then becomes greater than the inflow and the levels fall.

The wind causes temporary changes in level of short duration but frequently of considerable magnitude. These changes do not affect the mean level, but are the result of tilting of the water surface. Other variations of very short duration but of considerable size occur probably on all of the lakes. These superficially resemble tidal waves. Their cause is not definitely known. The Weather Bureau has advanced the theory that they are due to a sharp barometric gradient moving rapidly across the lake, pushing a wave of water before it. It has been demonstrated definitely that lunar tides exist on Lake Superior and Lake Michigan, and they probably occur on the other lakes. Their magnitude is so small that they are obscured in other fluctuations. The tide on Lake Michigan has amplitude of about an inch and a half.

When the first settlers reached the Great Lakes, they seem to have been much impressed by the variations in the level of the water. Some of them made records of these changes which have been preserved. Most of them are fragmentary, isolated readings at irregular intervals, and usually they were not referred to permanent marks.

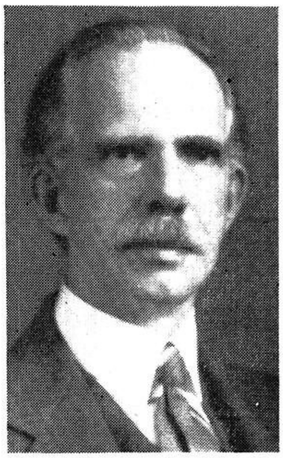
The first definite determination of the elevation of the surface of Lake Erie was made at Buffalo in 1819. These measurements were referred to the mitersill of the guard lock of the Erie Canal. The stage for August, 1819, on present datum, was 570.42 ft. This is the lowest August stage of record with the exception of that of 1934 which was 0.19 ft. lower. There are records at Buffalo for at least one month in each year from 1836 to 1851.

The first records at Cleveland were made in 1838, with observations each month from May to October. Additional records are available for at least two months in each of eight years between 1845 and 1857. The datum of these records is definitely known, as the reference point was adopted as Cleveland City Datum. Records of the depth of water on the sill of the guard lock of the Welland Canal at Port Colborne are complete from 1850 to the present time.

In 1859 the Lake Survey established water gauges on all of the Great Lakes, and records have been continuous since that time. At present, the Lake Survey maintains gauges on Lake Erie at Detroit River Light, Put-In-Bay, Toledo, Cleveland, and Buffalo, and has copies of the records of the Canadian gauges at Port Colborne and Port Stanley. During the last 30 years the variation in the annual mean stage of Lake Erie as measured at Cleveland has been 3.21 ft. from a high of 573.20 ft. in 1929 to a low of 569.99 ft. in 1934. The variation in mean monthly stage during this period has been 4.80 feet, from a high of 574.27 ft. in June, 1929, to a low of 569.47 ft. in December, 1934.

Lake Erie lies in a general northeast-southwest direction paralleling a recognized storm path. It is therefore frequently subject to winds of high velocity. Due to the configuration of the shores, and to the fact that the lake is so shallow that the return sub-surface currents are retarded, there is a greater fluctuation in level due to wind than on any of the other lakes. Southwest winds of high velocity pile the waters of the lake into the narrow end at Buffalo, resulting in changes of level exceeding eight feet, and causing corresponding lowering of the level at Toledo. Northeast storms have an opposite effect, although the magnitude is seldom as great. An examination of the records shows that during the storm of January 2, 1942, there was a period of six hours during which the water surface at Buffalo was more than twelve feet higher than that at Toledo, with a maximum simultaneous difference of 13.6 ft.

There are other factors that have affected the level of Lake Erie to a small extent. As a result of the diversion of water from Lake Michigan through the Sanitary Canal at Chicago, the level at the present time is 0.19 ft. lower than it otherwise would have been. The diversion of water through the Welland Canal has caused a lowering in level of about 0.25 ft. Diversions of water at Niagara Falls affect the level of Lake Erie by only about one-tenth as much as do equal diversions directly from the lake. The dumping of rock in the river immediately above the Falls about 1920, and the construction of the Peace Bridge compensated for the total diversion of water authorized by treaty. The increased diversion at Niagara Falls during the war had no effect on the level of Lake Erie due to certain works placed in the river above the first cascade. If the diversion of water is now reduced without removing these works, there will be a slight rise in Erie levels. Since 1941 there has been a diversion of water from Hudson Bay drainage into Lake Superior. If this is continued in its present amount it will result in a rise in the level of Lake Erie of about 2½ inches. The full effect of this increase in supply will not be felt for several years.



MR. SHERMAN MOORE, c'02, has been connected with the U. S. Lake Survey for forty-five years. His work has been largely concerned with the hydraulics of the Great Lakes, including the levels of the Lakes and the laws governing the flow through the connecting and outflow rivers. Mr. Moore has held, for the past few years, the position of Engineering Consultant.

The outflow from Lake Erie is determined by the elevation of the ridge of rock at Buffalo over which the river flows. It, therefore, determines the elevation of the lake for a given supply of water. This ridge is slowly rising with respect to all points on the shores of Lake Erie due to movements in the crust of the Earth. This results in encroachment of the water on the shores of the lake varying in amount from point to point because the elevations of the shores are also slowly changing. This movement is slow, amounting to about one half inch each ten years at Cleveland with a maximum of about three quarters of an inch in ten years at Port Clinton.

It can be stated with assurance, that the works of man have had but little, if any, effect on the levels of Lake Erie. Such changes have been compensating to a large extent, and their accumulated effect has been less than two inches. There probably has been no permanent change of appreciable size in the mean level nor in the fluctuation

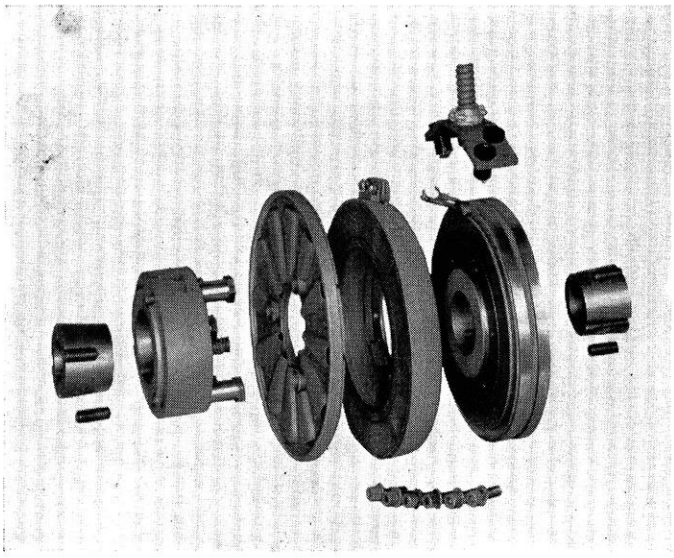
(continued on page 30)

Electric

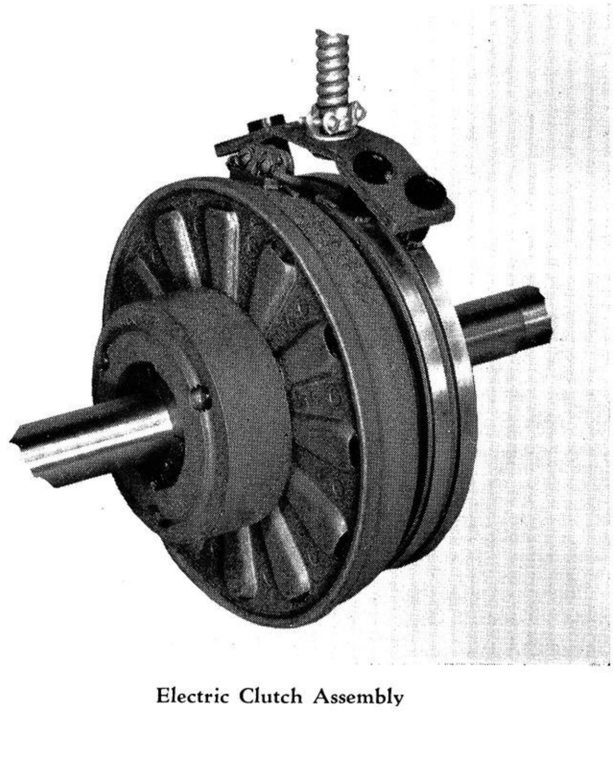
ENGINEERS have long strived to develop a simple, yet flexible, method for coupling prime movers to industrial machinery and equipment. In many instances the clutches and brakes needed to accomplish this task have been highly intricate and costly. Since the war, however, a new type of electro-magnetic clutch has been perfected which promises to greatly simplify the problem of transmission and control of driving torque.

Previously most magnetic coupling devices consisted of a solenoid, plunger and cams connected through levers to a band-type friction brake. The new unit is much simpler and has only two principal parts—a flat circular electromagnet and a disc-type armature of the same diameter against which the pull of the magnet is applied.

The operation and theory of this clutch is relatively simple. The friction needed to engage any two shafts or members is supplied directly by the pull of the large-diameter energized coil against the flat, rotating surface of the armature, the magnetic attraction greatly amplifying the normal coefficient of friction. If the unit is to be used as a clutch, both armature and magnet are free to rotate on their respective shafts—current is then fed to the magnet through slip-rings. If the unit is to be used as a brake or retarder, the magnet is bolted down and the armature is mounted on the rotating member. Obviously combined brake and clutch action may be obtained simultaneously by using both types.



Electric Clutch Exploded



Electric Clutch Assembly

The magnet is shaped like one-half of a large metal doughnut cut lengthwise. The coil which carries the current is secured in the shell of the "half-doughnut" by a mixture of sand and glyptol solidified by baking. Twenty-five watts of direct current is the average power required to operate the magnet on full application.

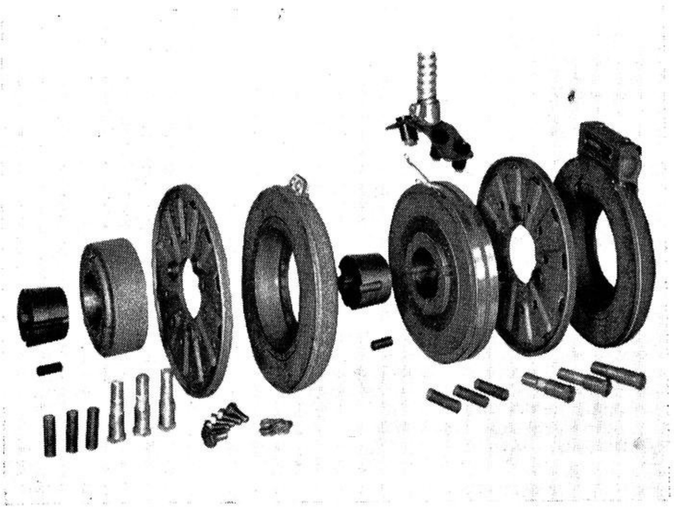
The armature is made up of segmented steel sections which together form a flat circular ring having approximately the same inner and outer diameters as the magnet itself. A slight spring tension assures that magnet and armature surfaces ride in light contact with each other at all times. Since static torque ratings are several times those of running torques there is no possibility of the clutch slipping after the magnet and armature have "locked in."

What advantages are presented by the new electric unit over other clutch and brake types? Primarily this unit is unique in its simplicity and compactness, the results of which are low initial and operating costs, minimum instal-

Braking

by J. Tanghe e'47

—Cuts courtesy Warner Electric Brake



Electric Brake and Clutch Exploded

lation space, and smaller chance for failures. Other advantages include sensitivity of control—since there are no gaps to close, no hinges, cams, solenoids or slack to take up, the action is direct, positive, and proportional to the current in the coil.

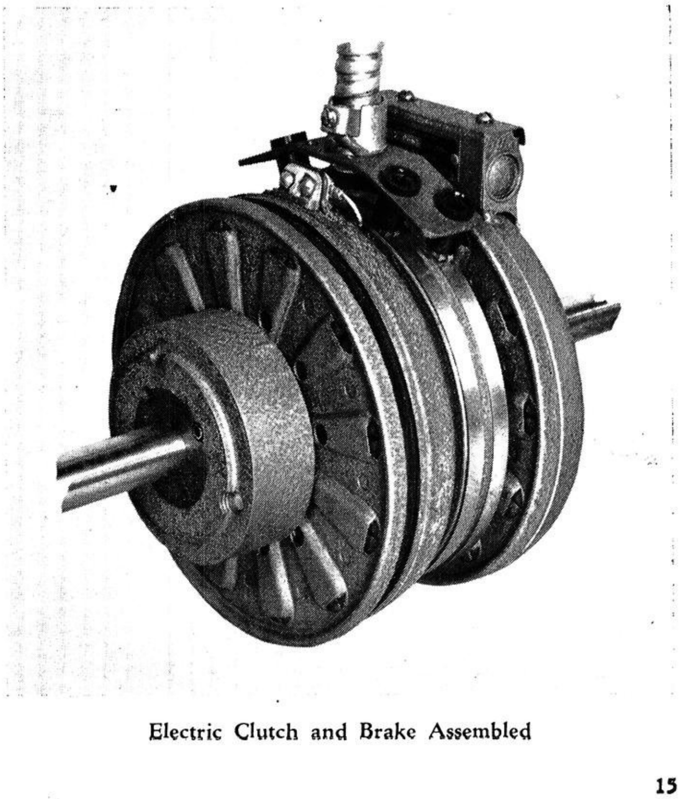
The units require only 25-35 watts of direct current for full application. As operation is dependent upon the power supply, it should not be used where power failure would result in damage to machine or operator. A source of auxiliary or emergency power, however, will serve to guarantee operation. Direct current must be used for energizing the magnet. This can be obtained without difficulty through a battery, other source of direct current, or from a rectifier. Both clutches and brakes are available for operation on either 6 or 90 volts direct current, the latter being the output of a 110 volt AC rectifier.

Simplicity and ease of mounting and installation are salient points of the units. The armature is carried on three or four pins, recessed to slide in holes in the armature. The contact of the armature with the magnet is assured by three or four springs, also recessed in the hub, exerting a light pressure against the armature. Either the armature or magnet may be installed on the driving shaft for clutch application, but mounting the armature on the driving shaft is usually preferred to take advantage of the blower action of its fluted backing plate.

The hubs which carry the armature drive pins, springs, and in the case of the clutch, carry the magnet and collector rings, is attached to the shaft by a taperlock-bushing. This bushing within minimum and maximum limits is the only variable involved in furnishing brakes or clutches for different sizes of shafts. These same armature drive pins and springs may be carried by a pulley, or any other rotating member such as a flywheel.

The new electromagnetic clutch may be used in many ways. Although in its infancy, this unit has already been installed on many industrial tools and machines. In some cases it is used to control the torque delivered from drive-shaft to machine; in others it is used to reduce the momentum of rotating parts after the drive power has been removed.

The perfection of this improved electric clutch-brake unit resulted from several years of experimentation by Warner Electric Brake Company of Beloit, leading manufacturers of electric automotive brakes. Engineers at the plant have become experts in "decelleration engineering", and in past years have developed electro-magnetic brakes for all types of vehicles, from huge semi-trailer trucks down to pint-sized "jeeps."



Electric Clutch and Brake Assembled

Alumni Notes

by J. J. Kunes e'48 *Lawrence Hunholz e'47*

—Cuts by General Electric

Announcement was made recently of the retirement of Lewis R. Brown (EE '03), manager of General Electric's Transformer Divisions at Pittsfield, Mass., and a prominent figure in electrical and industrial circles during his 44 years with the company.

Lewis R. Brown

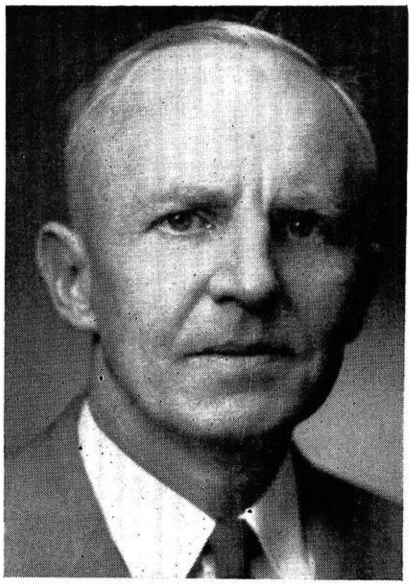
Mr. Brown was responsible for the sales of all transformers and allied equipment. He was G. E.'s first transformer specialist, and was largely responsible for the company's expansion and leadership in the transformer field. Among the important changes in transformer equipments instituted under Mr. Brown's direction was the development of Pyranol, the first non-inflammable insulating liquid used. Such attachments on transformers as switches, radiators, fans, automatic control pumps, and others became standard apparatus through the years as a result of his recommendations.

The American Society for Engineering Education has conferred the Second George Westinghouse Award in engineering education upon Benjamin Richard Teare, Jr.: "For his invaluable work in the development of courses in engineering analysis; for his spirited support and ready cooperation in every worthwhile effort toward betterment of engineering education; and for the bracing influence on his students and fellow workers of the power of his attack on every new problem."

Dr. Teare (EE '27, MS '28) is Buhl Professor and head of the Department of Electrical Engineering at Carnegie Institute of Technology. He is the author of numerous engineering papers and has gained a national reputation for his pioneering work in the development and coordination of engineering courses.

While passing through Madison last May, Mr. L. O. Meyer (ME '39) spent a few hours at the University, visiting with some of the mechanical engineering faculty and observing various changes which have taken place since his last visit. Mr. Meyer is engaged in research work with the Phillips Petroleum Company at Bartlesville, Oklahoma, and reports that other Wisconsin alumni currently employed by Phillips are: Norman E. Ziege (ME '39), Carl H. Peterson (ME '40), William M. Larsen (ME '40), and Clay Henneman (ME '39).

The General Electric Company at Schenectady, N. Y., has announced two recent appointments of Wisconsin alumni in the Turbine-Generator Engineering Division. Mr. Walter E. Blowney (EE'20, ME'24) has been appointed assistant division engineer of the Turbine-Generator Engineering Division, and H. D. Taylor (ME '21) has been appointed section engineer of the Generator Section.



Walter E. Blowney

Mr. Blowney originated the practice of air testing turbine components, which has resulted in steam turbines with greatly improved thermal efficiencies.

Mr. Taylor has worked on turbine engineering with G. E. since

(continued on page 24)

Operation Mutual

by Robert J. Mitchell

ONE of the grandest things about friendship is that it goes both ways. A friendship is a hollow thing with only one friend. As a matter of fact, it is so different from the real thing that our forebears thought up a different name for it. They called a one-man friendship "conceit."

The Wisconsin Engineer would, indeed, be a conceited publication if it thought that it were self-sufficient. At the same time, we feel justified in saying that you, the engineering students of Wisconsin, cannot very well get along without us. The reason is that the Wisconsin Engineer is your sensitive finger-tip on the pulse of current engineering activity, developments, and thought. Again, however, it would be a useless digit without the central brain to signal to.

Now let us get away from generalities and be specific. How can you help the Engineer? In your practical engineering experience, and many of you have had such, you have, perhaps, run across facts pertaining to the conduct of various industries. This information is vital to building a broad concept of modern industry in the minds of our fellow students. If you have such a grouping of facts, they may be presented in the form of an article. Perhaps a member of the editorial staff could work with you to polish up the facts to a readable treatise.

The Wisconsin Engineer is going to help you by gathering together the results of studies by undergraduates, graduate students, members of the faculty, alumni, and industrial researchers. Through these articles we hope to see you become—not merely engineers, and **good** engineers—but balanced individuals of high social and technical accomplishments.

Now all these high-sounding ideals may make you wonder about the limiting factors. Think carefully. Are not the chief limiting factors **within ourselves?** Throw them out! Over-ride them!! Think more carefully. Would not mutual effort make it an easier task?

One of the first things that a man should find out, no matter what his profession, is that **he cannot stand alone.** This is taught in kindergartens, grade - schools, high-schools, colleges, and, ultimately, where it really hurts—in our everyday lives. You may never work on specific development projects, but you should know the results of such enterprises. Sometime during your career, someone will be dependent on your knowledge of developments outside your own specific field. Such knowledge can come from within you only if it has been placed there. Your obligation to future employers is to gather and remember such data. The Wisconsin Engineer is a good clearing house for varied technical material.

One of the major desires of the Engineer at the present is to interest members of the lower grades in the handling of technical literature and the accompanying jobs of makeup, advertising, and circulation. Eventually these men will be carrying on the tradition which is at present some fifty-one years old. They should be qualified and trained for the positions before the load is placed on their shoulders.

Cartoonists, photographers, and occasional contributors can be accepted now. Do you have talent for taking technical pictures? Would you like to try? Could you break the gray between these covers with an occasional cartoon? Talk to the staff members of the Engineer about it.

As for the rest of you, just continue reading the mag. When you benefit by this, so do we. You see, we are a mutual outfit, and all such groups reflect their sentiments on their surface. And there never was a reflection without a source of light.

Campus Highlights

by John Ashenbrucker e'49
Russ Pavlat e'48

Prof. Elliott Heads M.E. Dept.

Prof. Ben G. Elliott is the new head of the Department of Mechanical Engineering, replacing Prof. G. L. Larson. Prof. Larson will continue his duties as professor of mechanical engineering, and do consulting work on the side. Prof. Elliott has also recently accepted membership in the Panel of Conciliators and Arbitrators recently set up by the Wisconsin Employment Relations Board under the new law concerning strikes against public utilities.

Prof. B. G. Elliott

•

It seems that the names of the Dean's fair secretaries have been placed under suspicion concerning a piece of furniture mislaid from the lobby of the M.E. building. Fortunately a previous clean record concerning larceny has cleared their honor.

AIEE held two meetings with Dr. S. H. Mortenson from Allis-Chalmers talking on "Design of Turbo-Alternators" at a meeting July 17, and F. D. Hurd speaking Aug. 27 on "Unit Substations of Westinghouse Electric Company." Of timely interest to all engineers will be a talk by Mr. B. W. McClenzen of General Electric Company who will speak on October 7 to the AIEE on "Business Aspects of Engineering."

Two tentative meetings of technical men in conjunction with the University of Wisconsin Centennial are being planned for next year. A meeting of one day is being scheduled at which some of the leading engineers of the country will be in Madison discussing the high pressure of pulverized coal process used in heat engines. Many Wisconsin graduates have worked on this phase of work.

Another meeting concerning diesel engines may also be held in the latter part of 1948. Wisconsin industry is one of the largest manufacturers of diesel engines, both in horsepower per year, and size of engines developed.

Chi Epsilon Initiation

Chi Epsilon held its annual initiation at Kennedy Manor on August thirteenth, with R. Rohlich of the Department of Civil Engineering as the toastmaster. Mr. Baedecker of the Economics Department was the main speaker of the evening. The following men were initiated: F. E. Schmitt, W. Scott, C. Warren, R. Wierdsma, and R. J. Hansen.

Prof. Price Heads E.E. Dept.

Prof. Price is the new head of the Electrical Engineering department. He replaces G. F. Tracy who left to take a position as head of the Electrical Engineering Department at the University of Toronto, his alma mater.

Visiting Teachers

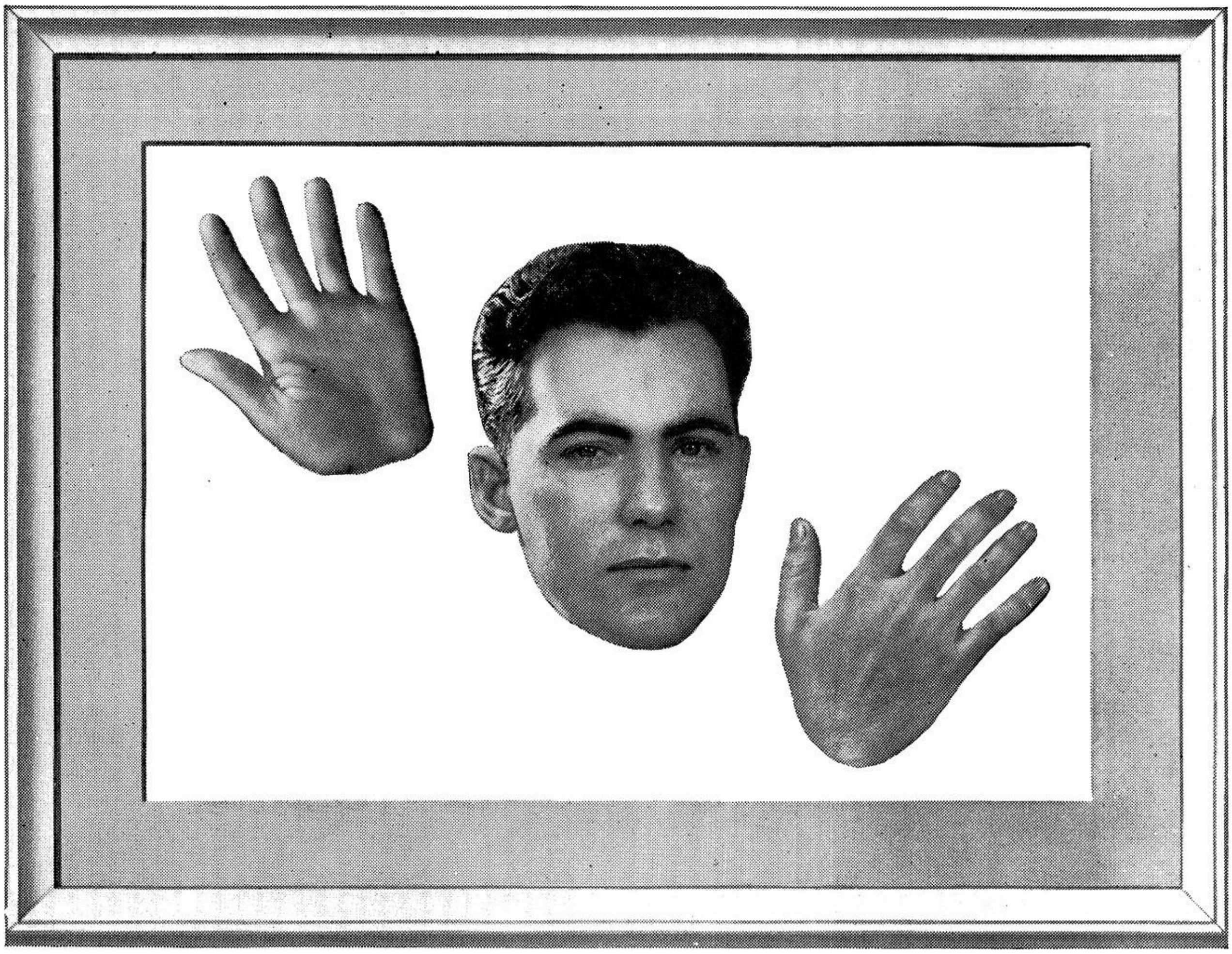
Professors W. H. Ball and N. B. Hutcheon from the M.E. Dept. of the University of Saskatchewan were in Madison on August 27 observing the M.E. Dept. at Wisconsin and getting ideas for a possible revision of that department at the U. of Saskatchewan.

With the greater part of the Engineering School in attendance at the summer session, the various student societies remained active during the summer:

Placement Office Has New Head

Henry Goehring, present personnel manager for Carnegie - Illinois Steel, will assume duties as head of the placement office beginning about September 15. He will also assume some of Prof. Rader's present duties as assistant dean in order that Prof. Rader may devote full time to instructing.

(continued on page 32)



S-t-a-t-i-c

by J. Woodburn

Civil Engineering Professor: "Describe the mechanism of a steam shovel."

Frosh Engineer: "Don't kid me, you can't carry steam on a shovel."

* * *

Lecturer in new building on campus: "When the room settles down I will begin my lecture . . . Now watch the blackboard while I run through it again."

* * *

"Your girl is spoiled, isn't she?"

"No, it's just the perfume she is wearing."

* * *

Preacher's daughter: "Good morning, God "

Co-ed: "Good God, MORNING!"

* * *

College education for women is futile. If they're pretty it's unnecessary; if they're not, it's inadequate.

* * *

Under the swinging street car strap
The homely co-ed stood,
And stood and stood and
Stood and stood and stood.

* * *

Observation: Of all labor-saving devices ever invented for women, none has ever been so popular as a devoted man.

* * *

"When I was a lad about two years old my mother hired a nurse girl to wheel me about in my baby carriage, and I have been pushed for money ever since."

* * *

The trouble between capital and labor is that too many people are trying to get capital without the necessary labor.

* * *

A bolt is a stick of hard metal like iron, with a square chunk on one end and scratchings wound around the other. A nut is the same thing only opposite, being just a hole with the wrinkles around the inside of it.

* * *

They cut down the old apple tree
That blossomed each spring by the door
And Rover missed it since that very day
Though he had never missed it before.

* * *

Girls without principal draw considerable interest.

I once had a classmate named Jessar
Whose knowledge grew lesser and lesser.
It at last grew so small
He knew nothing at all
And now he's an engineering professor.

* * *

A hug is energy gone to waist.

* * *

Newspapers are like women: They have forms, back numbers are not in demand, they have a great deal of influence, they always have the last word, there's small demand for the bold faced type, you can't believe everything they say, they are worth looking over, and every man should have one and not borrow his neighbor's.

* * *

Massey says: "Cold working is working while in the cold state."

I would say, "It was working while in the cold."

* * *

Slide rules don't make mistakes, just slips.

* * *

Marriage is like a cafeteria: You grab something now and pay for it later.

* * *

Married men don't live longer. It just seems longer.

* * *

Beer is like the sun. It rises in the yeast and sets in the vest.

* * *

A bathing suit—like a barbed wire fence—is designed to protect the property without obstructing the view.

* * *

Two spinsters met on the street and began to talk about their respective churches.

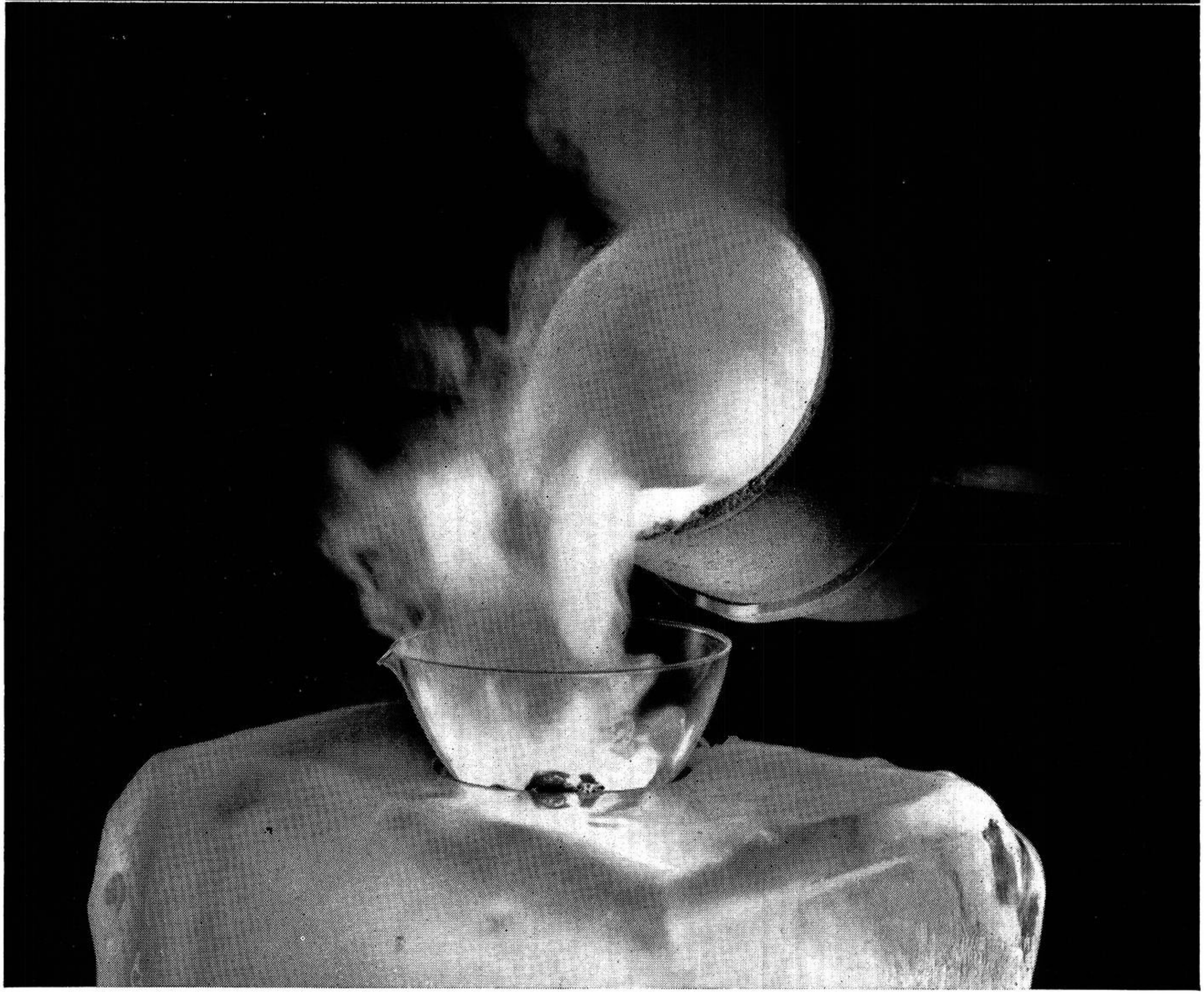
"I understand," said one spinster, "that at your church the attendance is very small. Is that so?"

"Yes, I'm sorry to say it is," replied her friend. "There are so few people there on Sunday that when the rector says 'Dearly Beloved' you feel as if you had received a proposal."

* * *

A Frenchman came to London to learn the language, and soon got into difficulties with his pronunciation, especially with the group comprising "though," "plough," and "rough."

When the film of "Cavalcade" began its run, and one newspaper review was headed " 'Cavalcade' Pronounced Success," the Frenchman went back home.



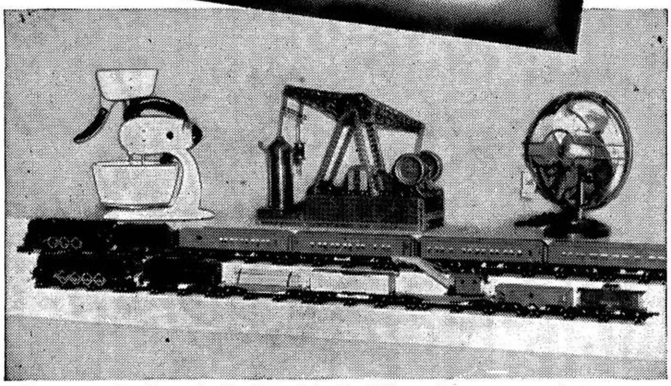
GAS... flexible TOOL for Production-line Heat Processes

When you need heat for drying, for metal-melting, for process steam, for any of the production-line heating requirements you need GAS and modern Gas Equipment.

And for proof of the many successful applications of the productive flames of GAS in modern industrial practice you need only look at the experience records of A. C. Gilbert Company, famed producer of miniature trains, scientific toys, motor-driven appliances.

In its modern New Haven, Connecticut, plant the company's production engineers have applied GAS to heating processes such as:

- **Pre-melting furnaces for metal used in die-casting**
- **Molten-metal reservoirs of die-casting machines**
- **Remelt furnaces for reclaiming scrap metal**
- **Salt bath for gear hardening**
- **Boilers supplying steam for bakelite mold-heating**
- **Continuous cycle and convection drying and enameling ovens**



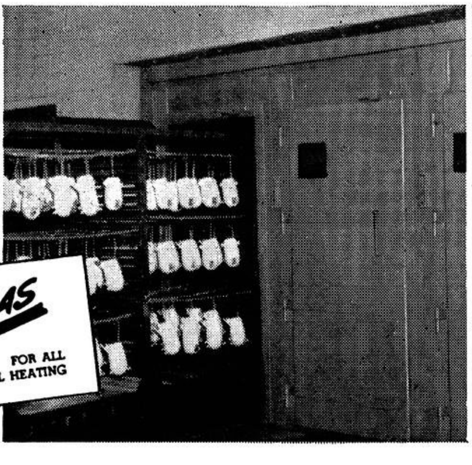
Some popular items in the list of A. C. Gilbert Company products

These varied examples demonstrate the applicability of GAS to the widest range of production-line processes. The growing use of GAS in modern productioneering is a constant challenge to engineers and manufacturers of heat treating equipment.

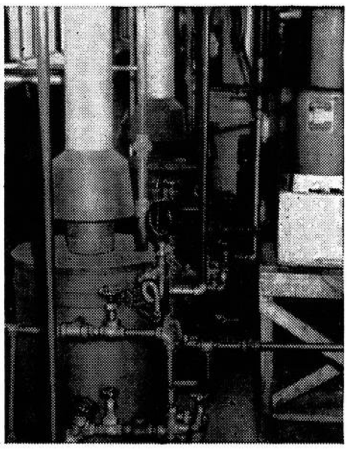
AMERICAN GAS ASSOCIATION

420 LEXINGTON AVE.
NEW YORK 17, N. Y.

Gas-fired traveling conveyor oven where Erector set parts are coated and dried



Automatic controls assure proper paint-drying temperatures in Gas convection ovens



Gas-fired boilers supply steam to the bakelite molding presses

Alumni Notes

(continued from page 16)

1921, and in 1933 was granted a Charles A. Coffin award in recognition of his contribution to the development of turbine generators.

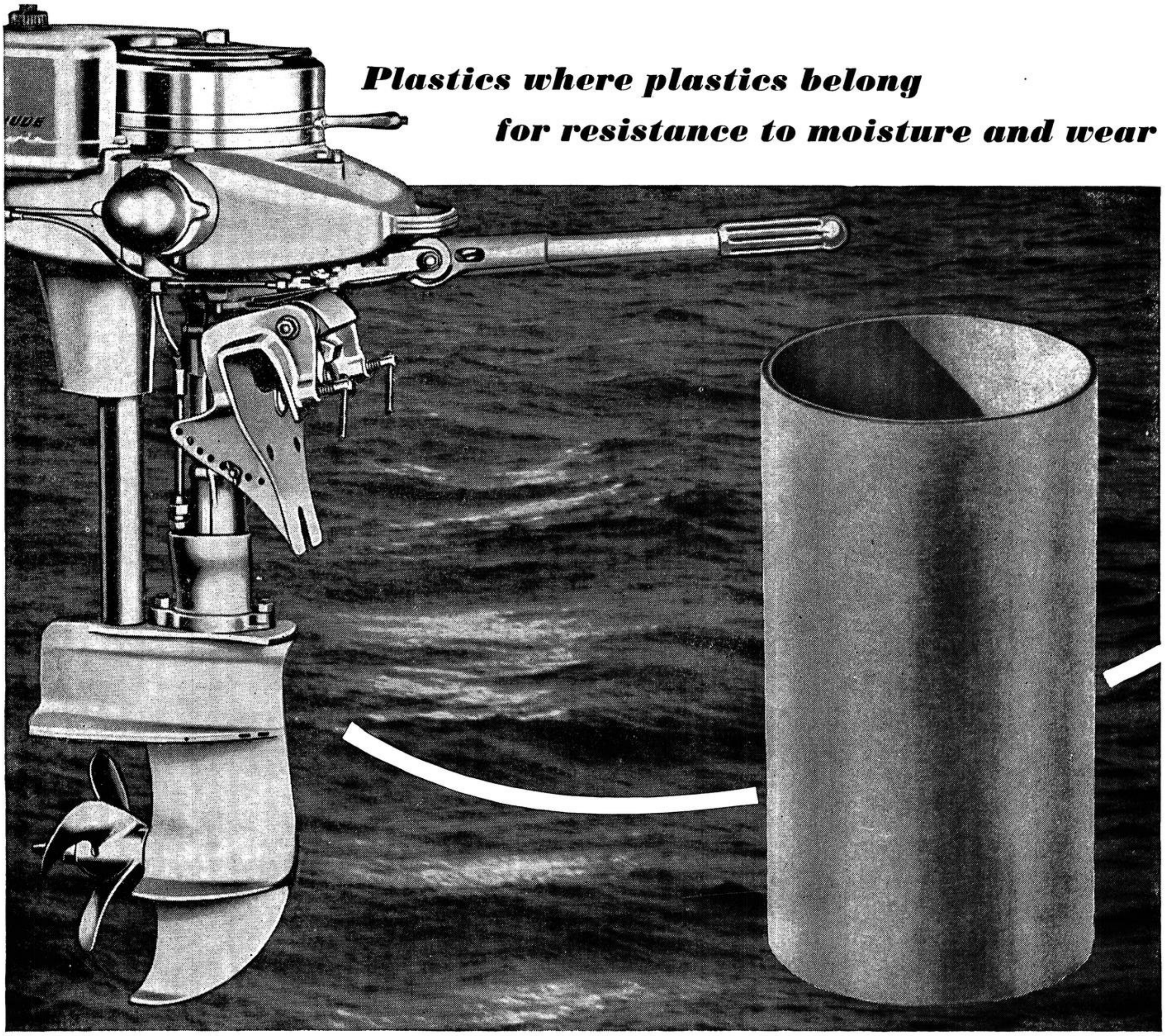
H. D. Taylor

John Tanghe (EE'47) of the Warner Electric Brake Company of Beloit, Wisconsin, reports on "Decelleration Engineering" in this issue of the "Engineer". In his article, Mr. Taughe tells how a new phase of electrical engineering has developed, and gives an interesting report on novel developments and applications of electrical engineering.

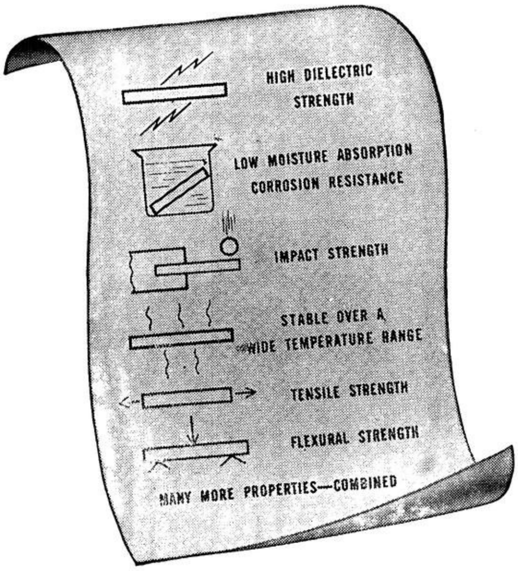
Mr. Tanghe, a member of Eta Kappa Nu and Triangle, was a member of the "Engineer" staff previous to his graduation.

Harold E. Rucks e'38 has recently been promoted to the position of Power Sales Director of the Interstate Power Company of Dubuque, Iowa. Previous to his three and one-half years with the Army Signal Corps in the South Pacific he worked with the J. Samuel Hart Company, Consulting Engineers, in Madison.

Plastics where plastics belong
for resistance to moisture and wear



Synthane where Synthane belongs



It's Synthane—this outboard motor pivot bearing . . . requires no lubrication . . . resists both salt and fresh water, wears long and well. It's a good example of the use of plastics where plastics belong and Synthane where Synthane belongs.

Synthane (our type of plastics) is also light, dense, strong, easily and quickly machined, an excellent insulator, a material for fighting corrosion.

These and many other properties—combined—make Synthane adaptable to countless applications. Synthane Corporation (Key Address) Oaks, Pennsylvania.

SYNTHANE

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

Science Highlights

NEW FM TRANSMITTING TRIODES

New-type transmitting triodes, designed for low and medium power in the 88 to 108 megacycles per second frequency - modulation broadcasting band, are described in an article appearing in the current issue of Electrical Communication, quarterly technical journal of the International Telephone and Telegraph Corporation.

Construction details of the triodes, developed by Federal Telephone and Radio Corporation, manufacturing associate of I. T. & T., and designated as the 7C26 and 7C27, are illustrated in photographs, plan drawings and charts. They permit from 1 to 10 kilowatts of output power to be generated with a minimum number of triode amplifier stages, according to P. I. Corbell, Jr., and H. R. Jacobus, co-authors of the article. Mechanical and electrical design features are discussed along with tables showing maximum ratings, typical operating conditions and general characteristics of the tubes.

PINT-SIZED CARILLON

A new method of producing the sound of church bells by the use of a two ounce General Electric Alnico permanent magnet has been devised by Liberty Carillons, Inc., of New York.

Designed to capture the inaudible vibration of the belltones when they are created by the blow of a small metal clapper upon the belltone bar, the sintered alnico 5 magnet helps produce a greater electrical impulse for a given amplitude of vibrations and thus feeds a greater signal into the amplifier. These vibrations are then sent through an extra high fidelity enhancement system from which they are transmitted to super-powered belfry stentors and then exploded with the realism of a great bell being struck.

The General Electric sub-assembly consists of an Alnico 5 permanent magnet one-eighth inches in diameter and five-eighth inches long, magnetized throughout its length and wound with approximately 50 turns of copper wire. This magnet is inserted in a nickel plated brass tube and filled with a plastic compound.

Located just below the point of the blow of the metal clapper, the sub-assembly lifts the initially inaudible vibrations from the tone bars and passes the electrical impulses along to the amplifiers. From 12 to 60 sub-assemblies are used depending on the size of the instrument.

UW ATOM-SMASHER GOES BACK TO WORK

On the campus again after three years of secret war work at Los Alamos, N. M., is Wisconsin's electrostatic generator, better known as an "atom-smasher." The machine and the University scientists who know how to work it are seeking peacetime secrets which lie within the nucleus of the atom.

Wisconsin's generator is capable of accelerating atomic particles to a speed of 70 million miles per hour, or one-tenth the speed of light. Unlike most atom-busters, our machine can measure high voltages with precision and maintain them accurately at any value, which makes it extremely valuable in calculating the so-called "resonance" effects of fission.

Prof. R. G. Herb is director of atomic research at Madison. He and his colleagues are cooperating closely with the Argonne National Laboratory at Chicago, which is directed by another Wisconsin professor, Farrington Daniels.

Ultrasensitive RCA Television camera tube cuts studio light requirements 90%

Television finds drama in the dark — with new RCA studio camera

Now television becomes even more exciting as lights are dimmed, and the camera reaches deep inside studio shadows to capture action as dramatic as any on stage or screen . . .

A new studio television camera—developed by RCA scientists and engineers—needs only 1/10th the usual amount of light.

The super-sensitive eye of the new camera is an improved Image Orthicon Tube . . . of the type once used only outdoors. With it, studio broadcasts are sharper, clearer—and since so little illumination is needed, heat in the studio is sharply reduced. No more blazing lights!

Such improvements come regularly from research at RCA Laboratories, and apply to all branches of radio, television, electronics, and recording. These improvements are part of any product bearing the name RCA or RCA Victor.

• • •

When in Radio City, New York, be sure to see the radio and electronic wonders at RCA Exhibition Hall, 36 West 49th St. Free admission. *Radio Corporation of America, RCA Building, Radio City, New York 20.*

Continue your education with pay—at RCA

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

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

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

Also many opportunities for Mechanical and Chemical Engineers and Physicists.

RADIO CORPORATION of AMERICA

Engineering Opportunities

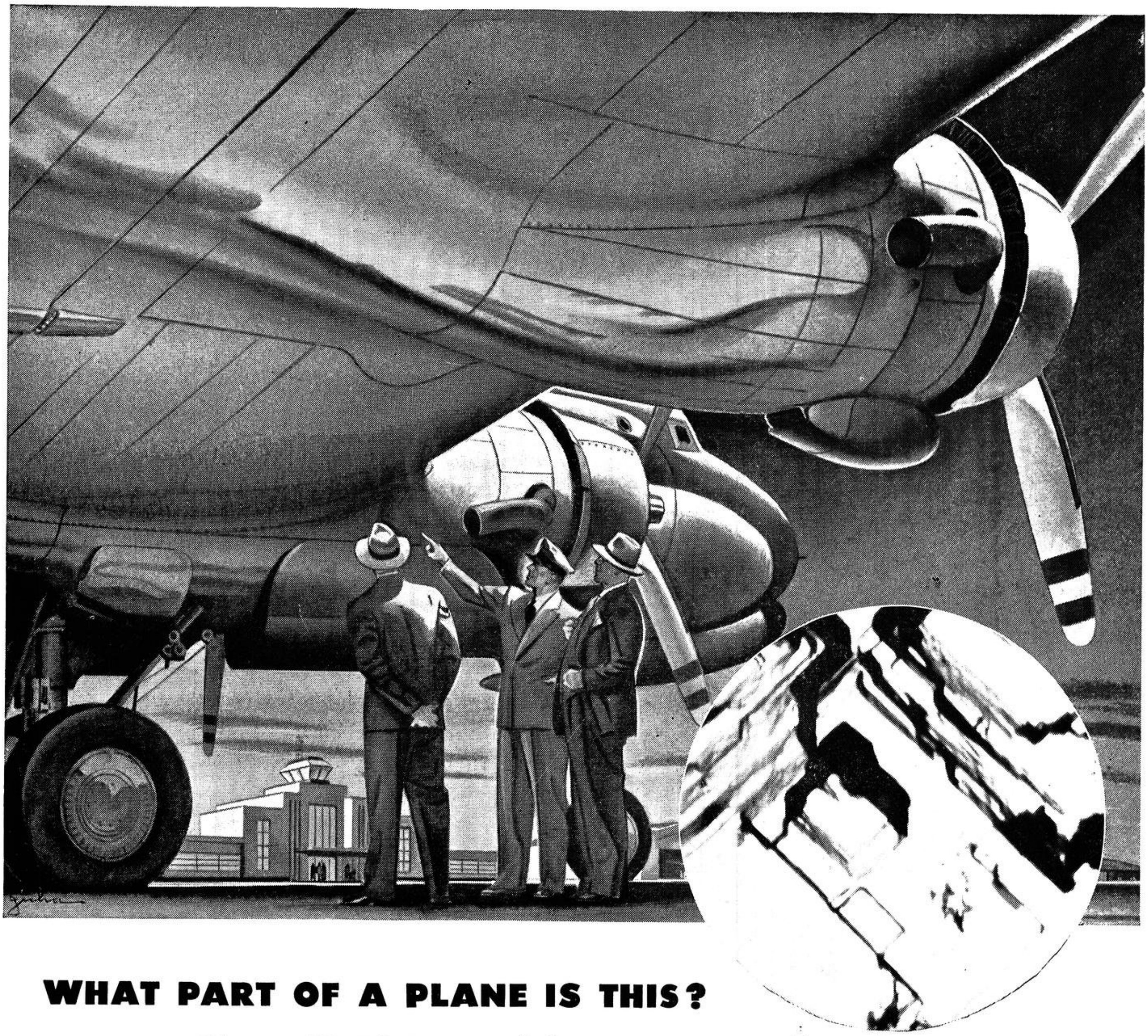
(continued from page 9)

There are a large number of misconceptions afloat concerning various fields of endeavor in engineering. For example, many men believe that sales engineering pays more than other engineering work. In some instances it does but it is the exceptional case which you hear about. Does the same student engineer who hears about the highly paid sales engineer realize that for every outstanding man there may be five, or ten, or even more mediocre salesmen who are earning modest livings? Does he stop to realize that many concerns do not pay on a commission basis for sales, that with sales often goes continual travel, evening work in preparing daily reports, a difficult day's routine which takes a particular type of individual to be outstanding and successful? On the overall average, sales engineers probably earn very little more than other engineers of equivalent experience or training who have specialized in a particular field.

Students often point to a particular job or a particular field as being enviable for its higher pay, but they fail to recognize the differential may be due to some important factors. Pay is usually in rough proportion to risk or some other extenuating factor. If the pay is high, the job may be demanding in responsibility and time, or it may be less interesting work to which the added inducement has been added. If the pay is far from average it may reflect a major difference in living costs for a particular area. It may represent longer increments between (smaller) increases. It may involve "produce or be replaced." One cannot look at a single factor such as pay differential without also looking for the reasons for that differential.

Another popular misconception seems to be that advancement opportunity exists as a function of any particular field entered, whereas actually advancement is usually **a function of the individual.** The variables being his competence, his initiative, his ability to do assigned jobs however menial, and his ability to make each job a steppingstone toward the next one. One can easily become "stymied" in a design department but one can just as easily become "stymied" in sales. Opportunities exist for men as individuals and an intelligent management recognizes leadership ability, and is willing to promote and advance it

(continued on page 36)



WHAT PART OF A PLANE IS THIS?

Clue: 31,700 would cover a pinhead

It is part of the wing surface . . . an area so microscopic that 31,700 spots like this would barely cover a pinhead.

You are looking at aluminum through an electron microscope, the way Alcoa Research scientists look at aluminum alloys in our laboratories. They get down to aluminum's *really* fine points . . . explore among the atoms.

Studying structures like this is one of the ways Alcoa metallurgists learn how to improve aluminum alloys and how to make new ones. By scientific experimentation they combine with aluminum the *right* amounts of the *right* metals to produce the results they want . . . alloys as strong or stronger than structural steel, at one-third the weight . . . alloys that make better castings, forgings, extrusions . . . alloys for innumerable uses

You wouldn't hear half, *not even a hundredth* as much about aluminum today if it weren't for these alloys that Alcoa Research has produced. Aluminum's great and growing usefulness springs directly from their development. Nature made aluminum light. Alcoa has made it strong and versatile and low in cost. ALUMINUM COMPANY OF AMERICA, Gulf Building, Pittsburgh 19, Pennsylvania.

MORE people want **MORE** aluminum for **MORE** uses than ever

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

Lake Erie Levels

(continued from page 13)

of Lake Erie since it received the waters of the upper lakes at the end of Lake Nipissing and established its present outlet through the Niagara River.

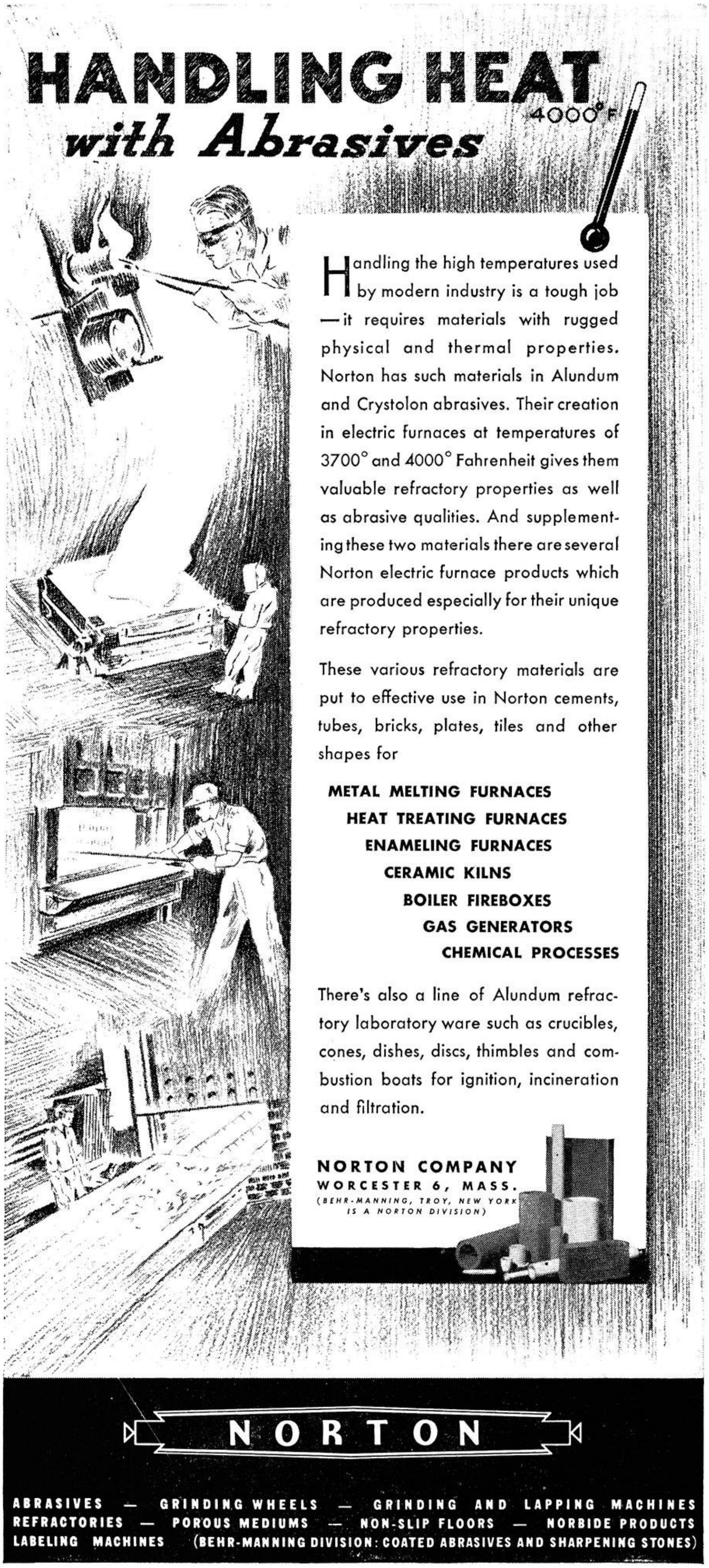
Gauge records, supplemented by tradition, show that from 1810 to 1830 Lake Erie was at low level. The level then rose about 1.6 ft. and continued to fluctuate above and below that higher stage for nearly sixty years. Since 1890 the mean level has become progressively lower until in 1923-1941 it was nearly the same as it was before 1830. During the last three years the stage has been appreciably higher. These recent stages have caused unnecessary concern and a great deal of comment, much of which has not been based on fact.

With respect to the past record Lake Erie is not exceptionally high. The maximum monthly stage during the last three years was 574.07 ft. in July, 1943. But the highest monthly mean stage in 1929 was 0.20 ft. higher, in 1876 it was 0.44 ft. higher, and in 1859-62 the average maximum stage was 0.31 ft. higher. The highest stage of record occurred in 1838 and was 1.08 ft. higher than the maximum of 1943. Since 1860 there have been 13 years in which the maximum monthly stage was above 574.00 ft.

The stage of the last three years is wholly accounted for by an excess precipitation. The level is now falling, and the level in June of this year was 0.70 ft. below the high of 1943.

From an engineering standpoint, it is possible to regulate the level of Lake Erie by works in the Niagara River. To reduce the variation in stage, it is necessary only to control the outflow, releasing large amounts of water with rising stages, and reducing the outflow with falling stages. But large variations in the flow of the river would damage the power interests at Niagara Falls. I know of no computations as to the possible limits of such regulation. The Joint Board on St. Lawrence Waterway studied the possibilities and found that at a cost of about $14,000,000 it would be possible to reduce the fluctuation in level by about six inches without seriously affecting the operation of the power plants. They concluded that the advantage to be gained did not justify the cost.

As I see the problem of beach erosion, it is the storm stages that do most of the damage. Reducing the mean annual fluctuation in level by six inches or a foot would be of little value unless storm stages could be controlled, and that seems to lie beyond the power of man.



Campus Highlights

(continued from page 18)

Tau Beta Pi Initiates

Wearing purple and gold ribbons in their lapels twenty-nine pledges were initiated into Tau Beta Pi, top engineering honorary society, on July 24, 1947. Professor O. A. Hougen who was master of ceremonies ably conducted the evening's activities of which the highlight was an address by Professor D. Lescohier on the Taft-Hartley Labor Act.

The following pledges were initiated: Mechanical—D. W. Retzinger, D. C. Andrews, R. J. Fibikar, C. W. Goldbeck, W. A. Hoftiezer, C. F. Leyse, A. Lieberman, J. W. Mann, J. W. Mohr, R. E. Nuckles, O. F. Rice, D. F. Stoller, J. Urdal, C. C. Verlo, Electrical—A. J. Beutler, C. E. Fordham, E. Kasum, R. J. Keeler, M. B. Knight, J. J. Kunes, R. H. Neynaber, R. A. Medenwald, H. R. Nieman, W. J. Scott, M. G. Spooner, Mining & Metallurgy—W. F. Hofmeister, K. W. Huckaby, W. H. Smith, Chemical—R. E. Leiser, B. L. Manny.

Carl F. Leyse was awarded the prize for the best plaque presented of all the new initiates.

Eta Kappa Nu Initiates

Personal Magnetism was the title of the prize winning essay submitted by the summer neophytes of Eta Kappa Nu, Electrical Engineering Honorary Society. The author, Clarence Fordham, walked away with all honors by also submitting the best plaque. The main speaker of the evening was Dr. Warren E. Gilson who spoke on Electricity in Medicine.

The initiates were: A. J. Beutler, C. E. Fordham, S. M. Morrison, F. F. Hansen, E. G. Ristola, R. K. Roe, R. W. Flugum, H. R. Nieman, R. A. Medenwald, F. G. Hibbard, G. H. Cohen, C. W. Pearson, and R. W. Brandt.

S-T-A-T-I-C

(left over from page 20)

Golf is a game where a ball $1\frac{1}{2}$ inches in diameter is placed on another ball 8,000 miles in diameter.

The object is to hit the small ball, but not the large one.

* * *

A spiritualist had a message from her husband to send him a package of cigarettes.

"Where shall I send them?" she asked a friend. "He didn't give an address." "Well," said the friend, "you n o t i c e he didn't ask for matches. That's a kind of an indication."

* * *

One pay day Private Stone received 50 cents too much, but he didn't say a word. During the week the paymaster found out his mistake, so on the next pay day he deducted 50 cents.

"Excuse me, sir," said Stone, "I'm short 50 cents this week."

"You didn't complain last week."

"No, sir, I don't mind overlooking one mistake; but when it happens twice, then it's time to say something."

* * *

The very slick customer settled himself in the barber's chair. The man with the scissors looked him over and inquired: "Hair cut or oil change?"

* * *

"Madam, what do you mean by letting your child snatch off my wig?"

"Sir, if it is just a wig, think nothing of it. I was afraid that the little devil had scalped you!"

* * *

After the flood was over Noah went back to see if all the animals were out of the ark. He found a pair of snakes in a corner weeping copiously. When he asked them what the trouble was, they said: "You told us to go out and multiply upon the earth, and we cannot, for we are adders."

Introduction

(continued from page 28)

regardless of where or when it appears. True, if any man can see no farther than the specific job he is working at, he may as well consider himself stopped from the very onset. Any job is a stepping-stone to promotion if viewed in its true perspective. Before a man is given a plant or department to manage, he must first have demonstrated ability for management at some simpler job.

Students often point to certain jobs as being more "appealing" or more interesting than others. They may shy away from design engineering because their conception of the designer's function involves being chained to a drafting board. Actually five interesting design jobs probably exist for every single "uninteresting" design job. They fail to recognize that a design engineer, to be successful, must be in touch with the factory, with new process and material developments, with outside salesmen who have technical information and data, with customer applications of the product, and with the purchasing department. Further, the design engineer may spend a good portion of his time in test work, in helping with sales application, and numerous other phases—all of which are **not** at the drafting board.

In this same connection, students may fail to realize that many engineers really enjoy design work, that a good designer often would not trade "his" interesting job for any other job in the plant. The man who is unhappy at design work may be entirely unfitted for it both technically and temperamentally.

Students may fail to recognize one more point, namely that high income does not compensate for lack of interest in a job. In other words, if a man is a misfit in any specific engineering job, probably no amount of income will make him really satisfied or happy at that job.

What conclusion can be drawn from these foregoing comments? Learn all you can about the various fields, try to decide the field or fields in which you are most interested and then try to fit into that field.

A Thought

Anyone who is bending all his **energies** toward reaching a worthwhile goal must aspire, strive earnestly to attain; but, above all, must hold on.

Steadfastness is a sterling quality, **and** a firm, unwavering determination is **of** the utmost importance. Keeping steadily at it is not the easiest thing in the world. Far from it. It is one of the hardest.

We must not become **discouraged, either,** for our reward is not to be obtained without much struggling. When things become difficult or monotonous, the temptation is to drop them. No one ever achieved success that way—so hold on!

—Arthur Hamilton