The Wisconsin engineer. Volume 51, Number 1 October 1946

Madison, Wisconsin: Wisconsin Engineering Journal Association, [s.d.]

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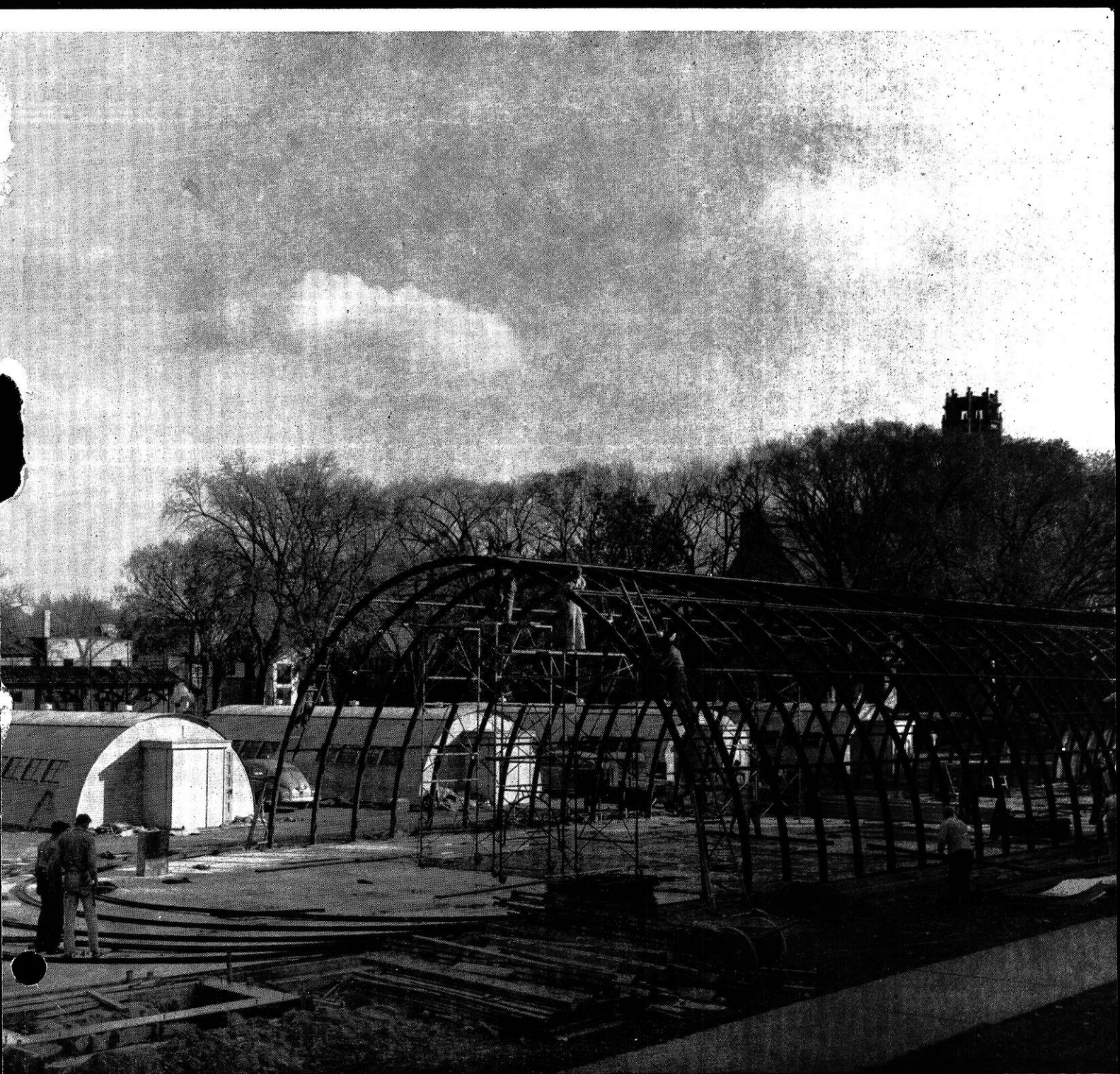
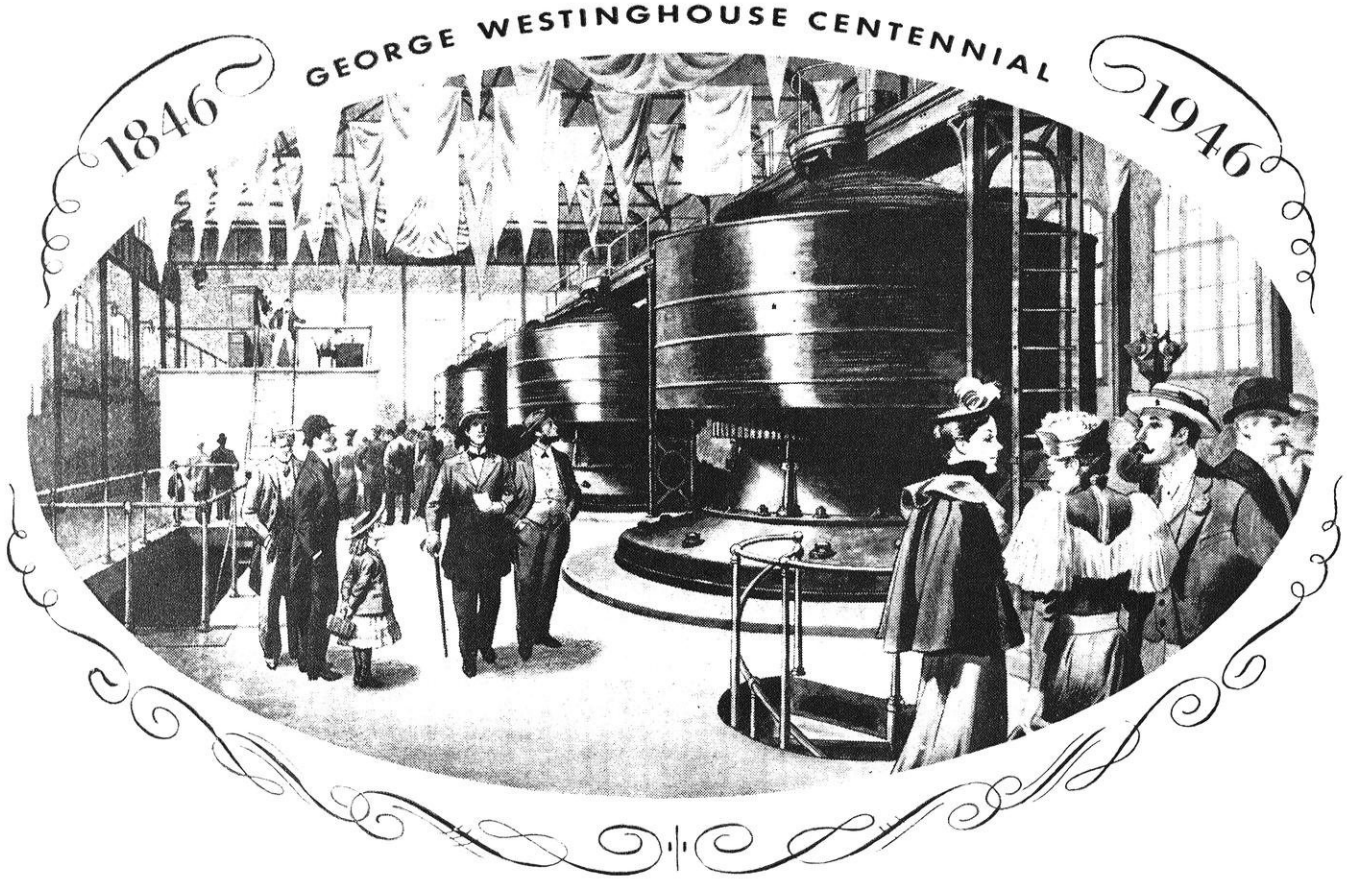
WISCONSIN ENGINEER



MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED



Harnessing the Power of Niagara

For thousands of years, water had roared over Niagara Falls at the rate of about *200,000 cubic feet per second* —representing enough power to supply the annual requirements of *24,000,000 average homes.* This enormous power continued to go to waste until . . .

In the late 1880's, a group of world-famous engineers began to study the problem of harnessing the vast power of Niagara Falls.

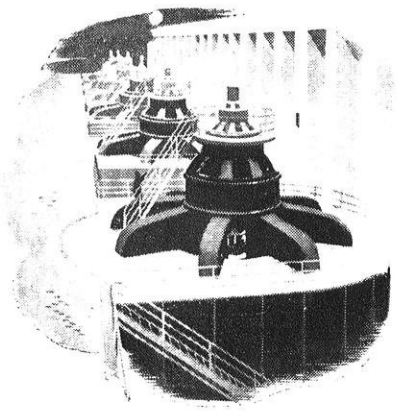
A bitter controversy raged for years as to whether *alternating* or *direct* current should be used. George Westinghouse, the world's greatest authority on alternating current, vigorously supported the *a-c system.*

Then, at the Chicago World's Fair in 1893, Westinghouse demonstrated the unqualified supremacy of the *polyphase system* for the *generation* and *transmission* of alternating current electricity.

In October of that year George Westinghouse won his famous "battle of the currents"—and received the contract for three 5,000-horsepower polyphase generators to be installed at Niagara Falls.

These world's largest a-c generators had to be engineered from the ground up. But within two years, the three mammoth units were placed in operation. And a year later electric power was supplying the needs of Buffalo, N. Y. . . . *20 miles away!*

It was a major victory for mankind as well as for George Westinghouse—for it *set the pace for power development all over the world.*

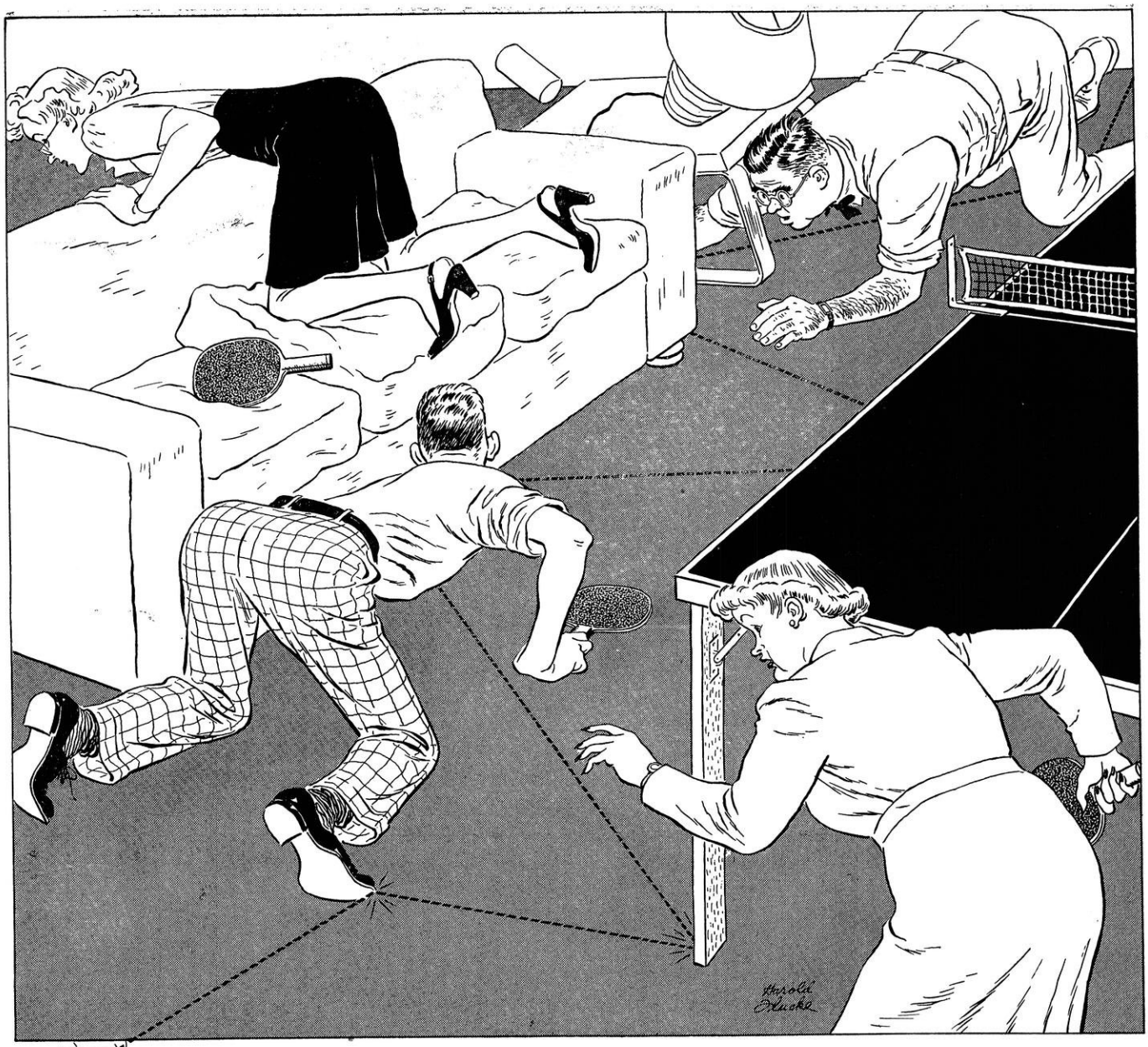


Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

TODAY—The Westinghouse Electric Corporation supplies much of the world's needs for the generation, transmission and utilization of electric power. For instance, throughout the world there are Westinghouse water-wheel generators with a total capacity of more than 12,000,000 kva. In addition, steam and engine-driven generators, with a combined capacity of *many more million kva,* proudly bear the Westinghouse name plate.

Tune in: TED MALONE, Monday, Wednesday, Friday, 11:45 am, EST, American Network.



Nothing Rolls Like a Ball . . .

. . . and the paddle-athletes above are convinced that "a ball rolls freely in *any* direction!"

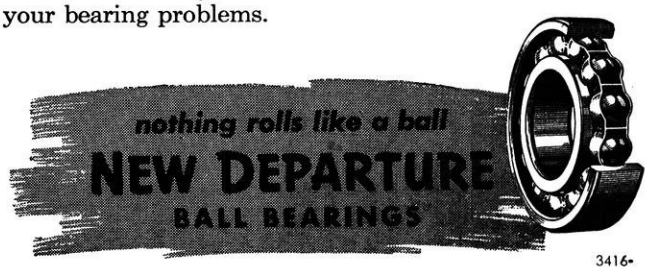
This fundamental—plus the fact that a ball is also Nature's favorite, *strongest* form—makes the ball bearing a "natural" for modern industry and its products.

Rugged New Departure Ball Bearings carry heavier loads on tough steel balls. They lick friction and excel for higher speeds and precise positioning. They are produced by the world's greatest ball bearing maker.

New Departure has a vast fund of practical experience to offer you. More than that, it offers *original thinking* in solving your bearing problems.

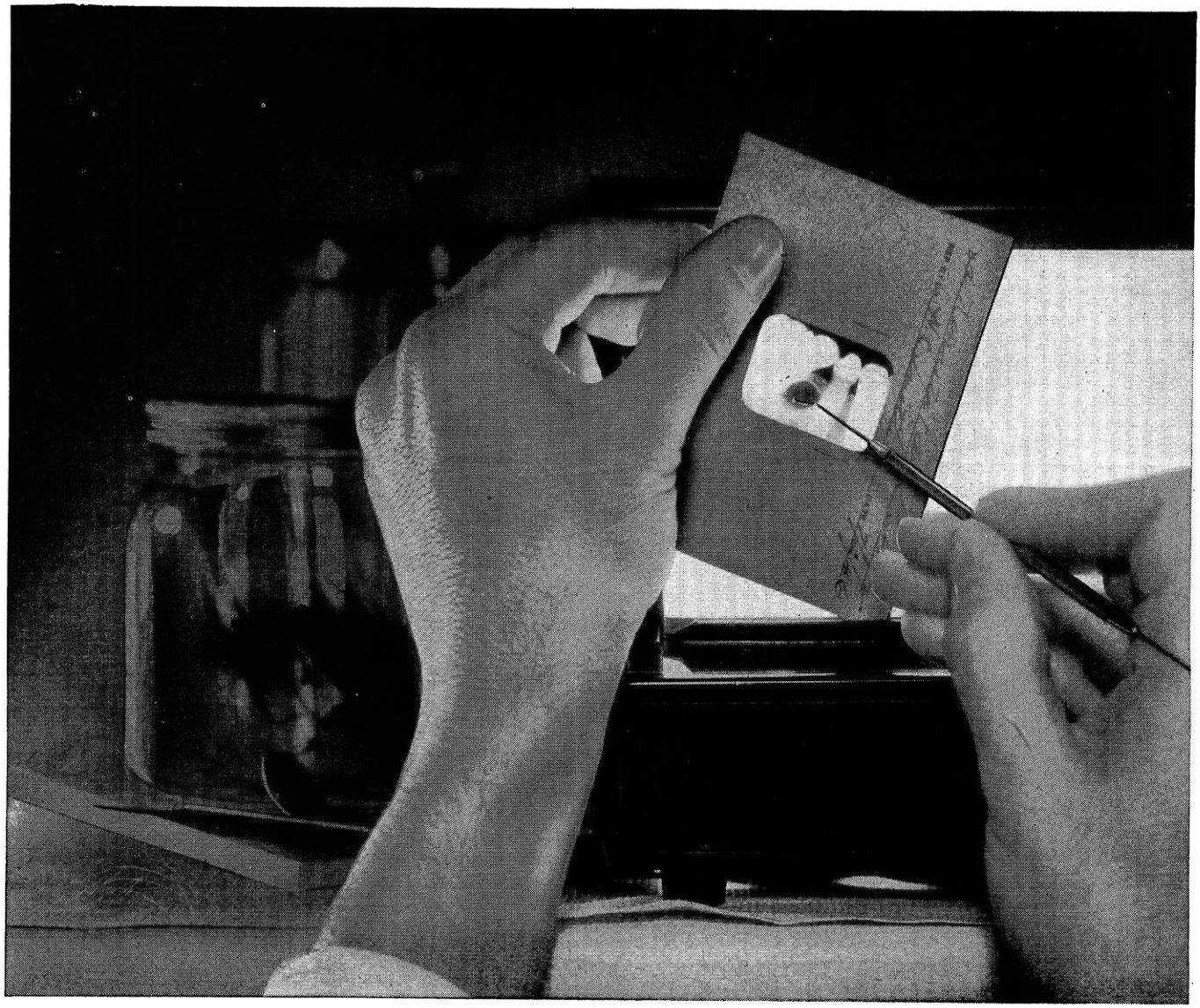
EVER WONDER ABOUT NAMES?

The name "New Departure" aptly describes that organization's brand of thinking. The many new departures by New Departure are stepping stones of engineering progress.



3416-

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN. • Branches in DETROIT, CHICAGO, LOS ANGELES and Other Principal Cities



Another job for a coke oven!

SO THAT bad tooth has to come out. What's it got to do with a coke oven?

Listen to your dentist: "Nothing to worry about . . . we'll shoot a little novocain in there and you won't feel a thing."

Novocain. The wonderful drug that robs a tooth extraction of its terrors and its pain.

That's where the coke oven comes in. For coke ovens are responsible for toluene, which is used in the synthesis of novocain.

Modern Koppers coke ovens collect and preserve the priceless products of coke-making . . . the tar, the light oils, the gases that used to be wasted.

From these products American chemists and manufacturers today are making not only novocain, but hundreds of precious things vital to health, safety, and comfort.

Koppers has designed and built the majority of all the coke ovens in America . . . as well as many of the processing plants which refine the numerous products that result from coke making.

Koppers does other important jobs, too. It treats millions of feet of timber every week with preservatives. It produces chemicals from coal. It makes piston rings, propellers, couplings, protected metal sheets, bituminous coatings, mothproofing preparations. It paves roads and streets with Tarmac. It manufactures roofing materials.

It is the application of these chemical and engineering skills to such a wide variety of fields that has made Koppers "the industry that serves all industry."

The industry that serves all industry

KOPPERS

STRENGTH, light weight and wear-resistance make Synthane laminated highly desirable for retainers in high speed ball bearings... and an excellent example of putting plastics where plastics belong.

Should you, in the future, want to know whether Synthane will fit into your plans... or where... or why... or what the cost will be... ask us to help you, preferably *before* you design.

* * *

This way, if Synthane is the answer to your needs, you can be sure of design and material not only right for the application but right for fabrication. For a whole job or any part of it — design, materials or fabrication — remember Synthane. It will give you a real sense of satisfaction to know whether the job can be done, how it can be done, how long it will take to produce and how much it will cost. Synthane Corporation, Oaks, Pa.

SYNTHANE TECHNICAL PLASTICS ARMY NAVY **DESIGN • MATERIALS • FABRICATION**

SHEETS · RODS · TUBES · FABRICATED PARTS · MOLDED-MACERATED · MOLDED-LAMINATED

SYNTHANE

WISCONSIN ENGINEER

Founded 1896

Volume 51 OCTOBER, 1946 *Number 1*

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

WAYNE S. BEATTIE, *National Chairman*

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Colorado Engineer
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Entered as second class matter September 26, 1910. at the Post Office at Madison, Wisconsin, under the Act of March 3, 1879. Acceptance for mailing at a special rate of postage provided for in Section 1103, Act of Oct. 3, 1917, authorized Oct. 21, 1918.

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Published monthly from October to May inclusive by the Wisconsin Engineering Journal Association, 356 Mechanical Engineering Building, Madison 6.

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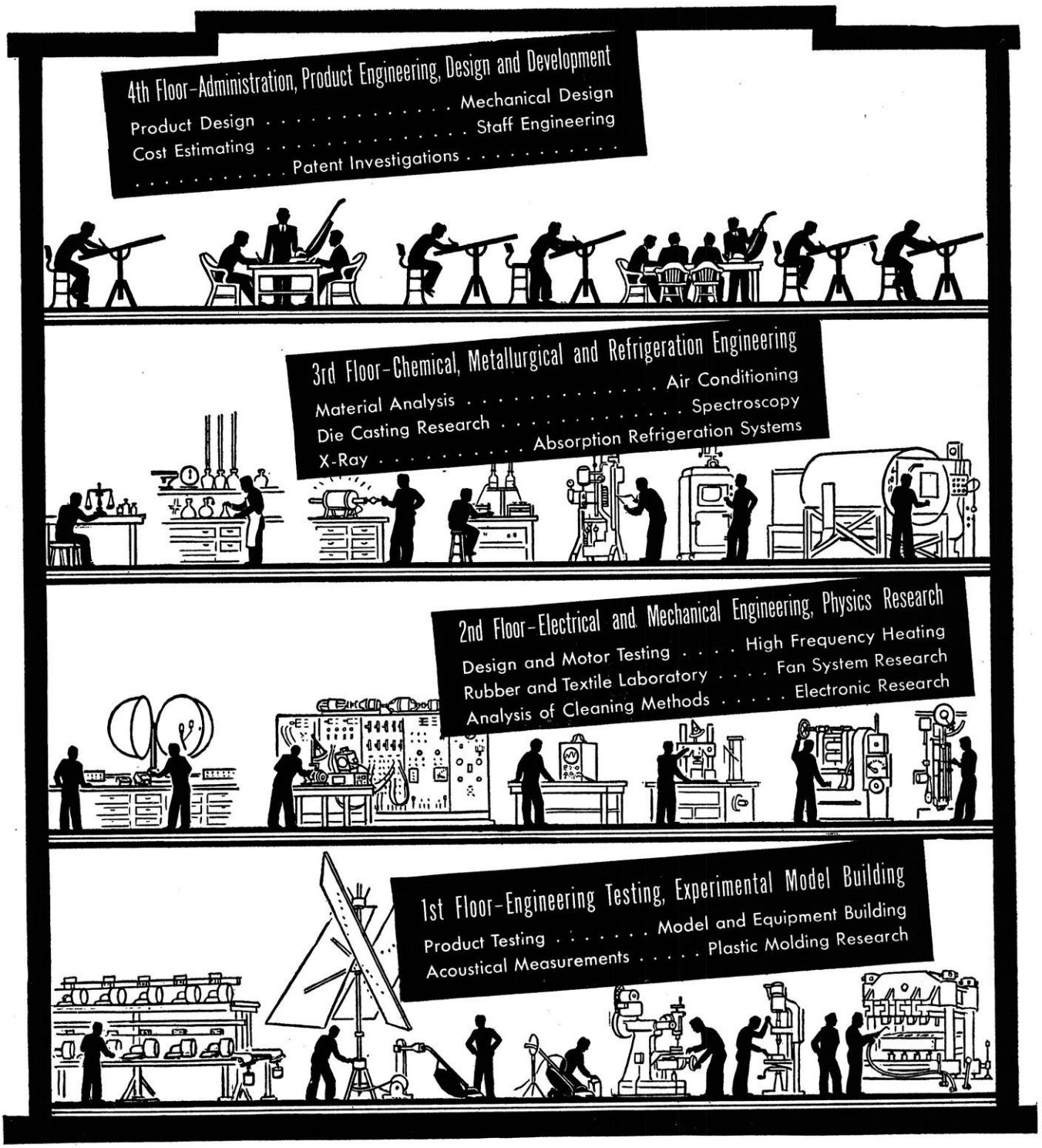
Subscription Price

$1.00 PER YEAR . SINGLE COPY 15c

In This Issue . . .

COVER:

A view of the Quonset huts (Army's name for castle) going up on lower campus. The large building is to house the reserve library from Bascom Hall, while the six smaller ones are to serve as classrooms.



WHAT'S INSIDE HOOVER'S ENGINEERING DEPARTMENT?

There's more engineering to the job of staying in first place with any home appliance than meets the eye . . . so we've cross-sectioned the Hoover Engineering Department's modern 4-story building to show you.

It's "big-time" engineering.

More than 130 skilled people, a third of them graduate engineers, staff this Hoover "idea factory." We call it that because in doing a thorough job of planning and proving the Hoover Cleaner, Hoover engineers come up with developments, new ideas that find wide application in other industries—many of them far removed from the home appliance field.

THE HOOVER COMPANY

NORTH CANTON, OHIO

WELCOME FROSH

by Dean M. O. Withey

MEMBERS of the entering class! In behalf of the faculty it is my privilege to extend to you a most cordial welcome to the College. Through the widespread interest in education, a direct result of our American way of life, you are being permitted to enter one of the largest and best state universities. It is our hope that you will cherish these rights. Let me urge you to honor your State and our Nation, both of which cooperate in providing so many unusual educational opportunities for you. You constitute the largest class ever to enroll in the Engineering College.

Those of you coming here directly from high school and away from home will be thrown largely on your own resources in making many decisions important to your future life. Assume these responsibilities with credit to yourselves and your parents. To veterans and others whose university education has been postponed the foregoing admonition should be unnecessary. All of you will find living conditions congested, educational facilities crowded, and in some instances, inadequate. Remembering your opportunities, try to be patient during registration. Bear in mind we are striving to accommodate as many Wisconsin students as possible. You may be assigned to a class at an undesirable hour because other sections are overloaded or for other good reason. Please don't complain over small matters: be cooperative.

The engineering curricula are exacting. They contain difficult courses of a highly mathematical or scientific character compacted into four years. Although students entering directly from high school are normally scheduled for 17 to 19 credits, other students whose education has been interrupted should take a lighter program for at least one semester, or until they have become readjusted to proper study habits. Athletes should lighten their programs in the semesters during which they compete. You are strongly urged to conserve your energy and time outside of the classroom by setting up and adhering to a schedule of hours for study and for recreation.

In studying, learn to read rapidly and to summarize clearly what you read. Use a dictionary to improve both your spelling and your vocabulary. Above all learn to speak and write clearly and concisely. In solving problems of a mathematical character, first perceive the basic principles, then attack the details involved in the solution. Strive to make good grades in all of your courses. Grades are very valuable criteria of technical ability and, other factors such as character and personality being equal, grades afford a reliable index of chances for future success.

If you review the achievements of the great engineer of days gone by, you become enthused over the length of the list of names and the glory of their accomplishments. If you read Herbert Corey's article in Nation's Business, September, 1943, entitled "The Engineer Can Do It," you will be thrilled by his entertaining account of the difficult problems solved by the Army Engineers during this war. In December, 1944, General Summervell, in speaking before the A.S.C.E. at New York, paid a glowing tribute to the important part played by civilian engineers in completing 10 billion dollars worth of needed construction for the Army since 1940. In the Navy the stellar performances of the Navy's Construction Battalions, the "Seabees," numbering 8,500 officers and some 230,000 men, were outstanding. Their motto "Can Do" was an inspiration to the consummation of many arduous tasks.

Postwar plans call for great activity in constructing buildings, highways, river and harbor developments, airports, municipal improvements, reclamation projects, housing, water supply improvements, renovation and construction of sewage disposal plants, the manufacture of automobiles, railway and farm equipment, power plant equipment, turbine development and an immense demand for a wide variety of household appliances. In the field of materials there will be perfecting of processes for manufacturing synthetic rubber, an increased demand for plastics, insulating and acoustical materials, improvements in glass, and the utilization of prefabricated units of concrete and clay products. In these and other fields there will be a heavy demand for the services of engineers.

Do not be satisfied with technical proficiency alone. Plan carefully your hours of recreation. If you are not already so connected, unite with a religious or fraternal association for mutual aid and improvement. Seek to round out your education and experience by affiliating with those engineering and civic organizations which will furnish incentives to your professional advancement. As soon as practicable become a registered engineer and join a professional society. If you have qualifications and a personality suited to political leadership, don't hide these

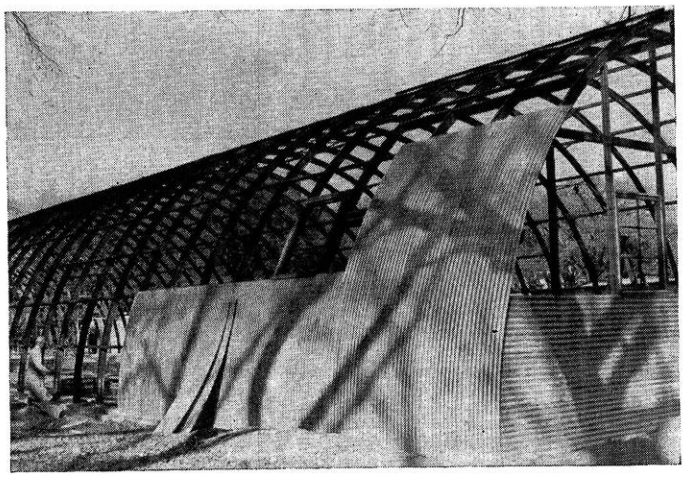
talents. Our commonwealth needs just such leadership. Finally, each of you should strive to find that place in this busy universe where you can fully demonstrate by your aptitude, education and experience our art and science by which the properties of matter and the sources of power in nature are made useful to man; that is the occupation and work of a professional engineer.

Like many later chapters in the book of life, the successful completion of a college course may be largely dependent upon cooperation. Your assimilation of information or technique from a course of instruction will often be largely dependent upon how completely you cooperate with the teacher in charge. When perplexed you are urged to seek enlightenment promptly from your instructors. General charge of the counseling of Freshman Engineers has been assigned to Professor Shiels, an able adviser with long experience. Professor Shiels is effectively assisted by our co-worker, Miss O'Keefe, who for many years has also patiently and sympathetically given advice to members of our classes. I assure you of cordial attention both at their office and at my office should you feel an appointment necessary. In closing let me wish you the very best of success as you advance in your educational program.

This Crowded Campus

by G. J. Heberer m'47

THERE is a shortage of everything except students. Experiencing the great influx of students is the College of Engineering. The Mechanical Engineering building, headquarters for this college, is one in which many tests are undertaken. But right now the structure itself is undergoing a great test, due to the increase of 111.5% in the number of students, over the pre-war fall semester of 1941-42.



Another View of the New Lower Campus Classrooms

The Mechanical Engineering building is bulging at the sides and bursting at the seams. The 3,478 engineering students are sitting in the aisles, perching on ledges, hanging from the rafters and beams, pushing, elbowing and crowding into classrooms of any size (generally too small), to catch the lectures of their professors and instructors.

Overflowing classrooms are prevalent all over the campus, but no school has experienced a greater growth than the Engineering College. It now comprises 19%, nearly one-fifth, of the total registration, an increase of 4.1% over 1941-42.

The College of Letters and Science has shown an increase of 74% in the number registered and an increase of 0.4% in total registration. Other schools on the campus have grown, but none as rapidly as the Engineering College.

A comparable situation was found in the post-war year of 1920-21. The College of Engineering increased 4.1% in the relative size of the University and the number of students enrolled was up 112.5% as compared with registration for 1917-18.

Professor Kommers of the Mechanics Department compared the enrollment for the class of 1902, of which he was a freshman, with the present number enrolled in the College of Engineering alone. He found that today there are 70% more students in this one branch of the University, than there were in the entire University for the year 1902.

The state-wide formation of 34 extension centers offering University courses has contributed greatly in relieving the critical congestion at the University. Outside of this group are 18,646 veterans taking university correspondence courses of a technical nature, and full time registration for this group would increase the engineering body by approximately 1,200 students.

Since registration is expected to reach even higher peaks in '47 and '48, the immediate future holds no offer of let-up in these critical conditions.

Industrial Spectroscopy

by R. J. Meisekothen ch'46

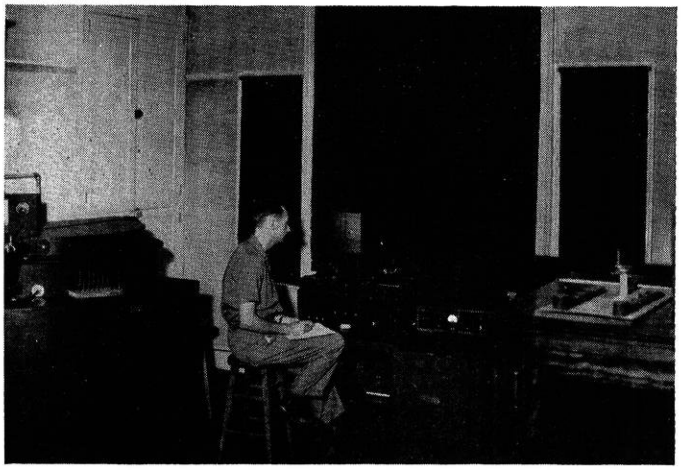
THE spectroscope, long recognized as one of the most powerful tools of scientific investigation, has been used during the past 50 years to obtain information which has revolutionized physics, chemistry, and astronomy, and greatly affected biology, metallurgy, and medicine. Since many modern industries rest on scientific discoveries in these fields, it would be surprising if the spectroscope were not found useful in connection with technological processes. So rapidly, in fact, are spectroscopic methods being adopted by industrial laboratories, that most manufacturers of spectroscopic equipment are having difficulty in keeping up with orders for their instruments. Spectroscopic methods have been found particularly valuable in the metals industries, in those which involve the packaging and canning of foods, and in all other industries which use materials whose purity must be carefully determined and controlled.

Grating Instrument Favored

The concave diffraction grating spectrograph has long been considered one of the more convenient types of spectrographs in research laboratories, and this instrument is now slowly making its way into industrial use. It has the advantage that it can be used with light waves of any length from the long infrared to the shortest ultraviolet, a single instrument covering all the desired ranges without change of optical parts. Again, the grating produces almost uniform dispersion from the shortest to the longest wave lengths, whereas the dispersion of a prism decreases rapidly toward longer wave length, which makes identification of the lines easier and uses the photographic plate more effectively. The new aluminum gratings on glass have produced spectra more intense than those produced by prisms, and with such a grating exposures in which thousands of lines from an iron arc are recorded in 5 seconds are not uncommon. Where good prism and grating instruments are both available, the grating instrument is commonly the favorite.

Use in Qualitative Analysis

The outstanding value of the spectrograph comes in qualitative analysis. Let us watch two scientists looking at a tiny piece of lamp filament. To all outward appearances it is exactly the same as any other piece of filament, but in an incandescent lamp it was found to last twice as long as did filaments made from ordinary wire. There is not enough material to analyze chemically, for the sample is too small and no advance hint tells what to look for. A chemist using ordinary methods would be forced to guess as to which elements were most probably present, and eliminate them one after another. Long before he was finished such a sample would probably be exhausted. But here is a spectrograph; the operator loads it with a photographic plate, opens the shutter, and inserts a tiny piece of the filament into an electric arc placed in front of the instrument. There is a flash of colored light and the spectrum is recorded. Shifting the plate the operator repeats the process, the second time burning a piece of ordinary filament. When he develops the spectrogram the story stands completely revealed. Each type of atom in each filament has sent out its own group of waves of different lengths, and produced its own pattern of spectrum lines. By looking for differences in these patterns, and identifying the elements from which the various lines which differ are known to originate, the spectroscopist can see quickly and accurately which elements are present in one film and not in the other. The pattern of lines on a spectrum photograph may look complicated and meaningless to the layman, but to the experienced spectroscopist it often tells a story as definite as that told by a line of printing.



Wisconsin's New Grating Spectroscope

In the food-preserving industries the spectrograph is coming into very wide application. That 2 or 3 parts of aluminum or lead can be detected readily in 10 million parts of lobster or condensed milk may seem unimportant, since such concentrations are below the toxic limits considered dangerous to health, yet obviously tests on the rapidity with which the internal coatings of cans dissolve in foods stored within them can be made more easily and

quickly when such sensitive methods of detection are available.

Use in Quantitative Analysis

In general, one might say that for major constituents, spectroscopic methods of quantitative analysis are slightly inferior in precision to chemical wet methods. For minor constituents they are equal in precision, and for traces they are superior. With it one can distinguish as readily between 0.0010 and 0.0011 per cent concentration of material as between 10 and 11 per cent, for example. The concentration of a minor constituent is determined by observations of the intensities of its spectrum lines relative to those of the matrix material, using an electronic microdensitometer.

Wartime experience with the spectrograph has provided abundant evidence that this instrument for rapidly determining the composition of metals will occupy a position of growing importance as a metal-working inspection tool in the post-war period.

One large metal plant, faced with an ordnance program that would tax the personnel and facilities of their materials laboratory far beyond its capacity, installed a spectrograph. A grating-type machine was chosen and within a month the laboratory was running routine spectrographic analyses of iron and steel; controlling four gray iron cupolas; checking incoming forgings and bar stock, and making frequent analyses for control of heat-treating processes.

By using a flat surface sparking technique this company can analyze a single sample in 15 minutes for eight elements. Nine such samples can be checked in 30 to 45 minutes. Two operators can analyze 100 to 150 samples per eight hour day. Total cost will average about 15 cents per sample or 3 cents per determination. This is quite an improvement over the tedious methods of wet analysis, isn't it?

Physics Option

by E. Kasum e'48

IN ATTEMPTING to satisfy the increasing demand of prospective employers for graduate engineers with more than a fundamental background in physics an Option in Physics has been made available to all engineers in a joint action of the Engineering and Physics Departments.

The steady increasing demand and interest has been roused to a great extent by recent monumental developments in seemingly new fields that call for a strong theoretical physics foundation. Though a good share of these developments were conceived during the time of war, industry is eager for capable personnel to utilize these advancements for peace time.

To accomplish this end, an increased physics background, there are two possible courses. One, to set up an autonomous Engineering-Physics Department with a separate faculty and curriculum whose graduates would be physicists first, engineers second. This method has proved quite popular at schools where it has been initiated.

Second, is to make use of the Physics Option that has been adopted by the two departments here. This makes use of existing faculty and does not in any way affect the existing curriculums. Graduates who participated in this plan would be engineers first and physicists second.

Time Allowance

As the plan is now in operation it would first effect students in their Junior year (Freshmen and Sophomores having their Chemistry and General Physics to cope with). An interested student can approach either his advisor, the Physics Department, or both and have a tentative course in physics planned as each case will be treated as a special one. Depending upon the student and his respective department, allowance for physics work will be in part from time normally allowed for required work and the rest from elective time. With all departments concerned agreed that a substantial part of the option time, approximately a half, will be granted from waived required courses, there will be variations as each case will be treated individually.

Trial Period

The whole program is to have a five year trial period, with twenty-two (22) credits in physics giving a student with his regular degree an Option in Physics.

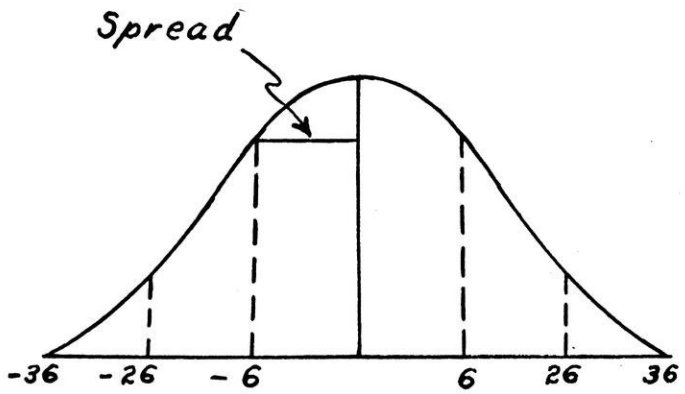
Although at present only standard advanced physics courses are being offered, new courses are being planned to meet the expected demands. The advanced heat and electrical courses now offered are being expanded as already there is a favorable response to this latest of offerings to engineers, which was planned after a rather intensive study by Professor L. R. Ingersoll, Physics Department head, in collaboration with the Engineering Department Faculty Committee on the Physics Option in Engineering.

Quality Control

by Don Povejsil

SINCE the beginning of the war, a new type of worker has entered the factory. He is the statistician who applies the principles of quality control in order to obtain quantity production of high quality and low cost.

Quality control methods, although first propounded in 1926, were never widely accepted until about 1940. This was due to several common misconceptions, some of which are: (1) They were too technical for the practical man. (2) Installation would interfere with the flow of production. (3) They could only be used when inspection was done by sampling. However, upon examination of the principles of quality control, these fallacies are revealed.



Quality Control Curve

The fundamental principle upon which the control chart is based is the fact that no two things can be made exactly alike and no matter how precise the workmanship, the finished product will always show residual variations in quality. Furthermore, if the elementary causes of these variations are large in number, and all are comparable in size of effect, and if each behaves in a random manner, the end results will behave in accordance with a perfectly definite law of chance. The curve which represents the law of chance operative for measureable quality characteristics has the form shown in the figure. This is known as the normal frequency curve and it has two important constants: its center and its spread or standard deviation. The first is an ordinary average and the second is the horizontal distance between the center and the point of inflection. The area under the curve from the center out to a given multiple or α, divided by the total area gives the percentage of objects which fall into that category. The practical working principle of this curve is simply that for a process functioning at its best all deviations will come within a 3α of definite center; if they do not do so it is for a specific specific non-random cause, relatively large in its effect, which can be identified and removed by checking over and correcting the process at the time and place that the chart has indicated.

In practice, working with measurements, a control chart is set up as follows: As the articles come off the assembly line, measurements are taken on consecutive groups. The measurements are averaged and the largest variation between them is found. Then the averages, in order of production, are plotted on a pair of axes with the order numbers of the samples as abscissae and the averages as ordinates. Then, from the position of the points on the chart, it can be determined whether the variation can be called random, indicating control, or whether it is due to assignable causes. If the latter is true, then the causes are removed or corrected until the process is under control.

There are many advantages to a controlled process. First, a controlled process is a process doing the best of which it is capable. Secondly, from a control chart, the inherent variability of a process can be found and with it the knowledge of how it will perform with respect to blueprint tolerances. Third, once control is established, the amount of inspection needed is only enough to keep certain control is being maintained. This eliminates the need for 100% inspection.

One of the most important aspects of the control chart is that it is simple to use, requiring only ordinary arithmetic, and its message is grasped by everyone from machine operator up. However, when using quality control methods, it is essential that there be as little delay as possible between production, inspection, and the placing of the points on the chart. In this way, the causes of defects, if any, can be quickly found and remedied before a great amount of harm is done. Another important feature of quality control is the fact that it pays off. It saves money by reducing the number of defective parts and it saves man-hours by eliminating the need for the great number of inspectors necessary to accomplish 100% inspection.

The great success of quality control in the past few years has awakened the interest of manufacturers to the possibility of applying other statistical theory to improve production methods. Although it is obvious that such methods are far from being a panacea for all production ills, they are important steps forward in bringing about greater economy and quality of production.

Symbol of Service

and OPPORTUNITY

This is the organization that continues to give America the finest telephone service in the world:

A group of Associated Companies provides telephone service in their respective territories.

The Long Lines Department of A. T. & T. handles Long Distance and Overseas service.

The Bell Telephone Laboratories and Western Electric Company are responsible for scientific research and the manufacture of equipment.

The American Telephone and Telegraph Company, through advice and assistance, coordinates the activities of the entire organization.

This is the Bell Telephone System.

Here the man of engineering skill—electrical, mechanical, civil, industrial and chemical—has wide opportunity to help meet the challenging changes of our time. For telephone engineering calls for a broad engineering viewpoint as well as specialization.

Basic technical knowledge, an appreciation of economic factors and the ability to cooperate are some of the things that count in Bell System engineering. As the System expands, opportunities for interesting life-work become constantly more varied.

There's Opportunity and Adventure in Telephony

Campus Notes

by J. Tanghe e'47

Spy in our midst

Is it possible!—the lawyers have smuggled an agent into our midst. She is Katherine Carew, who recently joined the secretarial staff in Dean Withey's office. Her husband is a Law student.

•

October A.I.E.E. meeting

Government vs. private ownership of public utilities was discussed by Prof. M. G. Glaeser, university economics professor, and Mr. G. P. Steinmetz, chief engineer of the Wisconsin Public Service Commission, at the Oct. 9th meeting of the student branch of A.I.E.E. At the meeting, held in the Education-Engineering Building, the films "Power of a Free People" and "Tennessee Valley Authority" were shown. Prof. Glaeser pointed out that the pictures represented biased viewpoints.

•

New Engineering Building

Did you know that: Two million dollars have been appropriated for the construction of a new engineering building . . . that the building will be located on Randall Ave. near the intersection formed by Johnson St. extended . . . that there is no other single item in the proposed university building program that will bring about as much relief from the entire university's crowded classroom condition . . . that construction will likely begin as soon as the architectural study and planning has been completed.

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Triangle Fraternity

The Wisconsin Chapter of Triangle, national all-engineering fraternity, elected its permanent officers for the 1946-47 term at its fourth meeting of the semester, held on October 15 at the chapter house. Those elected were Ray Holten, president; Dick Wilson, vice-president; Robert Burgy, recording secretary; Stuart Morrison, corresponding secretary; and Richard Novotny, treasurer.

Others elected included Robert Miller and Lee Moehrig, social chairman; Harry Lauritsen, athletic chairman; Lynn Bump, I.F. representative; Eric Ahonen, rushing chairman; and Pat Lee, assistant treasurer.

Plans and policies for the coming school year were also outlined at the meeting. (Incidentally, we have it on good faith that those future plans include "something special" that might interest the lawyers, in fact might even stir Oscar the steamman out of hiding. What's up huh?)

•

Low Grades? Watch Out!

In his address to the College of Engineering Faculty on Sept. 30 Dean M. O. Withey emphasized that in the future borderline students will be quickly dropped, that crowded conditions no longer make it possible to give students trial "second chances." The Dean suggested to the faculty members " . . . that the grade 'condition' be used sparingly and the grades 'poor' or 'fail' be substituted."

Don't say we didn't warn you!

•

Alpha Chi Sigma

Alpha Chi Sigma, professional fraternity of chemical engineers and chemistry majors, has planned an active program for the current semester. On October 21 Prof. Norris F. Hall of the university chemistry department addressed a professional meeting of the fraternity. Prof. Hall studied under Mme. Curie at one time.

On the 9th of November a homecoming party will be held at the chapter house. Richard Livesey, social chairman, is in charge of the arrangements. On November 11th a lecture and discussion concerning anti-fouling preparations for ships is scheduled.

•

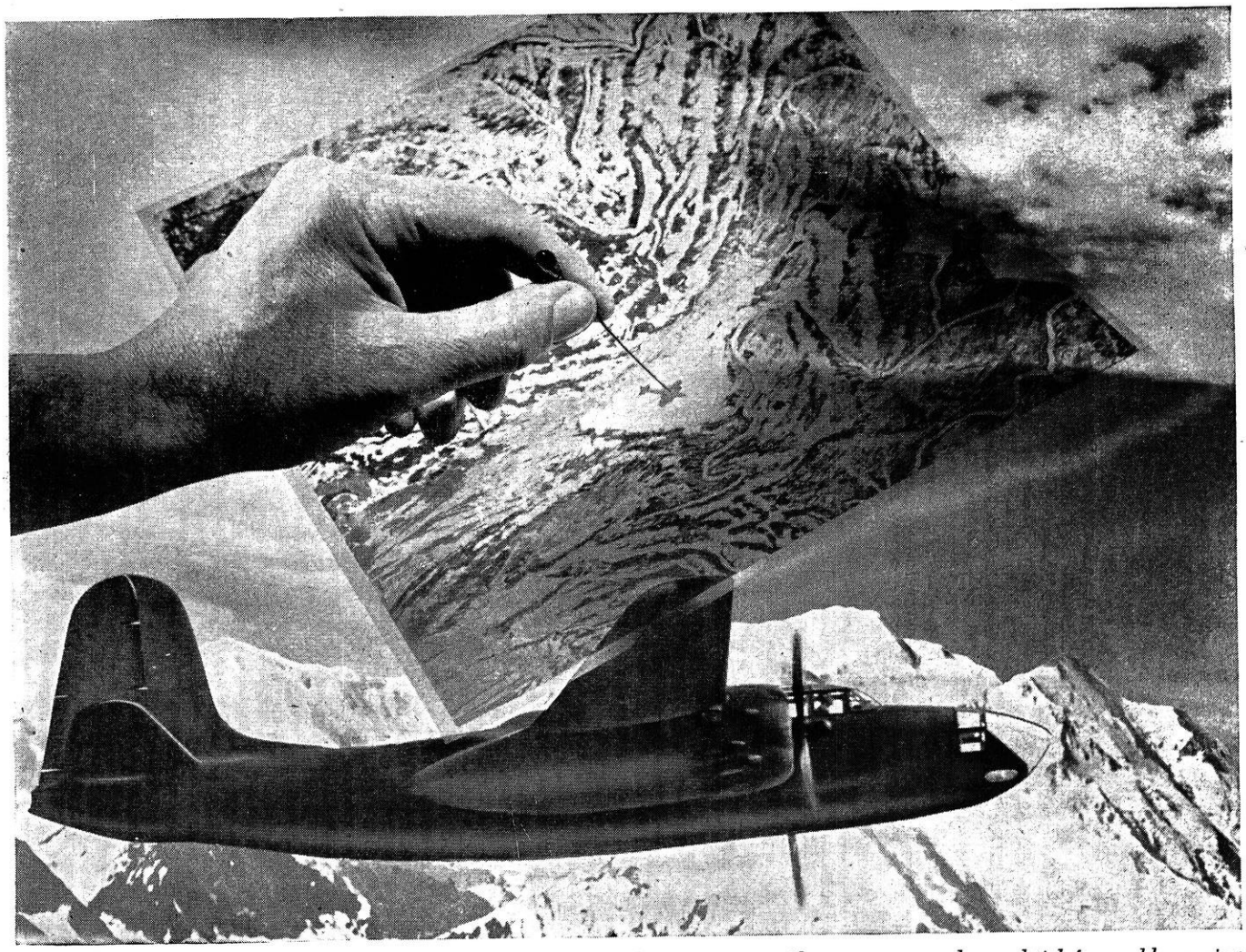
A.S.C.E.

The first meeting of the 1946-47 term of the Wisconsin Chapter of A.S.C.E. was opened at 7:30 p.m. on Thursday evening, October 4, by past Vice-President Harlan Skatrud. In the election of officers held during the first half of the meeting Ed Rein was elected president, Dick Breuer vice-president, Ed Slater secretary, and Bill Generke treasurer. Ed Rein and Bill Generke were also elected as delegates to the Mid-West A.S.C.E. convention to be held in Kansas City on October 17. During the second half of the meeting movies were shown of the Ohio State-Wisconsin game of 1945. Following the movies beer and pretzels were served. **—Richard Breuer**

•

Kappa Eta Kappa

The third meeting of Kappa Eta Kappa, semi-professional electrical engineering fraternity, was held on Monday evening, October 14. Plans for future activities, including parties, procurement of a new chapter house, and rushing, were laid. Officers for the present semester are to be chosen at the next meeting.



Developed by RCA as an aid to blind bombing in wartime, Shoran is a new radar yardstick for world mapping

SHORAN—a surveying system with pin-point accuracy!

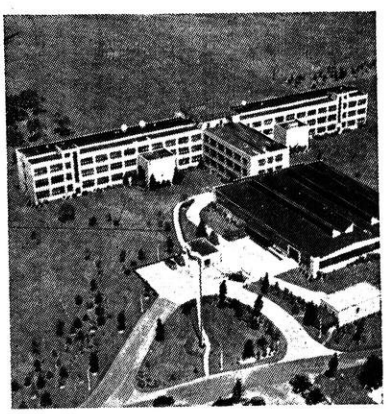
One small error in a map can be costly in the location of an oil well or mining property. But with Shoran, vast areas can now be charted by plane with an error of less than twelve inches in five miles—and in a matter of minutes or hours as opposed to weeks or months that would be required by laborious surveys made on the ground. Shoran is called one of the most important geographic inventions since the compass.

Shoran can also direct a plane flying in a blackout or heavy overcast with such accuracy that during the war it was possible to drop bombs only a few hundred feet ahead of completely invisible advancing troops below with unerring precision.

Just as Shoran is a revolutionary stride forward in map-making, so do all RCA products represent the farthest point of progress in their fields.

And when you buy anything made by RCA or RCA Victor, you are sure of getting one of the finest instruments of its kind science has achieved.

Radio Corporation of America, RCA Building, Radio City, New York 20. Listen to The RCA Victor Show, Sundays, 2:00 P. M., Eastern Standard Time, over NBC Network.



Until recently a closely guarded military secret, Shoran was developed at RCA Laboratories—a world center of radio and electronic research. Here, in this vast community of scientists, the same imagination and skills that developed Shoran keep RCA and RCA Victor the outstanding names in radio, television and recorded entertainment.

RCA **RADIO CORPORATION of AMERICA**

Underfed Stoker Combustion

by W. E. Hestikin m'47

THE underfeed stoker delivers fresh coal to the bottom of the firebox rather than throwing it on top as does the conventional overfeed stoker.

Coal is fed to a hopper and transported to the combustion zone by means of a mechanically driven ram or worm. The fuel is preheated as soon as it reaches the bottom of the retort, the temperature increasing as it moves up nearer the flame front. When a sufficiently high temperature has been reached the volatile matter in the coal is driven off. This region of carbonization is termed the distillation zone.

Air is forced into the fuel bed through the tuyers, being heated as is the fuel, before reaching the combustion zone. This hot air passing through the fuel is intimately mixed with the volatile gases before the ignition temperature is reached. Combustion of the volatile matter takes place in a zone generally below the combustion zone of the solid fuel and because of air available and the high temperatures the reaction is very complete.

The semi-coke left after the distillation of the gases is burned near the top of the firebox. Since the air is rising up from below and is already heated by the combustion of the volatile matter, this combustion is also very complete and requires a relatively small amount of excess air.

The great advantage of this method of combustion lies in the complete combustion of the gaseous fuels. One of the most serious losses generally encountered is the large amount of unburned volatile fuel passing out the chimney. When overfeed firing is employed the distillation zone is on top the firebox where the gases have a better chance to escape without coming into contact with the necessary air and heat to cause combustion.

The carbon or soot particles in smoke from solid fuels is not due to the incomplete combustion of the fixed carbon content of the fuel. They result rather from the incomplete combustion of the volatile and heavy hydrocarbon constituents, and it is the wholly or partially incomplete combustion of these constituents that causes smoke from all fuels solid, liquid or gaseous. Since the underfeed stoker can completely burn the volatile matter without the use of large amounts of excess air it can reduce the smoke nuisance without sacrificing economy. Prevention of this soot also increases efficiency by keeping the heat transfer surfaces clean. The coal used in underfeed stokers should not be a strongly coking coal as this fuel may form a coke tree or spire causing considerable difficulty in air circulation. Some stokers are provided with agitators to prevent this action.

As was noted above, the amount of excess air necessary is low because of the intimacy of the fuel-air mixture. The amount of air should not be reduced, however, to a point where the exit gases contain CO, or to a point where the furnace temperatures are greater than the furnace walls can withstand.

Underfeed stokers are built in all sizes from small, single retort domestic models to the large multiple retort stokers used in steam generating plants and they offer the same advantages to all types of installation. This is certainly a more scientific method of burning raw coal in a furnace than that usually employed.

SCIENCE SHORTS

SILVER RADAR ANTENNAE FOR SUBS—Tons of coin silver, drawn out into miles of slender strands and "weather-proofed," served as radio and radar antennae on Uncle Sam's submarines during the war.

•

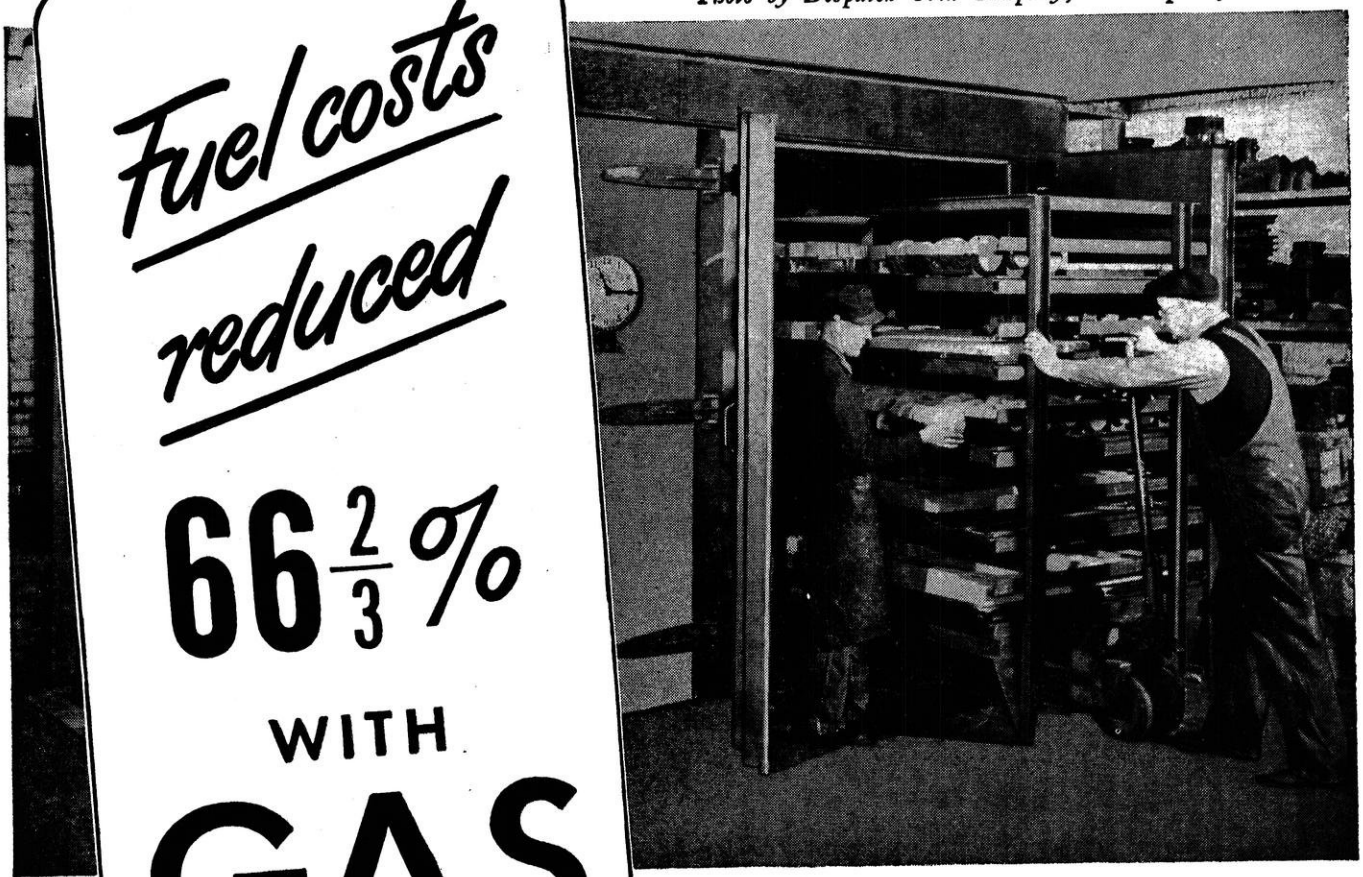
NEW LIGHTS AND NIGHT LANDINGS — New "contact" lights strung out along both sides of airport runways are now guiding pilots to safe landings at night. Developed recently, the lights have only three inches of heavy lens protruding above the ground and are unharmed even when a 100-ton airplane rolls over them.

UNIQUE TEST FOR SAFE MOTORS—Sparks are deliberately created inside electric motors sealed in tanks of 100-octane gasoline fumes in one of the tests that led to the development of motors that can be used safely in explosive atmospheres.

•

LIGHTNING STROKES "TRAPPED" FOR RESEARCH—Smokestacks. tall buildings, radio towers and forest fire observation points are among the lightning "depots" where Westinghouse experts tally, photograph, and measure thunderbolts. Such research provides an accurate basis for designing power systems so that storms will not interrupt electric service.

Photo by Despatch Oven Company, Minneapolis, Minnesota



Fuel costs reduced

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Mr. C. D. Pruden, Vice-President and Manager, points out several additional advantages of GAS-fired ovens:

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—***increased production through rapid baking***

—***cleanliness of core-rooms***

—***safety of operation***

—***simplicity of controls***

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Conversion to core-ovens fired by natural gas has proved to be a profitable investment for the South Park Foundry and Manufacturing Company, South St. Paul, Minnesota. GAS-firing reduced fuel costs by two-thirds.

Conversion to Gas is a consistent trend in industrial and process applications because of these important, inherent features of GAS:

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- **ECONOMY**
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SOUND SEARCHES FOR FLAWS

ONE of the great aids in mass production is the development of non-destructive methods of testing materials and products. What good is a large volume of production if a large percentage of the finished products are imperfect? There are quite a few non-destructive methods of testing which have been developed in the last few years. Among these are radiographic, spectrographic, magnetic, and supersonic methods of analyses.

Supersonic flaw detection operates on the principle of sending high frequency (inaudible sound waves of 0.5 to 12 megacycles) sound waves into the material and observing the reflection of these waves. It is necessary that the frequency of the sound waves is high, because, in order to get an appreciable indication of a flaw, the wave length of the sound wave must be less than the smallest laterial division of the material being inspected. Unlike radio waves, supersonic sound waves are dissipated very rapidly in air and travel best in materials such as metals, liquids, plastics, and wood. The velocity of these longitudinal sound waves depends on two properties of the material: the density and the elastic properties. Thus it can be seen that a change in speed will take place when a sound wave strikes a flaw, such as a crack, separation, or an air space. The time for a supersonic sound wave to reflect from a certain material can be measured and used as an indication of the internal qualities of the piece tested.

The machine which uses sound waves to detect flaws is called a "supersonic reflectoscope." In this apparatus, a quartz crystal makes contact with the material to be tested through a thin film of oil. When an oscillatory voltage is applied to the crystal, the latter grows thicker and thinner in synchronism with the electrical oscillations. The crystal puts a pressure on the material causing sound waves to be transmitted through it. The crystal is made to vibrate only a very short time—such as one-millionth of a second—then the pulse goes through the piece and reflects from the other side and also from any flaw. The reflected wave is picked up by the same crystal that initiated the first wave, and a voltage is generated in the crystal. This voltage is amplified and indicated on a cathode-ray oscilloscope in such a way that the over-all time can be measured. These short oscillations are sent out at intervals of sixty times per second. Now if a defect is in the piece being tested, this flaw will reflect part of the sound wave back to the crystal before the total reflection from the other face of the piece is received. The occurrence of various points along the scanning line on the oscilloscope indicate respectively: the initial pulse, any irregularities in the material, and the back face reflection. The distance of any flaw from the surface can be accurately detected from the time of reflection to within one-sixteenth of an inch.

The supersonic method of flaw detection has several advantages over other types of non-destructive testing. For example, there are no dangerous rays to work with, no films to develop, and an operator can be trained in a very short time. It is evident that this method of flaw detection is replacing many of the older types of material inspection and is destined to take its place among the great aids to fast and safe production.

News of Recent Engineering Graduates

John S. Scott, Jr. '46 and Garfield E. Peterson '43 have joined the Westinghouse Electric Corporation as members of the Graduate Student Course. Scott was recently discharged from the United States Navy after three years of service. Peterson is now on inactive duty with the Army, and was awarded the European theatre ribbon with four battle stars and the Purple Heart.

Peterson received his degree in mechanical engineering from the University of Wisconsin in 1943, Scott his in 1946. The latter is a member of Theta Chi.

Two of many young men selected from colleges and universities throughout the country, Mr. Scott and Mr. Peterson are receiving engineering, manufacturing and classroom instructions designed to fit them for active participation in the Corporation's postwar production program and for future leadership in the electrical industry.

Facts about a company which may figure in your future

● AFTER concluding your studies, you may wish to join an industrial company such as ours; or you may make a connection where you will use fuels, oils, greases, cutting fluids, liquefied gases, or the many chemicals that come from petroleum. In either case, it should be to our mutual benefit for you to know who we are, where we do business, and something of our operations.

Our corporate name is Standard Oil Company (Indiana), and the "Indiana" signifies our origin. We were born and raised in these north central states. From them we have spread out either directly or through subsidiary companies until now we market in 40 of the 48 states. We market in 15 of these states under the Standard Oil name. We are not connected by affiliation, by management, or by directorships, with any other Standard Oil company.

Competition benefits oil industry—and public

We are one of the country's four largest petroleum companies and do about 8 per cent of the domestic business. The industry is keenly competitive, which keeps us on our toes to hold the pace in technological progress, and to provide up-to-date service facilities. Our current building program calls for the expenditure of about $150,000,000 just as fast as the materials can be made available. Some of this investment will go to enlarge our engineering and research facilities.

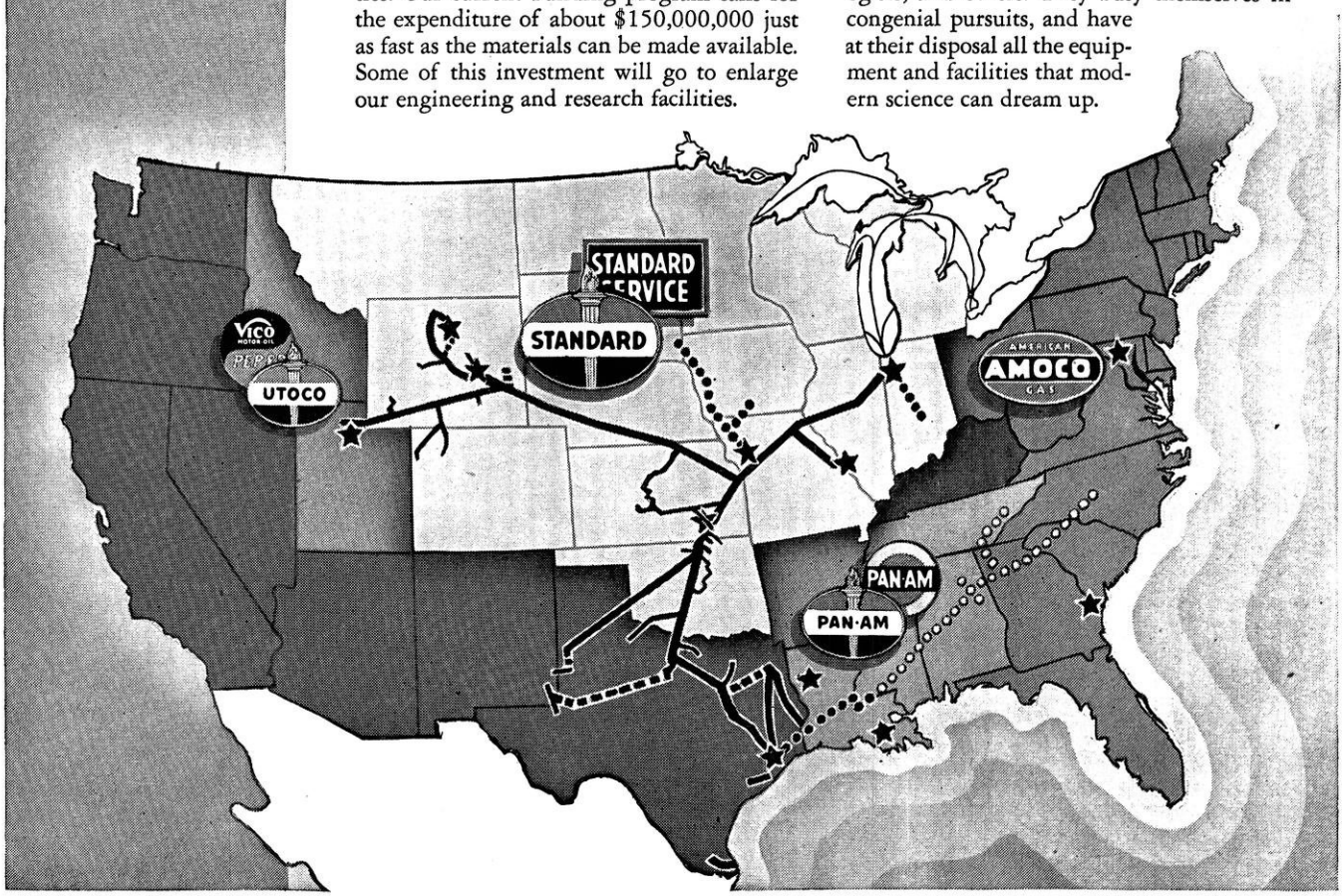
Pipe lines carry crude oil from several hundred fields in which we operate more than 6800 owned wells, and purchase oil from more than 1000 others. Nearly 12,000 miles of pipe lines which we own, and many miles owned by others, transport our crude supplies and petroleum products. Water-borne traffic totals more than 11,300,000,000 barrel miles annually, requires us to own eleven tankers and some 40 tugs and barges.

Wide territory coverage

About 26,000 retail outlets receive their stock in trade from 12 refineries, located in Illinois, Missouri, Kansas, Wyoming, Utah, Texas, Louisiana, Georgia and Maryland. Bulk plants number in excess of 4400, and there are 46 ships, barge and pipe line terminals.

All of the refineries have laboratories. Under construction near our Whiting, Indiana, refinery, close to Chicago, is the greatest of them all—a huge research plant which will employ about 1200 scientists, technicians, and helpers.

From the foregoing you can readily see why, among our 36,000 employees, there are technologists in numerous categories—chemists, physicists, engineers, geologists, entomologists, and others. They busy themselves in congenial pursuits, and have at their disposal all the equipment and facilities that modern science can dream up.



Alumni Notes

ROBERT B. JACOBS, ME'44, was discharged in July of this year from active duty with the navy. He attended a two year diesel engine course in the navy, after which he spent 18 months on active duty, first as engineering officer and later as Executive officer aboard an LCI.

LEE D. EVANS, ME'44, has recently accepted an engineering position with the International Harvester Co. at Melrose Park, Ill.

CLYDE L. KAISER, ME'42, has been working at the Electromotive Corp. at La Grange, Ill., as a diesel engine tester. Previously Clyde had spent three years in the Army Air Forces as a ground engineering officer.

JAMES S. ENTRINGER, ME'44, spent three years in the Navy as repair officer and then as Commanding Officer of a repair ship. He is at present engaged in graduate studies here at Wisconsin.

JOHN P. LOEF, ME'44, is another who is engaged in graduate work. He served two years with the Navy of which five months were spent in the Navy diesel school and then as submarine repair officer.

Among those who returned to the campus this last summer were the following: **SCOTT B. MILLER,** ME'39, **PAUL F. KARNSTEDT,** ME'45, **HENRY W. REHR,** ME'44, and **HARLO W. SCOTT,** ME'42.

OTTO H. NEILI, ME'26, is now president of the Neili - Blumberg Co., manufacturers of road sweepers, belt elevators, and other heavy machinery.

FRANK M. HOLMES, ME'46, has joined the engineering staff of the Metalfab Co. at Beaver Dam, Wisconsin.

HERB BLOCHI, ME'46, our old friend in the dim reaches of the "Engineer," has been working with the Giddings and Lewis Machine Tool Co. in Fond du Lac. He has two years ahead of him in on the job training.

EUGENE A. ODEGAARD, ME'42, has recently joined the engineering staff of Pratt and Whitney Aircraft Corp., Hartford, Conn.

JAMES G. ROBERS, ME'42, has recently joined the Westinghouse Electric Corp. as a member of the graduate student course. Previous to this he served three years with the Army in Egypt. While here at Wisconsin he became affiliated with Phi Kappa Sigma.

MERRITT GILES, EE'22, dropped in on the staff of the Engineering school recently. He is the Supervising Engineer of the Ohio Public Service Co. of Elyria, Ohio.

HOSPITAL - Side Elevation, Cut-away View

OXYGEN TO BREATHE is the most important thing in the world to one who is ill and unable to get enough for life from the air alone.

The use of oxygen in medical practice has grown rapidly in recent years. Physicians have found it effective in the treatment of certain types of heart disease, shock due to wounds or injuries, following major operations, and for numerous other illnesses.

The need for extra oxygen is so frequent in hospitals that many of them, instead of depending on cylinders of oxygen brought to the bedside, now have convenient oxygen outlets in many rooms and wards. Oxygen is brought directly to the bedside through an unseen "pipeline" from a centrally located "bank" of oxygen cylinders.

Oxygen is a principal product of Units of UNION CARBIDE. It is supplied to hospitals—and in much greater amounts to industry for numerous mass-production operations—largely through The Linde Air Products Company.

Linde Oxygen is now so readily available that no one need ever be without oxygen for any purpose. Oxygen is but one of the many basic and essential products from UCC—materials which, all together, require continuing research and engineering work with over a third of the earth's known elements.

FREE: *Physicians, nurses, teachers, and others who would like more information on the availability of oxygen, and on the various types of oxygen therapy equipment, are invited to write for a copy of the* "OXYGEN THERAPY HANDBOOK." *Ask for Booklet P-10,*

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INDUSTRIAL GASES AND CARBIDE

STATIC

by Jim Woodburn m'48
and Jack Hinkley m'47

There is nothing so strange about saying a modern girl is a live wire. She carries practically no insulation.

•

1st Lawyer: "As soon as I realized it was a crooked business I got out of it."
2nd Lawyer: "How much?"

•

"I guess I've lost another pupil," said the professor as his glass eye rolled down the sink.

•

And then there's the fellow who walked into the bar optimistically and left misty optically.

•

A girl doesn't have to watch the speedometer to know what her boy friend is driving at.

•

In the parlor there were three:
She, the table lamp and he,
But three's a crowd, there is no doubt,
And so the little lamp went out.

•

And then there was the little moron who took the cap off his knee to see if there was any beer in the joint.

•

Prof: "Are you teaching this class?"
Student: "No sir."
Prof: "Well, then sit down and stop acting like an idiot."

•

The little moron's watch had stopped ticking and he tried to find the trouble. Finally he took the back off it, went into the works, and found a dead bug. "No wonder it doesn't work," he said, "the engineer's dead."

•

They were driving along a country road.
He: "You look lovelier to me every minute. Do you know what that's a sign of?"
She: "Sure. You're about to run out of gas."

•

And then there was the EE that called his girl "Carbon" because her resistance went down as she warmed up.

"Izzy, vere iss my glasses?"
"On yer nose, Fadder."
"Vy must you alvays be so indefinite, Izzy?"

•

Professor: "Didn't you have a brother in this course last year?"
Student: "No, sir; it was I. I'm taking it over again."
Professor: "Extraordinary resemblance, though—extraordinary."

•

The naked hills lie wanton to the breeze,
The fields are nude, the groves unfrocked,
Bare are the limbs of all the shameless trees;
No wonder the corn is shocked.

•

"Too bad about the disappearance of Professor Smith. He was a profound thinker."
"Yes, he was always thinking, no matter where he was. The last time I saw him he was in swimming and he suddenly called out: 'I'm thinking! I'm thinking!' "
"You fool! Professor Smith spoke with a lisp."

•

Mother: "What are the young man's intentions?"
Co-ed: "Well, he's keeping me pretty much in the dark."

•

A wedding ring is like a tourniquet, is stops your circulation.

•

Professor (to class): "There's a young man in this class making a jackass of himself. When he is finished, I'll start."

•

There was a young fellow from Wheeling
Endowed with such a delicate feeling,
When he read on the door, "Don't spit on the floor,"
He jumped up and spit on the ceiling.

•

Golddigger: "So your old millionaire's check bounced back, huh?"
Chorus Girl: "Yeah; and it was marked 'insufficient fun'."

(continued on page 24)

Engineering News

U. N. TELEVISION SERVICE

Preparations have been completed to provide television service for the convenience of newspapermen covering the United Nations General Assembly which convenes at Flushing Meadows, it has been announced jointly by officials of Radio Corporation of America and the National Broadcasting Company.

The RCA Victor Division will supply pickup equipment, including the new supersensitive RCA Image Orthicon camera, for transmissions directly from the floor of the Assembly to quarters in the building reserved for the press and overflow audience. RCA television receivers are installed there to accommodate viewers. NBC television cameramen will operate the pickup equipment.

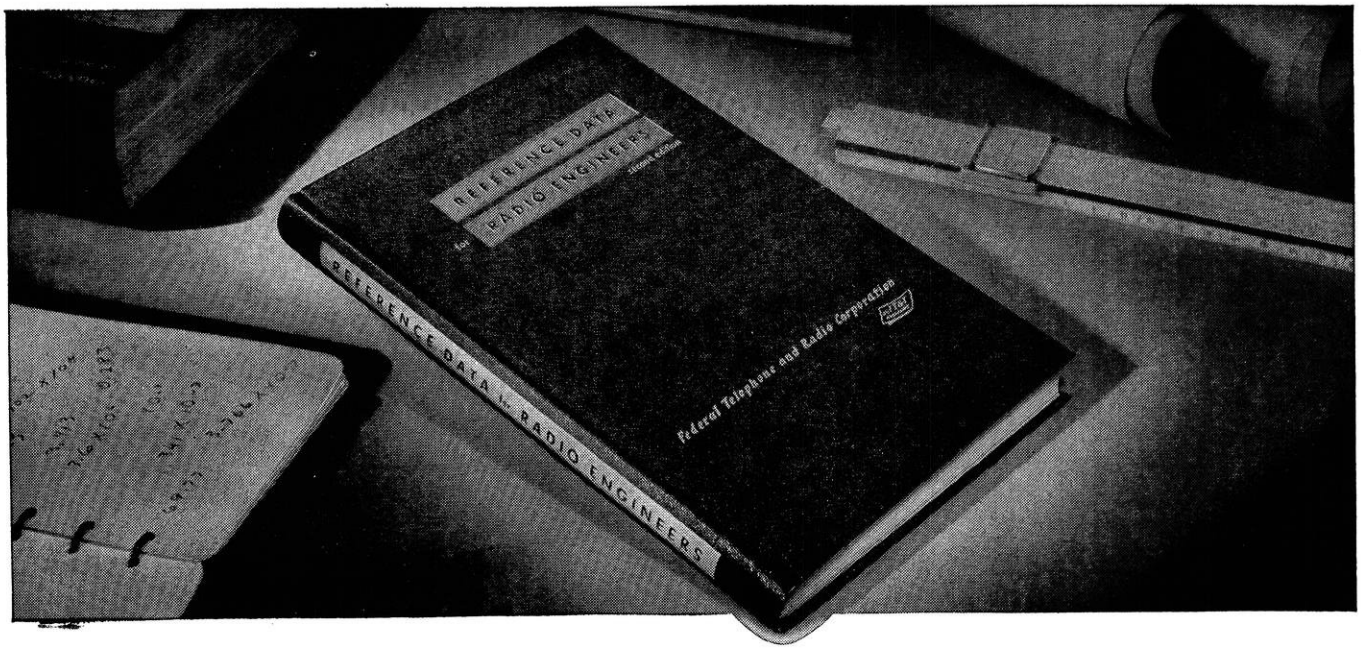
Newsmen made profitable use of a similar television service at the opening sessions of the U.N. Security Council at Hunter College last spring. At that time, more than one-half of the 700 or more reporters covering the meetings turned to RCA television as their most intimate contact with the proceedings. Many expressed preference for this method of coverage as compared to sitting in the council chambers.

CARBOLOY SLEEVE

A little metal sleeve—too small to fit over your little finger—probably has saved many lives during anti-aircraft gunnery training by the Navy. It certainly saved quite a lot of equipment. For such practice, the aerial "target" has to be launched from and towed with a long steel cable by airplane. As this target is launched, the cable has to run out quickly through some kind of a guide sleeve in the tail of the towing plane.

The trouble used to be that the sleeves wore so rapidly that with only one or two launchings the cable had a tendency to foul up and get frayed or even break. Then the cable would have to be cut, if possible, to free the plane from the dragging cable and target before landing.

Somebody hit on the idea of making the little sleeve out of the same material which the Navy was using in tools to machine its guns and shells. This material (Carboloy cemented carbide)—hardest metal made by man—did the trick. According to the Naval Air Station at Norfolk, Va., sleeves of this metal through which had passed some 3,000,000 feet of stainless steel cable, in months of target practice, still showed no signs of wear.



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"REFERENCE DATA *for* RADIO ENGINEERS"

Compiled especially for Radio Engineers, Students of Engineering, Educators, Electronic Technicians, Radio Amateurs, Inventors.

The second edition of this widely accepted pocket-size handbook . . . revised and enlarged . . . now includes important radio technical data developed during the war.

Compiled jointly by the physicists and electronic specialists of the Federal Telecommunication Laboratories and the International Telephone and Telegraph Corporation, the material in this new book has behind it the technical authority of an organization with international leadership in radio, communications and television.

Enlarged from 200 to 336 pages with over 400 charts and diagrams, it makes available quickly the answers to problems that normally arise in practical radio work. This ready reference feature is one reason why *Reference Data for Radio Engineers,* in its earlier edition, received such an enthusiastic welcome by electronic specialists. Orders totaled more than 50,000 copies. With the wealth of new material now included, the second edition can be of even greater aid to the practicing radio engineer.

Commenting on the first edition, Walter J. Seeley, Chairman, Department of Electrical Engineering, Duke University, wrote enthusiastically:

> *"It is so chock full of useful data that I am urging all students to purchase their own personal copies . . . fills a long-felt need for a convenient compilation of both mathematical and engineering data, and the combination will be appreciated by all who have to work with radio circuits and their concomitant mathematics. That applies especially to teachers and students and I should not be surprised if it becomes a must in many college courses."*

The new, second edition of *Reference Data for Radio Engineers,* in green cloth binding, revised and enlarged to include much new data, is ready now. To order, merely fill in the convenient coupon.

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Engineering and Material Data. Wire Tables, Insulating Materials, Plastics: Trade Names, Wind Velocities and Pressure, Temperature Chart of Heated Metals, Physical Constants of Various Alloys and Metals, Thermocouples, Melting Points of Solder, Spark Gap Voltages, Head of Water in Feet, Approximate Discharge Rate, Materials and Finishes for Tropical, Marine Use, Torque and Horsepower.

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Iron-Core Transformers and Reactors. Major Types, Temperature, Humidity, Pressure Effects, General Limitations, Design of Power-Supply Transformers.

Vacuum Tubes. Formulas, Performance Limitations, Electrode Dissipation Data, Filament Characteristics, Ultra-High-Frequency Tubes, Cathode-Ray Tubes, Preferred Radio Electron Tubes.

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STATIC . . .

(continued from page 20)

And then there was the dog that saw the sign "Wet Paint" on the bench—and so he did.

•

Prof. Kelso: "Why didn't you answer me?"
ME: "I did, sir, I shook my head."
Kelso: "You don't expect me to hear it rattle way up here, do you?"

•

"Mother, are there any skyscrapers in heaven?"
"No, son, engineers build skyscrapers."

•

"Let's stick this guy for the drinks," said one mosquito to another.

•

"Is there a factory on that road?"
"No, that's Lover's Lane."
"Oh . . . so that's why that girl remarked, 'I've been through the mill'."

•

Lady next door: "Little boy, I need a dozen eggs from the store. Do you suppose you could go for me?"
Little boy: "No, but I heard Pa say that he could."

•

Dairyman's motto: "All that I am I owe to udders."

As the pretty girl entered the crowded car, he rose to his feet.
"No, you must not give up your seat—I insist," said the young woman.
"You may insist all you like, Miss," was the reply, "But, I'm getting off here!"

•

After a terrific struggle, the law student finally finished his examination paper, and then at the end wrote: "Dear Professor: If you sell any of my answers to the funny papers I expect you to split 50-50 with me."

•

"Are you a college man?"
"No, a horse just stepped on my hat."

•

Tom: "My wife came from a very large family. Did yours?"
Jerry: "No, she brought it with her."

•

Taxi Driver: "Would you mind walking the other way and not passing that horse?"
Passenger: "What's the big idea?"
Cabbie: "I just don't want him to see what I've been hauling around for a dime."

•

A proud mother walked in to the "Small Monthly Payments" store clutching a small payment.
"There," she said as she threw it on the counter, "that's the last one on our baby carriage."
"And how is the baby?" asked the friendly clerk.
"Fine, fine," she said. "She's getting married next week."

•

Teacher: "What is the meaning of the word 'matrimony'?"
Pupil: "My father says it isn't a word. He says it's a sentence."

Listen birds
These signs cost money—
So roost a while, but
Don't get funny.

—Burma Shave

(continued on page 28)

MAYBE YOU NEED A PIANO LESSON

When you look inside a piano you see a harp-shaped metal plate on which the strings are strung. Even in a spinet it ordinarily weighs well over 100 pounds.

"Too heavy!" thought Winter & Company, who make pianos. (If you've ever moved a piano, you'll agree.) "Let's have Alcoa make an *aluminum* plate."

So, Winter's piano designers and Alcoa engineers put their combined experiences together to develop an aluminum plate. First, a strong aluminum alloy had to be found because the strings put an 18-ton pull on the plate. A special alloy was produced, *but* . . .

As the strings don't pull in the same direction or with the same force, in time the plate would creep, ause distortion, and the strings get out of tune.

Alcoa engineers found a way to tell exactly where and how great the strains were . . . figured out how to balance the stresses and then stabilize the plate by an Alcoa-developed heat-treating process.

The result: The first successful aluminum piano plate, weighing only 45 pounds instead of 125, with tone quality enhanced.

That piano plate offers this lesson for young engineers to remember when they step from college into industry: Take a look at aluminum—with Alcoa engineers at your side—when you want strength with lightness in anything you are designing. Ideas click when men with imagination plus engineering—"Imagineering" as we like to call it at Alcoa—work with this versatile metal and with the greatest fund of aluminum knowledge in the world—Alcoa's. ALUMINUM COMPANY OF AMERICA, Gulf Building, Pittsburgh 19, Pa.

ALCOA FIRST IN **ALUMINUM**

Hi-Lights

The Fairer Sex

No, the women on campus have not gone all-out for engineering courses. The reason so many are seen within our hallowed walls and halls these days is because a number of L. & S. courses are now being taught in Engineering School classrooms. Spanish, history, English, and math are typical examples.

•

New Equipment

The quantity and quality of new pieces of equipment that have been added to the various Engineering laboratories and shops is staggering. For interesting details watch the feature stories in the coming issues of the Wisconsin Engineer.

E. C. M. A. Convention

The Engineering College Magazines Associated, of which the WISCONSIN ENGINEER is a member, held its annual meeting at the Hotel Continental, Chicago, Friday and Saturday, October 11 and 12. Kenneth Cummins, business manager, and Harold May, editor, report that twenty-one member magazines were represented and that a very interesting and educational program was held.

The principal speakers included Mr. W. B. Littell, of Littell-Murray-Barnhill, Inc., national advertisers; Mr. R. E. Turner and Mr. W. Painter, editor and business manager, respectively, of Power Plant Engineering; and Mr. J. D. Wilder, editor of American Artisan Magazine.

Officers elected for the coming year are Prof. Beattie of the University of Colorado, as chairman, and Prof. Henry of the University of Illinois, as vice chairman.

Du Pont Digest

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

New Plastic Resists Heat, Acids, Electricity

"Teflon," Product of Group Research, is Solving Difficult Problems in Radar, Television and Industry

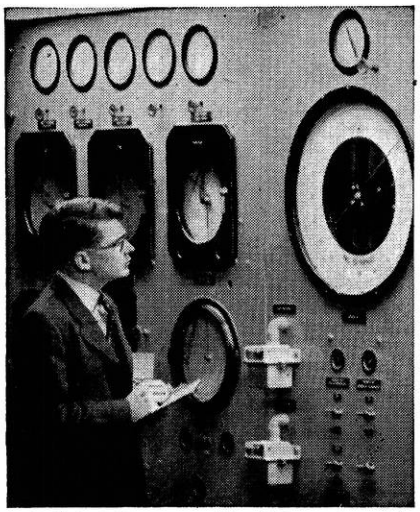
A group of Du Pont research men were looking for a new refrigerant of a particular type. These men found what they were after; but, as so often has been the case, they found something more—this time an industrial plastic whose unique qualities make it invaluable in many fields.

During the study, the chemist in charge proposed a route to the synthesis of HCF_2CF_2Cl via tetrafluoroethylene, $CF_2=CF_2$. In working with the latter, a chemically reactive gas boiling at –76.3C./760 mm., it was learned that it polymerized to form a resin having unusual properties.

After evaluation by organic and physical chemists, physicists and electrical experts, a suitable process for the difficult manufacture of this product was worked out by the chemists in collaboration with chemical and mechanical engineers.

Structure and Properties

"Teflon" is made by polymerizing gaseous tetrofluoroethylene to give a solid, granular polymer:



Controlled at this one panel is all the equipment for producing the polymer from which is made "Teflon."

"Teflon" (right) resists boiling acids and solvents to a degree unrivaled by other plastics.

$$n\begin{pmatrix} F & F \\ C & = & C \\ F & & F \end{pmatrix} \rightarrow \ldots \begin{matrix} F & F & F & F \\ C & - & C & - & C & - & C \\ F & & F & & F & & F \end{matrix} \ldots$$

The fluorine atoms in the molecule impart exceptional properties of resistance to heat and chemicals.

"Teflon" has unusual heat resistance. Having no true melting point, "Teflon" decomposes slowly to give the gaseous monomer and a few other gaseous fluorine derivatives at around 400°C. Under certain conditions small amounts of fluorine-containing gases have been observed at temperatures above 230°C. Because of its heat resistance, gaskets and wire insulation for jet engines are now made of this plastic. It is also used in aircraft ignition systems near sparkplugs and in high-temperature heating systems.

The chemical resistance of "Teflon" is such that it withstands the attack of all materials except molten alkali metals. Boiling in acid (aqua regia, hydrofluoric acid or fuming nitric acid) will not change its weight or properties. For this reason it may have wide use in such applications as tubing and piping for chemical plants and acid-distillation equipment.

Because the dielectric loss factor is extremely low, even at frequencies up to 3000 megacycles, it is an excellent insulating material for currents of ultra-high frequency. Its heat-resisting and aging qualities suggest immediate uses as a dielectric in coaxial cables for color television, and in radar and power fields.

Forms of "Teflon" Available

By use of special techniques the new plastic can be extruded as rods, tubes or wire coating. In general, its extrusion rates are low in comparison to other thermoplastics because of its resistance to softening.

More facts about "Teflon" are in Du Pont Plastics Technical Service Bulletin No. 13. Send your request to 2521 Nemours Bldg. Wilmington 98, Del. "Teflon" is one of the many products which represent the work and skill of Du Pont men, who, working as a team, contribute toward a better America for you and all of us.

STATIC . . .

(continued from page 24)

Economy: Spending your income without getting any fun out of it.

•

"Hey Moe, why's your face so red?"
"I'm wearing tight socks."

•

The trouble with fire is it's always looking for a place to happen.

•

"May I kiss your hand?"
"What's the matter, is my mouth sticky?"

•

When a man has a birthday he takes a day off. A woman, on the other hand, is inclined to take a year off.

•

PROBLEM FOR THE M. E.'S

How far and how fast could Joe Hammersley drive if someone put two cups of sugar in his gas tank?

Jim and Mary were roller skating when Mary suddenly fell. Immediately she flopped over and come to her feet again with remarkable agility.

"Did you see how quickly I recovered my equilibrium?" she asked.

"I sure did," answered Jim, "and almost before I noticed it was uncovered."

•

Nudism is a back-to-the-form movement.

•

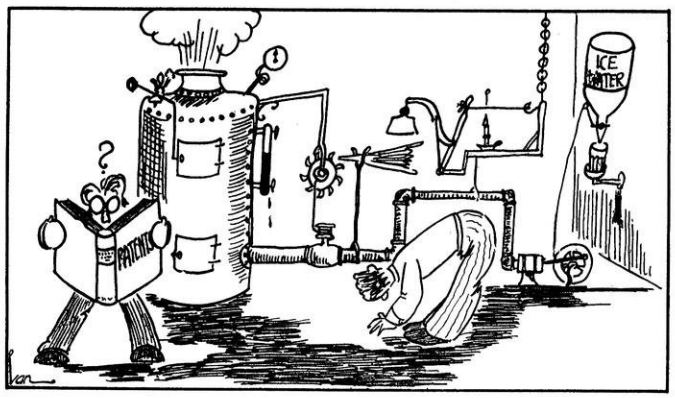
Agent: "You say your subscription to these 'art' magazines is continued?"
Subscriber: "Yes, re-nude."

•

Gert: "And then he and I talked about the weather."
Flirt: "The weather!"
Gert: "Yeah, weather to or weather not to."

"Oh darling," he murmered, "I love you so. Please say you'll be mine. I'm not rich like Percival Brown. I haven't a car, or a fine house or a well-stocked cellar; but darling, I love you, and I cannot live without you!"

Two soft arms stole around his neck; and two ruby lips whispered in his ear: "And I love you, too, darling, but—where is this man Brown?"



A tired wolf is one who hopes the gal will say no.

•

They laughed when I sat down at the piano but when that little blond soprano gave me the key to A flat—how I accompanied her!

•

A large woman wearing a loud purple dress and many phoney jewels visited a clothes designer and asked what colors she should wear.

"Madam," said the expert, "when God made the butterfly and the hummingbird he gave them brilliant colors. But when he made the elephant, he made it gray."

•

A Scotchman visiting a neighboring town was told that he could obtain liquor and feminine companionship at his hotel for the price of liquor alone. After considering the matter he decided that it was worth investigating. The door of the designated room was opened by a buxom blonde. "Hello there, big boy!" she said, "come right in." He hesitated a moment. "Ken ye nae tell me, ma bonnie lass, whither the bottles are fifths or quarts?" he asked.

•

The drunk stood on the corner singing "Amapola."

An airedale trotted up and said: "O.K., Bud, you asked for it."

•

District Attorney: "You say that when you visited the nudist camp on the night of the murder, you didn't do a thing. Do you realize you're under oath?"

Old Man (witness): "Yes, and do you realize I'm over eighty?"

•

In order to get married, a girl must show:

1. A generous nature.
2. How generous nature was to her.