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Wisconsin

engineer

FEBRUARY, 1955

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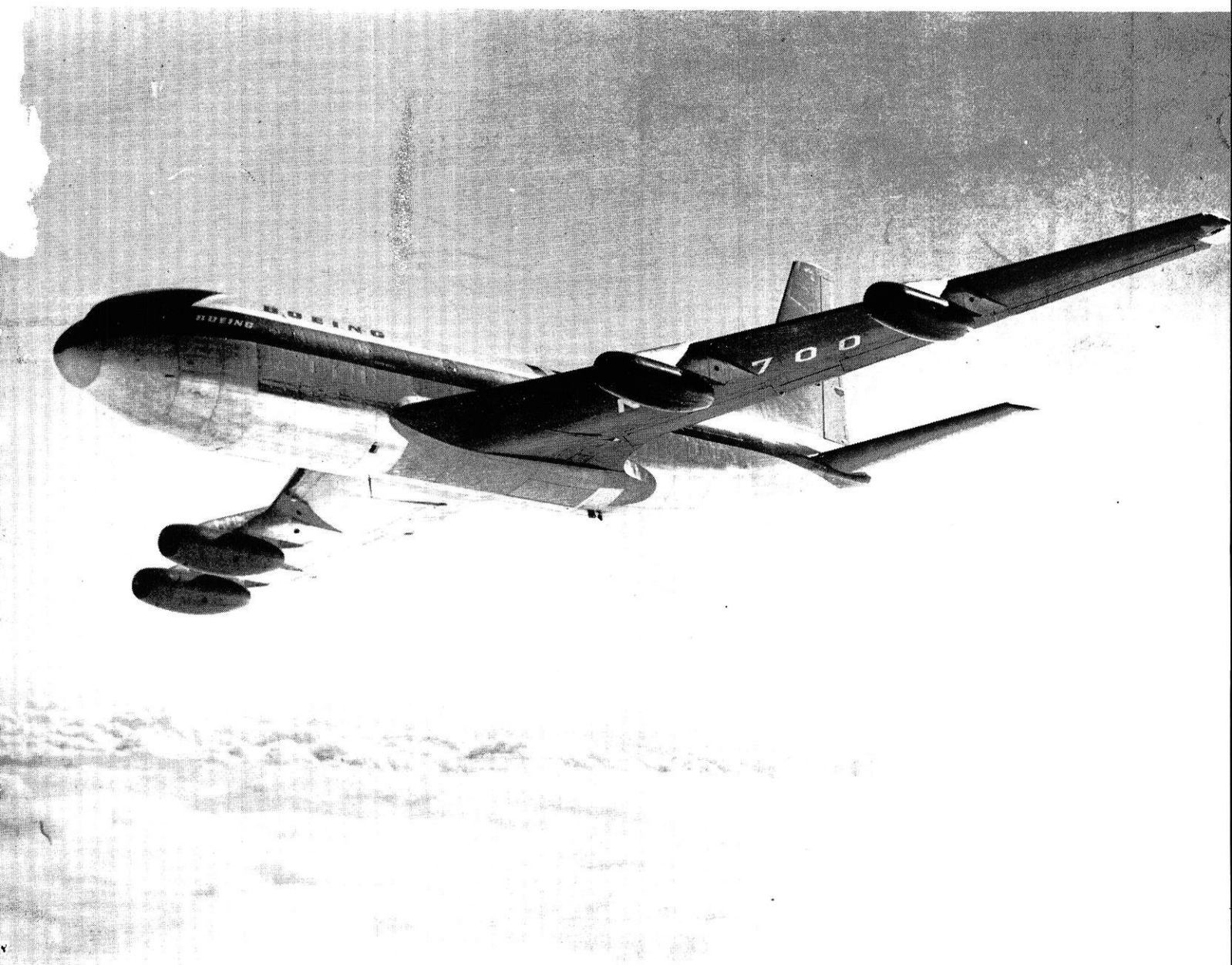

in this issue . . .

Sanford W. Wilson, class of '48
speaks from experience when he says . . .

"U. S. Steel offers a great combination—opportunity, security and an interesting job"

MR. WILSON was interviewed by U.S. Steel representatives in March of 1948. After receiving his B.S. in Chemical Engineering in June, he chose his U.S. Steel offer over several other job offers and began working at the huge Gary Works as a Foreman Relief Trainee. He gained experience in the Blast Furnace Department and in the front office learning the business end as well. In November of 1954 Mr. Wilson was made assistant to the superintendent of blast furnaces at Gary. His duties now include developing data for control of production, quality of materials, costs, and making technical reports. In addition, he directs the activities of Technological Co-Ordinators and part of the training of management trainees.

Mr. Wilson is naturally pleased with his progress at U.S. Steel and he feels that U.S. Steel offers qualified and ambitious engineers the very best in three important areas—opportunity, security *and* an interesting job.

He says, "Opportunity is unlimited at U.S. Steel and openings for advancement are frequent." In addition, Mr. Wilson feels that U.S. Steel affords a secure future because of the basic nature of the steel industry and the constant need for engineering talent. But most important, Mr. Wilson is deeply interested in his job because he knows he is really playing a vital role in a vital business. And he says, "The steel industry has many facets and is constantly changing. Talk to anyone who has been in the steel industry for any time and he will tell you that steel has gotten into his blood."

If you are interested in a challenging and rewarding career with United States Steel and feel that you can qualify, you can obtain further information from your college placement director. Or we will gladly send you our informative booklet, "Paths of Opportunity," upon request. Just write to United States Steel Corporation, Personnel Division, Room 1622, 525 William Penn Place, Pittsburgh 30, Pa.

SEE THE UNITED STATES STEEL HOUR. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

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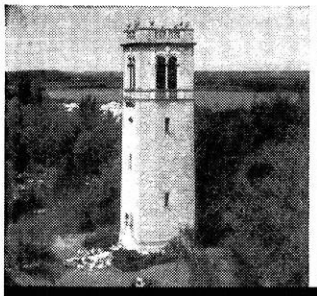
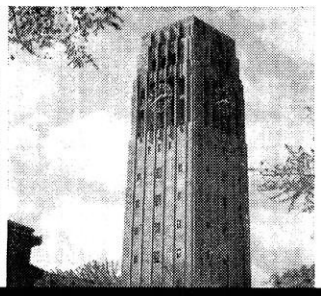
UNITED STATES STEEL HOMES, INC. • UNION SUPPLY COMPANY • UNITED STATES STEEL EXPORT COMPANY • UNIVERSAL ATLAS CEMENT COMPANY



WISCONSIN



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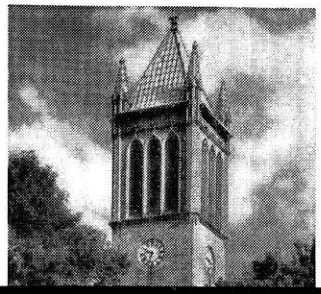

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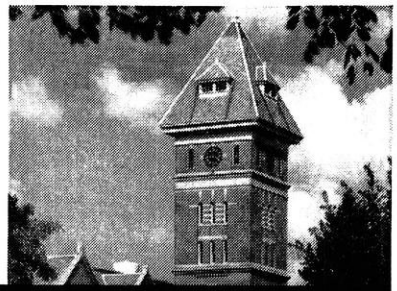

PURDUE

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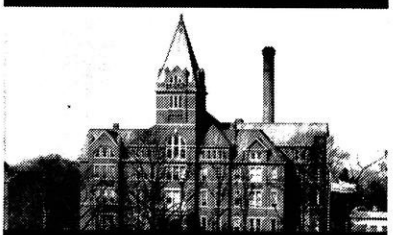
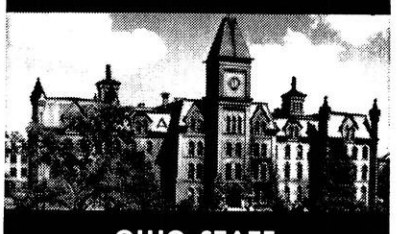
PENN STATE



GEORGIA TECH



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where we Find

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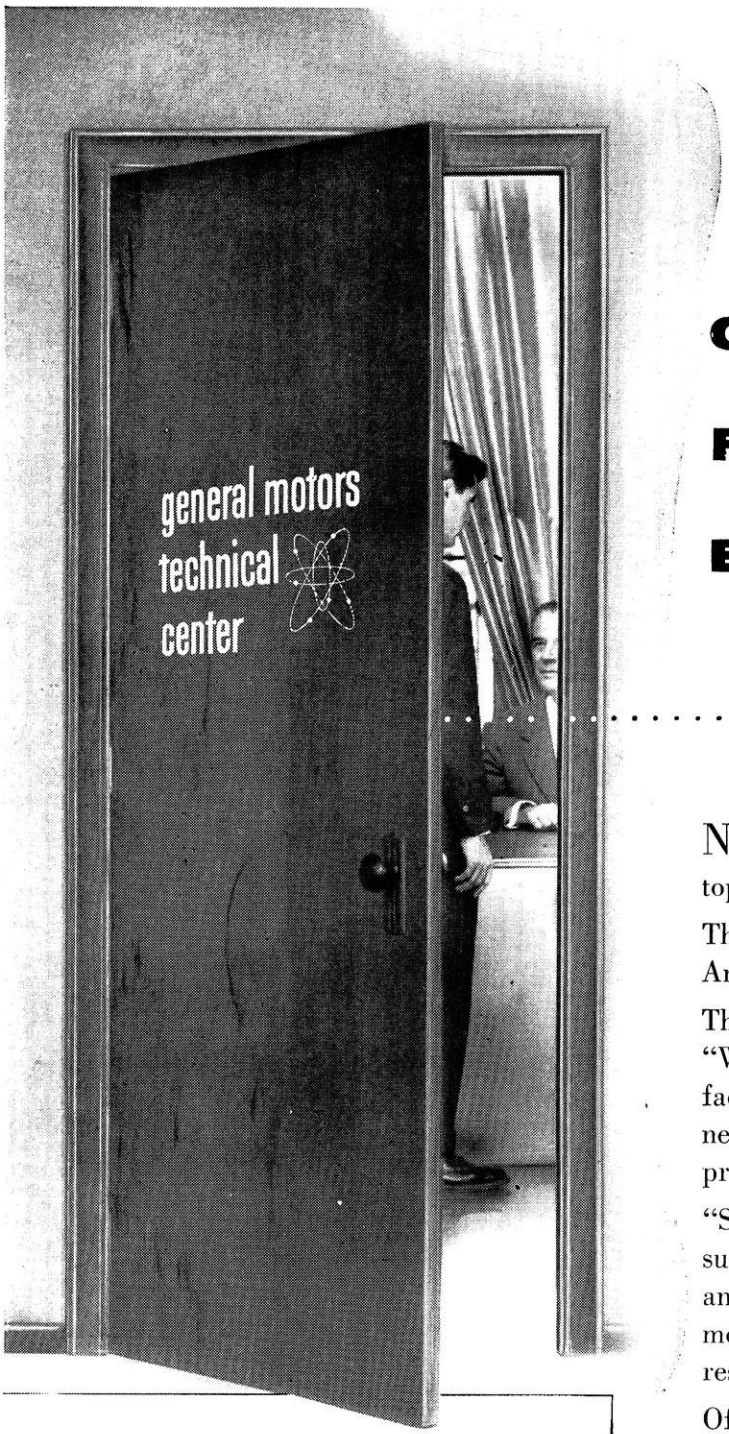

OPEN DOORS FOR ENGINEERS

Now more than ever, our nation needs engineers in top policy-making positions.

That's what Alfred P. Sloan, Jr. recently told the American Institute of Consulting Engineers.

The Chairman of the Board of General Motors said, "We need the respect that the engineer has for basic facts. We need his analytical frame of mind. We need his imagination. We need his contact with interpretation and control of the physical forces.

"Such is the type of discipline, as I see it, that is sure to contribute to a maximum degree of order and sense in our complicated economy — and promote the best and most efficient use of our national resources, both human and material."

Of course, these words — so typical of GM's entire outlook — foretell great things for engineers in the country at large. But even more, they explain why career opportunities for good men are so exceptional here at General Motors.

We invite you to write for "The College Graduate and General Motors," a booklet that should encourage you to see the GM College Representative when he visits your campus.

GM Positions Now Available in These Fields:

MECHANICAL ENGINEERING
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and building

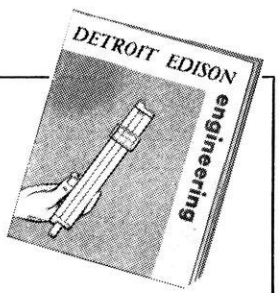
Looking ahead with Detroit Edison

Important new addition to the engineering facilities of Detroit Edison is this huge System Analog and Network Computer, bringing new speed, accuracy and convenience to solving the problems of providing better power systems, both for today and for tomorrow.

Designed and built by Detroit Edison engineers, this unique four-ton machine reproduces in miniature the company's power system, and can be varied to simulate other power systems as well. The effect of any combination of generators, transformers, lines, cables and other equipment, and of any variations in components within the system, can be determined in a fraction of the time required by conventional methods.

The System Analog and Network Computer, along with other advanced electronic equipment, such as the digital computer, serves Detroit Edison engineers in a variety of fields, including research, system operation, and production, planning, project and design engineering. . . . Such advanced facilities, combined with the steadily rising demands for electrical power in Detroit and Southeastern Michigan, enable Detroit Edison to offer young engineers an outstanding opportunity and challenge to build for their own futures.

For the full story of career opportunities at Detroit Edison, simply call or write for a free copy of this new booklet, "Detroit Edison Engineering."



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Detroit 26, Michigan

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WISCONSIN ENGINEER

The Student Engineer's Magazine

FOUNDED 1896

ARTICLES

DEPARTMENTS

COVER

The new Boeing Strato-tanker, the latest in jet transportation, is designed to fly at speeds greater than 550 mph, and to reach altitudes of 42,000 feet. Turbo-jet engines, each developing 10,000 pounds of thrust, are mounted in suspended streamlined pods, characteristic of Boeing's trend in jet aircraft.

FRONTISPIECE

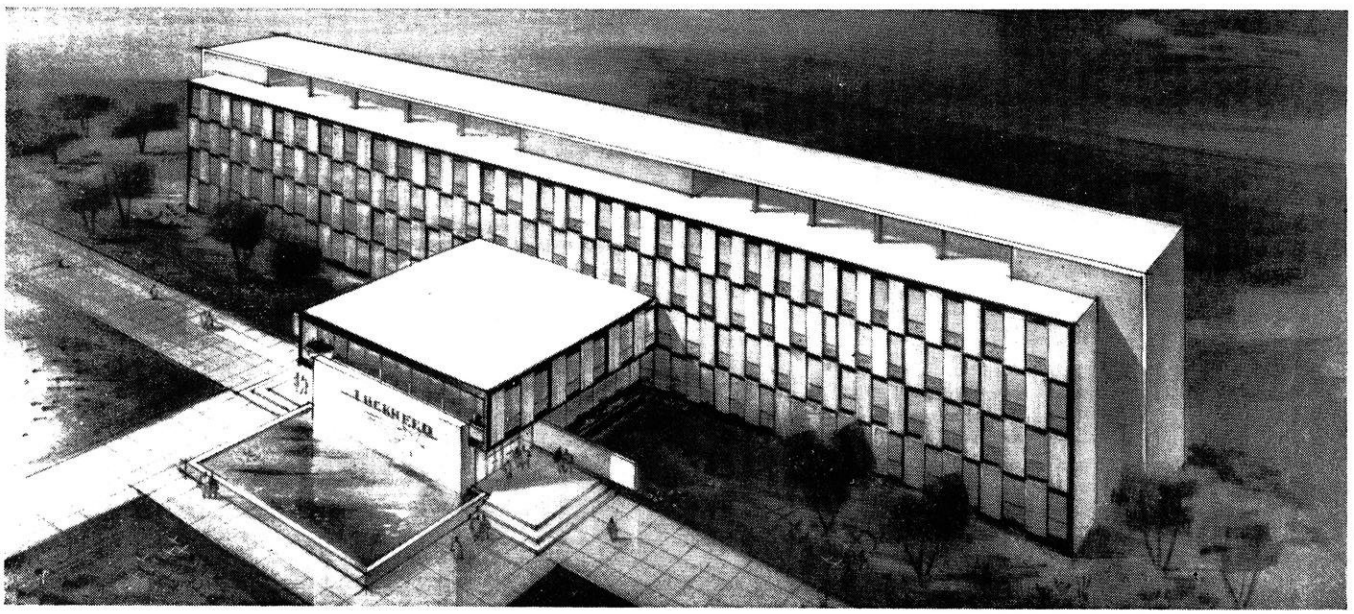
This radar antenna, typical of many designed for installation in the Arctic, will soon be one link in the defensive chain that the Continental Defense Command has ordered for our northern reaches. It is housed in a plastic dome which protects it from the weather but doesn't decrease its effectiveness.

NEW MISSILE SYSTEMS RESEARCH LABORATORY

The technology of guided missiles poses increasingly complex problems in virtually every field of science.

To provide physicists and engineers with the most modern facilities for meeting those problems, Lockheed Missile Systems Division has begun construction on a laboratory for advanced research—first step in a $10,000,000 research laboratory program.

Scheduled for occupation in early fall of 1955, it will augment existing Missile Systems Division facilities.



Individuals able to make significant contributions to the technology of guided missiles are invited to contact their placement officer or write us.

Lockheed MISSILE SYSTEMS DIVISION

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A MESSAGE TO
COLLEGE ENGINEERING
STUDENTS

from Donald C. Burnham, Vice-President
Manufacturing,
Westinghouse Electric Corporation
Purdue University, 1936

To the young engineer with a creative mind

America is on the threshold of the *automation era.*

New automatic machines with their electronic brains are opening the way to a tremendous industrial development in which machines will largely replace man's routine brainwork and handwork.

Westinghouse is taking a leading part in developing equipment for the automatic factory. At our new Columbus, Ohio plant, refrigerators move along *27 miles* of automatic conveyors, with many parts being installed by automatic assembling machines... refrigerator controls are automatically calibrated... automatic testing devices maintain quality control... and the crated refrigerator is automatically conveyed to warehouse storage.

At Westinghouse, young engineers like you are playing an increasingly important role in such new developments for all kinds of industry. Here, there is plenty of room for your creative talents to expand—in designing new products . . . and in developing new improvements for existing products. It's a fascinating job that offers you real opportunities for growth.

And at Westinghouse, we recognize *individual ambition* as well as technical ability. There will *always be a place* for the young engineer who wants to forge ahead. For professional development you can do graduate work toward Master's and Ph.D. degrees in 19 universities. You will be treated as an individual and Westinghouse will do all in its power to help you reach your goal.

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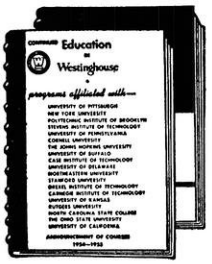

Ask your Placement Officer about career opportunities at Westinghouse, or write for these two booklets: *Continued Education in Westinghouse* (describing our Graduate Study Program) and *Finding Your Place in Industry.*

To get these booklets, write: Mr. C. W. Mills, Regional Educational Co-ordinator, Westinghouse Electric Corporation, Merchandise Mart Plaza, Chicago 54, Ill.

Rotating Radar Antenna Sweeps the Arctic Skys.

(See page 5)

editorial

Today engineers are in a sense mass-produced to meet the demands of a rapidly expanding industrial technology; the emphasis upon expediency is so great, in fact, that a four year college engineering curriculum becomes a whirl of problems to be solved, reports and exams to be written, and lab experiments to be completed. To many undergraduate engineers that is the story of college life. With such emphasis on giving the students as much diversified technical knowledge as possible, an important educational goal is overlooked. Thomas Henry Huxley wrote in his essay on liberal education that, "Education is the instruction of the intellect in the laws of nature", under which name he included "not merely things and their forces, but men and their ways."

In the type of engineering education described, it seems that "things and their forces" are adequately taught, but that the "ways of men" are left to be gleaned from sources outside the technical curriculum. Because the failure of an engineer to do his job satisfactorily is due more often to social unadaptability than to technical errors, the problem of "men and their ways" might bear some consideration.

An obvious solution—a cure-all as some would have it—is the liberal education integrated into an engineering curriculum. There is no serious doubt that such a program is beneficial to the engineer as an individual and to engineering as a profession. Although a foundation in the humanities—courses in psychology, philosophy, literature, sociology, for example—will be of benefit to any well-rounded individual, yet there is much that can never be learned by taking notes in a lecture room.

A program which should interest any ambitious undergraduate must include not only a foundation in fields of the liberal education and a sound basic knowledge of engineering practices and principles, but also a wholesome participation in group activities. It is while working together with other men that one actually learns the "ways of men". There are many "laws of nature" that can be spoken of in the classroom, but never learned there. Working together teaches, simply, working together. That may sound paradoxical, but upon closer consideration one infers from the statement that working with other people, in any form of group activity, is a trial and error process from which the more successful people can derive a spirit of co-operation, an attitude of toleration, and a respect for others and their ideas.

On the college campus, this working together is done largely in the form of extra-curricular activities, though to be sure, some evidences of group activity can be found in the various laboratories which are part of the required curriculum. Whether the activities include a college publication, a dance committee, a student government position, a social organization, or just taking part in the activities of a living unit, one can gain a wealth of experience in community living and social co-operation. If the activity bears some responsibility, it then helps to give the participants valuable experience in bearing responsibilities well and directing the work of others.

Unfortunately, engineering curricula do not usually provide sufficient free time for everyone to take advantage of these opportunities. Even more unfortunately, many engineers would not participate if they did have the time; either they do not realize the importance of extra-curricular study and work, or they do not believe in it. It is a well known fact that undergraduate scholarships are distributed on the basis of character and promise as well as need and academic achievement; character and promise, incidently, are based mostly on extra-curricular activities, the reasoning being that an individual who enters activities above and beyond those required in the ordinary curriculum shows personal initiative and promise of taking his place as an active citizen after graduation. It is also true that prospective employers will often accept applicants with good scholastic averages and a list of extracurricular activities rather than those with the much higher averages but less well-rounded in outside activities—and they will usually pay more.

It is too often true that an engineer's grades are much over-emphasized, for many interviewers and technical management people admit that the grades earned in college are not a good measure of promise; in fact, since many believe that college engineering training is only a foundation with small value in an absolute sense, and that a man becomes an engineer only after sufficient practical experience, they look elsewhere for their criteria of sizing up an applicant. The criteria they use are often based on impressions of personality and the record of having worked with other people.

With the larger and larger technical organizations in our corporations taking over the role of the individuals, this country needs the social animal that will fit into the organization as well as the one who will contribute to it.

—R. A. H.

Take A Giant Step...

INTO THE SUCCESS-FILLED WORLD OF SYLVANIA

There's little doubt about the fact that rubbing shoulders with success, early in your career, is one of the best ways to assure your own long-range success.

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An aggressive, forward-looking company with all the drive and vigor of youth . . . whose average executive age is only 45 . . . Sylvania can provide the environment of success and encouragement that will help you build a highly satisfying professional future.

For detailed information, see your College Placement Office, or send for our comprehensive brochure, "Today and Tomorrow with Sylvania," by writing to Supervisor of Technical Employment.

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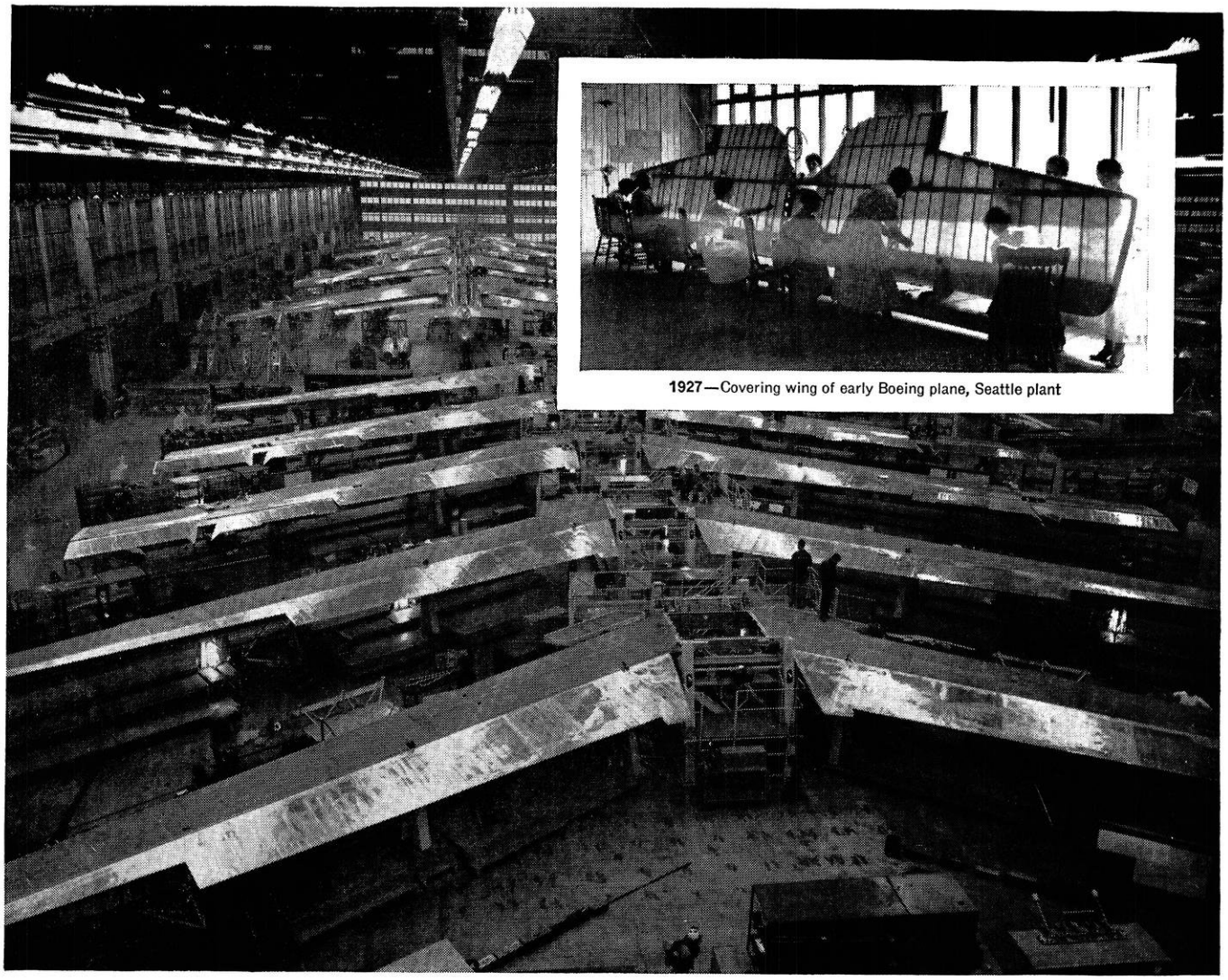


1927—Covering wing of early Boeing plane, Seattle plant

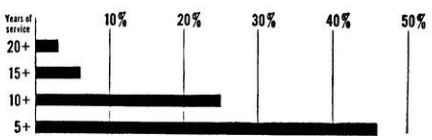
1955—B-47 Stratojet assembly, Boeing Wichita Division

Boeing offers engineers long-range careers

Throughout its 38-year history, Boeing has consistently pioneered advanced new types of military and commercial aircraft, and new methods of production. This history of leadership has meant continued growth for the company. It means continued opportunities for Boeing engineers to move ahead according to their ability in Research, Design and Production.

Today Boeing is producing the jet age's outstanding bombers, the B-52 and the B-47. Other Boeing projects that mean continued growth and stability include: America's first jet transport (the Boeing 707). Research in nuclear-powered and supersonic flight. And one of the nation's major guided missile programs. These and other new-horizon projects are expanding at such a rate that Boeing now employs more engineers than even at the peak of World War II.

The high inherent interest of these programs, together with the stimulation of expanding opportunities, add to the stability of careers at Boeing. One measure of stability is given in this chart.



It shows that 46% of Boeing engineers have been with the company for five or more years; 25% have been here 10 or more years, and 6% for 15 or more years. Another measure is the increasing proportion of engineers to total employees. Fifteen years ago the figure was one to 16. Today one out of each seven employees is an engineer.

Boeing promotes from within and holds regular merit reviews to assure individual recognition Engineers are encouraged to take graduate studies while working and are reimbursed for all tuition expenses.

Boeing has openings for virtually all types of engineers—electrical, civil, mechanical, aeronautical and related fields, and for applied physicists and mathematicians with advanced degrees.

For further Boeing career information consult your Placement Office, or write:

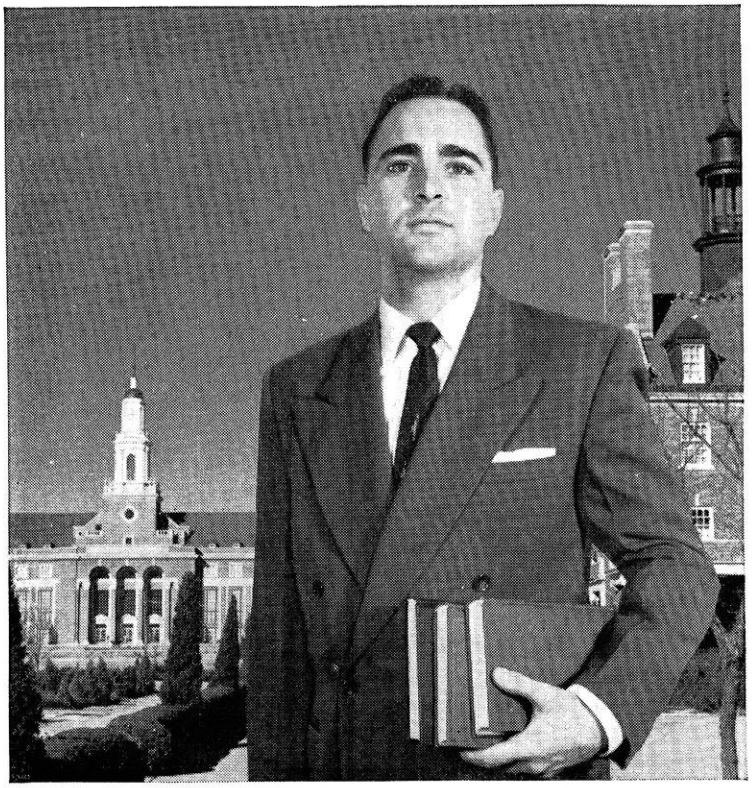
JOHN C. SANDERS, Staff Engineer — Personnel
Boeing Airplane Company, Seattle 14, Wash.

BOEING

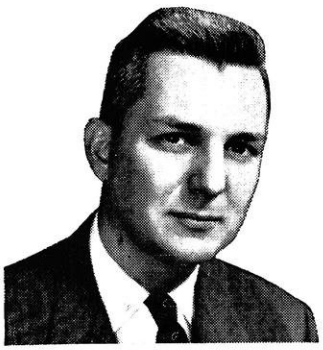
SEATTLE, WASHINGTON WICHITA, KANSAS

"Dress" Pruett wants to know:

What type of training program does Du Pont have?



DRESSLAR M. PRUETT expects to receive his B.S. in Industrial Engineering this summer from Oklahoma Agricultural and Mechanical College at Stillwater, Okla. He is president of the local student branch of A.I.I.E. Naturally, he is interested in selecting the best job opportunity for a successful career based on his technical training.



DONALD C. MILLER received his B.S. in Chemical Engineering from Ohio State University in June 1937. During the following month he started work with the Organic Chemicals Department of Du Pont at Deepwater Point, N. J. Since then he has received and given many kinds of technical training. Today Don Miller is a general superintendent at Du Pont's Chambers Works—well qualified to answer questions about training programs for college men.

Don Miller answers:

Training has many facets in a big firm like Du Pont, Dress, and a great deal of thought has been given to make it truly effective. We look upon training as a very important factor in a man's career. We think that the best way to train a college graduate is to give him a maximum of on-the-job responsibility in a minimum length of time. That's the general guiding policy at Du Pont, Dress.

Of course, each department varies this general policy to suit its special needs. A new man being trained for production supervision may first spend a year or so in laboratory or plant development work. Or he may spend his training period as a plant operator. Thus a man obtains firsthand knowledge of his process, and establishes a bond of mutual respect with the men he'll be working with on his first major assignment.

A young man interested in sales is often first assigned to a plant or laboratory dealing with the products he will later sell; or he may join a group of trainees to learn selling techniques right from the start.

An engineer, chemist, or other technical graduate is usually chosen for a specific job within his major field of study. Such a man brings specialized knowledge and skill to his job, and he is encouraged to put them to use promptly. But at Du Pont his experiences on the job are supplemented with lectures, conferences and discussion groups. In a very real sense, new technical employees continue training in their specialties after joining the Company.

To sum it all up, Dress, Du Pont's training program is individualized to provide a new man with specific opportunities to learn from contacts with more experienced men. The *prime objective* of Du Pont training is always kept clearly in mind—to develop men for future advancement and effectiveness in the organization.

Meet the Authors

by Fritz Callies, m'55

RICHARD C. BOND
"Atomic Energy for Industry", page 14

Dick Bond, a Mechanical Engineering senior, admits having been born and raised in Sheboygan, though he, his wife, and three-month-old Jimmie now make their home here in Madison. An outstanding student, Dick is president of Tau Beta Pi and a member of Pi Tau Sigma, as well as belonging to ASME and Phi Eta Sigma. Despite his crowded schedule, he manages an occasional game of golf and as a second semester sophomore was Feature Editor of the **Wisconsin Engineer.** In addition to his engineering degree, Dick plans to receive his Masters degree next year in the School of Commerce, where he is majoring in Industrial Management.

FRITZ A. CALLIES
"Cool, Man!", page 16

According to the records Fritz Callies of Menomonee Falls, Wisconsin, is a senior Mechanical Engineer, but actually is more of an Electrical Engineer at heart, being very interested in communications and electronics. In the Mining and Metalurgical Engineering field, he spent part of the summer of '53 at the "placer claim" which he staked out near Central City, Colorado. And as a Firearms Engineer, he has designed and built several pistols embodying, according to the report of an ordnance expert, "some very novel concepts of small-arms functioning".

Fritz is a member of Pi Tau Sigma, Society of American Military Engineers, and S.A.E., besides being Captain of the University of Wisconsin Varsity Rifle Team and of the ROTC Rifle Team, and President of the Dorm Workshop.

(P.S.—Also writes this column.)

JACQUES H. HOUDRY
"Smokeless Smoke", page 24

Jacques H. Houdry, 28, has been actively at work with his noted father, Eugene J. Houdry, in the development of oxidizing catalysts ever since 1948. At that time Jacques joined his father in the converted stable-laboratory adjacent to the family estate in Ardmore to participate in the painstaking, trial-and-error series of tests that led to the development of the Oxycat, the first of Houdry's commercially practicable oxidizing catalysts.

In 1950 when Houdry formed a company to manufacture his air pollution control catalysts, Jacques became vice president of the industrial division. Ever since he has been personally in charge of the design, development and sales of Oxycats for industrial uses and has been active in all other phases of the company's operation, which include the development and manufacture of catalysts for the control of internal combustion engine exhausts and home odors and pollutants.

A graduate of the Episcopal Academy, Philadelphia, Jacques studied engineering and chemistry at the University of Pennsylvania to prepare him for his work in catalysis.

An avid golfer, Jacques is one of the top amateur players in the Philadelphia area.

JOHN BOLLINGER
"Tomorrow's Transportation", page 22

John Bollinger calls Manhasset, Long Island and the surrounding waters his home. Eight years of sailing experience gained there enabled him to become Captain of last year's Wisconsin sailing team and Vice-Commodore of the Hoofer's Sailing Club.

Ashore, he is a member of the University of Wisconsin Marching Band, where experience gained with his own dance band during high school days serves him in good stead. He is also interested in high fidelity music.

John, who is a sophomore in Mechanical Engineering this year, is a member of Phi Eta Sigma, the freshman honor fraternity, and of ASME.

END

Atomic Energy For Industry

Latest Technical and Economic Developments in Atomic Energy for Private Industry

by Dick Bond, me'55

Many of the blocks to rapid development of the atom for peacetime uses have been removed by the 1954 Congress by the passage of a new atomic energy law. The new law affords private industry a larger role in development. It has not removed all barriers, but will be a great aid. Private concerns can now own and operate production facilities like reactors, but the government retains a control of fissionable material.

There are both technical and philosophical problems to be settled before atomic power becomes an economic possibility. One of the chief obstacles to development is a philosophical question—"Private or Government control of the atom?" Up to now the technical problems had been much closed to solution than the philosophical; now, however, both are about on a par.

Plans for power stations, engines, and many models of such systems have been devised and built. They have been tested and proven to be practicabilities, as well as possibilities. It is only a matter of time before there will be commercial application of these developments. Already atomic power has been put to isolated power applications. Heat is a natural by-product of the atomic piles and reactors; one of the first practical uses of atomic energy was to pipe the cooling water into buildings for heating purposes. On a limited scale, electrical power can also be generated in this manner. These, however, are not commercial applications, but rather coincidental with research operations.

However, there have been two different methods, at least partially developed, for the generation of electrical power on a commercial basis. The first is basically the substitution of atomic reaction for coal as the means of steam generation. This is indirect since the steam is actually used to generate the electrical power. The second is the direct production of electricity from atomic reaction.

Typical of the reactor adapted to the steam generation of power is a "sodium-graphite" nuclear reactor being developed by North American Aviation, Inc. in conjunction with the Atomic Energy Commission. This reactor will be capable of generating 20,000 kilowatts of heat energy at a very high temperature. The apparatus is illustrated on the opposite page.

Because the most essential development problems are in the reactor and heat exchanger system, rather than in turbines and other generating equipment, no electricity will be produced at the present time. When fission occurs in the reactor, heat will be produced. This heat will be transferred to liquid sodium circulating through the "core" of the reactor where fission takes place. This sodium will then be pumped to an exchanger where the heat will be removed. If electricity were to be produced, the heat would then be used to make steam, which in turn would drive a turbogenerator unit. While it is not difficult to produce electricity from atomic energy, a large amount of technical development is necessary to reduce the cost of the process. Economical electrical power from atomic energy depends upon the production of useful heat in a reactor at a cost comparable with the present methods using conventional fuels such as coal, oil, and gas.

Characteristics of sodium which make it particularly suitable as a reactor coolant are the metal's low neutron absorption qualities, good heat transfer properties, low melting point, and high boiling point. Use of sodium permits the production of the very high temperature without the problems of high pressure. The sodium is heated and pumped to a primary heat exchanger. Because the sodium coming directly from the reactor will be radioactive, this metal will give up its heat through the primary exchanger to a secondary sodium circulation system. This second system takes the heat via uncontaminated sodium to a second exchanger where the heat can be provided without the presence of radioactivity. No fumes, gases, or other exhaust will be emitted into the atmosphere, as the reactor operates on a closed cycle system.

This method is representative of most of the present methods of obtaining electrical power from atomic energy. There is nothing really different about the power generation, but rather with the steam generation.

The second, or direct generation, type is being worked on by the Radio Corporation of America, and is as yet mainly in the theoretical stage of development. They have, however, built an experimental atomic battery which for the first time actually converts atomic energy directly into small, but useful, quantities of electricity. The basic elements of the battery are a radioactive source of electrons, and a semiconducting crystal. Previous radioactive generators simply captured the high-speed electrons as they came from the radioactive source; this meant that there was only one electron for each bombarding electron. In the experimental battery each high-speed electron releases about 200,000 low-speed electrons in the crystal. These released electrons flow across the crystal producing a voltage which can be applied to an electrical circuit to produce a current flow.

While this device is sufficient to generate power for some small radios and transmitters, it is a long way from being on a scale for commercial power generation. If the method can be enlarged upon and developed further, boilers and turbo-generator units may be relegated to obsolescence. It would mean that power cables could be connected directly to the nuclear reactor.

It is therefore quite obvious that science is on the trail of practical atomic power generation. However, research has been greatly hampered because the philosophical questions pertaining to ownership of the atom have not been settled. The problem of governmental control versus private ownership is one of increasing importance all through our economy, not only in connection with the atom. The recent Dixon–Yates controversy was just such a dispute. The basic issue was whether or not the federal government should go further into the public utility field in competition with private capital.

The Atomic Energy Act of 1946 has been a controversial factor in the development of the atom. Under this act, private industrial enterprise could own neither reactors nor fissionable materials. Even if they worked in close conjunction with the Atomic Energy Commission by donating land, money, time, and service to research, they could not receive any protection for their work through our patent system. Lacking such patent protection for developments it is very difficult to obtain investment capital with which to initiate research programs. To illustrate—"The Engineering Research Institute of the University of Michigan has a client, a manufacturer of chemical products, who desires to study the promotion of chemical reactions with radiation. This client will pay for the use of radiation facilities and for the research involved, but asks for the usual patent rights on the results of the research. I understand the law gives no patent rights to the investigator in such cases, but that all patent rights are the property of AEC. As a result the client has lost interest in the research."—L. E. Brownell, Fission Products Laboratory, University of Michigan.

The Act was passed almost nine years ago, in 1946.

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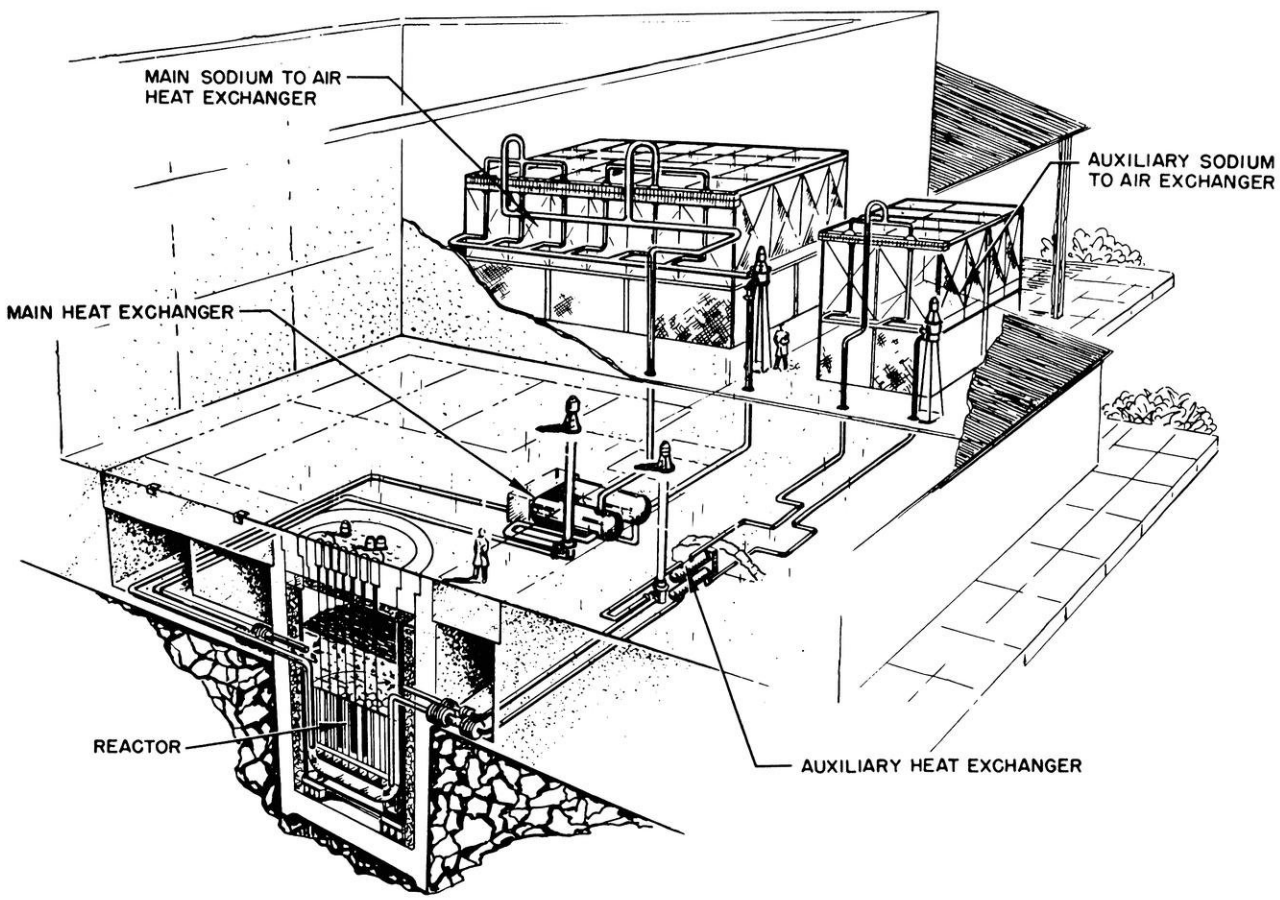


—Photo Courtesy North American Aviation

This is an artist's conception of a new experimental reactor to be designed, built, and operated by North American Aviation, Inc. in a joint project with the Atomic Energy Commission. It will be used for special studies in development work towards eventual production of electricity from atomic energy at costs competitive with cost of power from coal and oil. In the sodium graphite reactor, heat will be produced by the reactor (front), and absorbed by liquid sodium. The hot sodium will be pumped out of the reactor to the main heat exchanger (center) where another sodium system absorbs the heat to carry it to exhaust fans (upper right). If electricity were to be made, the heat would be used to produce steam which would drive turbo generators.

COOL, MAN!

Air Conditioning in the United States Has Developed, in 53 Years, Into An Industry of 43 Manufacturers Who Last Year Produced 1,500,000 Units

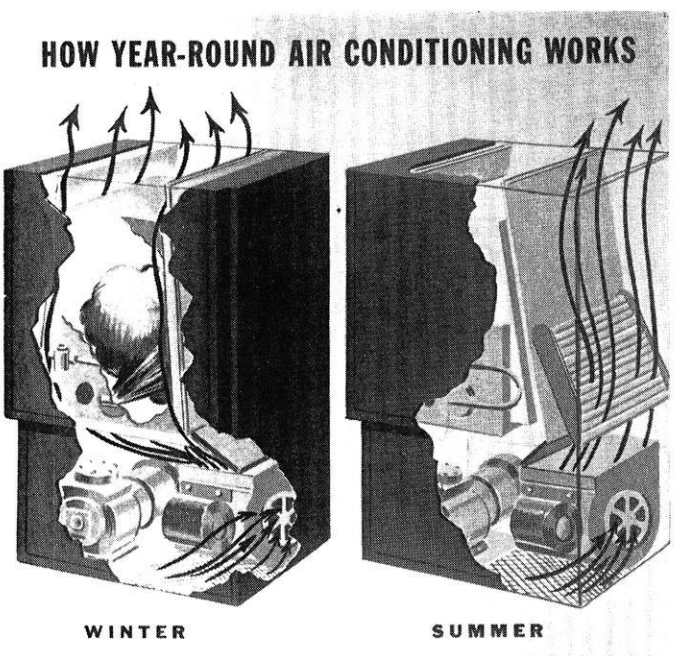
by Fritz Callies, me'55

Beginnings of the Industry

Quite a few thousand years ago—during the Pleistocene Epoch, if you had been alive then—you could have had all the summer cooling you wanted at no cost. In fact, with tons of sheet glacier covering half the landscape, you'd have had trouble avoiding it in that Ice Age period.

More recently, (around 200 A.D., to be exact), the Roman Emperor Heliogabalus achieved similar results when he sent 1,000 servants into the mountains to bring back snow and pile it in his garden. On oppressively hot days he leisured among the mounds of white coolness.

The ancient engineer Leonardo Da Vinci invented what was probably the first mechanical air conditioner. The Duke of Milan needed some device to cool the bedchamber of Duchess Beatrice D'Este. Da Vinci constructed a 12-foot paddle wheel with four air scoops. River water turned the wheel and at the same time cascaded a flutter of air down a conduit and into Beatrice's boudoir, where her royal highness could snooze in comfort.



—Photos Courtesy Carrier Corp.

Fig. 1.—All-weather units cool in summer, direct air through furnace section for winter heating.

But it was Willis H. Carrier, a young Cornell graduate, who in the year 1902 developed the first successful air conditioner of the type we know today. The problem he was working on concerned a multi-color printing plant in Brooklyn. Changes in the weather caused shrinkage or expansion of the paper between printings due to its absorption of moisture. This prevented accurate impressions of successive colors, and too much "off register" colors were plaguing the printer.

Young Carrier knew, from observing the beads of condensed water vapor on a cool glass in a warm room, that air gives up moisture when it comes in contact with a cold surface. Applying this fact to the problem, he forced warm humid air over refrigerated coils; the excessive moisture condensed onto the coils, and the cool dry air was sent back to circulate in the paper plant. This same principle was quickly put to work by textile manufacturers to prevent their yarn from absorbing excess moisture.

By the 1920's air conditioning was beginning to spread. Three Texas theaters—the Palace in Dallas and the Texan and Iris in Houston—were very successful with centrifugal installations in 1924, and soon movie managers all over the country sold tickets on the strength of their air conditioning as much as on the quality of the films. The chambers of the U.S. Senate and House of Representatives were air conditioned in 1926 and 1929 respectively. The J. L. Hudson Company, a Detroit department store, was the first store to use air conditioning as a major sales-getting tool; comfort in hot weather brought more customers, who stayed longer and spent more.

With widespread air conditioning of stores, theaters, and office buildings, the public became aware of the comfort it brought, and began demanding home units. The development in the early 1930's of FREON gas, a non-toxic, non-explosive refrigerant, made home air

conditioning feasible for the first time. But two world wars and a major depression stunted the growth of this new business, so it was not until 1946 that the industry began to come into its own. Its growth since then has been phenominal, practically doubling itself every year, until in 1954 some 43 manufacturers produced almost a million and a half home air conditioning units in 73 "name" brands. Yet only four per cent of U.S. homes are now equipped with units. No wonder then, that spokesmen for the industry consider residential air conditioning "the largest single potential market" for the air conditioning industry!

What Air Conditioning Does

Independent experiments show man is best off in a climate not too hot nor too humid; he's at his peak of efficiency in a temperature of about 70° with a humidity of about 30 per cent. With the thermometer on 100°, efficiency slumps 50 per cent.

The primary purpose of a home air conditioning system is to maintain as nearly as possible these ideal conditions, regardless of the outside air. But air conditioning does far more. A good year-around home unit will not only cool and dehumidify in the summer and heat in the winter, but filter out dirt, dust, pollen, and odors in all seasons and circulate conditioned air throughout the house. With the new filters, home air conditioners are a blessing to hay-fever sufferers in pollen-polluted parts of the country. In the Southwest, air conditioning adds moisture to the high dry air to make 115° livable in Phoenix. And just the reverse is true in oppressively humid areas like New York, where dry-type units condense moisture out of the air.

This conditioned air can be circulated at any speed desired. About 25 to 35 fpm is most satisfactory; velocities less than 15 fpm cause a feeling of air stagnation. Good ventilation calls for circulation of at least 30 cfm per person.

From this, one can appreciate what a variety of jobs an air conditioning unit might be expected to do. For example, the General Electric room air conditioner has the following five settings of the "Comfort Dial":

Cool. Room air only enters the unit, is filtered, cooled, dried, and returned to the room. Maximum cooling is obtained in this position, but since the same air is being reused, smoke and odors may accumulate to an objectionable extent.

Cool-vent. Room air plus some outside air are drawn into the unit, and this mixture of air is cooled, dried and filtered before being returned to the room. This is the position used for normal operation.

Vent. Room air and outside air are brought into the unit, filtered, and returned to the room. More outside air is introduced on this setting than on Cool-vent, and no cooling takes place. This position provides maximum ventilation.

Dry-air. Room air is cooled, filtered, dried and recirculated. Less room air is brought into the unit on this position than on others, but as a result greater dehumidification takes place.

Exhaust. Room air only enters the unit and is forced outside through the exhaust opening by the circulating fan. A portion of the air is recirculated into the room. This position is provided for exhausting stale air from the room, and no cooling takes place.

How Air Conditioning Works

Basically, an air conditioner takes in warm air, cools it, and discharges the cool air by means of a blower. The refrigerant responsible for this cooling in a home air conditioner is a volatile liquid called Freon. It is passed through the following cooling cycle:

First, the liquid Freon flows under pressure to the expansion valve. As it passes through this valve to the lower pressure in the air cooling coils, it evaporates, or changes into a vapor. Heat absorption is necessary to accomplish this change of state, and this heat comes from the air which is passing over the coils. This cools the air, which, of course, was the original object.

The Freon in the vapor state passes on to the compressor, which is the heart of any refrigeration system. The refrigerant is compressed, which raises its temperature so that heat can flow out of it into the air or water in the condenser. The combination of the high pressure produced by the compressor and the cooling effect of the water (or air) passing through the condenser causes the Freon to change to a liquid again, ready to repeat the cycle.

The air, meanwhile, has been chilled by contact with the coils, and also gives up some of the moisture present in it, since it can hold less water vapor at this low temperature. Thus the air is dehumidified at the same time it is cooled.

The air is then sent to the rooms directly, or through

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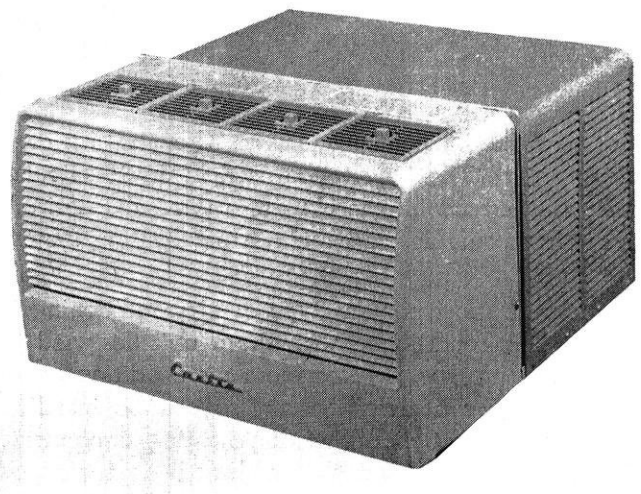

—Courtesy Curtis Mfg. Co.

Fig. 2.—A typical window-type room air conditioner. Louvered portion at rear extends outside the window; front half is in the room. Window units are presently the most popular type of room air conditioning system.

ducts, and released from outlets with directional fins so that it will circulate without drafts throughout the room. When it has picked up heat and humidity from the room it returns to the unit to be cooled and dehumidified once more.

Year-around units provide for heating the air in winter, as well as cooling it in summer. For winter operation, a damper is shifted. This turns off the refrigerating system and turns on the burner. The air, after being pulled through a filter (Figure 1), goes through the fan and is blown up to the heat interchanger at the upper left of the unit, where heat from fuel burning inside warms it to the proper temperature.

Types of Home Units

There are two basic types of air conditioning systems which might be used in the home, either the room air conditioner, or some form of central air conditioning unit. The type to be used in any particular home will depend on the climate, the results desired, the money available, and the existing heating system in the home.

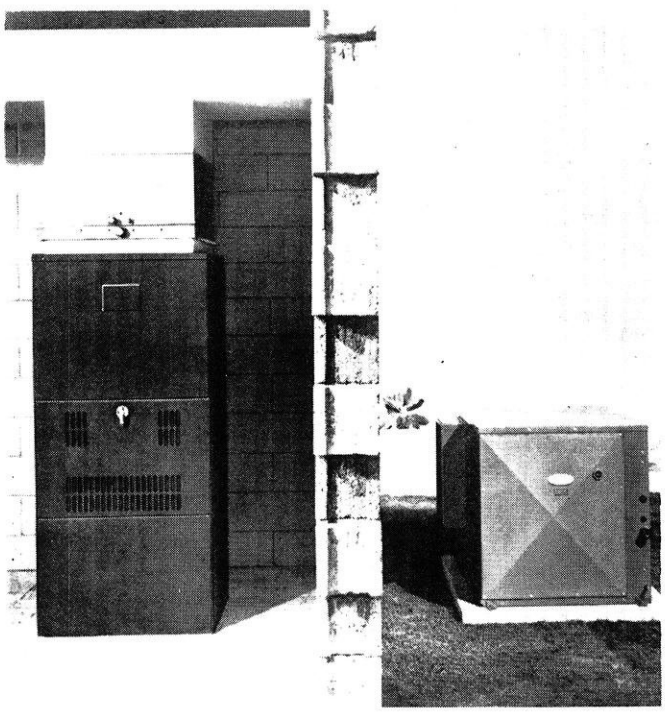

Fig. 3.—A furnace conversion unit, as shown atop the oil burner at left, permits economical conversion of forced air heating systems to complete year-round air conditioning.

By far the most popular type of air conditioning is the room air conditioner, which is a unit designed to handle a single room. Most room air conditioners do not provide for heating the air, so can be installed without consideration of existing heating equipment. All are designed for installation directly in the space to be conditioned, so ducts are not needed for air distribution. Therefore in houses using a heating system which does not have warm-air ducts, such as any form of wet heat, radiant heat, or electric heat, the ductless window units offer a definite economic advantage.

Individual room air conditioners also provide greater flexibility, making it possible to cool only the rooms which are being used, or to maintain different conditions in different rooms to suit individual tastes. Furthermore, where cost is a prime factor, partial cooling of the house with room units can be done at less cost than with a central system.

The room air conditioner might be either a window installation, or a console type of self-contained unit which sets on the floor, with an air duct connection to a window or wall opening.

The window type of unit (See Figure 2) has the largest sales of any equipment produced by the air conditioning industry. It is normally installed on the window sill, with part of the unit inside the window and part outside. They will normally fit any window from 26 or 27 inches wide and larger, and do not have to be removed in the wintertime. The normal installation has the unit about half in and half out the window, but the trend is towards pushing the unit farther and farther out the window. Customers, designers say, want cool comfort but they don't want a big box lunging at them, taking up valuable space.

The Carrier Corporation produces a model with a solid case design, which eliminates all vents and openings from the sides, top and bottom of the unit. All air enters or leaves the unit only through the front or the back. Therefore it can be mounted all the way outside or all the way inside the window, or at any point between them.

It can be installed flush with outside building line to meet certain metropolitan codes. The space underneath might be used for a bookcase, or the unit could be put in the top of the window. It might also be built-in over a closet or shower stall, which is especially popular in motels and for house trailers.

The most popular method of installation, of course, is to mount the front panel flush with the inside of the window. However, as air conditioners are designed to go further out the window, there is the problem of overall weight. This is where plastics come in. Units using reinforced plastic cases weigh as much as one-third less than those using metal cases. Besides, several leading manufacturers rate plastics ahead of even the best-insulated metal casings when it comes to softening the whir of a unit's inner works. Incidentally, noise is often at an objectionable level even in some of the better-designed units, since the unit is right in the same room with the occupants.

Despite the popularity of room air conditioners, most air-conditioning engineers believe that a central cooling system will do a more efficient job for an entire house. In new homes, the most practical method is a combined unit which cools and dehumidifies in summer and heats in winer. This then is the real air "conditioner", since conditioning air, in the true sense

of the word, means making it comfortable, which would obviously include heating it in the cooler seasons.

Usually all the components for heating, cooling, dehumidifying, filtering and circulating the air are contained in a single cabinet. (See Figure 1).

Units are available which heat with fuel oil or different types of gas, while the cooling portion might be either air or water cooled, with most of the larger units being water cooled. They can be installed either in the basement or in a small closet on the main floor level. In climates where heating is not a problem, or in homes with an existing heating system, self-contained units with no provision for heating are popular.

If you're one of the six and a half million people with forced warm air heat, the most practical air conditioning installation for you would probably be a furnace conversion unit. The conversion system is a compact cooling and dehumidifying unit which slips on top of the furnace, taking the place of the normal sheet metal box from which ducts are led off to the different rooms in the house. This is connected to the refrigerating package, which can be placed in an out-of-the-way location. (See Figure 3). Since the existing warm air distribution facilities are used for distributing the cooled air, the installation of these units is more economical than other systems.

Water Requirements

In selecting a central air conditioning unit, a very important factor to be considered is the water supply available. If it is adequate, a water cooled unit may be installed, often at a saving of three or four hundred dollars over a similar air cooled unit.

However, with the rapid increase in the number of air conditioning systems, water supply and drainage facilities in many areas are not adequate. Water cooled refrigeration is already limited by statute in some sections of the country.

One answer to this problem is the air cooled unit. Here a stream of outside air is sent over the condensing coil instead of water to absorb heat from the compressed refrigerant. The condensing unit can be mounted in the yard, breezeway, garage, attic, or other unobtrusive location.

However, an air cooled condenser for the larger sizes of air conditioning installations becomes rather bulky, and a water cooled unit is necessary. The Carrier Corporation has designed their 38C2 "Weathermaker" to operate effectively at substantially higher than normal condensing temperatures. This makes it possible to reduce the consumption of water from the city supply by about 50 per cent without the use of an external water saving device.

Cooling water can also be conserved by recirculating it instead of disposing of the warmed water down the drain. The condenser water might be circulated through a spray pond or a swimming pool, where evaporation from the surface will cool the water.

Even more efficient is a "cooling tower", a device that reduces water consumption to about five per cent of what it would otherwise be. It should be used in areas where water is very scarce or the cost is high enough to make the cooling tower investment pay off in a relatively short time.

Power Requirements

Another problem in the installation of air conditioning equipment is the electric power available. Much of the dissatisfaction with room coolers stems from inadequate wiring. Units will not deliver full cooling capacity unless they can draw full power. Moreover, poorly wired units cause sharp voltage fluctuations; lights flicker and TV is affected.

Difficulty often arises from the wide variation in electrical characteristics among different brands. Some have power factors as low as 60 per cent, and some may draw as much as 25 per cent more starting current than the same size unit of another make.

Central air conditioning systems can cause even greater electrical difficulties than room air conditioners. Usually wiring is not adequate to handle the additional load of an air conditioning system. The Arizona Public Service Company sees three-phase installations as the most desirable solution, even though it means extending three-phase distribution to residential districts. Distribution engineers, however, say that regardless of the air conditioning load, it is a matter of good distribution economics to extend three-phase primary laterals well into residential districts, since with only one more primary wire twice the load of a single-phase primary can be carried. Moreover, voltage regulation is better and it is easier to balance load on the three phases on feeders and substations. For these reasons, this company decided on a three-phase 120/240 v delta system.

Customers, as well as the electric company, are in favor of the three-phase system, since equipment and maintenance costs are lower than for single-phase systems.

A different approach to the electrical problem was recently introduced by the Ultrasonic Corporation, which claims a full two tons of cooling from a one hp compressor motor in their new "Temtron" air conditioners. Since the compressor's electrical demand determines operating costs, the current used by this unit will be 30 to 50 per cent less than that of the usual two hp motor that powers other two-ton coolers. Total electrical imput of the Temtron will be less than two kw, instead of the three to four kw for most air cooled units, thus simplifying wiring problems. It operates on the usual 240 v three-wire AC current.

The doubled-capacity of the Temtron is based on a still secret arrangement of the evaporative condenser

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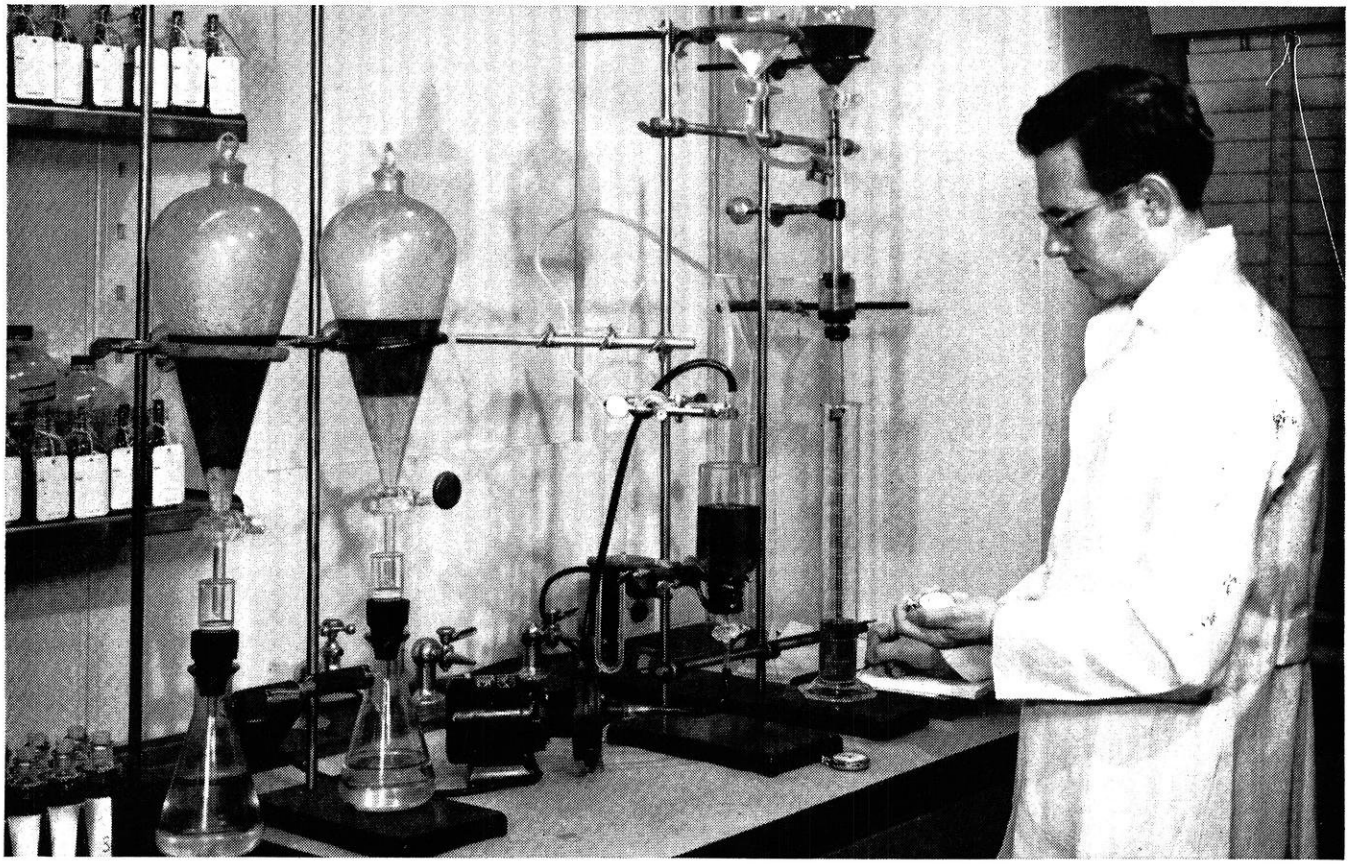

To help develop STA-CLEAN for STANDARD Furnace Oil, the testing apparatus shown here was constructed. Running an experiment on the improved oil is Dr. Jack A. Williams, a chemist at Standard Oil's Whiting laboratories.

HOW TO SOLVE A BURNING PROBLEM!

Scientists in Standard Oil laboratories work with the stimulating knowledge that practical and valuable results will be obtained from their discoveries. A recent achievement of Standard Oil scientists is now benefiting hundreds of thousands of STANDARD Furnace Oil users throughout the Midwest.

In 1952 our research people undertook the problem of finding a method to eliminate oil burner failure or inefficiency arising from clogged filters and burner nozzles.

After months of painstaking laboratory work and many more months of thorough field testing throughout an entire heating season, Standard Oil scientists perfected a new, efficient additive—STA-CLEAN. Blended into our furnace oil, the new additive acts as a detergent, sludge inhibitor and rust stopper—all in one. STA-CLEAN assures clean oil filters and nozzles—a dramatic contribution to efficient and economical heating.

The development of this remarkable new additive is further proof of the progress possible when scientists are given time and equipment to explore and develop thoroughly their ideas. Young scientists find such an atmosphere inspiring.

Standard Oil Company

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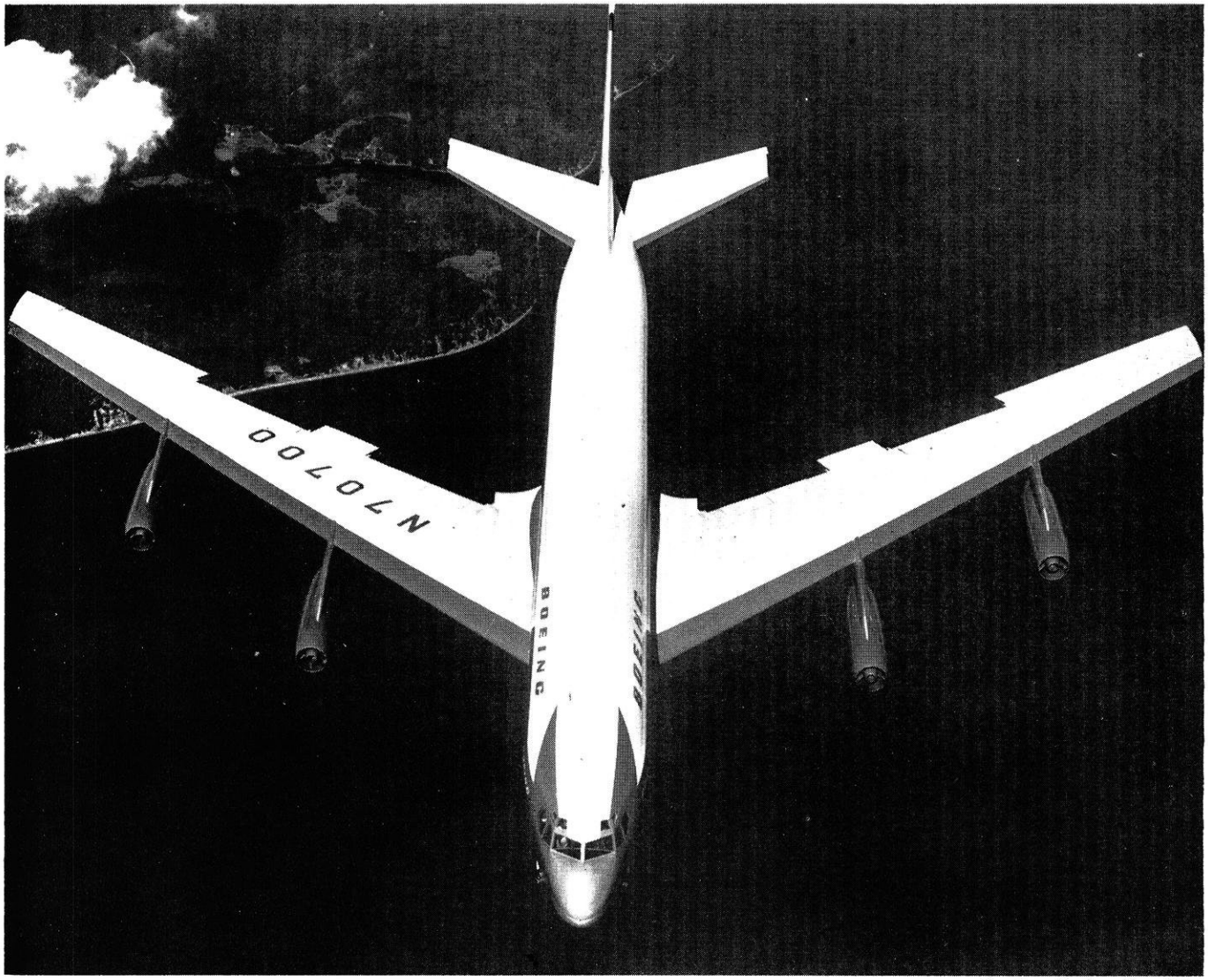

—Courtesy Boeing Aircraft

Tomorrow's Transportation

BOEING AIRCRAFT'S FOUR JET COMBINATION TANKER-TRANSPORT, IS AMERICA'S FIRST BID IN THE COMMERCIAL JET FIELD

by John G. Bollinger, me'57

The development of jet aircraft has, in the not too distant past, been focused on fast, light, fighter type planes. Squadrons of jet fighters and other relatively small jet propelled aircraft are no longer an unusual sight in our skies. The power and speed of the jet engine have placed in the creative minds of engineers, dreams of a new medium of transportation. On August 30, 1952, the Boeing Airplane Company of Renton, Washington, pioneers in the development of light and heavy jet bombers, announced that it was engaged in a prototype jet transport project. The Boeing 707, as it is now called, was to be America's first large jet transport. This marked the first step in our country toward competing with the already well established British Comet, a heavy high speed jet airplane.

The Boeing 707 is described as a tanker-transport of the swept-back wing design. At present, being essentially a military model, it is equipped with large cargo doors, equipment tie-downs, and provisions for aerial refueling maneuvers. It has a total length of 128′ with a 130′ wing span and stands 38′ 3″ high at the tail. The finished ship weighs 190,000 pounds and is powered by four Pratt and Whitney Aircraft JT–3 turbo-jet engines, each rated at 10,000 pound thrust. The four turbo-jets are capable of producing in the neighborhood of 75,000 horse power and are mounted in sus-

pended streamlined pods beneath the wing, characteristic of Boeing's latest jet aircraft.

"Tex" Johnston, Boeing chief of flight test, and R. L. "Dix" Loesch, senior experimental test pilot, were announced as pilot and co-pilot for the first flight scheduled on July 15, 1954. The plan is designed to carry a crew of three, pilot, co-pilot, and flight engineer, plus positions for three flight test engineers to operate special recording equipment. The first flight was essentially a preliminary evaluation of the plane's flight characteristics. The take-off was a joyous moment for those who were responsible for the ship's development. The plane was airborn in seventeen seconds and was 2100 ft. along the ground after its brakes were released. On this first flight a speed of 335 mph was reached at an altitude of 10,000 to 18,000 feet. In later trials cruising speeds ranged in the vicinity of 550 mph, flying at altitudes from 30,000 to 42,000 feet. Experimental tests included checking characteristics of roll, pitch, and yaw. "Tex", the pilot, reported, "Stable in all three axes." The experimental model is loaded with 3400 pounds of test equipment of all descriptions, located forward of the passenger deck. A new four-wheel landing gear has been adopted in place of the conventional dual truck, although the dual wheel arrangement is still incorporated in the nose gear. The tricycle arranged landing gears are all designed to fold up into the belly of the plane rather than having the second two fold into the wing. This improvement did away with the weight of extra wing supports commonly used on other models.

The Boeing 707 is a dual purpose aircraft adaptable to commercial airlines as well as military use. As a member of the armed forces, the new plane will be called Strato-tanker and as a civilian it will be known as the Strato-liner. Provisions for available equipment were decided upon by the comments of airline and Air Force officials as to what they felt a plane of this type should include. Among the equipment which will be available is airborne radar, aerial refueling equipment, cargo hoists, de-icing system, and for individual airlines, a choice of possible passenger seating arrangements. The production line version of the 707 is estimated between 3 and 4 million dollars. The military services can acquire, through the use of the new Strato-tanker, faster and longer non-stop transportation of troops and equipment, as well as long range refueling operations. Last August, the Air Force announced a "limited number" of Strato-tankers will be purchased.

The new plane as a commercial airliner will be capable of non-stop trans-continental flights in less than five hours. A business man will leave New York in mid-morning and, allowing for changes in time, be in San Francisco for lunch; considering non-stop oceanic flights, the trip from New York to London would be less than seven hours. An ardent play-goer might leave London after tea and arrive in New York in time to enjoy a first nighter on Broadway—for a nominal fee, of course. Another factor in favor of jet aircraft for commercial use is the better passenger conditions. The annoying vibrations of the present reciprocating engines are done away with—there is only an apparent whine of the jet engine.

In coordination with Boeing's development of the new jet transport, United Air Lines has embarked on an investigation of the use of the 707 jet for commercial transportation. Their "Paper Jet" program as it is known, is designed primarily to predetermine possible flying times, passenger facilities, cargo capacities, and operational costs of a line of new jet airships. United has been especially impressed with the 707's low seat-mile or ton-mile cost which is more than competitive with today's aircraft. The high initial cost of the 707 is the one most limiting feature; nevertheless, with new designs and better materials, plus higher speeds at higher altitudes, the life of the aircraft will be considerably longer and maintenance reasonably less than one of today's commercial planes.

The new project represents a private initial investment by the Boeing Airplane Company of 15,000,000 dollars. They have estimated that the additional cost of tooling and production facilities mount between 50 and 60 million. Considering other expenses the total investment in the production of the prototype will probably reach the 100,000,000 dollar mark. The project began more than two years ago on an artist's easel before the Board of Directors of the Boeing Company. William M. Allen, president of the company, is the man responsible for Boeing's entry into the jet transport field. His enthusiasm in the project, and the substantial evidence that there is a demand for such a plane, convinced the executive board to create the necessary funds to go ahead with the proposal. A small staff was assigned to the new project, and three hun-

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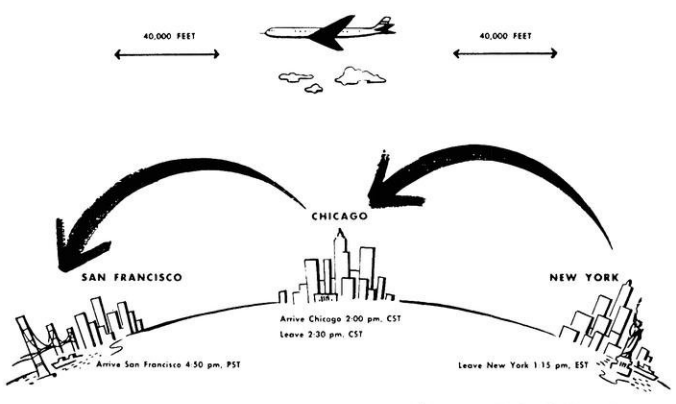
COAST-TO-COAST PAPER JET



—Courtesy United Air Lines

Paper Jet Speeds: Clock times are given in this depiction of United Air Lines' westbound Paper Jet flight. Passengers leave New York at 1:15 p.m., EST, arrive Chicago at 2:00 p.m., CST, and arrive in San Francisco at 4:15 p.m., PST. Elapsed westbound time of 6 hours, 35 minutes, is bettered by eastbound Paper Jets which span the nation in 5 hours, 45 minutes.

SMOKELESS SMOKE

THIN RODS SET IN AN EXHAUST STACK ACT AS CATALYSTS TO REMOVE TROUBLESOME IMPURITIES

by Jacques H. Houdry

There is a new technique in engineering that promises to remove something old and troublesome from the air.

The something old in the air is pollution—tons and tons of contaminating particles, vapors and gases that for years have been pouring from our industrial plants, our power stations, our railroads, our incinerators, and above all our automobiles—noxious elements that threaten public health and impair the cleanliness of cities and industrial centers. This cumulative contamination of the air we breathe has been high-lighted recently in charges made by Los Angeles scientists that hydrocarbon contaminants in the atmosphere may be responsible for the marked increase of lung cancer in heavily polluted areas.

The new technique—very definitely an engineering approach to the problem—is a family of oxidizing catalysts developed by Eugene J. Houdry, pioneer almost twenty years ago in the catalytic cracking of petroleum.

To assign so sweeping a role to any one method of pollution control might seem presumptuous. But various types of oxidizing catalysts perfected by Mr. Houdry or now in development have indicated that they can burn at the source any gaseous or fine particulate matter that is combustible.

One type of oxidizing catalyst, called the Oxycat, is already offering a positive and economical solution to industrial plant pollution problems. The catalytic agent of this Oxycat is a platinum and alumina alloy that is coated onto a surface of porcelain rods.

After two years of study in various industrial installations the Oxycat has shown that it can:

1. Remove odors and visible smoke resulting from hydrocarbon exhausts—and also eliminate carbon monoxide.
2. In many cases generate usable heat in the process—enough to cut the plant fuel bill of one user by 90%—enough to return $27,500 yearly on a $25,000 investment for another company.
3. Turn waste gases into usable power—in one case to run a gas turbine.
4. Indirectly improve production processes and products in some applications and
5. Increase safety and reduce fire hazard in others.

In a typical case, that of the Radio Corporation of America plant in Camden, N. J., the Oxycat ended a localized but intense inplant pollution problem.

Plagued by an irritating wax smoke that blew into its office building from a nearby exhaust stack, RCA installed a bed of Oxycats to oxidize the smoke at its source—a burn-off oven in the company's powdered metals division.

In making powdered metal parts, RCA uses a wax binder to hold the parts together before final pressing. But after pressure molding and before the parts can be sintered, the wax binder must be driven off.

In doing this in a burn-off oven, RCA had been driving out to the air a mixture of wax particles and vapor —a smoke with an odor of burnt cork—very annoying to breathe.

The company first considered various methods of eliminating the wax smoke. The exhaust could be collected, condensed, filtered or burned. It was decided that some method of burning would give the most positive results with a minimum of maintenance and operating headaches.

Burning, in the ordinary sense of direct ignition of the fumes, would have been costly. A large volume of fume-air mixture (1400 cubic feet per minute) would have to be brought up to an ignition temperature of 2000 degrees or more. This in turn would require a high fuel consumption, a large combustion chamber and elaborate insulation and stack construction to withstand high temperatures.

RCA turned to catalytic oxidation—a method for burning the wax smoke at temperatures well below the normal ignition point. The company installed a bed of 204 Oxycats above its burn-off oven.

Each Oxycat unit is a cage-like structure of 73 porcelain rods held together by two square porcelain endplates and a porcelain spacer bar. The surfaces of these rods—tear-drop shaped to minimize back pressure—are coated with the catalytic agent—platinum and alumina alloy.

The Oxycats are stacked side-by-side and one on top of the other on a simple grate in the exhaust stack of the oven. The waste gases flow across the Oxycat rods. At the coated surfaces of these rods a catalytic reaction takes place, oxidizing the exhaust to a harmless effluent of carbon dioxide and water vapor.

(The catalytic agent of the Oxycat here acts to stimulate the oxidation reaction, to permit oxidation at temperatures far below the normal ignition point of the combustibles. Contrary to classical theory on catalysis which holds that the catalyst takes no active part in a reaction, Mr. Houdry has found strong evidence to corroborate the theory that a catalyst definitely does

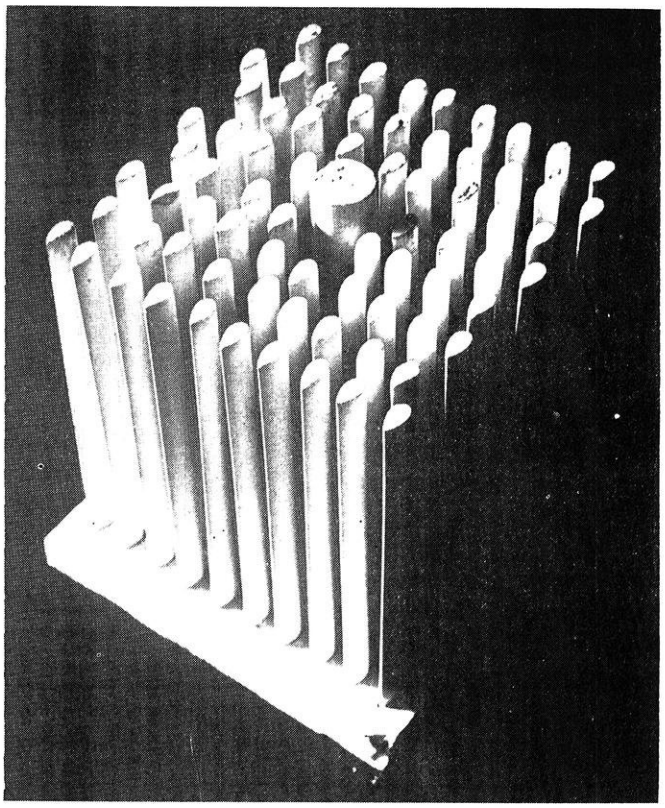
take part in a reaction, repeatedly entering and leaving, later returning to its original state when the reaction is completed.)

The oxidizing temperature of the Oxycat is about 500 degrees F. Since the wax fumes leave the burn-off oven at about 300 degrees, RCA installed a preheat burner to raise temperature to the desired point. The catalyst in oxidizing the preheated fumes raises exhaust temperatures another 50–100 degrees—a relatively small increase in this case due to the low concentration of the contaminants. Operation to date has shown complete elimination of the wax smoke.

The catalyst also eliminated explosive pockets of fumes that previously had a tendency to collect above the oven. At the same time the slow build-up of wax deposits in the oven stack was stopped. This build-up would obstruct air movement through the oven, gradually changing oven conditions. Now RCA can more easily obtain uniform operating conditions and maintain consistently high quality production.

RCA has mounted both the preheat chamber and catalyst housing above the burn-off oven on a steel platform nine feet above the floor. The compact installation minimizes the travel distance of the wax fumes and prevents the accumulation of wax in the ductwork.

The catalyst units sit one foot deep in an insulated chamber 42 inches square. An additional 18 inches of depth provides inspection area. The insulated combustion chamber is 90 inches long, 42 inches wide, and 42 inches deep.



Cross-section of an individual Oxycat unit showing arrangement of teardrop shaped rods on which .003 inch layer of catalytic agent is coated.

Profitable Heat Recovery

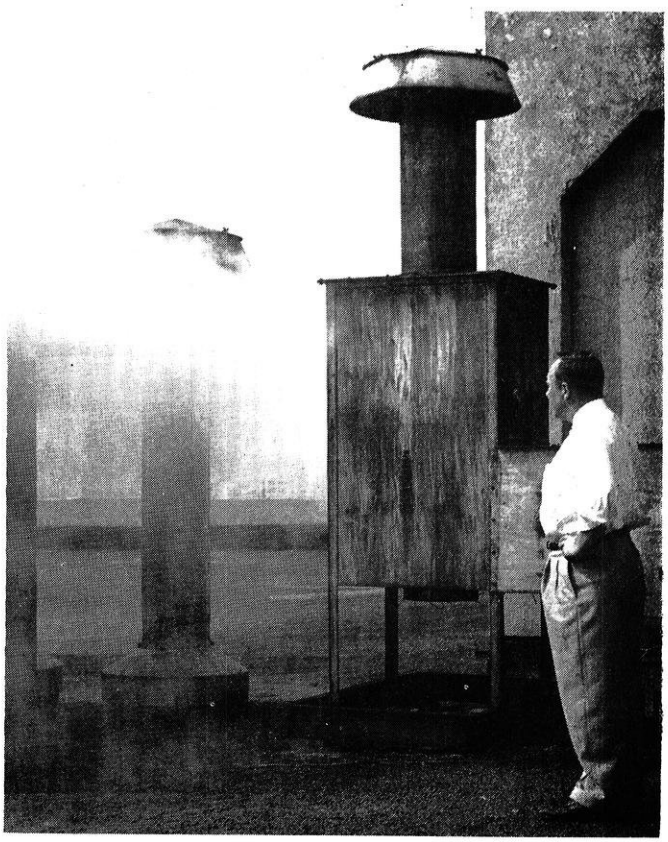
A good example of pollution control that really pays is the Oxycat installation at the enameling plant of Enamelstrip Corp., Allentown, Pa. Installed more than two years ago—in fact the very first installation by Oxy-Catalyst, Inc.—a total of 1200 Oxycats have curbed a serious community problem for Enamelstrip and in the bargain have generated enough usable heat energy to cut plant fuel bills by 90 percent.

Enamelstrip runs four metal coating lines—processes in which enamel and lacquer coatings are tolled onto continuous metal coil, then baked dry in an oven. These ovens had been driving off as many as 30 drums of xylene and toluol solvents a day into the neighboring community. The company's public relations problem with the neighbors, needless to say, was an acute one.

Typical catalyst operation at Enamelstrip can best be described in one of the company's two largest coating lines. Each can coat up to 50 tons of stock a day and exhausts 6800 cubic feet per minute of air-solvent mixture. Temperatures range from 300 to 600 degrees.

Because the oven exhaust is sometimes below 500 degrees (the oxidizing temperature of the Oxycat) a preheat burner has been installed to raise stream tem-

(Continued on next page)



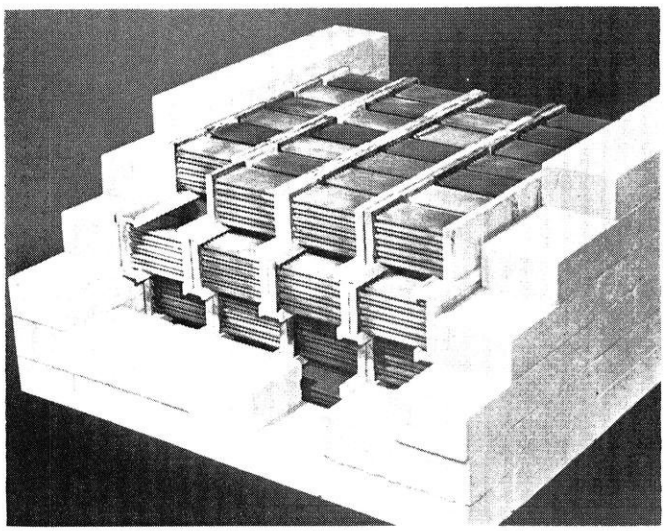
Performance test of bed of Oxycats (in stack at right) in exhaust from coffee roasting ovens. Stack at left is emitting cloud of dirty steam containing hydrocarbons coffee dust.

perature at the start of a production run if necessary. The hot solvent fumes next strike the catalyst bed (814 Oxycats in this case) and are immediately oxidized to a harmless vapor.

Stack temperatures above the catalyst then rise to as high as 1400 degrees F. The preheat burner is automatically shut off since there are enough combustibles in the gases to make the catalyst bed self-sustaining. The main gas burners are also shut off since Enamelstrip can then recirculate catalyst heat to run its ovens.

The plant has enough heat left over to supply other processes and when steam coils are installed over the catalyst bed will have enough energy for general plant heating needs. Even then the company will be throwing most of its catalyst heat away.

Enamelstrip gets another cost-saving bonus in the form of increased production. The company had been operating its ovens to the full capacity of the burners. With unlimited catalyst heat it has now doubled coating speeds and plans to double them again.



Model of bed of catalyst units, comparing size with standard masonry bricks.

Power Generation, Too

Pollution control was not the problem when the Sun Oil Company installed $25,000 worth of catalysts to consume waste cat cracker gases. The objective was heat recovery and power generation.

Sun uses a different Houdry catalyst—in pellet form—to crack crude oil into high-octane gasoline at its Marcus Hook, Pa. refinery. During each cracking cycle the catalyst pellets become coated with tarry hydrocarbons.

In regenerating the catalyst (burning these hydrocarbons off with hot air) a large volume of waste gases (carbon monoxide and hydrocarbons) is generated. Sun now runs these gases through a catalytic bed and thereby generates 7,500,000 Btu per hour of usable energy.

Most of this heat is picked up in molten salt pickup tubes in the catalyst chamber and is used to generate process steam. The remainder of the energy in the gases is fed to a gas turbine that powers a turbo-compressor.

With the Oxycat installation complete on only one-half of this particular cracking plant, Sun was recovering $27,500 worth of previously wasted energy a year.

When installation is completed on this unit, annual savings should jump to $80,000.

Refinery-wide savings when all Sun crackers are catalyst-equipped are expected to reach $500,000 a year. And should the Oxycat be applied to all cracking plants throughout the country, the potential recovery of waste heat energy would be the equivalent of 10,000,000 barrels of fuel oil a year.

Coffee Odors, Engine Smells

Still another use for the Oxycat is the removal of coffee odors. An installation on the roof-top of the coffee-roasting plant of Eppens, Smith Co., New York has shown that the Oxycat can completely end the odor problem.

This catalyst has also shown that it can reform smokey incinerators, completely removing visible smoke, odors and organic particles.

A major use for the Houdry catalyst—in fact its first use—is in a catalytic muffler for control of industrial truck exhausts.

A typical user, Land o' Lakes Creameries, Inc. reports that it uses four such units to permit mechanization of handling operations in its basement storage area—a confined, unventilated room 90 by 120 feet with a nine-foot ceiling.

When Land o' Lakes first tried to run a gas-powered truck in this area the fumes proved too much for the operator. The company now operates four catalyst-equipped trucks in the same area with no harmful effects. As in industrial installations, the catalytic muffler burns the noxious fumes to harmless carbon dioxide and water vapor.

This first type of catalytic exhaust was applicable only to engines running on unleaded gasoline or on LP gas. A modification of this muffler has been developed for 4-cycle diesel engines and is now being adapted to 2-cycle diesels. Mr. Houdry has also developed a catalytic exhaust for leaded gasoline—for automobile use—but this unit uses an entirely different type of catalyst.

A Versatile Instrument

The basic chemistry of the Oxycat indicates a wide range of uses. The Oxycat will burn just about any vapor or gas that can be oxidized, and do it at temperatures that are lower and hence less costly than direct flame incineration.

In actual practice, the Oxycat seems to do its best job on fumes that can be oxidized to either CO_2 or H_2O or both. That includes the entire family of hydro-

(Continued on page 42)

FUN WITH RECIPROCALS

(OR PUTTING ONE OVER)

by Paul J. Grogan

This Article Is an Excerpt from the Paper *Lay That Slide Rule Down*

Often a problem solution will result in the reciprocal of a certain number. In mathematics as a science it is common to leave the expression in that form, which is of course the exact answer. In engineering work, however, the decimal fraction form of answer is generally to be preferred despite the loss of an exact solution when conventional three or four significant figures of the answer are shown.

The decimal equivalent of all integer fractions fall into two rather obvious classes. They are either exact decimal fractions, which may be expressed in a finite number of places, or they are never-ending decimals. It may not be so obvious, however, that the never-ending decimals invariably settle down to the endless repetition of a certain sequence of one or more integars.

Some examples of exact demical fractions are

$$1/16 = 0.0625.$$
$$1/125 = 0.008.$$
$$1/4{,}096 = 0.000244140625.$$

The exact decimal fractions are relatively uncommon, stemming from just those denominators which contain no prime factors other than two and five. There are but 40 such exact decimal equivalents of the reciprocals for all integers up to and including 4,096, the last example cited above.

Putting one "over" one under.

Some never-ending decimals which repeat the same integer after one or more places are:

$$1/3 = 0.3333333333\ldots$$
$$1/45 = 0.0222222222\ldots$$
$$1/576 = 0.0017361111\ldots$$

These decimal fractions appear only if the integer three is one of the prime factors of the denominator; although the mere presence of three as one of the prime factors does not assure a constantly repeating single integer as in the examples mentioned here.

Another form of never-ending decimal fraction repeats a certain small group of integers.

$$1/11 = 0.09\ 09\ 09\ 09\ \ldots\ \ldots\ \ldots$$
$$3/22 = 0.136\ 36\ 36\ 36\ \ldots\ \ldots\ \ldots$$
$$1/55 = 0.018\ 18\ 18\ 18\ \ldots\ \ldots\ \ldots$$

Nevertheless, the decimal fractions which repeat a somewhat length sequence of integers over and over again are more interesting. We have reference to decimal fractions of the form:

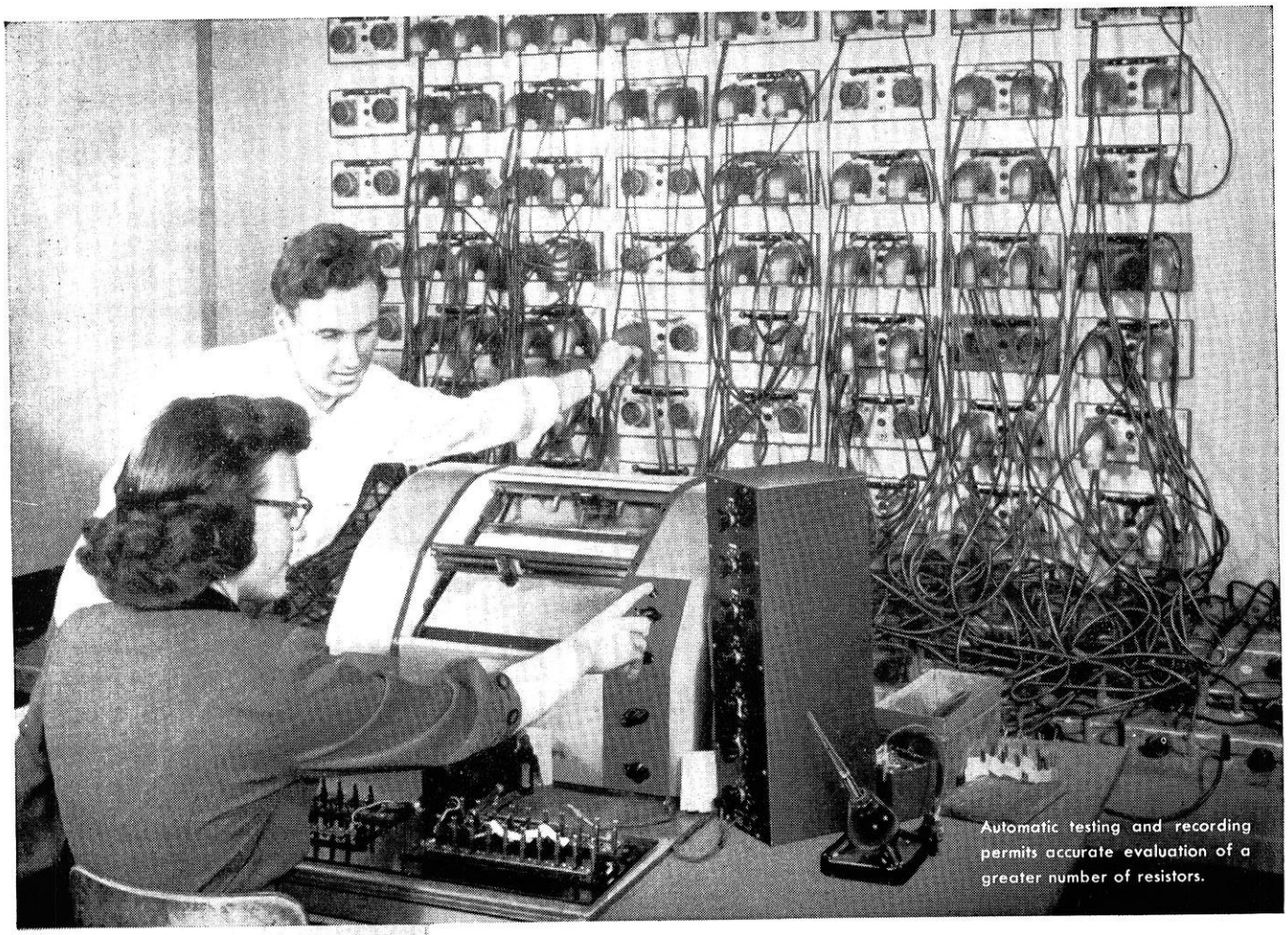
$$1/7 = 0.142857\ 142857\ 142857\ \ldots\ldots\ \ldots\ldots$$
$$1/13 = 0.076923\ 076923\ 076923\ \ldots\ldots\ \ldots\ldots$$

These decimal fractions are particularly unusual. They appear as the reciprocal of a prime number. The preceding statement may be challenged as not applying to the instances of 2, 3, 5, and 11, but it has been found to be true for every other instance investigated by the writer.

Another property exhibited by these repeating decimals is that the fraction begins to repeat itself in the nth place in the example of $1/n$, providing n is a prime number other than the four exceptions noted above. The decimal fraction of 1/13 repeats itself in the thirteenth place, the "double frequency" notwithstanding. Similarly, the decimal fractions representing 1/17 and 1/19 repeat themselves in the seventeenth and nineteenth places, respectively.

The interval of the cycle always involves an even number of decimal places. This would appear to be a condition imposed by meeting the requirement of beginning to repeat in the nth place, where n must necessarily be odd if it is to be a prime number other than two.

(Continued on page 50)



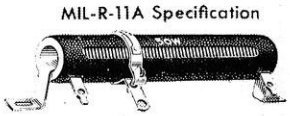
Automatic testing and recording permits accurate evaluation of a greater number of resistors.

BASIC REQUIREMENTS

JAN and MIL Specifications are basic guideposts for electronic advancement, whether used as engineering reference points or as procurement standards. IRC's dual emphasis on mass production and exacting testing assures highest performance standards at lowest possible cost.

SPECIFIC EXAMPLES

Type BT Insulated Composition Resistors
MIL-R-11A Specification



IRC Power Wire Wound Resistors
MIL-R-26B Specification

Type BW Low Wattage Wire Wounds
JAN-R-184 Specification

Sealed Precision Voltmeter Multipliers
JAN-R-29 Specification

ONLY IRC MAKES SO MANY JAN AND MIL TYPE RESISTORS

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56 different IRC resistors is today's figure—all equivalent to JAN or MIL specifications. Manufacturers of military equipment who must meet these specifications depend on IRC for all their resistor requirements. Offering the widest line of resistors in the industry—138 different types in all—IRC is the logical source of JAN and MIL type units.

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Wherever the Circuit Says

INTERNATIONAL RESISTANCE CO.

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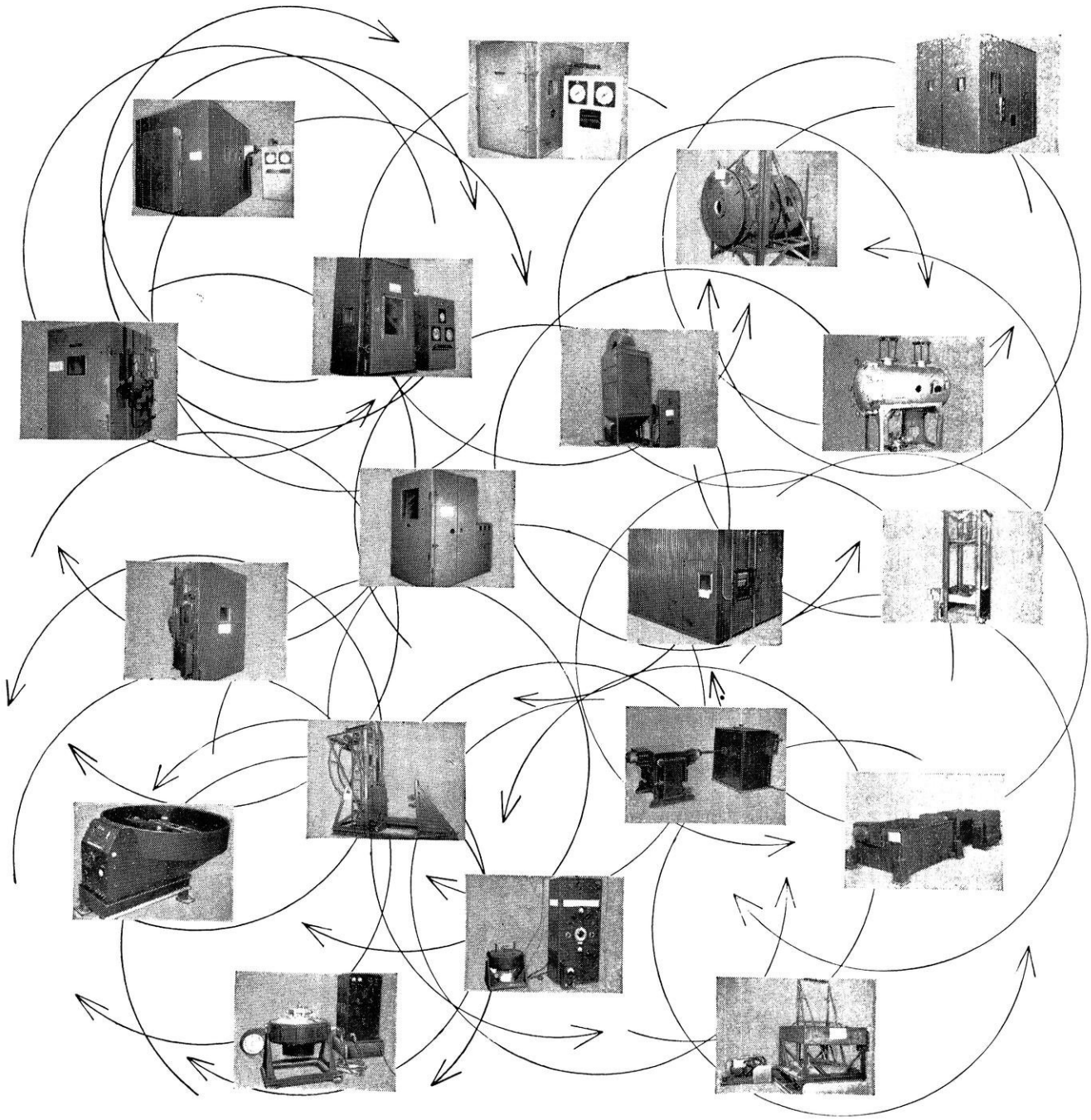


19 chambers of hell

You are looking at the units of a $2,000,000 Martin testing laboratory—part of a man-made hell of fire and water, shock and vibration, explosion and corrosion, designed to torture *electronics equipment!*

For these vital components of today's aircraft, guided missiles and weapons systems must carry tremendous responsibilities. Consider, for example, the electronic system of the Martin B-61 Matador:

Incredibly versatile, it comprises the entire brain and nervous system of America's first successful pilotless bomber. Yet this sensitive equipment must withstand the shock of many tons of thrust in the first second of take-off—violent changes in temperature and pressure—and ground conditions ranging from sand storms to arctic blizzards, desert dryness to tropical downpour.

Today, Martin's facilities are among the finest in the world for design, production and proving in the field of avionics...one of the major developments of Martin Systems Engineering which is now tailoring airpower to previously impossible requirements.

You will hear more about Martin!

MARTIN

BALTIMORE · MARYLAND

Atomic Energy

(Continued from page 15)

Conditions have changed considerably in that span of years regarding the atom. While nine years ago the act was passed for security reasons and not to retard development, today it hampers research operations. The government itself has recognized that industrial giants are essential in carrying on basic research. Such financial enterprises are the only groups which have both the ability and capital to take the risks involved in the development of such revolutionary devices as the atomic reactor for power uses. Yet it is foolhardy for them to engage in such a program if they are not certain that they will have control of their own course of events. Without patent rights competitors could make use of their developments without spending a cent for research or rights. It is obvious that large investments are very risky ventures under such circumstances.

Industry has been willing to go along with this governmental control up until recently. They realized the security risks involved, and respected their patriotic obligations. Also, the research was mainly of a pure nature. Now, however, there is more and more applied research which will lead to commercial products and industrial competition. Because of this competition, investment security is more important. The corporations have cooperated because they felt that it was a period of learning and discovery when central control was desirable. Now they believe that the time has come for the ties to be broken and individual initiative encouraged.

While the new law makes some ownership possible, it still does not allow patent rights or ownership of fissionable materials.

Even though all special nuclear materials remain the property of the United States, the Act does provide a greater promise for more widespread availability of this material to private persons. Eliminated is the requirement of the 1946 Act that no private person may receive an amount of material sufficient to construct an atomic weapon. Furthermore, there is express provision in the new Act for a determination by the President at least once each year of amounts of special nuclear material that may be distributed by the AEC.

The requirement for security clearance of licensees is extremely important. The new Act provides that prospective licensees for facilities must agree in writing not to permit any individual to have access to restricted data until that person receives AEC security clearance. Thus the personnel-clearance system of the AEC will extend beyond employees of the Government and of Government contractors to employees of AEC licensees even though those licensees will be operating privately owned facilities.

What use industry makes of the new law cannot be predicted. At best, atomic power generation as an economic feasibility is still about ten years away.

END

Jet Transport

(Continued from page 23)

—Courtesy Boeing Airplane Company

While under construction, the first of Boeing's new 707 jet transports was surrounded by a three-story scaffolding; 1,000 men and women collaborated in the construction of the new aircraft.

dred engineers were set aside in a special section to begin the development.

The new plane progressed from the paper design state to the wind tunnel where, after being scaled to one half of one percent the size of the actual airplane, the carefully constructed models are flown. In Boeing's wind tunnel, capable of speeds greater than the speed of sound, engineers tested various contours, wing designs and general flow characteristics. With the aid of accurate instruments, characteristics of lift, drag, thrust and side loads produced by the model in any desired position were carefully measured. The wind tunnel tests for the new 707 amounted to less than one fifth the number of hours required by its jet ancestors, the B52 and B47.

Following the wind tunnel developments, woodworkers, aircraft electricians and aircraft plumbers were brought together to construct a wooden mockup of the 707. At this point in the development many minor changes in the original blueprints were made, all leading to a better aircraft. The new ship is so well balanced that there is no need for heavy hydraulic booster equipment for flight control. The new ship is flown comfortably with one hand. In addition to the ease in handling, the simplicity of manual control allows fewer instruments and more reliable operation. To illustrate the improved simplicity: within the cockpit alone there are 75 instruments rather than the 126 instruments on the control panel of a piston airplane, 17 levers as compared to 50, 45 switches instead of 204, and only 42 warning lights versus 114 on conventional aircraft.

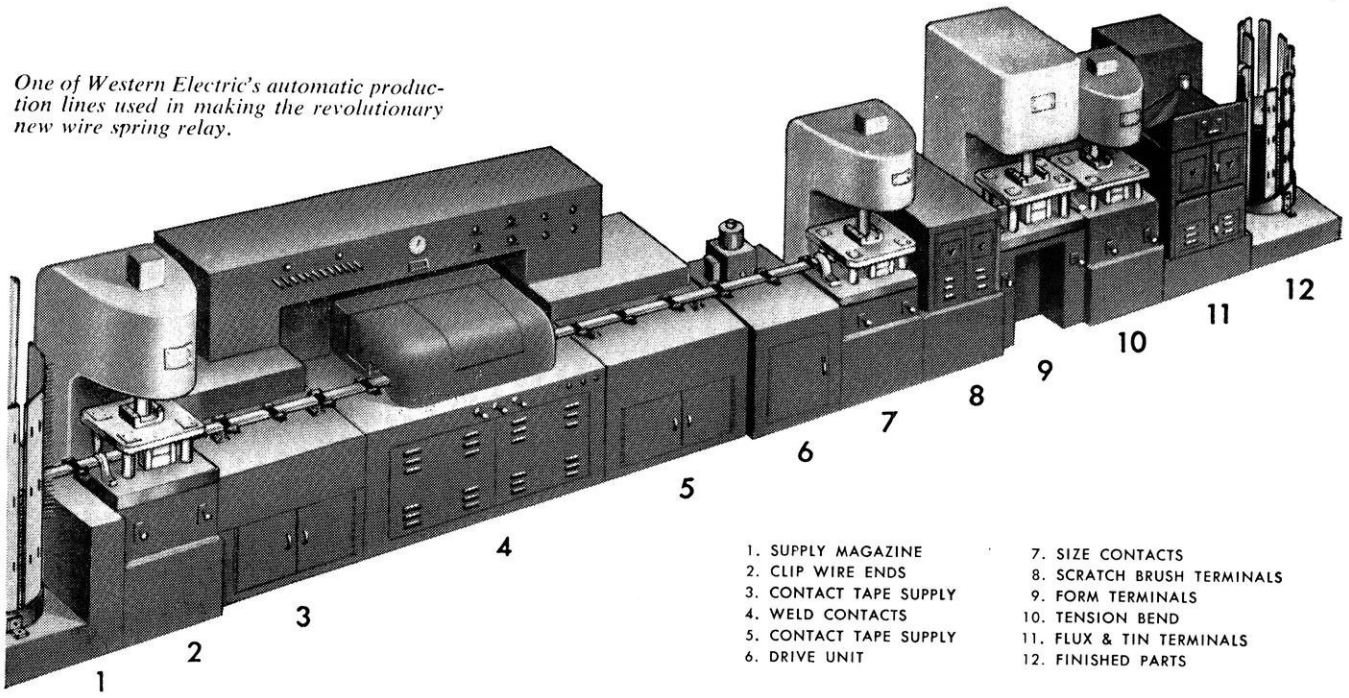
The Boeing 707 is truly a great step toward the ultimate in aerial transportation. Boeing engineers have combined simplicity, beauty and speed to develop an entirely new airplane, designed around a powerful turbo-jet engine.

END

AUTOMATION at work

How a revolutionary new design was translated into a production reality

One of Western Electric's automatic production lines used in making the revolutionary new wire spring relay.



1. SUPPLY MAGAZINE
2. CLIP WIRE ENDS
3. CONTACT TAPE SUPPLY
4. WELD CONTACTS
5. CONTACT TAPE SUPPLY
6. DRIVE UNIT
7. SIZE CONTACTS
8. SCRATCH BRUSH TERMINALS
9. FORM TERMINALS
10. TENSION BEND
11. FLUX & TIN TERMINALS
12. FINISHED PARTS

So great was the departure in design of the new Bell System wire spring relay as compared with conventional relays that it posed a major undertaking for development engineers at Western Electric, the manufacturing and supply unit of the Bell System. Indeed, it was an undertaking that called for new machines and new methods because none was available to do the job.

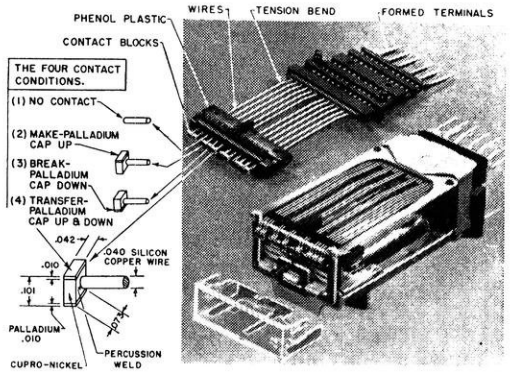
Longer life, higher operating speed, lower power consumption, and lower manufacturing cost were some of the advantages promised by the new relay design. Engineers reasoned that a lower manufacturing cost could be achieved through greater precision in manufacture (which would cut adjustments) and through extensive use of automatic processes.

One of the products of this reasoning is pictured at the top of this page. This battery of equipment, developed by Western Electric product engineers, constitutes one phase of wire spring relay manufacture, which automatically performs several separate operations. Its function begins after one of the fundamental elements of the new relay has been fabricated. This element, known as a "comb," consists of a multiplicity of small diameter wires in parallel array imbedded for part of their length in molded phenol plastic.

These molded elements, of which there are two types used in the new relay, are delivered to this line of machine units in magazines. By fully automatic means they are removed from the magazine, carried by a reciprocating conveyor through each of the several processes and, when completed, placed into another magazine to await further assembly.

Between the first and final magazine the automatic battery of equipment does the following operations: clips wire ends, attaches palladium contacts to wire ends by means of percussion welding, sizes contacts, forms terminal, tension bends wires, fluxes and tins terminals.

Most remarkable of all is the fact that this is a *precision* operation throughout. For example, the small block contacts, which are percussion welded to the tips of wires of one type of "comb," must be located on the same plane across the twelve contact positions to within a tolerance of ± .002″.



Single Wire Comb with Percussion Welded Contacts, Wire Spring Relay Designed by Bell Telephone Laboratories

One type of "comb" element is shown at top while a completed wire spring relay is below. The small blocks of metal on the ends of the wires are cut from a composite tape during the automatic multiple percussion welding operation. "Contact conditions" are determined by the code of relay being manufactured and may vary greatly.

Western Electric

MANUFACTURING AND SUPPLY UNIT OF THE BELL SYSTEM

Manufacturing plants in Chicago, Ill.; Kearny, N. J.; Baltimore, Md.; Indianapolis, Ind.; Allentown and Laureldale, Pa.; Burlington, Greensboro and Winston-Salem, N. C.; Buffalo, N. Y.; Haverhill and Lawrence, Mass.; Lincoln, Neb.; St. Paul and Duluth, Minn. Distributing Centers in 29 cities and Installation headquarters in 15 cities. Company headquarters, 195 Broadway, New York City.

Preparation of Rubber Insulation and Jacket Compounds

MATERIALS AND THEIR PREPARATION. The materials used in the preparation of rubber insulation and jacket compounds may consist of natural or synthetic rubber along with mineral rubber and reclaimed rubber and the necessary compounding ingredients consisting of anti-oxidants, fillers, pigments, plasticizers and vulcanizing agents. The rubber or rubber-like materials are given a preliminary mastication or break-down on rubber mills or internal mixers to facilitate subsequent compounding operations. They are stored in a suitable form until required for compounding.

The required compounding ingredients, except the vulcanizing agents, used in insulating compounds, are carefully weighed into a suitable container. The plasticized rubber or rubber-like materials are weighed last. The vulcanizing agents are weighed in a separate container.

COMPOUND MIXING. Rubber insulation and jacket compounds may be mixed on rubber mills or in internal mixers.

The rubber mill consists of two driven rolls about 28 inches in diameter and from 60 to 84 inches in length. The axes of the rolls are held in a single horizontal plane by the mill frame above a suitable pan. Adjustments are provided to control the spacing between the rolls. Each roll is equipped—for water circulation—for cooling. The rolls rotate in opposite directions in such a manner that the surfaces approach each other at the top. The surface speed of the back roll is about 1.2 times that of the front roll. This difference in surface speed assists greatly in break-down of the rubber and incorporation of the compounding materials.

The rubber-like materials, and mineral rubber, when used, are placed between the rolls first and masticated until so plasticized that they form a continuous sheet on the front roll. The solid ingredients, except the vulcanizing agents for insulating compounds, are then placed on the mill and incorporated in the rubbers. Any solids which drop between the rolls are retained in the mill pan and then returned to the mill.

After the solid materials have been incorporated, the batch is thoroughly blended by cutting the rubber sheet about half way

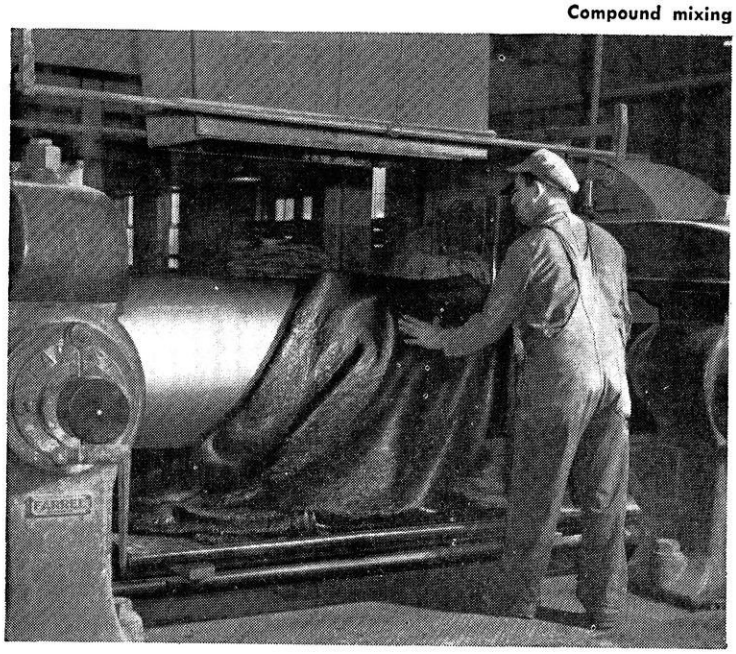
US RUBBER
UNITED STATES
ELECTRICAL WIRE & CABLE DEPARTMENT

across the roll from alternate ends and folding it back over the uncut portion. This blending may require about fifteen minutes and the entire mixing cycle approximately a half hour. After blending, the compound is removed from the mill in rolls suitable for feeding to the strainer.

The internal mixing unit consists of a mixer located above a rubber mill. The mixer consists of essentially two rotors with spiraled blades rotating in opposite directions at different speeds in a closed chamber. The direction of the spiral of the blades changes at the middle of the rolls. An air-controlled ram forces the materials into the mixing chamber. The mixed batch is discharged from the bottom through a hydraulically operated gate.

The effectiveness of the internal mixer as compared with the mill for breaking down and compounding rubber is evident from a consideration of its method of operation. In addition to the difference in the rate of rotation of the rotors, the interrupted spiral of the blades produces a continuous and uniform movement of the compound

Compound mixing



from the middle to the ends of the rotors. The walls of the chamber are stationary and hence the difference in rate of movement of material adjacent to the rotors and the walls is great. These conditions insure that every part of the batch being mixed will come in contact with every other part in a relatively short time. Mixing requires about fifteen minutes. After mixing, the compound is discharged to the mill below from which it is removed in a form suitable for feeding to the strainer.

STRAINING. The strainer consists essentially of a mechanically driven screw located in a cylindrical cast iron housing. The housing is provided with an opening for feeding the screw and supports the head of the strainer. The head at the outlet end of the screw provides a suitable support for a thirty-six mesh screen through which the rubber insulating compounds are forced by the screw. The strainer operates on the same general principle as the ordinary household food chopper.

The mixed compound is fed into the strainer and forced through the screen. Large particles of foreign or undispersed materials are retained on the screen. The strained rubber compound is returned to a mixing mill or internal mixer where the vulcanizing agents are added. The complete insulating compound is then removed from the mill in sheets for immediate application to wire or for storage.

Jacket compounds are prepared in the same general way as insulating compounds except that the vulcanizing agents are incorporated along with the other solid fillers in mill mixing or on the sheeting mill of the internal mixing unit. Jacket compounds are not strained.

LATEX COMPOUNDING. Compounding rubber in the form of latex involves the handling of rubber in the form of a liquid and, therefore, requires lighter and less costly equipment than that just described for the compounding of plastic rubber. In addition to the actual preparation of the compound, it involves, for latex insulation, the purification of the rubber in latex form.

Latex rubber is purified by diluting a known quantity of latex to approximately 33 per cent solids and heating to a temperature of 150°F. in a steel tank provided with a stirrer. The required amount of creaming agent, dissolved in water, is then added and the mixture stirred. The stirring is discontinued and the warm latex allowed to stand for about 48 hours. The rubber, being lighter than water, rises to the top in much the same way that cream separates from milk. The bottom layer, the serum containing the major portion of the impurities, is discarded leaving the purified rubber in the form of a cream in the tank. This process is repeated until rubber of the desired purity is obtained.

For use in latex compounds, ordinary rubber compounding ingredients are ground more finely, thoroughly protected, and wet with water. This is accomplished in a ball mill. A ball mill consists of a porcelain lined steel drum, provided with a suitable opening and supported with its axis horizontal in such a manner that it can be rotated. The cylinder is about half-filled with flint pebbles.

Definite amounts of the various compounding ingredients, together with the required amounts of protective agents and water, are then placed in the ball mill and suitably ground. Sulfur, being the most difficult material to grind, wet and protect, is milled for about three weeks. All the other ingredients require about one week.

The required amounts of these properly protected and wet ingredients are then carefully weighed and added, along with the stabilizers and water, to a known amount of purified rubber, in the form of latex. The mixture is stirred for about two hours to insure thorough mixing. It is then transferred through a 100 mesh strainer to a storage tank until applied to wire.

Latex compounding

W. S. P. E.

WISCONSIN SOCIETY OF PROFESSIONAL ENGINEERS

ENGINEERS' CREED

As a professional engineer, I dedicate my professional knowledge and skill to the advancement and betterment of human welfare.

I PLEDGE

To give the utmost of performance, to participate in none but honest enterprise, to live and work according to the laws of and the highest standards of professional conduct. To place service before profit, the honor and standing of the profession before personal advantage, and the public welfare above all other considerations. In humility and with need for Divine Guidance, I make this pledge.

W.S.P.E. "Outstanding Engineer" Award

Hans P. Dahlstrand was awarded the W.S.P.E. annual award for being the engineer who has made the greatest contribution to the engineering profession during the previous year.

Mr. Dahlstrand received his mechanical engineering degree at Boras College of Technology in Sweden. He came to America in 1903 and was employed by Allis-Chalmers in 1904 where he was employed until 1951 when he retired.

Mr. Dahlstrand, recognized as the dean of American steam turbine engineers, has been active in many technical and other societies including A.S.M.E., National Association of Power Engineers, American Museum of Natural History, Pi Tau Sigma, and others.

Mr. Dahlstrand has written many significant technical papers on the subject of steam turbines. He has been granted about 20 patents, and he has contributed many outstanding improvements in steam turbine engineering.

In June, 1950, he was cited by the University of Wisconsin in recognition of his "eminent professional services." He is listed in both "Who's Who in America" and "Who's Who in Engineering."

The award was made at the twelfth annual meeting of the W.S.P.E. held at the Schroeder Hotel in Milwaukee on January 27–29.

National Engineers' Week

The week of February 20–26 has been designated as National Engineers' Week to honor the creative science and art of engineering.

We also observe another important event during this week—George Washington's birthday. It is interesting to note that in addition to being our first great statesman, Washington was also one of America's first and ablest professional engineers. His actual practice of the profession was not limited to his younger years. He planned and designed highways, canals, and drainage works as a means of increasing the economic health of the young Republic. It was Washington who urged formation of the American Army Corps of Engineers.

It seems particularly appropriate, therefore, that the week of Washington's birthday has also been designated as National Engineers' Week, in order that a great engineer be honored as well as a great profession.

Progress Report No. 4

December 11, 1954

The membership campaign is gaining momentum. On Saturday, Dec. 11, at Milwaukee the WSPE Board of Directors approved 33 applications, 26 Members and 7 Affiliates. The new totals are tabulated as follows, with NW in first place by a big margin. Bill Baumgartner is getting excellent results, having now reached 53% of his quota.

Honor Roll

The following engineers have sponsored 3 or more new members since July 1, 1954: W. E. Schubert, Appleton—7; Foster C. Koehn, Milwaukee—7; Lyle Kingston, Green Bay—3.

The Board Saturday voted to remit to the chapter $2.00 for each new application approved during the administrative year July 1, 1954 to July 1, 1955. The Board recognizes the need for funds by the chapters for use as they see fit in membership promotion and this

(Continued on page 36)

Meet the Presidents

CHARLES E. PFLUG
Southeast Chapter President

Mr. Charles E. Pflug, southeast chapter president, was born in Tobias, Nebraska. He received his bachelor's degree in electrical engineering at the University of Nebraska and upon graduation began his engineering career as a test engineer for General Electric in 1926. Two years later Mr. Pflug was employed by the Wisconsin Power & Light Company where he remained for ten years, holding positions of Assistant Division Engineer, Local Manager, and construction engineer. He then worked for the Wisconsin Gas & Electric Co., and in 1939 he moved to the Nash-Kelvinator Corporation. He was employed there until recently, when Nash-Kelvinator became the American Motors Corporation. He has been with them ever since and presently holds the position of Plant Engineer at Kenosha.

Mr. Pflug has been active in many professional and civic organizations, including A.I.E.E., American Welding Society, and the Industrial Electrical Engineering Society of Detroit of which he was a director. He is also a member of the Kenosha Chamber of Commerce, Kenosha Manufacturers Association, and the Kenosha Traffic Study Committee.

Mr. Pflug and Audrey Cochran were married in 1929, and they now have two children, Marilyn, 25, now married, and Charles, 20. For recreation Mr. Pflug enjoys golf.

W.S.P.E.

(Continued from page 34)

action by them should help materially in getting the desired results.

Also Harold Trester, National Representative, reported that Michigan accepted our challenge of a membership race beginning June 1, 1954 through April 30, 1955, the results to be based on net gain in members (Affiliates not included) per 1,000 prospects. As you can see by the attached copy of NSPE MEMO dated December 6, 1954, Michigan is still in the lead in Group IV but the margin is less than last month. I believe that each chapter making its quota will be enough to beat Michigan, the Champs at present in Group IV. They bet us a pancake dinner to be prepared and served by them at Milwaukee to each WSPE Board Member and Chapter Membership Chairman (19 total) against 25 lb. of our World Famous Cheese.

N.S.P.E. Membership Line Up

At the end of the first six months of the Membership Contest we find little change in the relative standings of the states. There, of course, have been slight changes in net gain which have juggled the standings in the respective groups, but generally those that have previously been leaders are maintaining their lead. The exception to the above statement is reflected in Group 3 when Georgia, who had a net gain for the month of November of 72, moved out ahead of Maryland. In Group 1 there was relatively little change. Arizona showed the best gain with 11 members gained for the month. In Group 2, Oklahoma, the leader, actually showed a net loss of 1 member, but the other states failed to take advantage of this loss and Oklahoma remains in the lead. In this Group, however, West Virginia did come through with a net gain of 12 members. In Group 3, Georgia jumped into the lead, thereby pushing Maryland into second place. Group 4 remained about the same as last month, with Wisconsin leading for November by showing a net gain of 12 members. In Group 5, Texas is putting the pressure on Missouri, by picking up 53 new members for the month.

The net gain for the month of November was only 282, which is considerably below the quota for the year. At the end of the first six months we have a net gain of only *1686* P.E.'s.

GROUP 1

	Net Gain	Net Gain Per Thousand	Standing
Ariz.	11	24.8	4
Ark.	–6	–49.2	9
Del.	3	6.8	6
Idaho	2	8.4	5
Nev.	19	85.2	1
N. C.	28	56.1	3
N. D.	3	78.9	2
R. I.	3	6.1	7
S. C.	–2	– 4.4	8

GROUP 2

	Net Gain	Net Gain Per Thousand	Standing
Ala.	10	11.1	7
Colo.	22	20.5	6
Fla.	15	23.5	4
Neb.	29	52.0	2
N. M.	2	2.2	8
Okla.	73	63.4	1
Tenn.	27	31.2	3
Utah	–1	– 1.4	9
W. Va.	19	22.2	5

GROUP 3

	Net Gain	Net Gain Per Thousand	Standing
Conn.	11	8.0	5
Ga.	86	46.7	1
Kans.	11	7.6	6
Md.	49	35.8	2
Minn.	41	25.6	4
P. R.	3	1.6	7
Va.	46	28.9	3

GROUP 4

	Net Gain	Net Gain Per Thousand	Standing
D. C.	24	8.1	6
Ind.	25	9.2	5
Mass.	42	11.7	4
Mich.	129	48.2	1
N. J.	111	41.7	2
Wash.	5	1.3	7
Wisc.	77	31.9	3

GROUP 5

	Net Gain	Net Gain Per Thousand	Standing
Calif.	39	1.9	7
Ill.	52	3.3	6
Mo.	121	28.2	1
N. Y.	131	12.1	4
Ohio	63	6.2	5
Pa.	187	25.4	3
Tex.	176	27.3	2

Chapter	P.E.'s & E–I–T's not Members or Affiliates 7/1/54–7/1/55 P.E.'s	E–I–T's	Membership 1/1/54	Quota	Sponsors for New Members 7/1–12/11	% of Quota
Northwest	60		53	15	8	53%
Fox River Valley	275		150	50	16	32%
Southwest	325	Est.	229	65	15	23%
Milwaukee	1,600	900	411	165	26	16%
Western	20		63	20	3	15%
Southeast	260		72	30	2	7%
Wisconsin Valley	60		52	15	1	7%
Out of State	800	100	52	0	0	0%
Total	3,400	1,000	1,082	360	71	19.7%

We are about 61% over last year at this time.

Our membership team is good—we should equal or improve the percentage over last year as more and more personal contacts with prospects are made.

You Too—Can Do!!

The **Dallas, Texas Chapter** reports "85 membership applications received, before the 3rd letter was sent out." (Not Ours!)

Flint, Michigan Chapter has designed a very attractive brochure extending an invitation to professional engineers to attend their meetings.

Georgia reports "a letter that was directed to all registered engineers in Georgia who are not now members of NSPE brought in more

than 100 applications for membership in the Society and some 12 or 15 requests for re-instatement."

Wisconsin Society Membership Report for 1954 states "NSPE increased from 30,597 to 33,010 from 1 July 53 to 1 June 54 or 7.9%. The WSPE total as of June 30 was 1,082 or the net gain was 168, which is an increase of 18.3% in approximately the same period."

East Bay Chapter, Oakland, California—"For many years the East Bay Chapter of C.S.P.E. had experienced difficulties in its drives to increase membership. These difficulties were largely due to the indifferent and apathetic attitudes displayed by registered engineers toward the society and its social activities.

"The East Bay Chapter decided to adopt a new public-relations program in order to create more friendly relations with Bay Area technical societies and to make engineers and the public more conscious of the importance of the engineering profession. For the past two years the East Bay Chapter has been working along these lines.

Number 2 Solicitation Letter

Each chapter received a letter that may be used as the No. 2 letter in the membership campaign. Again, we say that it may not be perfect and probably will not be satisfactory for all types of membership solicitation. However, we do believe it will interest the prospective member in NSPE. Please feel free to use the letter in its present form, modify it, add to it, or take whatever action you feel that will improve it. The important thing is—do something. Put it in the mail, along with an application blank and a couple of pieces of membership material. Who knows what the results may be? We believe that it is worth a try. Let's see what can be done!

After the Third Letter—Then What?

After the third letter of the proposed membership mailing campaign has been mailed, which should be in February prior to Engineers' Week, your membership committee has obtained an excellent piece of membership material to be used in the *Month of March* as a *personal follow-up* to your letters. We have a limited supply of the *annual report,* which we believe should help to serve as the "clincher" in this campaign. It must be borne in mind that the Annual Report is an expensive publication and that it should be used only in connection with a *personal follow-up* and should *not* serve as an additional mailing piece. We regret to tell you that it will be impossible to provide an unlimited number of these reports to each Chapter, however, every effort will be made to provide you with sufficient copies for personal solicitation.

Address Change

John K. Primm (FRV), has changed his office from 104 No. 8th St., Manitowoc to 808 Washington St., Manitowoc. The name under which John does business is John Kenton Primm and Associates, Consulting Electrical Engineering. John is Chairman of the Public Relations Committee for the Fox River Valley Chapter.

Board Meeting

At the WSPE State Board meeting held December 11, 1954, the following items were passed upon:

NEW MEMBERSHIP APPROVAL

In an action to reduce red tape the WSPE State Board approved rescinding an action which required chapter Membership Committee Chairman approval on each new application for membership received. It is possible to send them direct to the state secretary and they will be brought up before the Board providing they have proper membership sponsors.

Mr. Frank Carlson, Chairman of the Membership Committee, gave a report on their activity and proposed that each chapter be given *$2.00 for each new member.* This would be a fund that the chapter could use for promotion of more activity in the membership drive. The committee's recommendation was approved so that each chapter will have some funds to work with to be used for mailing expense, etc. in solicitation of new members.

NSPE EMBLEMS

In selling NSPE lapel emblems to members it was pointed out that they should be sold at the regular price as specified by the national society. When the state society buys them they can be used as gifts to new members by the chapters, but they are not for sale to other members except at the price set by the national society.

NSPE ANNUAL MEETING EXHIBITS

At the forthcoming national convention to be held at the Bellevue-Stratford Hotel in Philadelphia, June 2–4, 1955, the committee is planning exhibits by manufacturers and suppliers. The Exhibits Committee writes as follows:

"We plan to feature exhibits, not simply to assist in financing the convention, but primarily because we believe that the exhibits will be an added benefit and incentive for more engineers to attend.

"If you have in mind any company who would desire to arrange an exhibit of interest to engineers, we would appreciate your soliciting their exhibit, or if you prefer we will be happy to contact them direct."

Anyone interested please contact Mr. Howard H. Sheppard, Chairman, Exhibits Committee, Pennsylvania Society of Professional Engineers, 1317 Spruce St., Philadelphia 7, Pennsylvania.

STATE MEETING REGISTRATION

The Board of Directors authorized the state meeting committee to charge different prices for advanced registration. This was done to assist the committee in obtaining as many advanced registrations

as possible. The authorization was for the committee to reduce the price from $3.00 to $2.75 for advanced registrations and to increase the price from $3.00 to $3.25 for those who want to register when they come to the convention.

Chapter News

MILWAUKEE CHAPTER

ROBERT J. MENDENHALL
Reporter

In accordance with the Milwaukee Chapter constitution, which calls for an annual election of new officers to be held in January, the following report of the Nominating Committee, consisting of L. H. Stark, chairman, Robert Siegel, and Kurt Both, was submitted to the membership:

Nominees for 1955–56 Term of Office:
President—Mr. Orrin E. Andrus
Vice-President—Mr. Wesley C. Lallier
Director—Mr. Robert W. Smeation
Secretary-Treasurer—Mr. J. Randall Meyer

Election of officers was held on January 29 and the newly elected officers were presented at the annual meeting of the chapter held at Hotel Schroeder in Milwaukee on January 29.

SOUTHWEST CHAPTER

L. W. STOCKNER
Reporter

Harvey Wirth, Chapter President, has appointed an "Engineers' Week" Committee to plan a balanced program for the observance of this period from February 20 to 26 in the Southwest Chapter area.

The Committee consists of Al Ahearn, Prof. Tom Higgins, W. F. Turner and L. W. Stockner, Chairman. The first meeting was held during December to formulate the outline for publicity, dinner meeting, radio and television coverage, and Engineer Week exhibits.

Members of Southwest Chapter will be contacted during the next few days as to the help needed by the Committee to successfully observe Engineers' Week. Each member can do his part by starting immediately to "talk" Engineers' Week.

SOUTHEAST CHAPTER

JOSEPH H. KURANZ
Reporter

John J. Degen, Veteran Delavan Professional Engineer, died in a Milwaukee hospital on November 4, 1954, after an illness of three months. He was 67 years of age.

Mr. Degen, who was a veteran Professional Engineer and resident of Burlington, Wisconsin, served both his home town and Delavan as City Engineer. For thirty years he planned and directed public works projects, including the extensive paving projects which have made Delavan a city of beautiful and improved streets. He also supervised installation of extensive water and sewer installations throughout Delavan and also installed several bridges.

He was an expert in waterworks designing and installation. He designed plants and installed them in Pewaukee, Union Grove, Sturtevant and Lake Como, and at one time was Engineer at Silver Lake and Twin Lakes.

Mr. Degen was responsible for hundreds of other jobs, including the designing of 50 subdivisions in this section of the state, several drainage districts, construction of dikes and stillways. His designs were always readily accepted at Madison by all of the approval boards because they knew Mr. Degen's work was thorough.

Mr. Degen was a charter member of the Southeast Chapter of the Wisconsin Society of Professional Engineers and was always an active participant in the Society's activities.

Survivors include his wife, Norma; one daughter, Mrs. Norma Seri, as well as one son, John F., all of Burlington. Both John and Mr. Seri are working in the Degen Engineering Company. Two brothers and four sisters also survive.

Plans are being developed for a successful Engineers Week program. The Waukesha Daily Freeman will carry a special section in the newspaper, devoted to the Engineering profession.

Local industry has given its full support to the program.

It is hoped that similar editions will appear in the Racine Journal Times and the Kenosha News.

Ground work has begun on these other two editions.

WISCONSIN VALLEY CHAPTER

JESS HOLDERBY
Reporter

No chapter news received.

WESTERN CHAPTER

D. W. GRUNDITZ
Reporter

No chapter news received.

NORTHWEST CHAPTER

WM. ROSENKRANZ
Reporter

No chapter news received.

FOX RIVER VALLEY CHAPTER

JOHN K. PRIMM
Reporter

Virgil Gunlock, NSPE vice-president for the central area, will be the guest speaker at the next meeting of the Fox River Valley chapter. The meeting will be held at the Elks Club in Appleton at 6:30 P.M. on February 24 which is during National Engineers' Week.

Mr. Gunlock is chief engineer for the transit authority of Chicago and will speak on the significance of the national observance of engineers week.

Mr. Wayne Bryan, president of Fox River Valley Chapter extends an invitation to all interested W.S.P.E. members to attend.

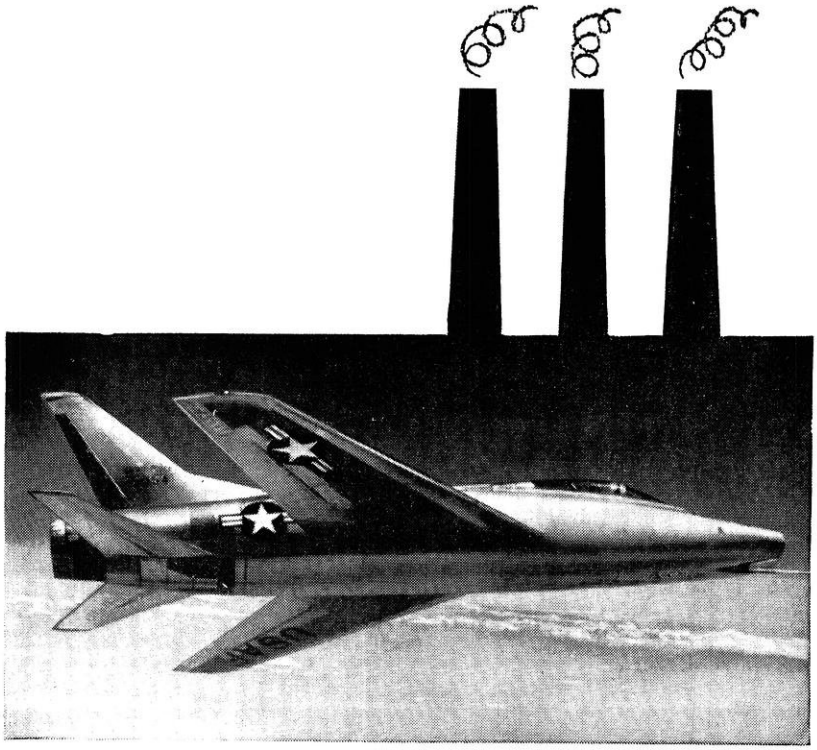
END

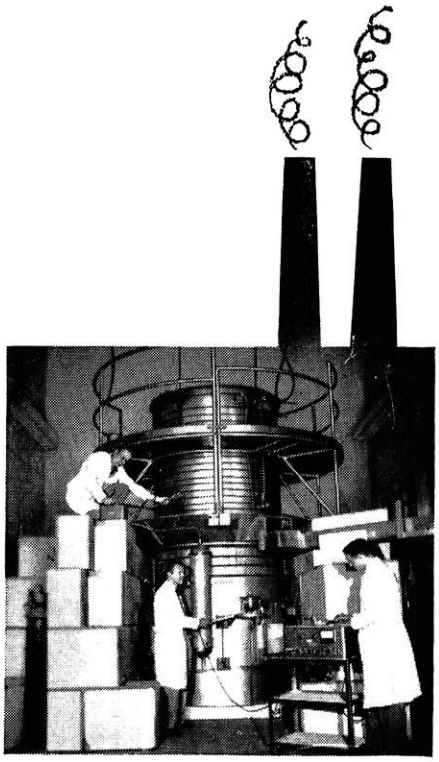
The automobile motor began to pound, and finally stopped.

The worried boy friend said to his companion: "I wonder what that knock could be?"

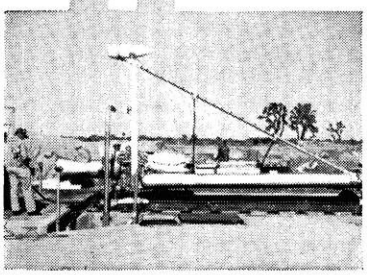
"Maybe," said the blonde girl friend, "It's opportunity."

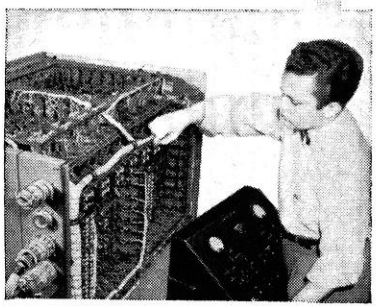
NORTH AMERICAN HAS BUILT MORE AIRPLANES THAN ANY OTHER COMPANY IN THE WORLD





DIVERSITY CREATES OPPORTUNITY





Although best known for design and production of world-famous aircraft like the Korea-famed F-86 *Sabre* Jet and the new, record-smashing F-100 *Super Sabre* . . . North American Aviation also offers engineers excellent opportunities in other technical fields.

North American needs engineers with imagination to help design and build the aircraft of the future. Other fascinating careers are created daily in its rapidly developing guided missile, jet, rocket engines, electronic and atomic energy programs.

When you are ready to enter the engineering profession, consider the well-paid opportunities at North American. Meanwhile, write for information on your future in the aircraft industry.

Contact: **Your College placement office or write:**

Engineering Personnel Office
5701 West Imperial Highway,
Los Angeles

12214 South
Lakewood Blvd.,
Downey, Calif.

North American
Aviation, Inc.
Columbus 6, Ohio

ENGINEERING AHEAD FOR A BETTER TOMORROW

NORTH AMERICAN AVIATION, INC.

Cool, Man!

(Continued from page 19)

mechanism, an accelerated transfer of heat from refrigerant (Genetron 141 or Freon 22) to the cooling surface, and an improved spray head that jets cooling water onto the entire rectangular condenser coil.

Size of Units

The cooling capacity of an air conditioning system is usually expressed in tons. One ton means the ability to produce, over a twenty-four hour period, the cooling effect released by the melting of one ton of ice. In estimating required air conditioning capacities, experts often use a smaller unit, the Btu. One ton of capacity is equal to 12,000 Btu per hour or 288,000 Btu per day.

Size of equipment is sometimes given in horsepower rather than tons; a room air conditioner might be listed as ½, ¾, or 1 hp. In normal practice one hp provides roughly one ton of capacity.

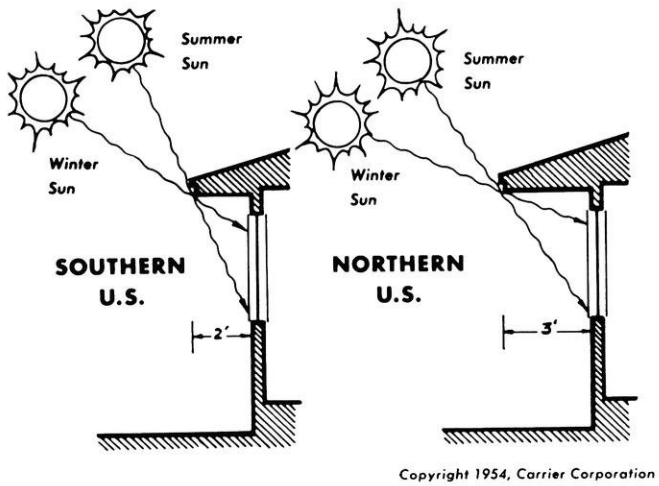


Fig. 4.—A roof should overhang enough to shade the south windows in summer, yet admit solar heat during the winter months. For average windows, overhang should be at least two feet in southern United States, three feet or more in Wisconsin.

As for the size of the unit needed, two tons of cooling is considered adequate for the average three-bedroom house in almost any climate. Three-ton sizes will handle larger homes up to 1800 sq ft, or even more in moderate climates. Approximately the same rating of one ton per 600 sq ft applies to room air conditioners. Of course these figures serve only as an order of magnitude, since the actual cooling needed depends upon many different factors, such as outside temperature, type of insulation, and design of the house. These factors are discussed in greater detail later in this article.

Average Costs

The price of a 3/4 hp window unit is close to $400, plus about $35 for installation. A two-ton central cooling unit will run about $1200 installed, while a complete year-around air conditioning system would cost only about $700 more than a forced warm-air heating system alone. A furnace conversion unit costs about $900 for the average three-bedroom home.

Replacement costs are highest for window units. Their life is probably not over ten years, and most users trade them in after five years. Central units may last twice as long under the same operating conditions.

Operating costs vary widely with climate, architecture, and electrical rates. Some houses have been so well constructed that the builders think their owners will be able to heat and cool all year for $100. In an ordinary house, a 3/4 hp unit operating ten hours a day in 95° outside temperature would add, at 3¢/kwh, about $10 per month to the electric bill.

Most air-conditioning engineers agree that central units produce more cooling for an entire house at less expense than window units. Experiments in Dallas, Texas during the record-breaking summer of 1953 showed that two tons of central cooling for whole houses cost, at the Dallas rate of 1.65¢/kwh, about $13 per month.

Finally, an often-overlooked factor influencing operating cost is the skill and integrity of the dealer-serviceman. His ability can affect your entire success with air conditioning.

Architecture

As mentioned earlier, architecture plays an important role in the amount of air conditioning required. With good design, it is possible to reduce both the initial and operating cost of the system by as much as a third over a poorly designed house.

Furthermore, it is often possible to effect construction savings over a non-air-conditioned house sufficient to pay for most of the air conditioning cost. For example, wings, jogs, and setbacks ordinarily required for ventilation are no longer necessary. Windows become sources of light or view only, and can be placed without regard for ventilation, or even eliminated completely in some places. Most of them can be set in less-expensive fixed frames, saving the cost of window hardware, weather stripping, screens, and removable storm windows. Screened porches and breezeways are not needed for summer comfort. And cheaper solid wall construction can be used to shield out summer sun and add privacy.

The following principles should be followed in designing an air conditioned house for minimum heat gain:

(1) The roof, which is the greatest source of heat, should be carefully chosen. A light colored, smooth roof will reflect much of the sun's heat. A low double pitched roof is the most efficient type, if attic space is well vented. A large overhang, particularly on the south exposure, shades glass and wall area in summer, yet exposes a portion of it for solar heating in the winter when the sun is lower in the sky. (See Figure 4).

(2) Orientation of the house and window areas is also of great importance. Major window areas should face to the north and south; windows on the east and

west should be shaded with trellises, screen walls, shrubs, or awnings. The summer heat gain of east and west walls is approximately equal. Deciduous trees, which provide shading in summer and pass the warm sun rays in winter give excellent control for east and west exposures. Shrubs or fences protect the house from low sun's rays and are a visual barrier. The north window area should be protected from winter winds by a windbreak of evergreens. Or, the carport might be placed on the north.

(3) The central "Core Unit" concept is particularly applicable to air conditioned homes. Grouping of the kitchen, bath, and utility room in one area, or "core", has always made sense in dollars saved. This is the area with the plumbing, gas lines and heavier electrical service for such items as sinks, stoves, automatic washers and dryers, water heaters and heating plants. It is much cheaper to install plumbing and heavy wiring in one location than to extend it to several parts of the house. With the compact and quiet new year-around air conditioning units which can be installed near living areas, the core unit makes even better sense. (See Figure 5). It should be located in the center of the plan to minimize ductwork from the air conditioning unit. It is entirely feasible to place the bathroom near the center of an air conditioned house, without the necessity of an outside window, since a vent for water vapor, heat, and odors can be used. Thus the rest of the plan can be extremely flexible and utilize house orientation to the best advantage.

(4) Insulation is as important in keeping heat out in summer as it is in keeping heat in in the winter. Wall insulation was practically unheard of in the South until a few years ago; most Southern builders still omit it because heating problems are not severe. But air conditioning puts new importance on the need for heavy wall insulation because outside heat can penetrate, virtually unchecked, through uninsulated walls, often increasing the air conditioning requirements by as much as 50 per cent. Aluminum foil promises to be as effective as mineral wool, serving in addition as a vapor barrier to keep out excessive humidity. Attic insulation is vital since attic temperatures may reach 150° on a hot day, and most of this heat is radiated down into the house unless the ceiling is well insulated.

(5) An often over-looked factor in evaluating air conditioning loads is the "thermal mass" of a house. Thermal mass means the capacity to store cooling, just as a block of ice does at much lower temperature. And a house has greater thermal mass in proportion to the total amount of heat that must be removed than almost any other kind of structure. The walls, roof, floor, and furnishings will store cooling during the night and release it to help fight higher temperatures during the daytime. For instance, floor slab construction reduces total cooling load about 10 per cent over full basement construction, since the slab stores cooling effect over night, and helps cool the home the next day. (Of course, this thermal mass causes a time lag in temperature control which may sometimes be undersirable.) By using the thermal mass to level out the peaks in the air conditioning load, smaller units can be used. This, besides lowering costs, produces greater comfort, since bigger systems would run only a part of the time and whenever they turned themselves off humidity would climb, producing a cold, clammy effect.

"Air Conditioned Village"

To prove the effectiveness and economy of residential air conditioning in the $12,000-to-$15,000-class home, the Austin and the National Association of Home Builders are sponsoring an "Air Conditioned Village" in the new Edgewood residential area northwest of Austin, Texas. Twenty-two air conditioned homes have been built to make a year-long study of residential heating and cooling problems. In this one

Fig. 5.—This is the Carrier Weathermaker, a combination heating and air conditioning unit, here installed in a utility room. In this plan, air conditioner, laundry facilities, and kitchen are grouped in one area, or "core unit", thus reducing heavy wiring and plumbing expense.

village can be found more types of cooling equipment and more new ideas on air conditioning than anywhere else in the world. Although the project is sponsored by the NAHB's Research Institute, 22 air conditioning manufacturers, and other firms, the houses were built by local builders at their own expense. The houses are lived in by families who paid an average of about $15,000 for them. Houses are approximately the same size, ranging from 1146 to 1468 sq ft plus carport and outdoor storage.

For one cooling season and one heating season the houses and the families in them are to serve as a field laboratory. It is hoped that investigators can get answers to many questions which will lead to the improvement of cooling-equipment installation methods and lower cost air conditioning systems.

Each house has a separate electric meter for the air conditioning unit so that operating costs can be re-

corded and analyzed by University of Texas engineers. Practically every type of cooling equipment, air-distribution systems, insulation, and shading device is used. From instrumentation and observation, engineers will check the effectiveness of each installation and design.

Other tests will also be made. Physicians from the Texas Medical Association will see families periodically to determine how a cool house influences allergy sufferers, and University of Texas psychologists will study how air conditioning affects the mental health and spirits of the occupants.

The fact that the 22 houses are different, the units are different, and the families are different, will provide a rich source of subject matter for observation. But the main question which the NAHB, as well as FHA and VA officials, would like to see answered is: "Is air conditioning practical for the $12,000 to $15,000 house?"

Results so far indicate that the answer will be an emphatic "YES!".

The Future?

In view of the outstanding success of home air conditioning so far, the future of this rapidly expanding industry looks bright indeed. Sales of air conditioning units have increased fifty-fold in nine post-war years. And the end is nowhere in sight, for at the present time only four per cent of U.S. residences are air conditioned. This leaves some 27 million homes as prospects for air conditioning units, and this figure grows by almost a million new homes a year.

What's more—and with compelling evidence to support his stand—one air conditioning manufacturer declares the home market potential is exactly double the number of homes. This is what Bernard A. Mitchell, president of Mitchell Manufacturing Co., bases his stand on:

Surveys show that within weeks after a householder buys a unit, say for his bedroom, he buys, or wants to buy, a second for maybe his living room. Other manufacturers concur: the average air conditioned home has between 1.5 and 1.8 units.

Cloud Wampler, president of Carrier Corporation, predicts that within the next five years, approximately one out of every five homes and apartments in the country will be equipped with complete or partial air conditioning, and that the year-around air conditioning of homes will have become the largest single part of the entire business, with further sharp increases still to come.

Market indices show 98 per cent of all homes have radios. Nearly the same is true for refrigerators, 91.3 per cent, washing machines with 77.3 per cent. Air conditioning people make no secret of the fact that their future, seen against this backdrop, could not look brighter. **END**

Smokeless Smoke

(Continued from page 26)

carbons, as well as carbon monoxide—prime industrial causes of air contamination.

The Oxycat will function successfully over a wide range of inlet temperatures and concentrations—from gas streams near the explosive limit to those with concentrations of parts per million of contaminants.

Inlet temperatures—the temperature of the gases entering the catalyst—can range from room temperature or less up to 1500 degrees F. or more. In some cases pre-heating of the gases may be necessary depending on the actual inlet temperature and the concentration of the pollutants.

If the gases are above 500 degrees (the oxidizing point of the catalyst) and are rich in combustibles probably no pre-heat will be needed.

If the gases are rich in combustibles but below 500 degrees some pre-heat will be needed at start-up only.

If concentration of combustibles is not high enough to maintain catalyst temperature above 500 degrees, continuous pre-heat will be needed. In general, the Oxycat will raise stack temperature 55 degrees F. for every Btu per cubic foot of dry exhaust gas passing over the bed.

All such factors of design must be determined by competent engineering analysis.

Prospect of Unlimited Life

As yet no definite limit has been set to the useful life of the Oxycat. Under most stack conditions it is expected that the catalyst will last for many years without appreciable drop in activity.

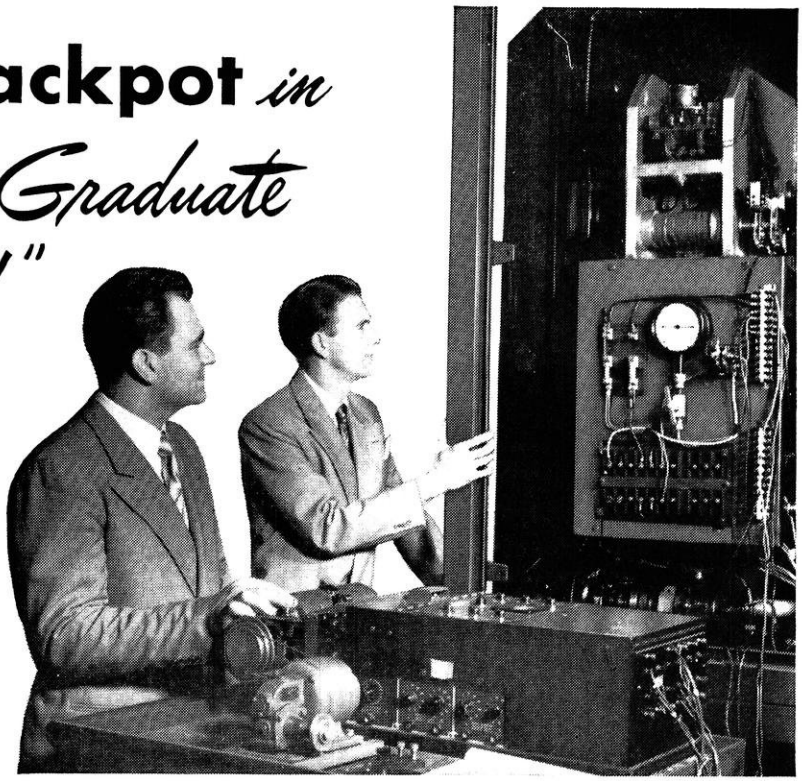
Basis for this conclusion is a test conducted on catalysts initially installed at the Sun Oil Marcus Hook refinery almost two years ago. Tests showed that after 8500 hours of continuous operation, these catalysts eliminated 99.2 percent of the combustible material in the waste gases—exactly the same percentage as in June 1952 when the catalytic heat recovery unit first went on stream.

These results were most significant since all previously known combustion catalysts have declined steadily in efficiency during operation.

Operating conditions at Marcus Hook were severe. In addition to light hydrocarbons, carbon monoxide and sulphur, the waste gases from the cat cracker contained abrasive dust (from the petroleum catalyst) and heavy tarry materials. The catalyst was also subjected to continued thermal shock. The temperature of the waste gases jumps 500 degrees—from 800 to 1300—and and back again every 10 minutes.

The findings at the Sun Oil Co. were later corroborated by the Research Institute of Temple University in tests on the original Oxycats installed at Enamelstrip Corp. Temple scientists reported that after 18 months of operation these Oxycats were eliminating 99.6 percent or more of solvent pollutants. **END**

"We Hit the Jackpot *in* Allis-Chalmers Graduate Training Course!"



say N. W. MORELLI

Oregon State College, B.S.,M.E.—1950

and

E. R. PERRY

Texas A. & M., B.S.,E.E.—1950

WHILE taking the course, two engineers developed a revolutionary new circuit breaker mechanism.

"Our experience shows what *can* happen if you work with people open to suggestion. We found men of this kind at Allis-Chalmers, and it has given us a special pleasure in our job.

"We started out like most other graduates with a hazy idea of what we wanted to do. After working in several departments, we requested that part of our training be at the Boston Works of Allis-Chalmers, where circuit breakers are made."

New Design Principle

"Circuit breakers soon became an obsession with us, and we got the idea of designing a hydraulic operator and triggering mechanism for these breakers. Most operators for big breakers are pneumatic.

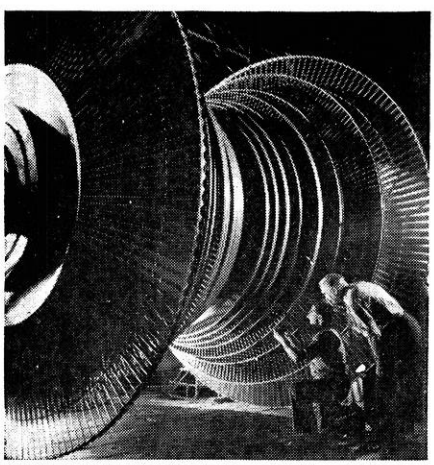
"Unsuccessful attempts had been made in the past by all circuit breaker manufacturers to build hydraulic operators. The important thing is that no one at Allis-Chalmers said, 'Don't try it—it won't work.' "

Start New Era

"To make a long story short, our study of the problem led us to the hydraulic accumulator and high speed valves being used by the aircraft industry. These had not been available when earlier attempts were made to build a hydraulic operator. With these highly developed devices to work with, we were able to build an operator that combined the best features of pneumatic and hydraulic operation. We call it the *Pneu-draulic* operator. Engineers are saying it starts a new era in circuit breaker actuation.

"This fact is important to us, but it is even more important to know that Allis-Chalmers Graduate Training Course is full of opportunity . . . and as we found out, there's opportunity right from the start."

Pneu-draulic is an Allis-Chalmers Trademark.



Low-pressure spindle for a 120,000 kw steam turbine generator. Said to be one of the largest ever built in the United States, this spindle is nearing completion in the Allis-Chalmers West Allis shops.

Facts You Should Know About the Allis-Chalmers Graduate Training Course

1. It's well established, having been started in 1904. A large percentage of the management group are graduates of the course.

2. The course offers a maximum of 24 months' training. Length and type of training is individually planned.

3. The graduate engineer may choose the kind of work he wants to do: design, engineering, research, production, sales, erection, service, etc.

4. He may choose the kind of power, processing, specialized equipment or industrial apparatus with which he will work, such as: steam or hydraulic, turbo-generators, circuit breakers, unit substations, transformers, motors, control pumps, kilns, coolers, rod and ball mills, crushers, vibrating screens, rectifiers, induction and dielectric heaters, grain mills, sifters, etc.

5. He will have individual attention and guidance in working out his training program.

6. The program has as its objective the right job for the right man. As he gets experience in different training locations he can alter his course of training to match changing interests.

For information watch for the Allis-Chalmers representative visiting your campus, or call an Allis-Chalmers district office, or write Graduate Training Section, Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

C-5675

DEANS' COLUMN

KURT F. WENDT
Dean, College of Engineering
•
W. R. MARSHALL, JR.
Associate Dean
•
K. G. SHIELS
Assistant Dean

Twenty-Eight Free Hours Per Week!

Did you ever ride down the waves of the Pacific Ocean on a Hawaiian beach in an outrigger canoe with the whole ocean coming at you full force? This experience is a bit comparable to the third week of college for a freshman engineer. Rowing out in the canoe has been a bit rough but not at all overwhelming. So it has been with the first couple weeks for the student with the speedy review of algebra, that nodding acquaintance which he picked up in high school which made the early part of chemistry resemble a review, and that ever-present but as yet unfulfilled intention to really study. Suddenly in the third week the student realizes that if he is to enjoy the ride down the waves toward shore, he must take a deep breath, set up a plan of his time, and make his first important decision as to what college will mean to him and what he will do about it.

To assist the freshmen, it was about this time of the semester that Dean Ruedisili was asked to tell the freshman engineers how to study, and he so cleverly pointed out that with 29 hours in classes, the student still has 34 hours for study, 56 hours for sleep, 21 hours for meals, and 28 free hours before the 168 hours in a week were exhausted. Were we to give a final examination in Freshman Lectures, one question would no doubt be, "Did you set up a week's schedule in accordance with Dean Ruedisili's division of time, and did you endeavor to follow his suggestions to review frequently?"

With the organization of his time and study habits well established, the academic achievement of the student is quite well assured, and he is now ready to take a quick glance around the University to plan and to weigh the wise use of the spare 28 hours per week. The alert freshman observes that the invitations posted on the bulletin boards from the professional engineering societies or from various student groups are really meant for him and that the upperclassmen want him to attend the meetings and to be a real part of his University and college. Even occasional attendance at student chapter meetings, or of some organizations along the line of his major or extra-curricular interests, brings him into contact with students who are already enthusiastic and useful citizens of the campus, and contact with them is stimulating.

K. G. SHIELS

In his search for some phase of college activity which will contribute to his growth intellectually and in his relationship with people, he discovers that the motto of The Wisconsin Union is, "The light of learning is increased through human relationship." Suddenly he realizes that the payment of his fees automatically gave him membership in the Union, and he investigates their social, recreational, and cultural campus programs. While a freshman is restricted in active participation, membership is open in some organizations and committees. Suggestions are ever welcome, and the Union activities can contribute much to the development of the individual in assuming leadership, in learning how to get along with fellow students, and in giving an outlet to the splendid ability inherent in so many students. Eventually it might even be possible to serve on the Union Council or the Union Directorate.

Industry surveys a prospective employee from many angles. Industrial interviewers like to know in what manner a student has contributed to the world in which he lives. They respect, for instance, the training which the workers on the student magazine, The Wisconsin Engineer, receive. The engineering faculty in recognition of the worthwhile work and responsibility of the Business Manager and the Editor of The Wisconsin Engineer agreed in 1953 that these officers be permitted to earn up to three credits of Engineering 180 by virtue of their position on The Wisconsin Engineer, with the grade to be given at the end of the semester to be based on the ability displayed by the student in publishing the magazine. Industry recognizes participation in publications as valuable training, and in interviewing students for placement they watch for evidence of leadership and training as developed in extra-curricular participation.

Engineer—what use do *you* make of your 28 free hours per week?

—K. G. SHIELS

He who laughs last has found a double meaning the censors missed.

* * *

Judge: "Why did you strike your wife?"

Husband: "Well, your honor, she had her back to me, the broom was handy, and the back door was open, so I thought I'd risk it."

* * *

Upon being sentenced, Rastus muttered something that sounded suspiciously like an oath.

"Repeat that," thundered the Judge.

"Ah didn't say nothin' Jedge."

"You did and I want to know what it was—repeat it!"

"Well, all ah says, Jedge, was: 'God am de Jedge, God am de Jedge'."

CAMPUS NEWS

ENGINEERING INSTITUTES

DRAFTING ORGANIZATION

March 2 and 3, 1955

Some of the problems encountered in drafting departments both large and small will be discussed in this institute. A few of the topics to be presented are: standard drafting practices, training of draftsmen, tolerances and dimensioning, and organization and aims of a drafting department. Engineers, supervisors and any others engaged in drafting, design and development work will find this institute of benefit.

Fee: $15. Robert A. Ratner, Institute Co-ordinator.

* * *

INDUSTRIAL PLANT MAINTENANCE

March 9, 10 and 11, 1955

This institute will place emphasis upon the presentation of practical information on specific maintenance problems in the areas of lighting, painting, housekeeping, safety, electrical and fluid flow.

Fee: $20. Ralph D. Smith, Institute Co-ordinator.

* * *

INDUSTRIAL PLASTICS

March 14 and 15, 1955

New developments in the plastics industry have made it necessary for practically all companies to consider the impact of such developments upon their own product. It is the intent of this institute to present information concerning some of the properties and most recent uses and applications of plastics, synthetic fibers and silicones. For those who are interested in plastics production, some time will be devoted to molding techniques and machining properties. Product design engineers, manufacturing engineers, and other technical or administrative personnel concerned with product development will find this institute of benefit.

Fee: $15. Ralph D. Smith, Institute Co-ordinator.

STEAM PLANT OPERATION

March 16, 17 and 18, 1955

This institute will be of interest to persons responsible for the reliable and economical operation of steam plants for heating, process, and industrial power. Operation of the principal steam plant auxiliaries will be discussed. New developments in steam cycles and equipment also will be presented.

Fee: $20. Paul J. Grogan, Institute Co-ordinator.

* * *

TRAFFIC ENGINEERING

March 22 and 23, 1955

The problems of rapidly and safely moving vehicles through the congested areas and the provision of necessary parking facilities for those vehicles which must stop will be considered in this Institute. The discussions will be, in as far as possible, directed toward the conditions prevalent in Wisconsin communities.

Fee: $15. Leonard F. Hillis, Institute Co-ordinator.

* * *

WORK MEASUREMENT

March 24 and 25, 1955

This institute will be of interest to industrial engineers and other supervisory personnel interested in work measurement problems. Considerable time will be devoted to a discussion of various predetermined time systems that are now in use. Since any method of work measurement is concerned with the determination of a fair day's work, there will be a discussion of this subject by a panel composed of representatives of labor and management. Recent statistical techniques in time study will be presented.

Fee: $15. Robert A. Ratner, Institute Co-ordinator.

★

CHI EPSILON INITIATION

Chi Epsilon, civil engineering honorary fraternity, held its fall initiation on Tuesday, December 14th. Prof. L. R. Laudon of the Geology Department was the main speaker at the initiation banquet held at Leske's Steak House. Prof. G. A. Rolich of the Dept. of Civil Engineering was the toastmaster. The new initiates are as follows:

John Albrecht, '56
Ron Fiedler, '55
Lyle Hird, '55
Richard Jann, '55
Paul Jenkinson, '56
Norman Petersen, '55
Rodney Pike, '56
David Woolhiser, '55

★

GEOPHYSICS BULLETIN

An important aid in the solution of subsurface geologic problems in Wisconsin has been made generally available with the publication of "Geophysical Methods Applied to Geologic Problems in Wisconsin," the result of four years of investigations within the Badger state (1949–1953). Written by UW Geophysics Prof. George P. Woollard and State Geologist and UW Staff Member George F. Hanson, purpose of the report, Bulletin 78 in the Wisconsin Geological Survey series, is "to show the degree to which geophysical studies can be of assistance in resolving some of the problems of subsurface water supply, mineral exploration, engineering, and subsurface geology encountered in Wisconsin."

Geophysics, a relatively young branch of geological investigation which has been pioneered at the University of Wisconsin, uses some seven types of measurement which are basic to the work of determining what lies hidden beneath the earth's surface: gravity, magnetic, electrical, electro-magnetic, seismic, thermal, and radio-active. Woollard and Hanson describe in detail each measurement method and discuss the Wisconsin studies carried out through these methods.

Towns at which the studies were made include Cumberland, Spooner, Haywood, Cable, Upson, Hurley, Crystal Falls, Marek, Antigo, Gresham, and Greenwood in the north; Marshfield, Vesper, Neillsville, Oshkosh, Wisconsin Dells, Baraboo, and Campbellsport in the central portion of the state; and Argyle, Madison, Lake Mills, Milwaukee, Blue Mounds, Shullsburg, and Elkhorn to the south.

Some 31 Wisconsin graduate and undergraduate students undertook much of the field investigation for the four-year project, made the necessary computations for reducing results, and analyzed the results.

★

FELLOWSHIPS AT M.I.T.

The Massachusetts Institute of Technology announces a program of financial aids for students who will study for advanced degrees in the School of Industrial Management during 1955–56.

According to Dean E. P. Brooks assistantships and fellowships will be available to a number of students in the two-year course which leads to the degree of Master of Science in Industrial Management. This educational program, he said, is planned as preparation "for effective and imaginative leadership in the field of industrial enterprise."

The program is especially intended for college graduates in fields of science or engineering. Assistantships, with a stipend of $1,640 for each academic year, are available to certain men with an educational background which permits them to carry a reduced course load. For these assistants the tuition is $540. Applications should if possible be filed before March 1, 1955.

Further information about this program of financial aids may be obtained from the Chairman of the Graduate Committee at the School of Industrial Management, Massachusetts Institute of Technology, Cambridge 39, Massachusetts.

ATOMIC ENERGY RESEARCH AT U. W.

A cooperative assault on the "major land of the unknown in physics" by the University of Wisconsin and seven other midwestern universities is described in a report of the midwestern Universities Research Association (MURA). The association, which includes the Universities of Illinois, Iowa, Michigan, Minnesota, Wisconsin, Purdue, and Indiana, and Iowa State College, was organized in 1953 to explore the possibility that large midwestern schools could combine forces to obtain a laboratory for research into high-energy physics. The board of directors includes one administrator and one scientist from each university. Board representatives from Wisconsin are H. T. Richards, professor of physics, and A. W. Peterson, UW vice president in charge of business and finance.

"The problem of the great expense, in money and manpower, of high-energy physics can be solved if groups of universities will organize and combine forces for the creation of cooperative laboratories," the report points out. "The effectiveness of this solution has been well demonstrated on the East Coast by the Associated Universities, Inc., in the creation and operation of the Brookhaven National Laboratory. There the control of the laboratory is vested in a board of directors elected by the member universities, and the financial support is provided by the Atomic Energy Commission".

One of the men active in organizing MURA was Prof. Ragnar Rollefson, professor of physics at Wisconsin who is now on leave for work on a presidential advisory committee in Washington.

At the present time, MURA members are studying three major problems: 1. The designing of a new type of high-energy accelerator for the production of atomic particles for experimentation and bombardment; 2. The best site for the laboratory (Wisconsin has been mentioned as a possibility); 3. Fund-raising for eventual construction of the high-energy machine.

Ten members of the association's machine-design group under the chairmanship of Prof. W. D. Kerst, a Wisconsin graduate now with the University of Illinois worked eight weeks at the University of Wisconsin this past summer. From this group came the first ideas for a generator design that holds promise of being superior to any yet constructed or in the process of construction.

"Among the specific accomplishments of the Midwest study group, the one which has attracted the greatest interest, is the invention and theoretical exploration of a fixed-field, alternating-gradient (FFAG) accelerator," the MURA report continues.

The idea for the new FFAG accelerator was conceived by Keith Symon, formerly of Wayne University and now an assistant professor at the University of Wisconsin.

Two former Wisconsin scientists, Prof. J. L. Powell and R. S. Wright, using the Illiac electronic computor at Illinois were responsible for the development of computational methods which were vital in designing the new machine.

END

* * *

After a brief visit at a fellow engineer's home, Pat was amazed at how often his friend's grandmother read the Bible. Before leaving, he asked why the elderly woman took such a deep interest in the book. "Cramming for the finals," was the reply.

* * *

E. E.: "Well, what would you like to drink?"

Coed: "I guess I'll have champagne."

E. E.: "Well, guess again."

* * *

"I'm anxious to make this shot. That's my mother-in-law up on the clubhouse porch."

"Don't be a fool, you can't hit her at 200 yards."

* * *

He: "Why do the most important men on campus always get the prettiest girls?"

She: "Oh, you conceited thing."

ALUMNI NOTES

by Dick Paske, ee'56

Eleven engineering alumni of the University of Wisconsin are employed at Hamilton Standard, division of United Aircraft Corporation, Windsor Locks, Connecticut. Pictured are, l. to r.:

Front row:

Lambeck, Raymond P., m'39, chief product engineer.

Domrose, Donald A., met'54, metallurgist.

Leopold, Edith L., '47, junior engineer.

Paquette, Donald G., met'43, senior metallurgist.

Radtke, Edward W., m'39, development design supervisor.

Back row:

Muth, Victor O., '53, test engineer.

Weiss, Robert M., m'54, engineering trainee.

Feige, Norman G., met'54, metallurgist.

Meyer, Richard C., '52, test engineer.

Foxwell, Leo G., m'53, test engineer.

Davies, James H., m'54, engineering trainee, is not shown.

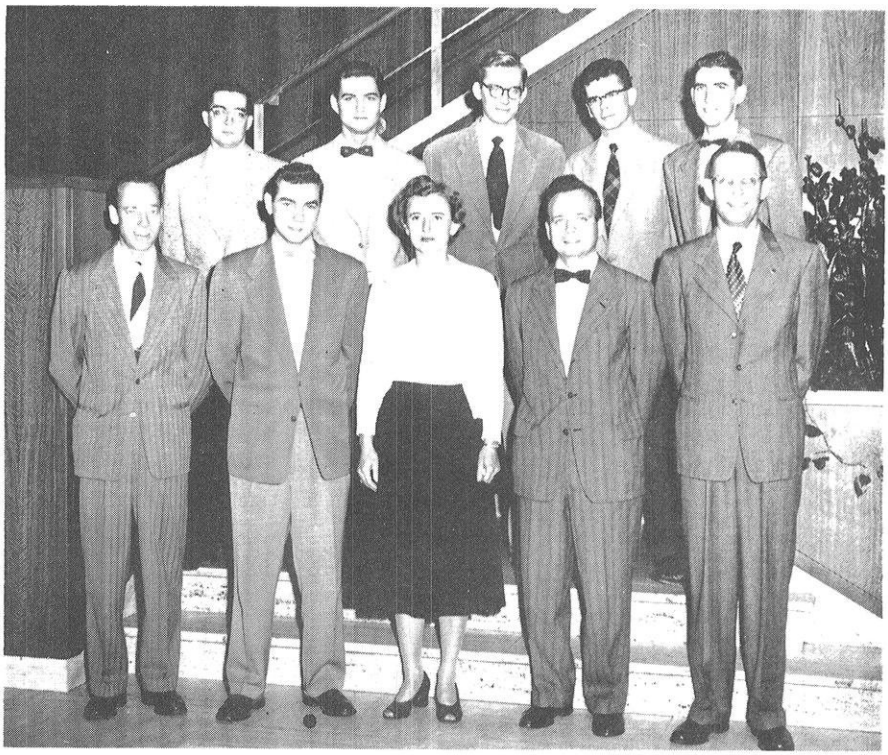
* * *

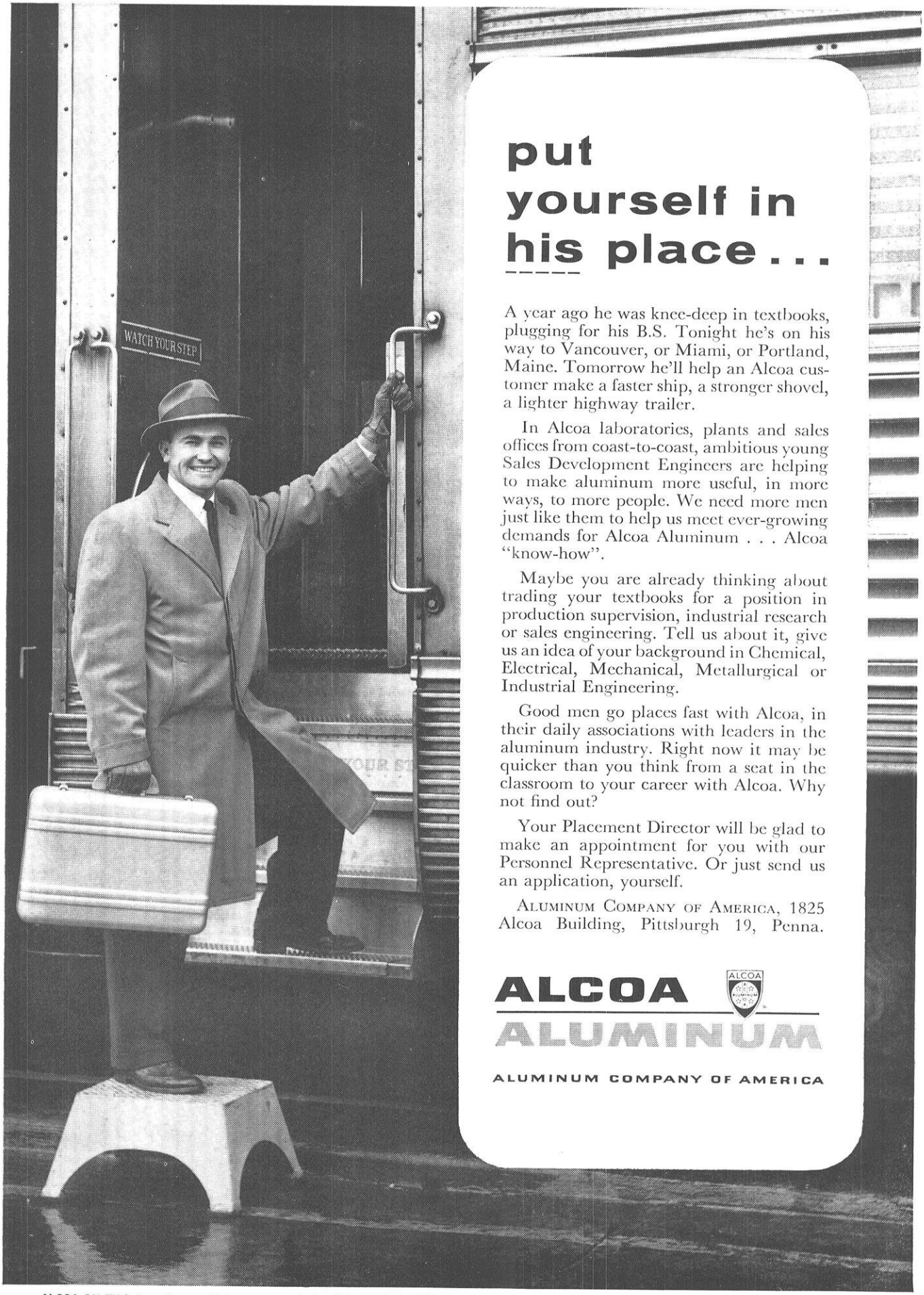
Schneible, Douglas E., c'38, who is with the Bureau of Public Roads, has been transferred from Independence, Mo., to Atlanta, Ga.

Hinkley, Elroy H., c'21, has been appointed district engineer for the Wisconsin Highway Commission at Lancaster.

Gamble, Raleigh W., c'16, was named "Engineer of the Month" in the Dec. issue of Milwaukee Engineering. Obtaining recognition as a competent engineer for the Milwaukee Sewerage Commission, he was appointed superintendent of Milwaukee's Bureau of Street Construction and Repairs. Upon retirement after 30 years of service he was presented with the key to the city by Mayor Frank P. Zeidler.

END





put yourself in his place...

A year ago he was knee-deep in textbooks, plugging for his B.S. Tonight he's on his way to Vancouver, or Miami, or Portland, Maine. Tomorrow he'll help an Alcoa customer make a faster ship, a stronger shovel, a lighter highway trailer.

In Alcoa laboratories, plants and sales offices from coast-to-coast, ambitious young Sales Development Engineers are helping to make aluminum more useful, in more ways, to more people. We need more men just like them to help us meet ever-growing demands for Alcoa Aluminum . . . Alcoa "know-how".

Maybe you are already thinking about trading your textbooks for a position in production supervision, industrial research or sales engineering. Tell us about it, give us an idea of your background in Chemical, Electrical, Mechanical, Metallurgical or Industrial Engineering.

Good men go places fast with Alcoa, in their daily associations with leaders in the aluminum industry. Right now it may be quicker than you think from a seat in the classroom to your career with Alcoa. Why not find out?

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Reciprocals

(Continued from page 27)

Having established that these cyclic groups always contain an even number of digits, we may divide them into two equally long integer groups and demonstrate another property which we shall call "being complementary with respect to nine about the mid-point." For the decimal fraction representing 1/7, we recall the sequence 142857. The sum of the two parts, 142 and 857, is 999. The six-figure group which repeats in the instance of 1/13 may be written in two parts, 076 and 923. Again, the add to 999. The same may be said for the reciprocals of 17 and 19 which appear below with the second half of the sequence arranged under the first half:

$$1/17 = 0.05882352\ 94117647\ 05882352\ 94117647\ \ldots$$
$$\underline{\quad 94117647 \quad}$$
$$99999999$$

$$1/19 = 0.052631578\ 947368421\ 052631578\ 947368421$$
$$\underline{\quad 947368421 \quad}$$
$$999999999$$

This feature, when put to work, makes it possible to find the last $\frac{(n-1)}{2}$ places of the decimal sequence for the prime number, n, simply by inspection.

From the foregoing it is hoped that a little interest has been aroused which will cause the reader to familiarize himself with the first dozen reciprocals. From a few, a great many others can be found.

For instance, the reciprocal of 15 is merely one-third of the reciprocal of five. We may readily establish,

$$1/15 = (1/3)(1/5) = \frac{0.2000}{3} = 0.0666\ \ldots$$

Similarly,
$$1/14 = (1/2)(1/7) = \frac{0.142857\ 142857\ \ldots}{2}$$
$$= 0.07\ 142857\ 142857\ \ldots\ldots\ldots\ldots$$

And,
$$1/18 = (1/2)(1/9) = \frac{0.11111\ \ldots.}{2}$$
$$= 0.055555\ \ldots\ldots$$

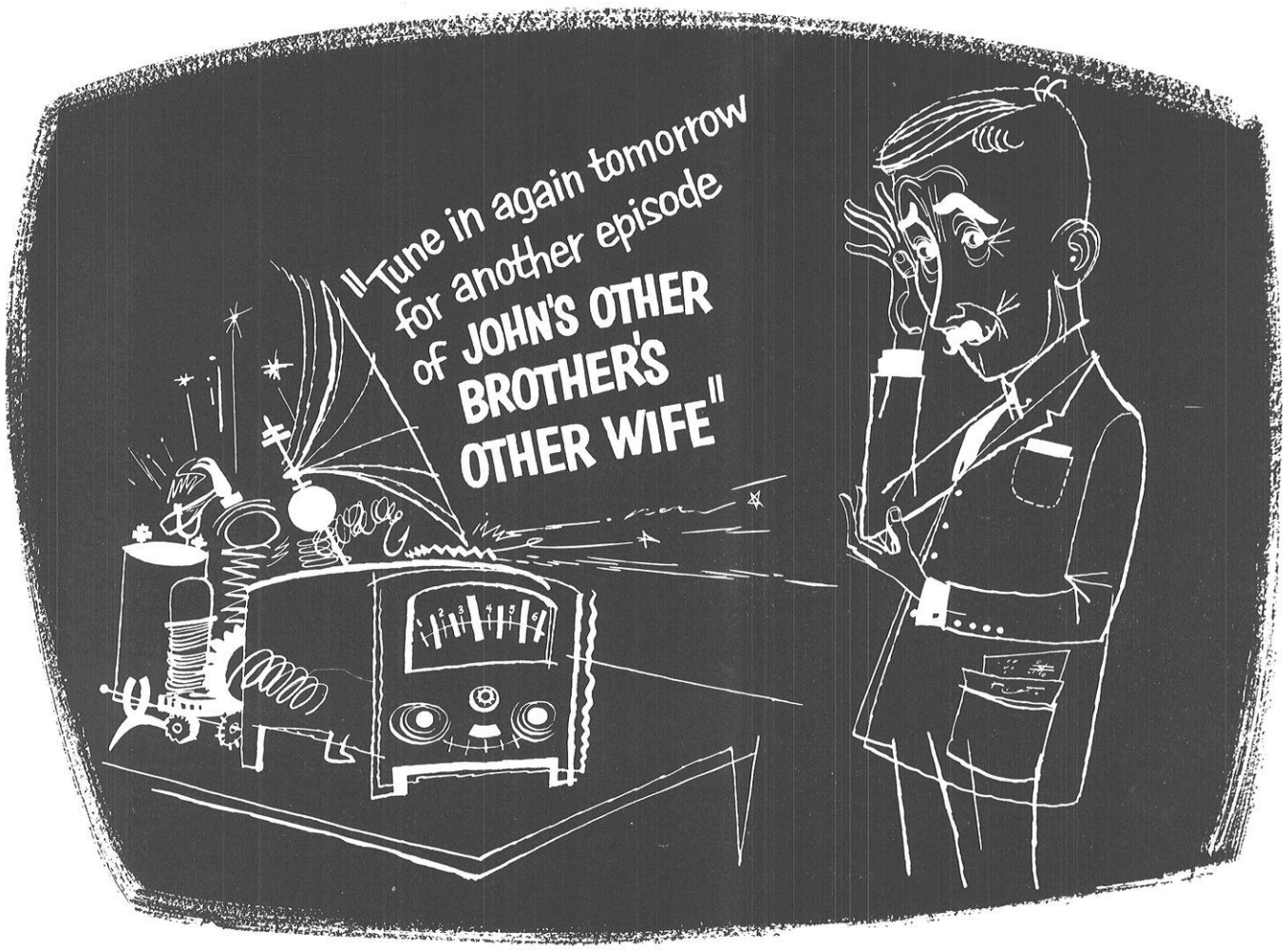
Note the persistence of the sequence, 142857, the reciprocal involving seven as a prime factor of the number.

Once the form of the cycle has been established, it may often be applied in expressing decimal fractions where the numerator is an integer other than one. The following sequences are illustrative:

$1/14 = 0.07\ 142857\ 142857\ \ldots$,	$1/18 = 0.055555\ \ldots$
$2/14 = 0.142857\ 142857\ \ldots$,	$2/18 = 0.111111\ \ldots$
$3/14 = 0.02\ 142857\ 142857\ \ldots$,	$3/18 = 0.166666\ \ldots$
$4/14 = 0.2857\ 142857\ \ldots$,	$4/18 = 0.222222\ \ldots$
$5/14 = 0.357\ 142857\ \ldots$,	$5/18 = 0.277777\ \ldots$
$6/14 = 0.42857\ 142857\ \ldots$,	$6/18 = 0.333333\ \ldots$

Thus, once the repetitive sequence is recognized, the result may be written down to any desired number of places.

END

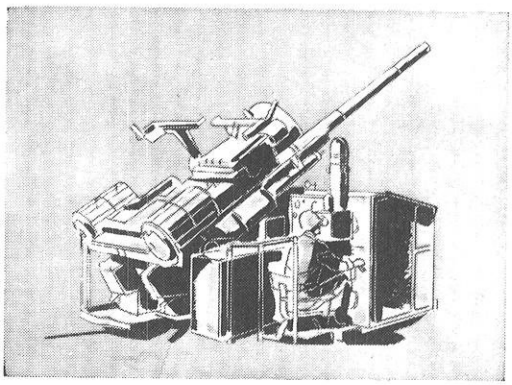


WHAT HATH MARCONI WROUGHT?

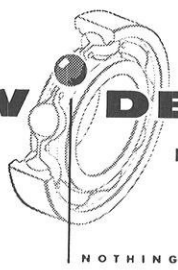
Of course, it was years before Mr. Marconi's wireless developed into radio as we know it. Then such wonders as the give-away program, the comedy show and the soap opera blossomed full-blown.

True wonders, too, have sprung from Mr. Marconi's "new departure" of 1897. And New Departure ball bearings have played a vital role . . . in electronic brains for business . . . in automation for industry . . . in radar for defense. In fact, New Departure was a pioneer in developing methods that could turn out ball bearings of ultra-high precision in the mass quantities needed for today's electronic marvels.

Such leadership is one of many reasons why engineers look to New Departure for the *finest* in ball bearings!



The amazing Skysweeper — which sights, tracks and shoots down air targets with fantastic accuracy — depends on New Departure instrument ball bearings for its internal accuracy.



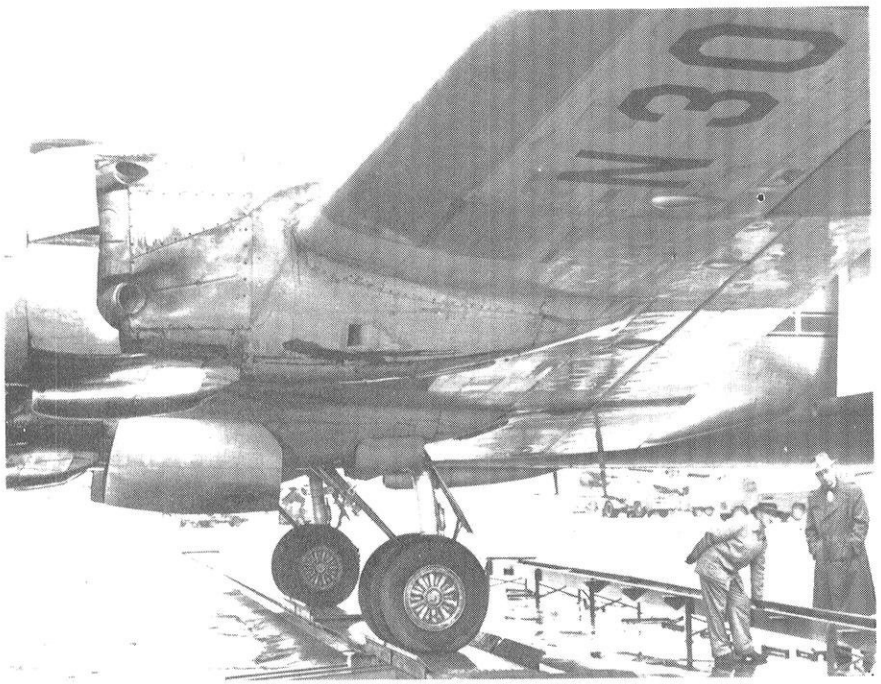
NEW DEPARTURE
BALL BEARINGS

NOTHING ROLLS LIKE A BALL

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

SCIENCE HIGHLIGHTS

Edited by Carl Burnard, CiE'57



LOADAIR MOVES PLANE TO TERMINAL

Shown here in action, the Loadair—the Whiting Corporation's new plane handling device—has just moved this 75-ton D–C 7 the 90 feet into the dock in just 40 seconds. The power is supplied by a 20-hp wound-rotor motor. Expected to whittle terminal time for passengers, provide completely indoor boarding, and greatly reduce the required plane parking space, the Loadair consists essentially of ground-level platforms mounted on buried tracks. Baggage is transported into the terminal by a 150 fpm belt conveyor powered by three explosion-proof motors. The control system for the main motor is a dual control for both inch and run with pushbuttons located both at the upper platform level and at the dock. And the electrical cost for moving the big plane into the dock?—About one-third of a kilowatt-hour.

ASME NUCLEAR COMMITTEE

The American Society of Mechanical Engineers has established a Nuclear Engineering Committee to co-ordinate the society's activities in "those areas of mechanical engineering in which a knowledge of nuclear physics is essential."

Among these areas are core design, shielding, waste handling, fuels and fuel fabrication, radiation effect (with special emphasis on metals and safety), special equipment, and operation of nuclear power plants.

The new committee will serve to co-ordinate a number of activities connected with nuclear engineering which are now carried out by various divisions of the society, primarily those devoted to fuels, heat transfer, instruments and regulators, metals engineering, power, and safety.

Increasing declassification of documents, made possible under the new Atomic Energy Act, will make the work of the committee more practical than it would have been in the past.

Primary assignments of the committee will be to plan for participation of ASME in a Nuclear Engineering Conference to be held under the auspices of Engineers Joint Council in the summer of 1955, and to study the society's long-range needs in the field of nuclear engineering and recommend a method of organization within the society.

It was emphasized that the Nuclear Engineering Committee is separate and distinct from ASME's Nuclear Energy Application Committee. The latter is a policy group. The former under the normal procedures of ASME, could lead to the formation of an organization of professional division status, similar to the 21 professional divisions through which much of the work of the society is now processed.

PILL "PROTECTS" PATIENT

Pills now can be made with an outer coating so hard that they can't be chewed. The coating, recently invented by a pharmaceutical firm, is intended to protect the mouth from discoloring dyes used for diagnosis and from unpleasant-tasting medicines.

LONG RANGE RADAR

A new radar height-finder, on test, detects planes three times as far as previous units of this type. Radar's energy is concentrated in a narrow beam like that of a searchlight and is powerful enough to light fluorescent lamps over a hundred feet away. General Electric and Griffiss Air Force engineers collaborated in developing the unit. The company is making the new radar in mobile and fixed versions and has supplied a large quantity for use in strengthening the radar fences guarding the North American continent and for defense posts in countries receiving aid from the United States under the Mutual Defense Assistance Pact.

SAFER BRIDGE BUILDING IS ACHIEVED BY USE OF ALUMINUM ERECTION SPANS

The use of aluminum erection spans, an innovation in bridge building practice, promises greater safety in deep-water operations, plus speed at least equal to conventional methods. In addition to the hoisting and moving advantages gained by aluminum's light weight, the procedure eliminates the use as falsework of permanent steel intended for use elsewhere on the job.

Two 280-ft. aluminum truss spans are being used as work platforms to erect 289-ft. steel truss spans on the superstructure of the Richmond–San Rafael Bridge across the north arm of San Francisco Bay. Constructed at a cost of $150,000 each, the aluminum erection spans provide a solid working surface and can be hoisted into position with equipment required for other phases of the erection work. The spans rest on brackets attached to the bridge's permanent piers.

Traditionally, two methods of truss span erection have been followed: assembly in place on some sort of temporary platform or falsework; or pre-assembly and floating into position. The platforms are supported by temporary piles where the bottom is not rocky; however, the Richmond-San Rafeal project would have required pile lengths too great to be economical. Steel trusses, occasionally used temporarily as erection spans and then used elsewhere on the same project as permanent fixtures, would have been impractical on this job due to their weight—in excess of 400 tons apiece. (The aluminum spans weigh 117 tons.)

Floating the spans into place also was ruled out, since the steel truss assemblies are too heavy for economical hoisting operations. Moreover, floating in at a high level involved a risk of tipping, since some spans are as much as 170 feet above mean sea level, and the site is subject to treacherous tidal currents and high winds.

LIGHTWEIGHT RECOILLESS RIFLE

A lightweight recoilless rifle and new-type ammunition with unprecedented tank-killing power were unveiled to the public today by the Army Ordnance Corps in Lacarne, Ohio.

The weapon, a 106 mm battalion anti-tank rifle known as "the BAT," has double the penetrating power of any existing recoilless rifle. Weighing less than 500 pounds, it can be carried by three men or mounted in a Jeep. It measures approximately 10 feet in length.

One of the features of the weapon is a rigidly mounted .50 caliber spotting rifle which permits greater fire control and speed in moving on a target. By firing tracers, the spotting rifle eliminates the need for a heavy and fragile optical rangefinder.

INTEROCEANIC CANAL

Colombia has announced plans to build a 350-mile waterway from the Caribbean Sea at Garien Gulf to the Pacific Ocean near Buenaventura. The $20-million waterway, using the Atrato and San Juan Rivers, is expected to be a shorter ocean-to-ocean route than the Panama Canal for Colombian coastal shipping.

SOLAR ENERGY BRINGS THE NOON DAY NEWS

A solar-powered experimental radio transmitter, the size of a package of cigarettes, has been built by a General Electric development engineer.

The transmitter is self-contained. It uses transistors instead of electron tubes, and selenium solar energy converters instead of batteries. When light rays strike the selenium, sufficient electrical energy is delivered to the transistors to operate the transmitter.

The transmitter currently has a short range, about 100 feet, which could be improved, Keonjian explains, by increasing the number of selenium solar energy converters

(Continued on page 58)

So You Think You're SMART!

by Sneedly, bs'59

It has been pointed out that the readers would appreciate more problems and less babbling from Sneedly. As a result, I shall bow to the wishes of our readers who think they are actually smarter than good ole Sneedly. Perhapse after the following set of problems, their respective egos will have suffered sufficiently so that I can write this column without constructive criticism in the future.

* * *

An ex-electrical engineer flunked a qualifying exam on the following multiple choice question: Suppose that the earth were 25,000 miles in circumference, and suppose it is possible to erect a telephone line on poles about the equator. Assuming that the telephone wire would then form a circle concentric with the equator, how tall must the poles be if the total length of the wire is only 100 feet longer than the circumference of the earth? The answers were a) 0.87 feet, b) 0.91 feet, and c) 0.90 feet. Since the answer was not given, the young engineer received a zero when he picked answer b. What is the right answer? Even you ChE's can work on this one—just assume the wire is a heat exchanger with 100 extra feet of pipe.

* * *

Recently, an engineer went into a candy store to buy a dime's worth of jellybeans. While making the purchase he clumsily knocked over the whole jar, spilling 573 jellybeans on the floor. The angry proprietor demanded payment; but the engineer, being more agile with his brain than he had been with his hands, challenged the proprietor to a contest.

Each would take turns picking up jellybeans, and anywhere from one to twenty-five beans could be picked up each turn. The person forced to pick up the last bean would lose the argument. The engineer courteously allowed the proprietor to take the first turn. The proprietor did, and it was his downfall. How did the engineer force the proprietor to take the last bean?

* * *

In each of two different rooms in the chem engineering building there are chairs and three-legged lab stools. If in each room all the legs had been stools, all the stools had been chairs, and all the chairs had been removed from the rooms, there would have been 100 too many legs in each room. How were the two rooms furnished?

* * *

A farmer discovers that a forest fire is approaching his farm at the rate of nine miles an hour and is, at the moment, exactly 9 miles away. He has a motor boat moored at a river-bank exactly 6¾ miles away; and since he can strike out cross-country at the rate of 6 miles an hour, he can easily escape from the fire.

His wife, however, can make only 4 miles an hour. Then there's a baby girl who has to be carried, and thus cuts down the speed of either parent by 1 mile per hour. There's also a boy who can run a mile in 15 minutes, but then drops exhausted and has to rest or be carried for 15 minutes until he can stir a foot. Carrying him retards the speed of either parent by 2 miles per hour. Fortunately, the farmer can take his wife's arm when he is going at a faster rate than hers; and that increases her speed by ½ miles per hour.

Even if all get aboard the boat, it still takes 30 seconds to cast loose and start up. Furthermore, the fire is strong enough to fell any human being caught within 6 yards of it.

If they waste no time can all be saved—or must one or more members of the family perish in the fire?

* * *

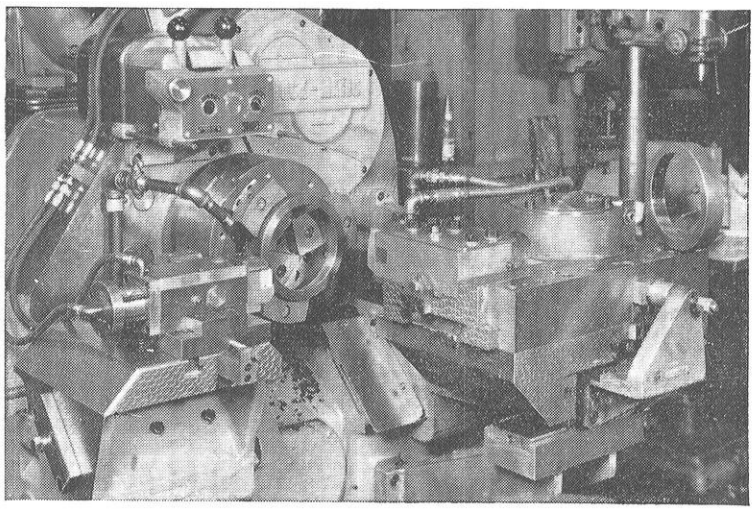
The answer to the Babylonian problem of last month was simply that the ancients used a number system based upon 8 instead of 10.

* * *

Here's a problem for the engineering profs, who should have some problem worthy of their positions. A bottle and its cork cost $4.80. If the contents of the bottle cost $4.80 (tax included), what is in the bottle? I'll have the answer finished by next month . . . positively.

END

Another page for **YOUR BEARING NOTEBOOK**

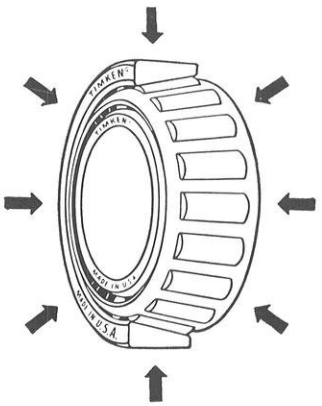


How to machine with high precision at high speeds

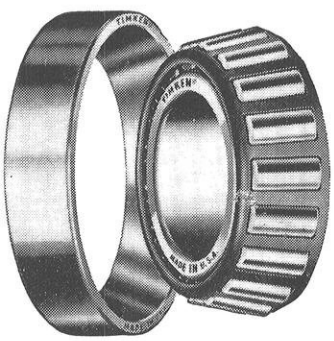
This lathe is designed to machine the races of bearings from 4″ to 8″ in diameter. And it must deliver high precision at speeds and feeds as fast as carbide tools can handle. To keep the spindle rigid under heavy combination loads, it's mounted on Timken® tapered roller bearings.

How TIMKEN® bearings maintain spindle rigidity

Because Timken bearings take radial and thrust loads in any combination, they hold spindles in rigid alignment, insure precision. And full line contact between the rollers and races of Timken bearings provides extra load-carrying capacity, prevents breakdowns.

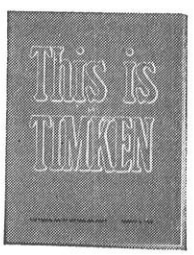


TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



Want to learn more about bearings or job opportunities?

Many of the engineering problems you'll face after graduation will involve bearing applications. For help in learning more about bearings write for the 270-page General Information Manual on Timken bearings. And for information about the excellent job opportunities at the Timken Company, write for a copy of "This Is Timken". The Timken Roller Bearing Company, Canton 6, Ohio.



NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⓪ AND THRUST —⓪— LOADS OR ANY COMBINATION ✳

STATIC

by I. R. Drops

A feminine tourist pointed to a decorated skull in a show case: "Do you know whose skull it was?"

Tired Mexican Guide: "That is the skull of the Emperor Montezuma."

The Giddy One then pointed to a smaller skull in the same case: "Who was that?"

Guide (with perfectly straight face): "That, Madam, is the skull of Montezuma when he was a little boy."

* * *

A certain businessman had the habit of leaving his umbrella at his office. One morning as he was going to work he sat next to a young lady in the trolley car, and as he rose to get off he absentmindedly picked up her umbrella.

"Pardon me," she said, "but this is mine." The man was quite embarrassed, naturally.

That night he decided to take all his umbrellas home with him from the office.

When he got in the trolley car, there sat the same young lady. She leaned forward and said in a low tone:

"I see you did pretty well today after all."

* * *

The letters the Negro preacher added after his signature were B.S., M.S., and Ph.D.

Finally, one of his flock was aroused to ask him how he derived these academic decorations.

"Well," replied the parson, "you know what B.S. means, don't you?"

"Sho, sho, ob course," replied the inquirer.

"Well, den, for your information," said the parson, "M.S. means 'more of the same' and Ph.D. means 'piled higher and deeper'."

* * *

Success is getting what you want. Happiness is wanting what you get.

Experience is what you have left when everything else is gone.

* * *

"Yeah," said the sophomore, "When I came out here I was pretty conceited, but they knocked all of that out of me and now I'm one of the best fellows in school."

* * *

I shot an arrow into the air,
It fell to earth, I know not where;
I lost ten of the things that way.

* * *

Said the tipsy gentleman to handsomely dressed bystander—"Shay, bub, call me a cab will you?"

Said the Commander, U.S.N.: "I am a naval officer, not a doorman."

Said the tipsy gentleman: "Awright; then call me a boat. I gotta get home."

* * *

Professor (irritated): "If there are any morons in the room, please stand up."

A long pause, and a lone freshman rose.

Professor: "What, do you consider yourself a moron?"

Freshman: "Well, not exactly that, sir; but I do hate to see you standing all alone by yourself."

* * *

My parents told me not to smoke;
I don't.
Or listen to a dirty joke;
I don't.
They made it plain that I must not wink
At pretty girls or even think
About intoxicating drink;
I don't.
Wild youth chase women, wine, and song;
I don't.
I kiss no girls, no, not a one;
I do not know how it is done;
You wouldn't think I have much fun;
I don't. . . .

Speaking on the dangers of modern food, the speaker pointed a finger at a harassed looking listener and demanded, "What is it that we all eat at some time or another, that is the worst thing imaginable for us? Do you know, sir?"

Softly came the answer from the little man, "Wedding cake."

* * *

Porter: "Did you miss the train, sir?"

Running Passenger: "No! I didn't like the looks of it, so I chased it out of the station."

* * *

Joke No. 495–36B

We can't tell it here. So write for it!

* * *

(Reprinted from a recent Government Bulletin)

"All commodities listed in Appendix A are those known to the trade as such, excepting therefrom such thereof, if any, while subject to another regulation."

* * *

The lawyer had just given his wife a beautiful skunk coat for Christmas.

"I don't see," she mused, "how such a nice coat can come from such a foul smelling beast."

"Well," replied the lawyer, "I don't ask for thanks; but I do demand a little respect."

* * *

Physics professor: "If, in going down this incline, I gain four feet per second, what will be my condition after 25 seconds?"

Smart Sophomore: "You'll be a centipede."

You'll encounter more uproarious humor if you turn to page 62.

ELECTRICAL ENGINEERS
MECHANICAL ENGINEERS
at all academic degree levels

for { electrical and mechanical engineering design and development, stress analysis, airborne structural design, electrical and electronic circuitry, systems studies, instrumentation, telemetering, electro-mechanical test, applied physics problems.

Sandia Corporation, a subsidiary of the Western Electric Company, offers outstanding opportunities to graduates with Bachelor's or advanced degrees, with or without applicable experience.

Sandia Corporation engineers and scientists work as a team at the basic task of applying to military uses certain of the fundamental processes developed by nuclear physicists. This task requires original research as well as straightforward development and production engineering.

A new engineer's place on the Sandia team is determined initially by his training, experience, and talents . . . and, in a field where ingenuity and resourcefulness are paramount, he is afforded every opportunity for professional growth and improvement.

Sandia engineers design and develop complex components and systems that must function properly under environmental conditions that are much more severe than those specified for industrial purposes. They design and develop electronic equipment to collect and analyze test data; they build instruments to measure weapons effects. As part of their work, they are engaged in liaison with the best production and design agencies in the country, and consult with many of the best minds in all fields of science.

Sandia Laboratory, operated by Sandia Corporation under contract with the Atomic Energy Commission, is located in Albuquerque — in the heart of the healthful Southwest. A modern, mile-high city of 150,000, Albuquerque offers a unique combination of metropolitan facilities plus scenic, historic and recreational attractions — and a climate that is sunny, mild, and dry the year around. New residents have little difficulty in obtaining adequate housing.

Liberal employee benefits include paid vacations, sickness benefits, group life insurance, and a contributory retirement plan. Working conditions are excellent, and salaries are commensurate with qualifications.

A limited number of positions for Aeronautical Engineers, Mathematicians, and Physicists are also available.

Make application to: **PROFESSIONAL EMPLOYMENT**

DIVISION A-5

Or contact through your Placement Office the Sandia Corporation representative with the Bell Telephone System College Recruiting Team for an interview on your campus.

SANDIA *Corporation*

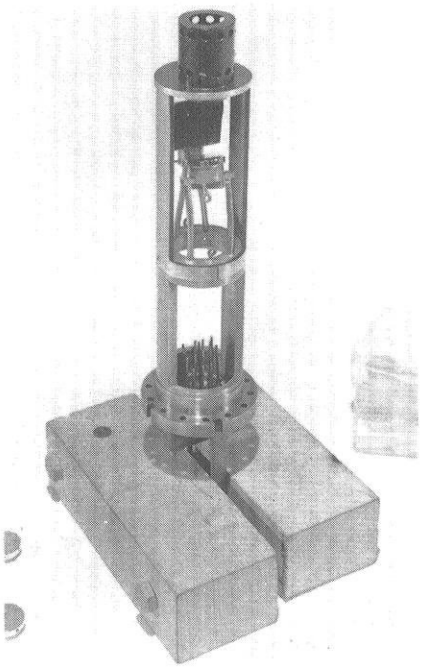
SANDIA BASE • ALBUQUERQUE, NEW MEXICO

Science Highlights

(Continued from page 53)

or using silicon or germanium instead of selenium.

Developments in light sensitive elements over the next decade may make practical small personal radio transmitters and receivers powered by solar energy.



ULTRA FLAT SURFACES HELP IN ELECTRON STUDIES

Although the multi-billion dollar electrical industry is based on the movement of electrons through metals, there are many, large gaping voids in our understanding of the mechanism of that passage. One of the problems on which Westinghouse research scientists are vigorously working is how conduction electrons (i.e., outer orbital electrons that can be freed to make amperes) absorb energy from impinging light, and how much. The end product of such research still in its early stages, is data for curves from which a theory can be drawn. These results, even these early ones, are of unquestioned value—but not exciting to the average engineer. However, some of the problems and the numbers dealt with in pursuing this data engender high respect for the investigators.

For example, the metal specimens must be polished to a degree that make the surface of even a high-grade telescope mirror look like an array of hills and valleys. The highest "hill" allowed on the surface is about five Angstroms high or 0.00000002 inch. A wavelength of green light is 1000 times greater.

Such super-smooth surfaces are achieved by electro-polishing. This is a relatively old technique by which individual projecting atoms are gently removed. Variations in surface can be reduced almost to the distance between individual atoms.

TVI SYSTEM IS CLASSROOM AID

In one of the first applications of its kind, RCA "TV Eye" closed-circuit television equipment is being used by the University of Kansas City as a classroom aid in teaching dental surgery.

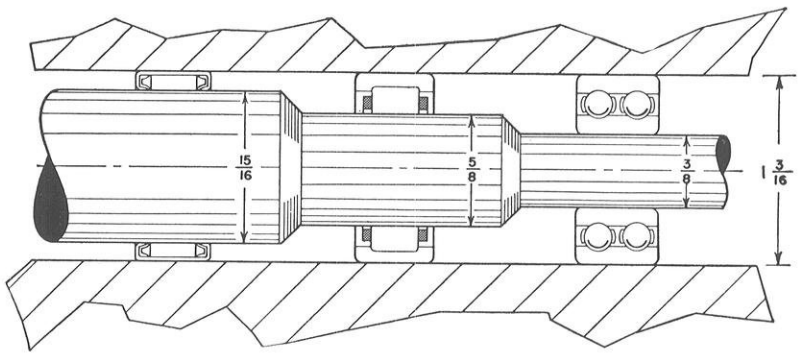
The compact equipment, built around a small TV camera weighing less than five pounds, enables surgeons at the University's School of Dentistry to project close-up details of oral operations to more than 100 students seated in a lecture hall a floor away. Heretofore, only six students were permitted in the surgery at one time, and none was close enough to see the operation in the detail presented by television.

The "TV Eye" camera and control unit are installed in the school's dental surgery. Television projections are made on a four-by-five foot screen mounted in the lecture hall on the next floor. The camera is fitted with a telescopic lens which enables the camera to "get inside" the patient's mouth without intruding on the surgeon's working area, despite the close quarters of oral operations.

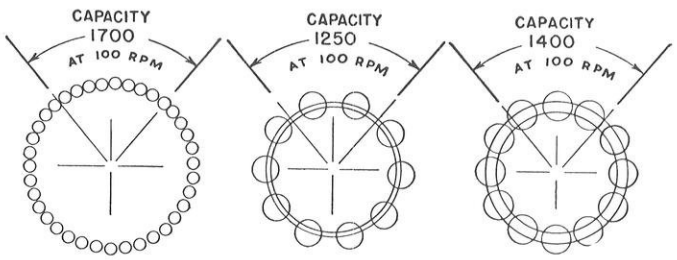
The installation also includes a two-way intercommunications system which enables the surgeon to describe the operation as he performs it, and to hear and answer questions from students viewing the operation several hundred feet away. END

The Torrington Needle Bearing
is designed for high radial loads

The many lineal inches of contact provided by the larger number of small diameter rollers give the Torrington Needle Bearing an unusually high load rating. In fact, a Needle Bearing has greater radial capacity in relation to its outside diameter than any other type of anti-friction bearing.



1. *Illustrates the fact that for a given housing bore size, a larger and, therefore, stiffer shaft can be used with Needle Bearings than with a roller or ball bearing.*



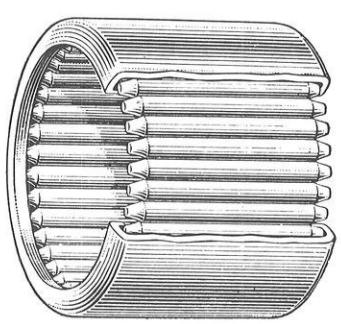
2. *Shows the greater number of lines of contact in the load zone of a Needle Bearing compared with a ball or roller bearing.*

Precision Manufacture and Unique Design

The exceptional load capacity of the Needle Bearing is the result of proper selection of steels, precision workmanship to close tolerances, and the application of modern anti-friction principles.

The one-piece shell, which serves as the outer raceway and retains the rollers, is accurately drawn from carefully selected strip steel. After forming, it is carburized and hardened. There is no further grinding or other operation that might destroy the wear-resistant raceway surfaces. The full complement of thru-hardened, precision-ground rollers is retained by the turned-in lips of the one-piece shell.

The small cross section of the Needle Bearing allows a large shaft which permits a rigid design with minimum shaft deflection, a factor of utmost importance to good bearing design.



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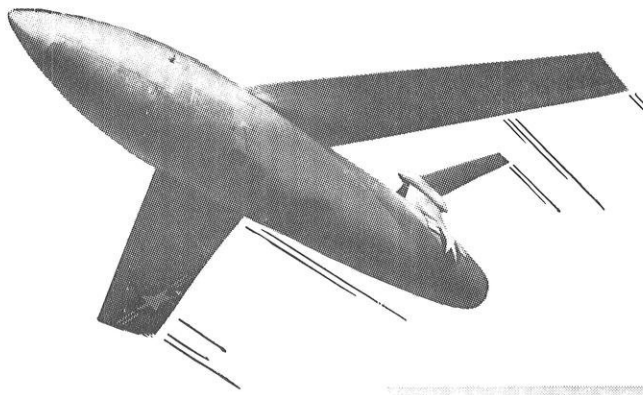
TORRINGTON NEEDLE BEARINGS

NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • BALL • NEEDLE ROLLERS

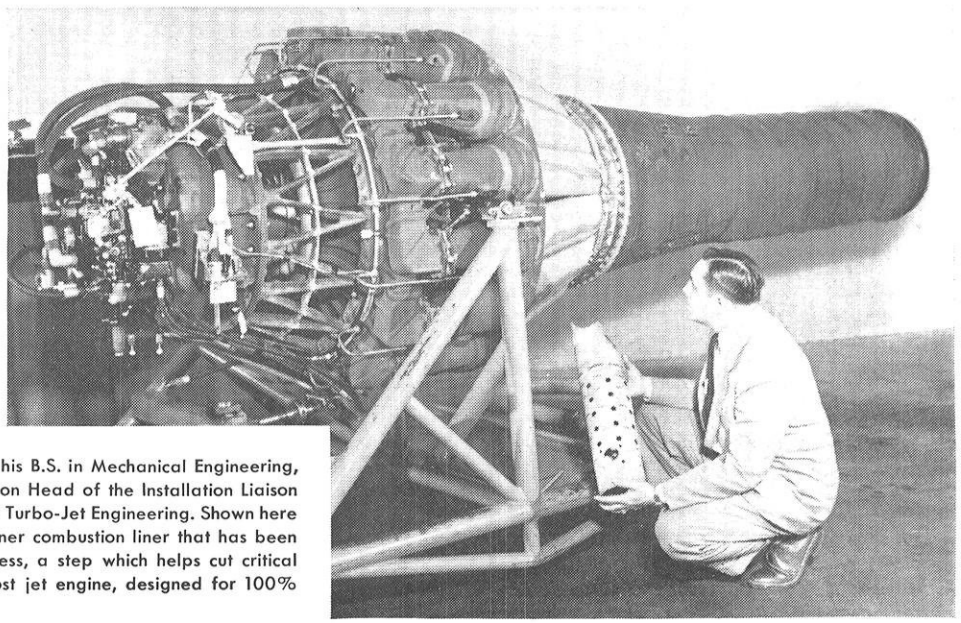


ALLISON

Engineers Pioneer

MISSILE

Power Plant Development



W. S. "Gus" Broffitt, who received his B.S. in Mechanical Engineering, U. of Kentucky in 1938, is now Section Head of the Installation Liaison and Engineering group of the Allison Turbo-Jet Engineering. Shown here by a J33-A-37, he is holding an inner combustion liner that has been through the aluminum dipping process, a step which helps cut critical materials in this high speed, low cost jet engine, designed for 100% reliability.

● The Allison jet powered USAF B-61 Martin Matador is the country's first operational ground-to-ground pilotless bomber. And, it's the first such missile to be sent overseas for duty.

The B-61 engine—an Allison J33-A-37—is based on the proven Allison centrifugal flow engine. This engine has accumulated more than 2½ million hours of flight in such aircraft as the Lockheed F-80 Shooting Star, the T-33 Trainer, F-94 Night Fighter, and in the Grumman F9F Panthers and the Cougars!

In 1950, Allison undertook the project of engineering and developing a 5-hour, low-cost, expendable jet engine for the Glenn L. Martin Co. which was under contract with the Air Force. The missile assignment made it necessary for Allison to design a J33 model—incorporating reduced material, manufacturing and testing costs—and still maintain a 100% reliability.

The concentrated efforts of Allison engineers resulted in an 85% reduction of critical materials in missile engines in comparison with the similar centrifugal flow engines built for piloted aircraft.

An aluminum dipping process, developed by Allison engineers—in cooperation with General Motors Research—helped materially in reduction of critical materials. This process was used on inner combustion liners and permits using a low alloy steel in place of highly critical material. The aluminum dipping process affords corrosion protection, and still enables the liners to withstand high combustion temperatures. First to use aluminum dipping equipment on large parts, Allison now uses the process on turbine engines scheduled for piloted aircraft.

The missile power plant project is another example of the variety of problems handled by Allison engineering. Because Allison is continually doing pioneer work in advanced engineering developments, we need more technically trained men, especially young graduate engineers. Want to know more about your engineering future at Allison? Write now for information:

R. G. GREENWOOD, Engineering College Contact
ALLISON DIVISION, General Motors Corporation
Indianapolis 6, Indiana

STATIC

We couldn't find anything uproarious, but at least this stuff is printable.

An after dinner speaker had gone on and on for what seemed several hours. Finally, one member of the audience slipped away from the table and out into the hall. There he met a fellow banqueter who had slipped out earlier.

"Has he finished yet?" he asked.

"Yes," replied the one who had just come out, "a long time ago, but he won't stop."

* * *

Slowly, her eyes glowing softly, the beautiful debutante raised the glass on high, exulting: "Port wine to me is the nectar of the gods, the elixir of life. When I imbibe its fluid, my soul begins to throb and glow. The music of a thousand muted violins whispers in my ear and I am transferred to the make-believe world of magic. On the other hand, beer makes me belch."

Three polar bears were sitting on an iceberg.

"Now," said the father bear. "I've a tale to tell."

"I, too," said the mother bear, "have a tale to tell."

The little polar bear looked up at his parents and said: "My tail's told."

* * *

Sunday School Teacher: "Lot was warned to take his wife and flee out of the city, and she was turned to a pillar of salt."

Little Boy: "Please, teacher. What happened to the flea?"

* * *

You know what the once over is?
That's this!
when like
you girl
look at a pretty

* * *

Econ Instructor: "Who invented the 40 hour work week?"

Wise C.E.: "Robinson Crusoe—he had all his work done by Friday."

A few years back a small African state was ruled by a native who insisted on having all kinds of wild animals roaming around the countryside—just so he could be certain of good hunting conditions. Finally, after the state had been practically ruined by the millions of tigers, lions, etc., the ruler's subjects, thoroughly disgusted with the situation, overthrew the government and installed a new leader. This is the first (and probably the last) instance in which a reign was called on account of game.

* * *

Another time when a fellow likes to have a girl stick to her knitting is when she's in a wet bathing suit.

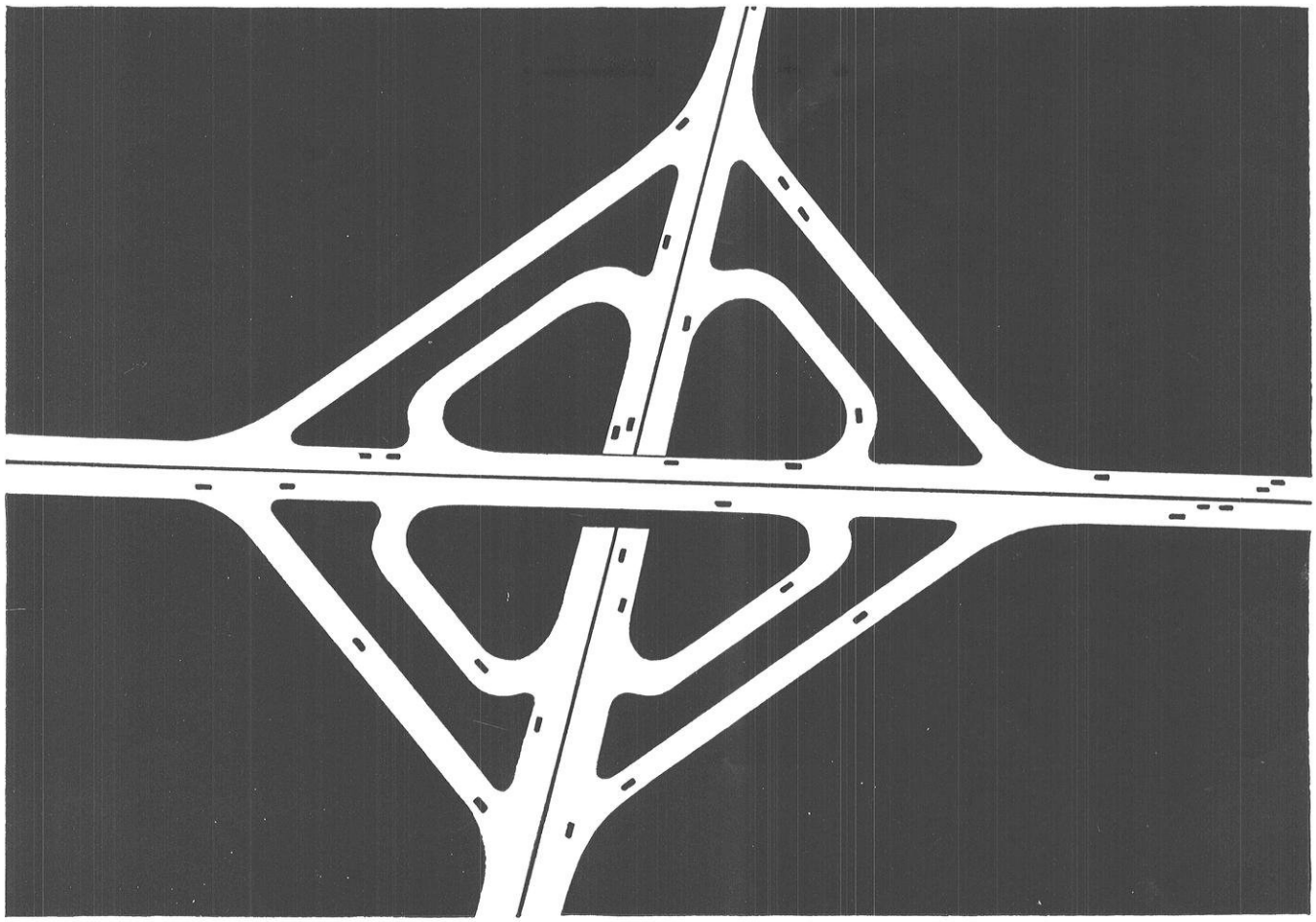
* * *

As they say in the Mechanics Department—"Every couple has its moment."

* * *

Employer: "Are you looking for work, young man?"

Engineering Student: "No, but I would like a job." END



FROM COW-PATHS TO CLOVERLEAFS...

The narrow, twisting, rut-ridden roads of yesteryear are being replaced by new multi-lane, high-speed highways. Crossroads have been bridged and cloverleafed . . . hills have been leveled . . . curves lengthened.

These changes have happened in the half century since the advent of the automobile. For more and better cars and trucks demand faster, safer roads and turnpikes.

SPACE FOR SPEED...

The traffic that flows over America's three-million mile network of roads represents the very life stream of our progress. Nowhere else in the world do people travel so far and so freely . . . nor do so many trucks deliver such a wide and plentiful supply of merchandise so fast and to so many places.

AMERICA WORKS LIKE THAT...

Here in America we have men who dare to dream and build for future needs . . . machines to move mountains . . . materials to make roads . . . and an all-seeing, all-hearing, and reporting Inter-Communications System that acquaints every branch of science and engineering . . . every technical skill . . . with the needs and the accomplishments of every other field of endeavor.

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Complete communication is the function, the unique contribution of the American business press . . . a great group of specially edited magazines devoted to the specialized work areas of men who want to manage better, research better, sell better, buy better.

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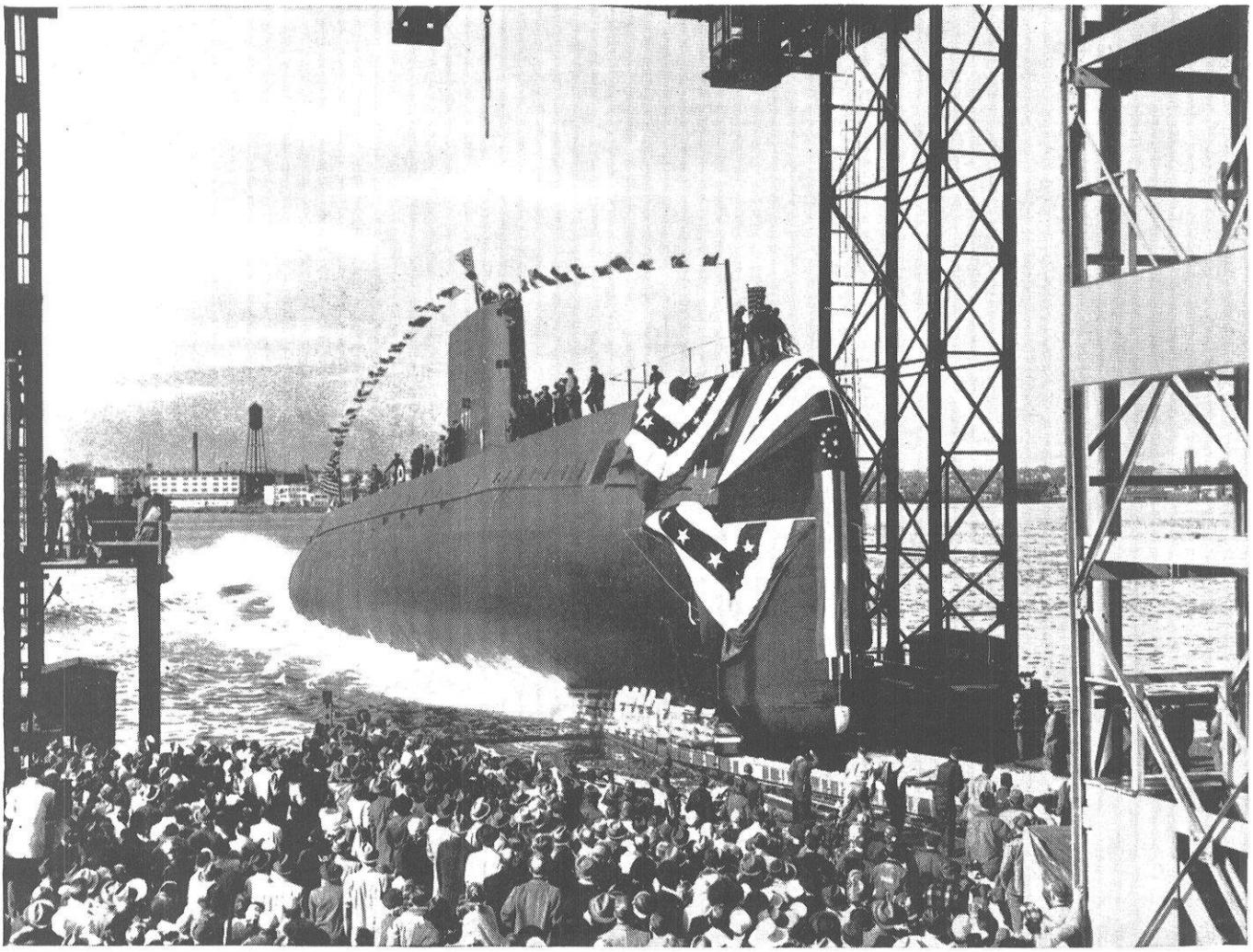


SLIDING DOWN THE WAYS at Groton, Conn., goes the USS Nautilus, newest and fastest member of our underseas fleet. During welding, Worthington heavy-duty turning rolls rotated the hull sections.

How the world's first atomic sub was welded

Welding the hull of the USS Nautilus, world's first atomic submarine, presented a tough problem.

Submerged-arc automatic welding seemed to be ideal for the job. Question was—could you rotate the hull sections of the Nautilus to take advantage of this fast, high-quality welding method?

Worthington's answer to General Dynamics Corporation's Electric Boat Division, builder of the Nautilus, was the largest turning roll ever built.

The result? Welding of the Nautilus hull was accomplished in record-breaking time — and cost less than originally estimated. Unchanged, the Worthington roll set-up is also being used in the construction of the nation's second atomic sub, the USS Sea Wolf.

Turning rolls for submarines aren't all that Worthington makes. The long list of Worthington-designed, Worthington-built equipment includes air conditioning units, construction machinery, compressors, Diesel engines, steam power equipment and, of course, pumps of all kinds. For the complete story of how you can fit into the Worthington picture, write F. F. Thompson, Manager, Personnel and Training, Worthington Corporation, Harrison, New Jersey. You may be glad you did.

4.25 B

See the Worthington representative when he visits your campus

See the Worthington Corporation exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 40th Street.

WORTHINGTON

When you're thinking of a good job—think high—think Worthington

AIR CONDITIONING AND REFRIGERATION • COMPRESSORS • CONSTRUCTION EQUIPMENT • ENGINES • DEAERATORS • INDUSTRIAL MIXERS
LIQUID METERS • MECHANICAL POWER TRANSMISSION • PUMPS • STEAM CONDENSERS • STEAM-JET EJECTORS • STEAM TURBINES • WELDING POSITIONERS

PHOTOGRAPHY AT WORK—No. 8 in a Kodak Series

Kodak
TRADE-MARK

Photography shows prospects

how their new service stations are going to look and operate

Alemite sets up scale models of their service station equipment on the customer's own floor plan—photographs them—and portrays the new custom-built station ready for action

Salesmen don't just pull lube racks, grease pumps and other service station equipment out of a sample case. They're far too big—far too bulky. Besides, final location and arrangement count heavily in how well they are going to work out.

The Alemite Division of Stewart-Warner solves the problem with photography. Prospects see new service station equipment virtually right in their own premises.

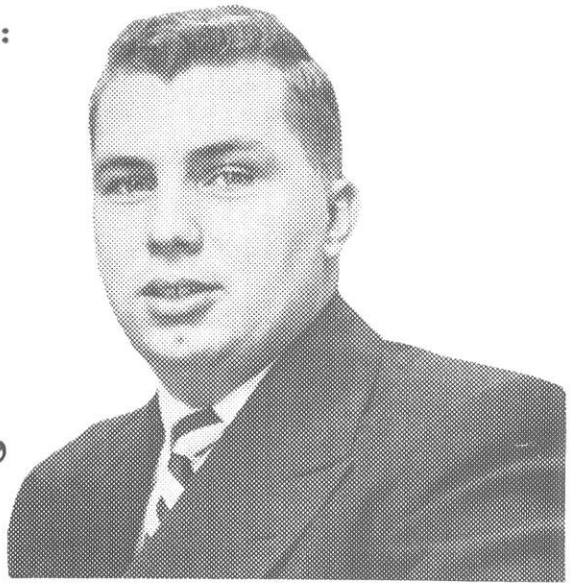
It works this way. The salesman sends in a rough sketch of the space available, with windows and columns marked. Experts fit exact replicas of racks, lifts, and other equipment to the plan, then put the camera to work. The customer pictures his new station—modern, efficient, handsome—and the sale is well on its way. It's an idea for any company with bulky products to sell. Photography is a great salesman for any business, large or small. And it's very much more. It works in all kinds of ways to save time, cut costs, reduce error and improve production.

Graduates in the physical sciences and in engineering find photography an increasingly valuable tool in their new occupations. Its expanding use has also created many challenging opportunities at Kodak, especially in the development of large-scale chemical processes and the design of complex precision mechanical-electronic equipment. Whether you are a recent graduate or a qualified returning service man, if you are interested in these opportunities, write to Business & Technical Personnel Dept., Eastman Kodak Company, Rochester 4, N.Y.

Eastman Kodak Company, Rochester 4, N.Y.

JOHN B. NOLTE, Purdue University '54, asks:

"What is G.E.'s Manufacturing Training Program?"



The Manufacturing Training Program at General Electric is a program of basic training for manufacturing leadership, including planned rotational work assignments and related classroom study for outstanding young men who are interested in a career in manufacturing. It was organized to meet the increased demand for effective manufacturing leadership and technical "know how," in line with the expansion and development of the Company's operations by developing trained men to fill future key positions in the organization.

Who is eligible for this program?

In general, the Program is open to college graduates with degrees in engineering and science, and a limited number of business administration and liberal arts graduates. We are looking for outstanding young men with sound educational backgrounds, well-balanced personalities, demonstrated thinking abilities, and having the potential to develop toward top level responsibility in key assignments.

How long is the program?

The normal length of the Program is three years. Assignments are normally 6 months in duration and provide experience opportunities in diversified manufacturing operations. Geographical moves occur at annual intervals.

What type of work assignments are made?

Work assignments are provided in all phases of manufacturing and related functions so that each man will acquire knowledge of manufacturing engineering, including manufacturing methods and techniques, shop operation, production control, personnel administration, labor relations, engineering activities, sales and manufacturing co-ordination, and general business administration.

In addition to job assignments, related study courses cover such subjects as Company organization, manufacturing operations, labor and personnel relations, business administration, law and relationships between manufacturing and other functions of the business. Progress on the job and in classroom work is carefully observed and reviewed periodically with each man to assist him in his career.

What happens after training is completed?

After completing the training program, graduates are placed in operating departments and divisions throughout the Company in positions where leadership and initiative are needed. All placements are made in relation to the aptitudes, abilities, and interests of the graduates.

At General Electric, manufacturing operations involve the administration and supervision of activities of more than 100,000 men and women in more than 100 plants, who are involved in the making of some 200,000 different products.

The wide scope of these activities, the great variety of products, and the diversity of manufacturing activities offer limitless opportunities and exciting challenges to college graduates today.

Manufacturing training is a foundation for leadership—and an opportunity to build a satisfying, rewarding career in one of America's most important industries.

If you are a graduate engineer, or a graduate with definite technical inclinations that include an interest in the career possibilities in manufacturing, see your college placement director for the date of the next visit of the General Electric representative on your campus. Meanwhile, for further information on opportunities with General Electric write to Manufacturing Training Services Section, Bldg. 36, General Electric Company, Schenectady 5, New York.

You can put your confidence in—

GENERAL ELECTRIC