The Wisconsin engineer. Volume 59, Number 8 May 1955

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MAY, 1955
25¢
The Wisconsin

engineer

James Chisholm, class of '41,
speaks from experience when he says,

"Men with ability and ambition really have a chance to get ahead at U.S. Steel"

● A responsible position can come quickly to those graduate engineers at U.S. Steel who show ability and ambition. Management training programs are designed to stimulate and develop these qualities as the trainee "learns by doing." His training is always a fascinating challenge and he works with the best equipment and the finest people in the business.

James Chisholm is typical of the young men who rapidly rise to an important position at U.S. Steel. Jim came to U.S. Steel as a trainee in 1941 after graduating as an M.E. Shortly thereafter he entered military service for four years. Upon his return to U.S. Steel in 1946, he advanced steadily until, in 1951, he was appointed to his present position as Assistant Superintendent of Blast Furnaces at the new Fairless Works at Morrisville, Pa.

Jim is now in charge of the unloading of all ore ships and the operation of the plant's two big blast furnaces—each with a rated output of 1500 tons per day.

Jim feels that the opportunities for graduate engineers are exceptional at U.S. Steel. He remarked that in his own department alone, six college trainees have been put into management positions within the last couple of years. He says that chances for advancement are even better now with the current expansion of facilities and the development of new products and markets.

If *you* are interested in a challenging and rewarding career with United States Steel, and feel that you can qualify, you can get details from your college placement director. And we will gladly send you a copy of our informative booklet, "Paths of Opportunity," which describes U.S. Steel and the openings in various scientific fields. Just write to United States Steel Corporation, Personnel Division, Room 1622, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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For, in the final analysis, the very life's blood of our organization is the never-ending production of "more and better things for more people"—and that, very definitely, requires the engineering mind at its best.

In point of fact, although engineering graduates comprise a mere two per cent of total GM employment, they will eventually fill about forty per cent of executive posts if the established pattern continues.

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GENERAL MOTORS CORPORATION

Personnel Staff, Detroit 2, Michigan

Systems Development and The Ramo-Wooldridge Corporation

The Ramo-Wooldridge Corporation (except for the specialized activities of our subsidiary, Pacific Semiconductors, Incorporated) is engaged primarily in developing—and will soon start to manufacture—systems rather than components. For military customers our weapons systems responsibilities are in the fields of guided missiles, fire control, communications, and computers. Our non-military systems activities are in the general area of automation and data-processing.

Emphasis on systems development has consequences that profoundly affect all aspects of an organization. First, it demands an unusual variety of scientific and engineering talent. A single systems development project often requires concurrent solutions of challenging problems in the fields of electronics, aerodynamics, propulsion, random phenomena, structures, and analytic mechanics. In addition, the purely technical aspects of a systems problem are often associated with equally important non-technical problems of operational, tactical, or human relations character.

Therefore, competent systems development requires that a company contain an unusually large proportion of mature, experienced scientists and engineers who have a wide range of technical understanding and an unusual breadth of judgment. Further, all aspects of company operations must be designed so as to maximize the effectiveness of these key men, not only in the conduct of development work but in the choice of projects as well.

At Ramo-Wooldridge we are engaged in building such a company. Today our staff of professional scientists and engineers comprises 40% of the entire organization. Of these men, 40% possess Ph.D. degrees and another 30% possess M.S. degrees. The average experience of this group, past the B.S. degree, is more than eleven years.

We believe the continuing rapid growth of our professional staff is due, in part, to the desire of scientists and engineers to associate with a large group of their contemporaries possessing a wide variety of specialties and backgrounds. It is also an indication that such professional men feel that the Ramo-Wooldridge approach to systems development is an appropriate one.

We plan to continue to maintain the environmental and organizational conditions that scientists and engineers find conducive to effective systems development. It is on these factors that we base our expectation of considerable further company growth.

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Digital Computer Research and Development
Business Data Systems Development
Radar and Control Systems Development
Communication Systems Development

The Ramo-Wooldridge Corporation

8820 BELLANCA AVENUE; LOS ANGELES 45, CALIFORNIA

Volume 59 **MAY, 1955** **Number 8**

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WISCONSIN ENGINEER

The Student Engineer's Magazine

FOUNDED 1896

Articles

Departments

Cover

Chicago bound, the Twentieth Century Limited streaks past a bridge at 141st Street in New York City. Though signals have just turned red in this time exposure, shiny side of train at left still shows the reflection of yellow light—even a patch of green—from signals before they changed.—*Courtesy STEELWAYS published by The American Iron and Steel Institute.*

Frontispiece

Ira Fetherolf gauges the thickness of white hot steel plate emerging from the rollers of the 160-inch plate mill at U. S. Steel's Homestead District Works, Munhall, Pennsylvania.—*Courtesy United States Steel.*

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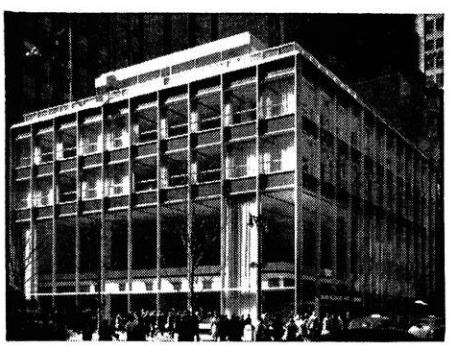

NEW BUILDING in New York is the glass-sheathed Manufacturer's Trust Building. It's cooled by a Worthington central station system—so big it does the same job as melting 300 tons of ice daily.

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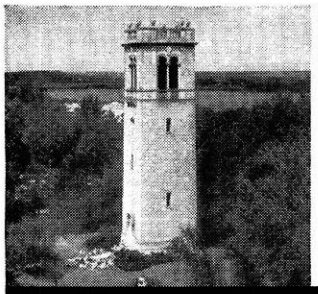

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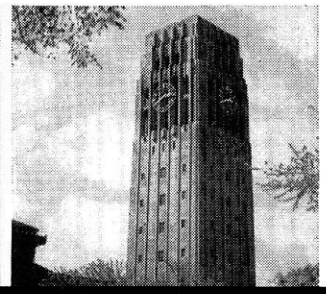

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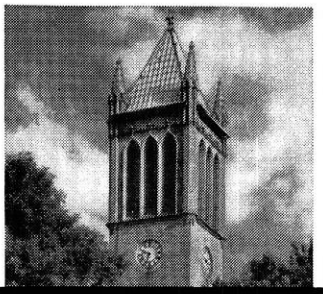

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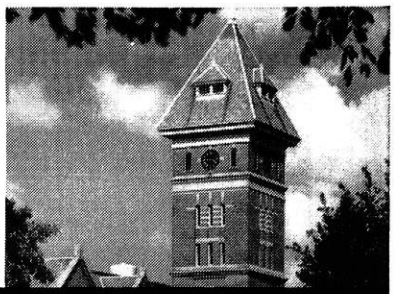

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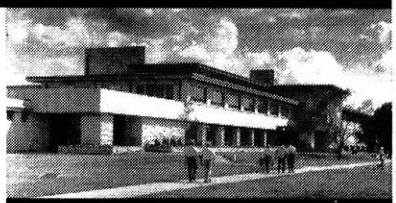

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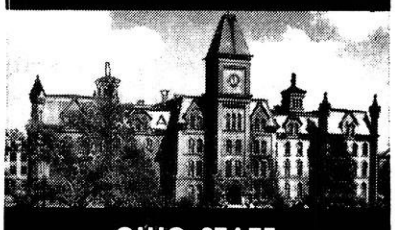

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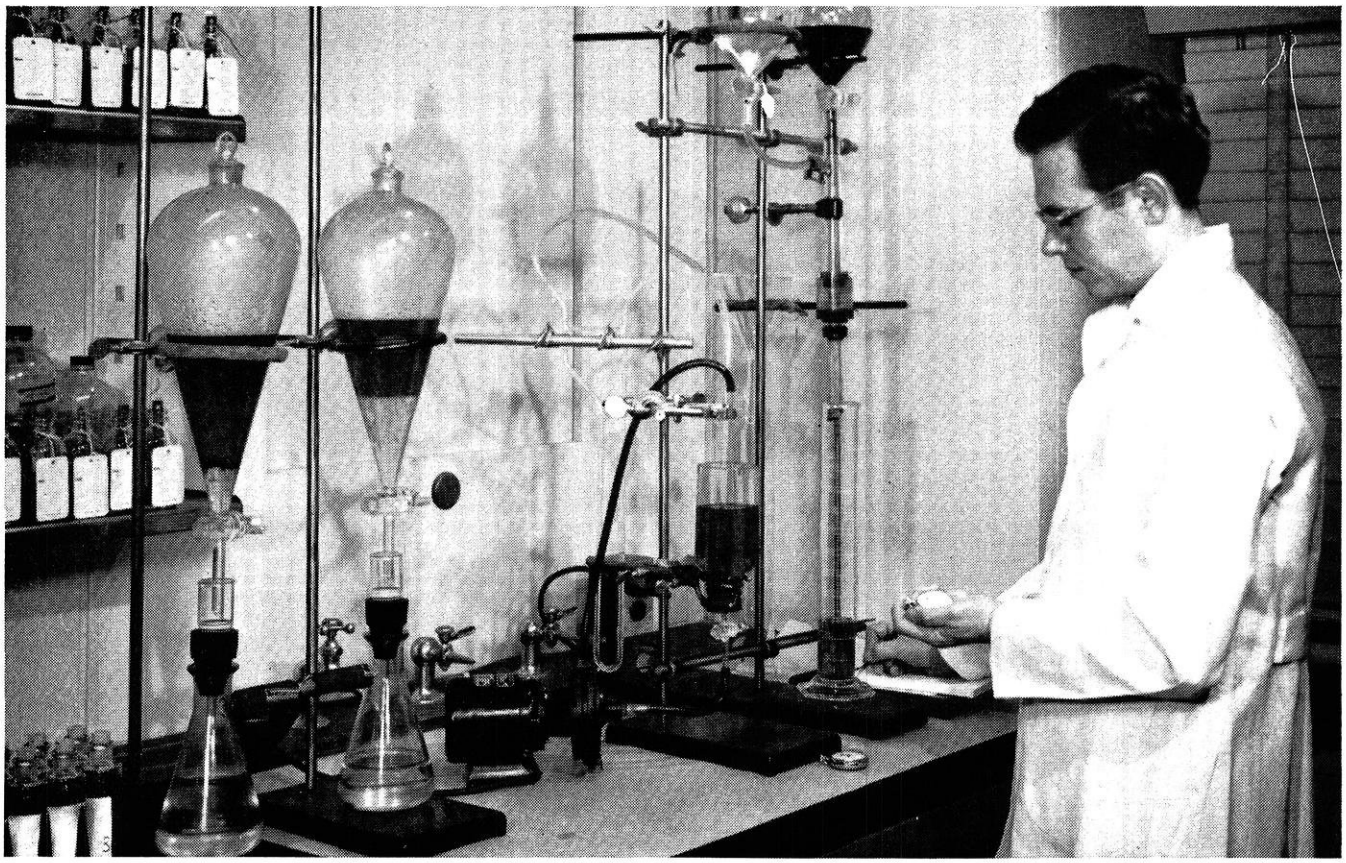


To help develop STA-CLEAN for STANDARD Furnace Oil, the testing apparatus shown here was constructed. Running an experiment on the improved oil is Dr. Jack A. Williams, a chemist at Standard Oil's Whiting laboratories.

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.

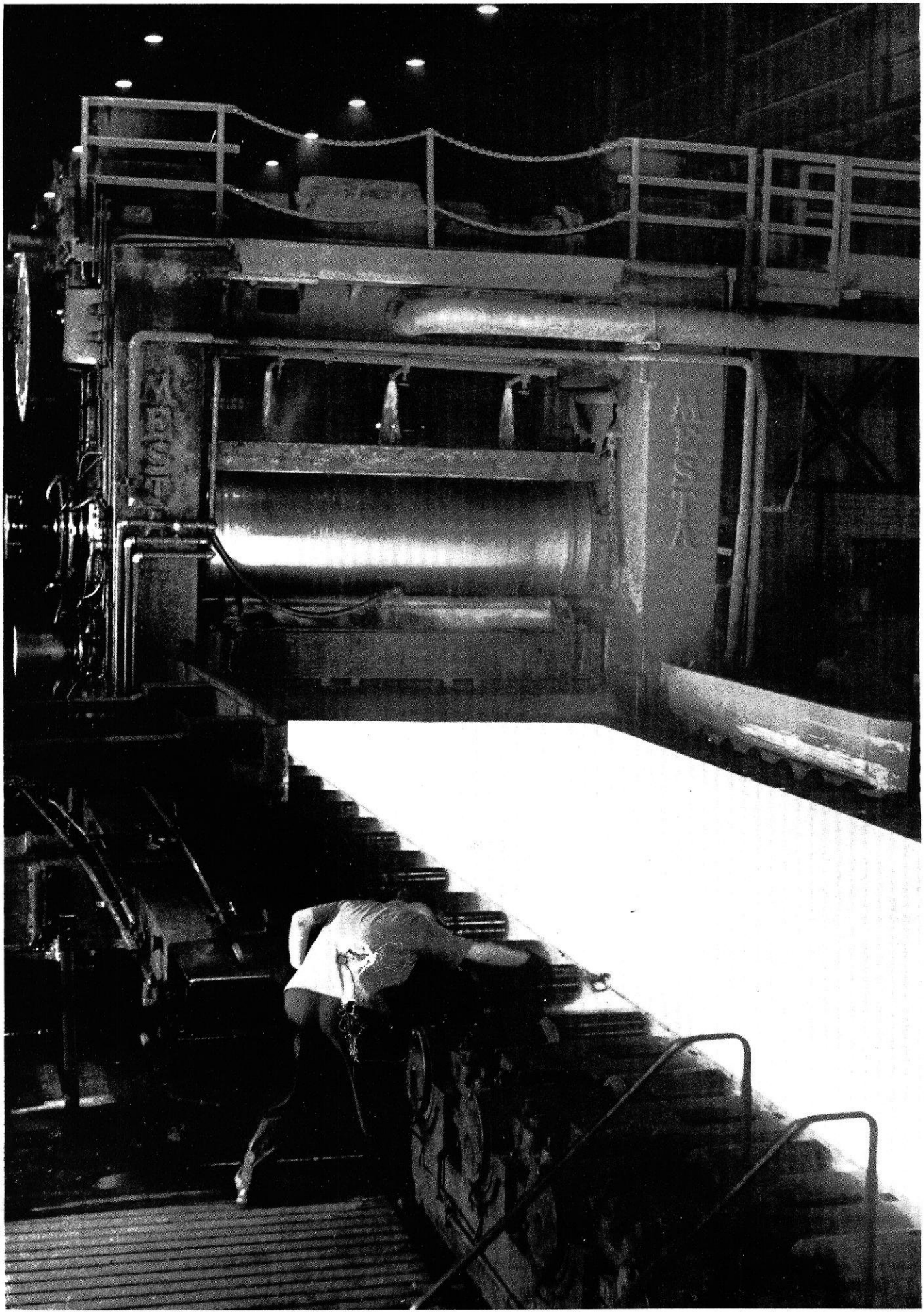
After months of painstaking laboratory work and many more months of thorough field testing throughout an entire heating season, Standard Oil scientists perfected a new, efficient additive—STA-CLEAN. Blended into our furnace oil, the new additive acts as a detergent, sludge inhibitor and rust stopper—all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

910 South Michigan Avenue, Chicago 80, Illinois

STANDARD



editorial

M.E.: Well, have ya got a job for this summer yet?

E.E.: Oh sure. I'll have the same job I had last summer. I'm gonna drive a delivery truck for my uncle again.

Ch.E.: I don't know if I can get a job. I've got ROTC summer camp to spoil my chances.

M.E.: That does spoil getting a good job. I think I'll put in my application for a life guard's job at home. It doesn't pay much, but oh what a life.

Ch.E.: That's not a bad idea. But I could use some good money in those few weeks and I don't know how I'll get it. Summer jobs at home are scarce as it is, so I guess I'll be out of luck for just a coupla weeks. I sure could use an uncle who would give me a job.

Listen fellas . . . All three of you are juniors; all three of you could get summer jobs in your field of engineering if you wanted to. Yes, even for only half of the summer. You probably realize the fact but you've overlooked it. The jobs are not difficult to get. Many of the companies that hire engineers are eager to have undergrads like yourselves spend a summer with them. This goes for you, the reader, also.

The company hiring the man for a permanent position is always taking a gamble. They have met and talked with him just a few times in artificial situations and have only his college record to go by. They are extremely eager to get to know the young engineers better before they hire them.

This isn't the real incentive you should have in seeking technical jobs, however. You are experienced enough to know that some real technical assignments, based on your own level of training, will be of great help to you in placing your classroom work in the proper perspective. In fact, as so many other student engineers have found, such experience guides you in your choice of professional electives, which might otherwise have been wasted.

Furthermore, you can get a feel of your own branch of engineering. You might very well find out what engineering is all about and thus perhaps find where you want to fit in.

If you know what you want to do and are able to obtain a position with an organization in which you are interested, you are getting an early start in your career. If the company gets to know you before hiring you to a permanent position, it may mean an increase in starting salary.

Why don't you sit down for a few minutes and think about this.

If you aren't afraid to go away from home for a summer or haven't already committed yourself, it's not too late to apply for a summer position. Check with the placement bureau for the remaining interview dates or get the addresses of the organizations offering summer jobs in your particular field. Even if you have a ROTC summer camp of a summer lab, some companies will still hire you. They are more interested in you than in any work you might accomplish during the brief time you are there.

Such an opportunity should be part of your engineering education, so why not make the most of it?

—R. A. H.

ASME's Diamond Jubilee

THE HISTORY AND SURVEY OF A SOCIETY DEDICATED TO THE SERVICE OF ENGINEERING AND MANKIND

by William E. Miller, me4
President, Student Branch ASME, University of Wisconsin

11 Eldridge Street
Syracuse, N. Y.
January 18, 1880

Dear Sir, It having been suggested by several prominent engineers that a national association of mechanical engineers would be desirable, and a meeting for the purpose of taking steps to organize such a society being in order, your presence is hereby requested at the office of the American Machinist, 96 Fulton Street, New York, the sixteenth day of February, 1880, at 1 o'clock sharp, at which time the necessary steps for organizing such an association will be made.

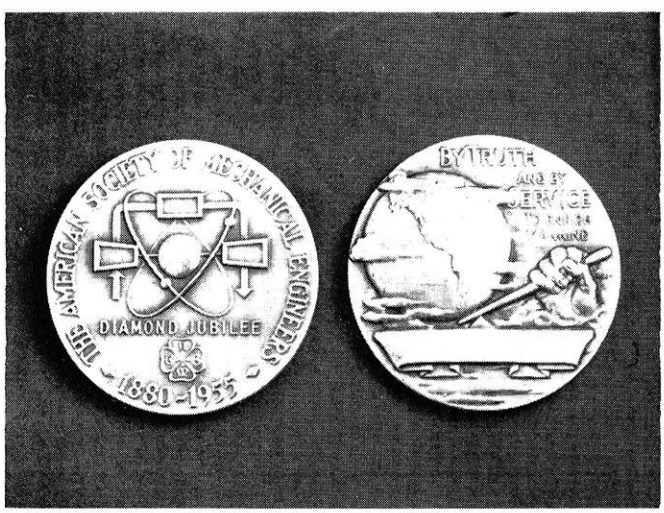
Any inquiries in regard to the meeting will be cheerfully answered.

Please avoid allowing this to be made public.

Very truly yours,
(Signed) JOHN E. SWEET

This letter, sent to a comparative handful of persons, marks the beginning of the American Society of Mechanical Engineers' seventy-five years of growth and success. On February 16, 1880, three men met in the offices of American Machinist in New York. The men were John Edson Sweet, Professor of Practical Mechanics at Cornell University; Robert Henry Thurston, Professor of Mechanical Engineering at Stevens Institute of Technology; and Alexander Lyman Holley, who was instrumental in bringing to this country the Bessemer process of manufacturing steel.

On April 7, 1880, an organizational meeting was held in the Assembly Hall of Stevens Institute of Technology. At that meeting, attended by eighty-five engineers, the committees appointed at the Founding Meeting submitted their reports, the first slate of officers with Professor Robert H. Thurston as President was elected, and the Constitution and By-Laws were adopted. A Certificate of Incorporation was granted on December 24, 1881.



ASME'S 75th Anniversary Medallion.

What these men wanted and needed in 1880 was an organization that would bring all people interested specifically in mechanical engineering problems in every field—industrialists who manufactured machines, businessmen and others who bought or used them, and the engineers who created them—into contact with each other. A society that would breed intelligent discussion of these problems at a high technological level.

The founders of ASME knew their new Society would serve men who worked in all engineering fields. But neither the diversity of fields nor the complexity of modern engineering problems had as yet arrived. They were, however, looking forward to an age of electrical power and were talking about the changes power delivered from a central station would eventually bring to the world. They anticipated aviation, but they had no intimation of radio, or of an atomic age which would burst upon the world in less than three quarters of a century hence. They knew a changing world was inevitable, that the mechanical engineer was essential, and that he would be called upon to serve in ways no one in 1880 could foresee.

The development of the Society may be said to have taken place in three stages. During the first stage the leaders of ASME devoted their principal efforts to the major cause for which the Society had been established: the development and dissemination of technical knowledge.

In the second stage the organization became more decentralized. It expanded its membership and the number and variety of its activities and interests, and began to exert its influences in the advancement of industrial management and the application of engineering principles to the less technical problems of industry.

The third phase of ASME's development has been characterized by a growing concern for recognition of engineering as one of the learned professions, and for the recognition of the engineer as a professional man. The opportunities and obligations of public service are also stressed.

Objectives of ASME

The objectives of this Society, as stated in the Constitution are:

1. To promote the art and science of mechanical engineering and the allied arts and sciences.
2. To foster engineering education.
3. To advance the standards of engineering.
4. To promote the intercourse of engineers among themselves and with allied technologists.
5. To encourage original research.
6. To broaden the usefulness of the engineering profession.

Meetings

Today, the ideal of the Founders—to gather, present, and disseminate information—is carried out on a scale that must surely exceed their expectations. The present schedule consists of four national society meetings—annual, semi-annual, spring and fall—and seven national meetings sponsored by the professional divisions. In 1954 these eleven meetings were attended by 13,000 people. In the same period, 1,070 meetings were held by nearly 100 local groups, organized as ASME Local Sections all over our country, while another 606 meetings and twelve regional conferences were held by the 139 student groups organized as ASME Student Branches.

Publications

Cooperating with the thousands of ASME committee members who give time and work each year to make these meetings worthwhile are other members who assume responsibility for disseminating new knowledge in published form. The present magazine *Mechanical Engineering* was first issued in 1919. Its predecessors were the *Proceedings*, and the *Journal* which were started in 1906 and 1909 respectively. Other works now being published by ASME include a series of biographies of engineers, and numerous standards, codes, handbooks, bibliographies, reports, and translations.

The great majority of papers presented at regional and national meetings are printed in the Society's various publications where they become available to all ASME members and the public as well. Most of these papers (they exceeded 600 in 1954 and covered more than 3000 pages of printed text) are preprinted in order that a more complete discussion may be included in the final publication. This work, of course, necessitates a paid editorial staff. Yet, in all truth, it can be said the ASME is a professional organization of 40,000 members of whom an amazingly high percentage contribute voluntary time and effort in promoting knowledge in their field of work, so that it may be used everywhere for the good of all.

(Continued on page 14)

ASME MEDAL WINNER

GRANVILLE M. READ

Granville M. Read, chief engineer of E. I. du Pont de Nemours & Company, Inc., Wilmington, Delaware, has been named to receive the ASME Medal, it was announced by David W. R. Morgan, president of The American Society of Mechanical Engineers.

The award, which is administered by the Board on Honors of ASME, is presented annually for distinguished service in engineering and science.

The citation accompanying the medal praises Mr. Read "for his outstanding leadership in developing men and in organizing and completing projects of extraordinary national and industrial importance."

Mr. Read was born in New London, Virginia, in 1894 and was educated at Virginia Polytechnic Institute and the Sorbonne, Paris. He began his career with Du Pont in 1915 as a centrifuge operator at the Hopewell, Va., guncotton plant which the company was operating for the government. Mr. Read has been chief engineer of the Du Pont Company since 1946. He is currently responsible for the engineering and construction of the $1.3 billion Savannah River Project near Aiken, S. C., which is nearing completion under contract with the Atomic Energy Commission.

Throughout his administrative career Mr. Read has stressed the importance of safety and has achieved an outstanding record in this field. For example, from 1942 to 1954 it is estimated that 600 lives were saved and 32,000 serious injuries prevented in Du Pont industrial projects because of the careful methods which he was responsible for instituting and maintaining.

In 1951 Mr. Read received an honorary doctor of science degree from the University of Delaware. He was named a trustee of that university in 1954, and in the same year was also appointed to the board of visitors of Virginia Polytechnic Institute. A director of the Remington Arms Company, Inc., he is a member of Tau Beta Pi, honorary engineering fraternity, and Omicron Delta Kappa, national leadership fraternity. Mr. Read is a member of the American Institute of Chemical Engineers and The American Society of Mechanical Engineers. Among the past recipients of the ASME Medal are Charles F. Kettering, automotive engineer; Edward G. Budd, developer of stainless steel railway cars; and the late Dr. Robert A. Millikan, Nobel Prize winner for his research in the field of physics.

The award was conferred on Mr. Read at the ASME spring meeting held in Baltimore from April 18 to April 22.

Codes and Standards

One of the most important accomplishments of ASME has been the formation of numerous Codes and Standards. The mark of ASME approval on many pieces of equipment is a guarantee of greater safety for millions of laymen who could not recognize the mark if they saw it. The ASME Boiler Code and Power Test Codes have long been accepted as standard practice for testing steam boilers and prime movers in this country. These codes and standards have been made by engineers who voluntarily assumed responsibility for gathering available, and discovering new information upon which to base proper specifications for safe construction, adequate testing, and safe operation, and by keeping this information and the standards up-to-date, as technical advances are made.

The safety that results from this service of ASME is illustrated in the decrease in the number of boiler explosions that have occurred since the first edition of the ASME Boiler Code in 1914. In the forty years preceding 1910, some ten thousand boiler explosions occurred in the United States and adjacent parts of Canada and Mexico. With increase in the use of steam, 1300 to 1400 boiler accidents occurred in our country in 1910. Property damages and financial losses often ran high and hundreds of people were killed or injured.

At this point the ASME voluntarily entered the picture with the appointment of a Boiler Code Committee which sought and attained cooperation from other groups closely concerned with the problem. Added to those who served as ASME members were representatives of groups who used and manufactured boilers and the steel that went into them, of boiler companies, state inspection authorities, technical schools, and of the public. As a result of its work, serious boiler explosions with loss of life are a rarity in American industry or on American ships today.

The ASME Elevator Code is the basis of laws which now cover elevator installation and operation in seventeen states, assuring a greater degree of personal safety for every individual who rides in them. Its adoption resulted in a striking decrease in elevator accidents, deaths and injuries. In Rhode Island a few years ago, elevator accidents decreased 54 per cent the first year that the ASME code was adopted. Even in those states where it is not yet adopted, its influence in the elevator-manufacturing industry has increased our personal safety.

In the larger matter of national safety, one incident alone illustrates effectively the importance of the ASME Program of Codes and Standards. During World War II a disabled British warship limped into one of our West Coast navy yards for repairs from wounds received in battle. It was a yard well supplied with spare parts, nuts and bolts, and all other material necessary for repairs on ships built to American standards. But the top of a British standard screw was round where ours was flat. The angle of their Whitworth thread was 55 degrees while our American Sellars thread was cut to an angle of 60 degrees. So here the crippled dreadnaught lay for three weeks before parts could be ordered and flown from England, at a time when Allied and Japanese fleets were locked in a life and death struggle in the South Pacific.

Except for the voluntary assumption of responsibility by the national engineering societies and of countless hours of unpaid work by thousands of their members in the years between World War I and II, that type of thing could have happened to our own ships limping into our own navy yards. It happened time and time again to disabled war material during World War I when, without nationally accepted standards for guidance, manufacturers had to meet production problems as best they could. So great was the danger to human lives, and so needless the drain on the nations' pocketbook that, in 1918, before World War I had come to an end, representatives of the five great national engineering societies came together to lay foundations for achieving sound engineering standards in industrial practice and to their voluntary acceptance by American manufacturers.

Through the efforts of the ASME and her sister societies in North America and Great Britain, agreement was reached recently on an American-British-Canadian, or "ABC" screw thread, which would build engineering strength for all of us. This thread is now used on all armed forces material manufactured in these countries. Internationalization of other standards is also underway.

This type of work had actually been started more than thirty years earlier by the ASME with the appointment of its first Standardization Committee on Pipe Threads in 1885.

Today, some 3000 members are contributing time and work in creating new standards and periodically reviewing old codes and standards. This group includes some of the best engineering talent in the country. They are now working on more than 350 projects in more than 90 different fields. Cooperating with them are representatives of manufacturers and users of equipment being standardized. Representatives of the public too, are always on these committees because standards affect the public interest.

Relations with Other Groups

ASME participates with the other engineering societies in many joint activities such as maintaining the Engineering Societies Library, conducting the Engineering Societies Personnel Service, and serving through the American Standards Association and the Engineering Foundation.

ASME has also stressed the importance of cooperative relationships with engineering groups outside of the United States. One of the first significant steps in this direction was taken in 1889, when members of the society visited England and France at the invita-

(Continued on page 47)

The Challenge and Opportunity Abroad

by Dr. Lillian M. Gilbreth

Dr. Lillian M. Gilbreth, Knapp Visiting Professor in the Department of Mechanical Engineering, is known as "the world's greatest woman engineer". She is president of Gilbreth, Inc., well-known consulting engineers in management, and is noted not only as an eminent engineer, but as an authoress, educator, humanitarian, lecturer, and counsellor. Born in Oakland, California, Dr. Gilbreth received her Bachelor of Letters degree from the University of California in 1900. She also holds degrees of Master and Doctor of Engineering, Doctor of Philosophy, Doctor of Science, and Doctor of Laws.

Dr. Gilbreth, with her late husband, developed many new techniques in the field of motion study, and the impact of her work in time and motion study, management, and rehabilitation of the handicapped has been internationally recognized. A Phi Beta Kappa, Dr. Gilbreth was cited recently as one of the University of California's most distinguished alumnae. Through the Gilbreth story, "Cheaper by the Dozen", many have received hope and inspiration from her philosophy that engineering principles can make the world a better place in which to live.

This is a wonderful time for a young man or woman to be in the engineering profession. Jobs are plentiful. Opportunities to get the necessary education and training are available almost everywhere. The work is interesting, stimulating and rewarding. The jobs at home are well described and often discussed. What of the jobs in other countries?

This is the age of the Questioning Method. Perhaps we can ask certain questions and learn something from the answers. What is an engineer expected to do, on any job he may take? That can be simply and easily answered.—"To utilize the resources of nature, and of human nature for the benefit of mankind". All scientists and technicians are expected to do this, no matter how young and inexperienced the engineer may be, he shares this responsibility. That is why he is an engineer —to learn, to apply what he learns, to be of service.

What must he know? How to live in this world, how to adjust physically, mentally, emotionally and socially —into any group where he may find himself. He must get on well with himself and other people. He must be able to take over a specific job and do it well. Ultimately he must be able to take over many specific jobs and to supervise or manage other people.

If he goes into foreign countries he will find more adjustments to be made—more jobs to be done—more problems in the field of supervision. Both his learning and his teaching will expand.

Education prepares him for the adjustment and for the expanding demands. Training gives him the ability to meet specifications, to do, skillfully what has to be done. Our engineering colleges and universities are set up to educate and to train, if we utilize the facilities. This is not always easy. The rich offerings of arts and letters are hard to evaluate, in the light of the small amount of time one has to give to them. Our laboratories and shops, the interesting new machines, processes and techniques can absorb all overtime. How can one ever know what to take and what to leave?

Fortunately, one thing has become increasingly apparent—we never have to stop learning unless we want to. Old ideas that one only learned up to this or that age, have been disproved. It is hard to start in again—if one has stopped learning, not impossible, but harder the longer the "stop" lasts. But if one never stops, one never has to.

The earlier one learns comfortable human relations, the better. Homes, schools, and activities groups all should realize this. The earlier one learns to be happy alone, or with other people—the better. This means unselfish focusing of one's attention on other people—and results in those spontaneous good manners that are a part of gracious living everywhere.

The earlier one learns to use his body easily and skillfully the better. Skills of all sorts are useful—here is where sports as well as arts and crafts come in. Skill includes not only knowledge, but also dexterity and ability to adapt to meet a changing situation. Gradually, easy, effective ways of doing things come to be well established habits. They take little if any conscious thinking. We scarcely attend to them, unless we meet an obstacle or see a way to improve a method.

The earlier one learns to use his mind easily, the better. To read at the speed that the material read requires—and to evaluate the speed that it does require

(Continued on page 42)

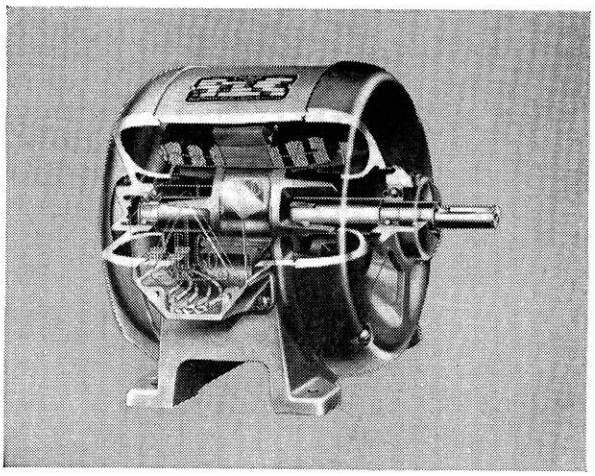
NIKOLA TESLA, THE MAN WHO HARNESSED NIAGARA

Water, water, everywhere — and no power. That was Niagara Falls when Nikola Tesla began work on its power system in 1888. Now Niagara is one of the world's largest electric power plants.

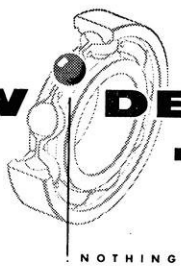
But to make the most of this power, many problems in electric motor design had to be overcome. New Departure ball bearings have helped solve many of them. For example, motors with New Departure self-sealed ball bearings may be mounted in difficult-to-reach locations because the bearings will operate for years without attention for relubrication or adjustments of any kind.

Highly important also are the facts that these ball bearings resist loads from *all* directions and, being grease-lubricated, permit motors to be applied in any position from horizontal to vertical without loss of efficiency or trouble from lubricant leakage. Whatever the loads, New Departure ball bearings maintain accurate rotor-to-stator relationship — are cool-running at all motor speeds.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

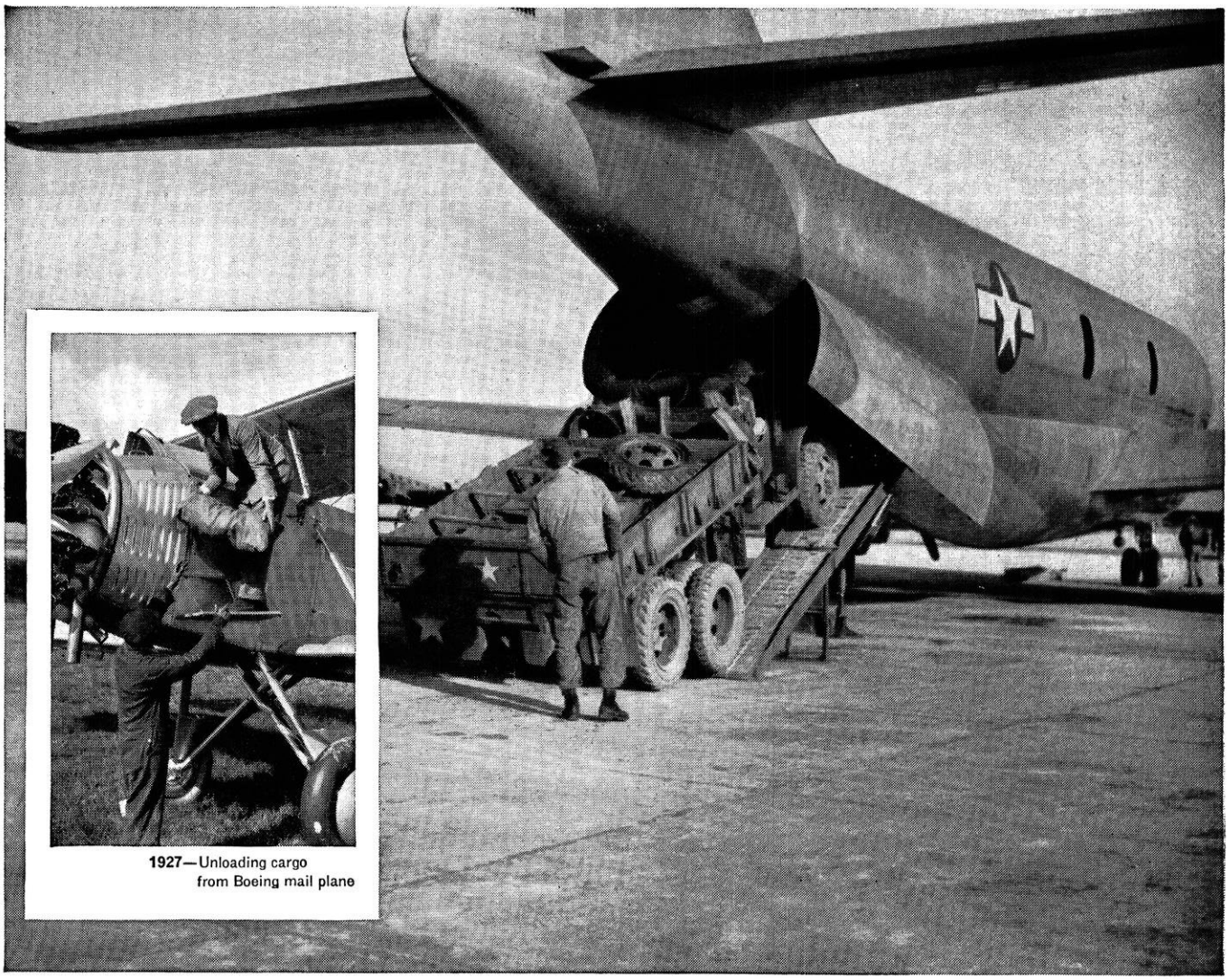


New Departure ball bearings assure positive rotor support under all loads in this motor. Bearing seals, pioneered by New Departure, keep lubricant out of the motor. Shields on the reservoir side keep foreign matter out of the bearings.



NEW DEPARTURE
BALL BEARINGS

NOTHING ROLLS LIKE A BALL



1927—Unloading cargo from Boeing mail plane

1955—Loading Boeing C-97 Stratofreighter

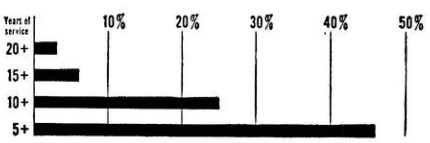
There's plenty of variety in Boeing engineering careers

America's pioneer passenger-cargo aircraft, the 40A, was a Boeing. So is the Air Force's versatile tanker-transport, the C-97 Stratofreighter shown above.

During the company's 38-year history, Boeing engineers have blazed new trails in the design of aerial freighters and tankers, commercial airliners, flying boats, fighters, trainers and bombers. Today Boeing continues to offer engineers a wide variety of opportunities in Research, Design and Production.

Students sometimes are surprised that Boeing's engineering staff includes those with civil, electrical, mechanical, aeronautical and other engineering degrees. Yet all find application in aviation. For example, the civil engineer may work on airframe structure or stress. Electrical engineers find challenge in the complicated electrical and electronic systems of modern jet bombers and guided missiles. Other engineers will find similar application for their talents.

The high degree of stability in careers at Boeing is reflected in this chart.



It shows that 46% of Boeing engineers have been with the company five or more years; 25% for 10 or more years, and 6% for 15 years.

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

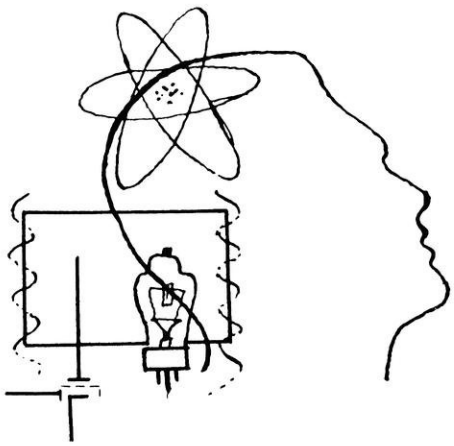
Current Boeing programs include: six and eight jet bombers; America's first jet transport—the 707; F-99 Bomarc pilotless interceptor (guided missile)—and advanced projects such as the application of nuclear power to aircraft.

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

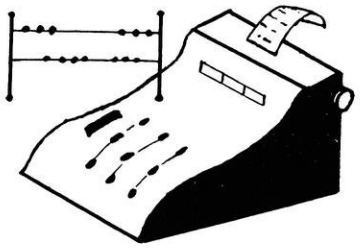
JOHN C. SANDERS, Staff Engineer — Personnel
Boeing Airplane Company, Seattle 14, Wash.

BOEING

SEATTLE, WASHINGTON WICHITA, KANSAS



CYBERNETICS

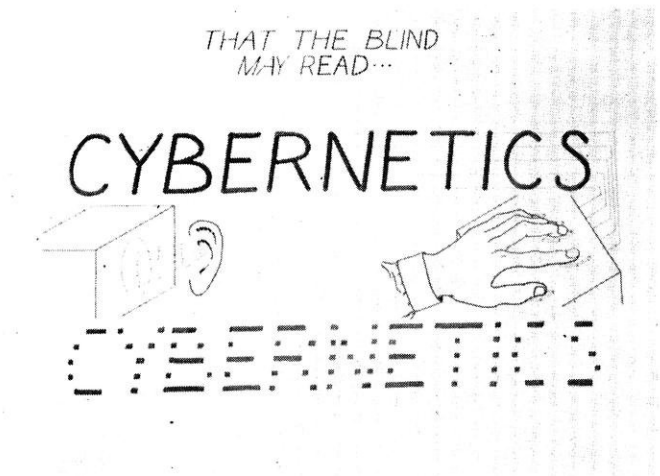


by Jack E. Binning, ce'54

Unless the reader is much better informed than most, he probably is more than a little confused by this unusual word "Cybernetics." Briefly, cybernetics is a study of information theory—the manner in which information travels from one place, or thing, to another. It involves the nervous system, the brain, communication systems, and even mechanical automata. It envelops the diverse fields of psychology, sociology, neurophysiology, anthropology, linguistics, mathematics, engineering, and electronics. It is a new science —the word was only coined in 1947—and shows promise of ranking in importance with the time-established quantum theory and the theory of relativity.

Development

Much of the credit for discovering the theory and grasping its dimensions goes to Dr. Norbert Wiener, a mathematician at M.I.T. Dr. Wiener had done considerable work on computing machines and electronic networks, and with the start of hostilities in World War II he turned his attention to the development of an automatic gunsight for anti-aircraft. The related problems of tracking and feedback slowly evolved into the unexplored field of communication theory.



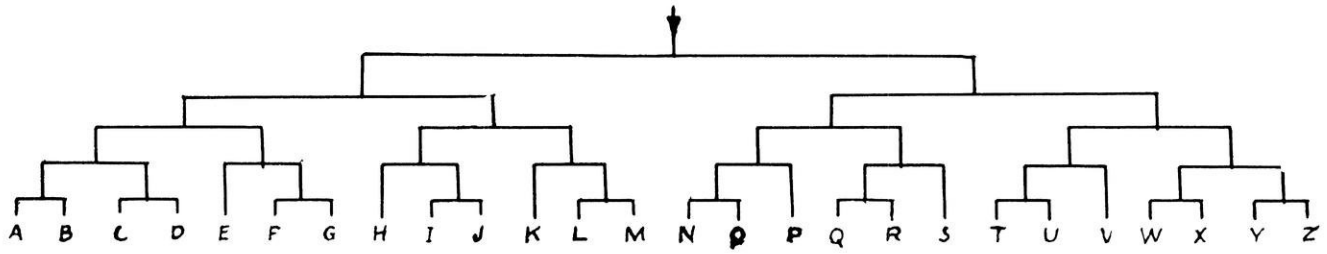
Much work has been done to enable the blind to read. A bank of five photoelectric cells scan the line of print; these cells, in turn, actuate vibrators in contact with the fingers. In another method, the cells are connected to five tuned buzzers so that notes and chords result. A graphic representation of the word "cybernetics" as scanned by this method is shown at the bottom of the picture.

As hostilities subsided, attention turned to domestic applications of information theory, one of the first of which was prothesis of lost senses. In particular, can we teach the blind to read?

Reducing vision to its basic principles, we must discover in what manner we recognize an object. By what mechanization do we recognize a square as a square, irrespective of its size position and orientation? If we are to compare it with a memorized standard, we must reduce it to standard size, rotate it and possibly reverse it. This can be accomplished with specialized mechanisms in the brain. In reading standard print, however, we will assume the height of letters standardized and the line of print orientated. The remaining problem, then, is to find some manner of transmitting the printed material from the page to the comparison mechanism of the brain, notably through the senses of touch and hearing.

Using the ear, we can set up a series of photocall scanners equispaced and each keyed to a given tone. As the scanner traverses a line of print, the photocell actuates its buzzer each time it hits the ink of a letter and stops again when it hits the white of the printed page. The resulting chords and notes can be interpreted as letters and words. However, two problems present themselves. First, it is assumed that the person has learned to read before blindness; and second, the ear is much inferior to the eye in an information capacity sense in a ratio of about 1:100. Using both ears we could perceive 10/100 vision which is about one per cent of normal, but still this is not blindness. In the other direction the outlook is more promising; the eye can convey all the ear can detect with only one per cent of its facilities and still leave 95/100 vision.

We can improve on the optical information capacity of the blind by utilizing the sense of touch rather than hearing. Here the photocells are connected to vibrators in contact with the fingers. The greater information capacity of the fingers gives this method much promise.



One system which may be used to transmit logical information using the binary system. Each letter of the alphabet is given a coded binary number. Thus, the letter "K" is 0110. It may be shown that any logical bit of information may be transmitted by channeling it through a series of "on and off" switches.

This same process can be used for lost or paralyzed limbs. A person so afflicted must rely upon his eyesight to determine the position of the afflicted member; consequently, he is unsure and hesitant in his motions. Now, it should be possible to attach pressure or strain gages to an articulated limb to register electrically or otherwise, say through vibrators, on intact areas of skin.

It is interesting to note that different areas have different transmission levels. Thus the loss of a thumb is a greater sensory loss than even a hip-joint amputation.

Information Theory

Newtonian and Bergsonian Time. In order to understand the principles underlying information theory, it is essential that we discover the time series upon which this information is based. The older theory of Newtonian time states that the fundamental laws of mechanics are unaltered by the transformation of the time variable "t" into its negative, i.e., time reads the same backwards as forwards. To use this system we must know the physical constants of every particle at any instant in time (This is virtually impossible in practice).

In a forward time system, light (or information) from other planets travels toward us; and, in a backward system, light must leave the planet. It follows that a system with a time constant negative to our own will attract radiation from the whole heavens and we will receive no light (or information) from it. Negative time would be as a movie run backward. Therefore, any world with which we can communicate has a time constant uniform with ours. Time may not even run forward at a different rate. In the movie *Brigadoon*, the inhabitants couldn't converse with the outer world two days in a row, because their time was, in effect, running slow.

Actually, our time is not reversible. Our universe is slowing down, evolution is a one way process, and time continues forward at a uniform pace. Newtonian time is an idealized version; it recognizes no beginning and no end of time; nothing new can happen because it would already have happened in its mirror image past.

Not so in Bergsonian time; something new is always happening. Bergsonian time is based upon probability distributions of what a given process may be expected to do. Even the accuracy of these statistical predictions fade out with time. Information theory is based upon these same probability distributions.

Statistical Mechanics. Consider a jar divided into two equal parts (for simplicity of explanation). Let m represent the number of particles in part A, and n, the number of particles in part B. In all probability the system will spend most of its time with $m = n$; i.e., where the probability of m particles in A and n in B is a maximum. The entropy of the jar may then be defined as the logarithm of this probability measure; or, more simply stated, the entropy is a measure of the randomness of the particles. It follows that if entropy is not at a maximum, it will tend to increase to that maximum.

Now let us suppose that we separate regions A and B with a partition having a small gate operated by a Maxwell demon such that fast particles from A are let into B and slow particles from B are let into A. B would then warm up and A cool off. Does it not seem that a heat engine between the regions would cause perpetual motion? If we examine the situation however, we see that if the demon is to act, it must have information from the approaching particles as to their velocity and point of impact on the wall. Now, the law stating that entropy will increase to its maximum applies only to a closed system and hence must include the demon. As will be explained later, a flow of information represents a negative entropy; so the entropy of the transmitting particle must increase. Therefore, the decreased entropy caused by a change of the particle's position is balanced by the increased entropy of the particle. (Incidentally, the information flow also involves energy and would cause the demon to gain in energy until he picked up a random motion of his own. He would then cease his function as gatekeeper.)

Information and Communication. A precise formula for the amount of information equals

$$-\log_2 \frac{\text{number (binary scale)}}{\text{Error (binary scale)}}.$$

The proof involves the binominal of statistics and will not be given here. By inspection, we see that as the error goes to zero, the information goes to infinity. A little thought shows the logic of this. If I can set a pointer on a scale with an error of $\frac{1}{8}''$, I can only get eight distinct settings in an inch and be sure that each

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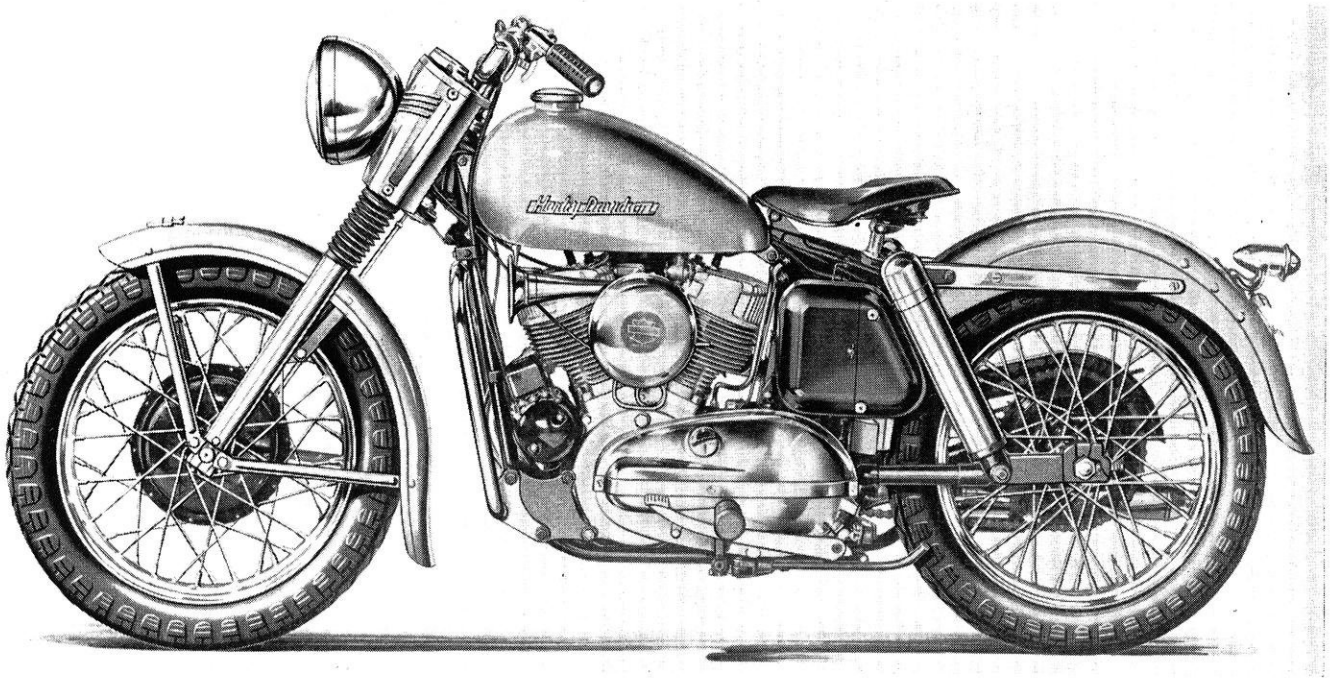


Harley-Davidson's Two Wheeled Transportation

by Kneeland Godfrey, Jr., C'55

Motorcycling in the United States grew up with the internal combustion engine. The "bike," as many riders call their mounts, has become a popular means of transportation and sport. Motorcycling is today the favorite sport of tens of thousands of fun-loving enthusiasts. The young in heart, who favor a brisk ride on a country highway or a rough trip cross-country, enjoy the staccato roar of the well-tuned machine.

A far cry from the single cylinder, belt driven motorcycles of fifty years ago are the powerful machines of today with their clean design and highly-developed power plants.

Advanced engineering and superiority of design have made the Harley-Davidson the most popular motorcycle in the United States, even though there is strong European competition. Interesting too, is the fact that the Harley-Davidson is the only American made motorcycle produced in quanity for the domestic market.

Harley-Davidson has for several years been producing a fine motorcycle with a 74 cu. in. displacement, V-type twin cylinder engine. This machine is perfectly tailored to the good highways and long distances between cities in our country. The "74 OHV" is called the Cadillac of motorcycles, and rightly so. It has hydraulically-actuated overhead valves (provide constant tappet adjustment), a roller bearing crankshaft, and hemispherical combusion chambers—all features which give it great power and long life.

After World War II, a certain segment of the motorcycling fraternity demanded a lighter weight, more maneuverable type machine. They wanted one suited to off the road riding—scrambles, endurance runs, drag racing—and yet one which had outstanding qualities for touring and pleasure riding. To meet this challenge, the Harley-Davidson Motor Company introduced a brand new model during May of 1952—the 440 pound Model "K". This new addition to the Harley-Davidson line was approximately 110 pounds lighter than the 74 OHV and had excellent handling qualities. It had a 45 cu. in side valve engine of about 30 horsepower with the transmission an integral part of the power plant. This was a departure from convention, but greatly improved the rigidity of the unit.

For 1954 Harley-Davidson announced a new and more powerful successor to the famous "K" model—the Golden Anniversary "KH." The stroke of the engine was increased to 4-9/16 inches, thereby increasing the displacement to 55 cubic inches. The KH will cover a quarter mile in 14.75 seconds from a standing start and has a top speed of 100 m.p.h.

A big feature of the "K" model series was the swinging arm rear suspension. Riders reported a wonderfully smooth, yet positive ride. The frame arms to the rear wheel pivot about a point very close to the chain's front sprocket. This design permits considerable up-down movement of the wheel, yet still maintains almost constant tension in the chain. Coil springs are mounted to the swinging arms approximately midway between pivot and axle (see cutaway). The springs are concentric with the shock absorber and serve to control

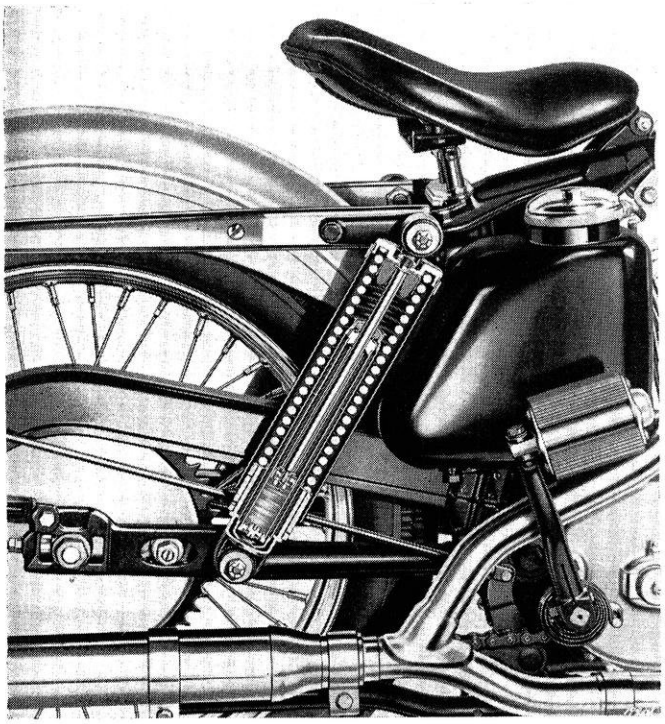
the wheel movement. Hydraulic (oil) snubbers limit this movement to three inches at the wheel. The front fork is telescopic—it also has springs with hydraulic stops and hydraulic dampening throughout the stroke.

The "KH" model incorporates fully enclosed front and rear wheel brakes 8" in diameter and 1" wide. Each brake operates something like this: The brake cable, when moved, actuates a cam placed at the ends of the two circular brake shoes. The shoes, forced outward by the cam, push against the drum. The rear brake is left foot operated, the front, by a lever on the right handlebar.

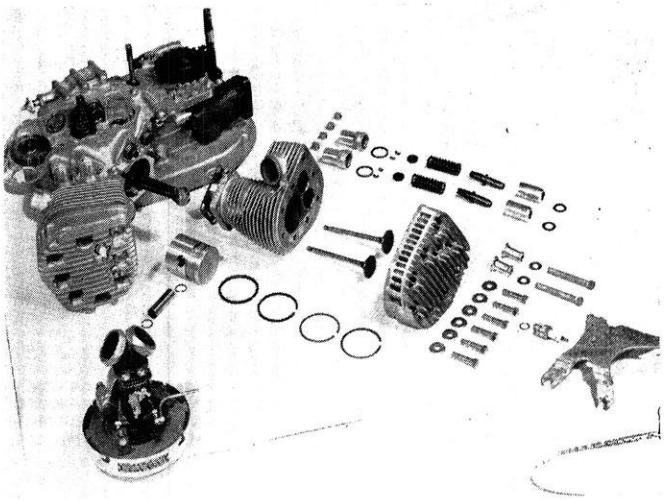
Handlebars are rubber mounted to dampen any road shock not taken up by the front suspension. The right hand "twist" grip is the throttle, the left hand grip, the spark control. The clutch hand lever is placed on the left handlebar. The gear shifter pedal is located on the right side where it may be operated with the toe of the right foot. By this means fast, sure shifts can be made to any of the machine's four forward speeds.

The model KH's power plant is a four-stroke, V-type twin cylinder, air-cooled engine. Most all motorcycles today are air-cooled because this type of engine is much lighter in weight, and thus gives better performance than the water cooled type. It has no radiator or passages in the block for cooling water; instead, deeply finned cylinders and cylinder heads provide great surface area to effect good heat transfer from the engine to the air. The heads are of an aluminum alloy, for this light metal has much less resistance to heat passage than does cast iron.

Pistons are of aluminum alloy, having two compression and one oil control ring. The pistons are cam ground (not perfectly cylindrical, a design which prevents binding).



This cutaway shows the swinging arms which position the rear wheel and the coil springs and concentric tubular shock absorbers which limit rear wheel travel.



Blow up view of the motor-transmission unit construction of the model K. Shown are a cylinder, valves, cylinder head, valve springs, piston, rings, and carburetor-air cleaner unit.

Cylinders are of cast iron. The bores are honed to insure controlled surface finish and "Parkerized," a process which increases wear-resistance. In effect the piston acts as a spring, closely fitted cold for control of slap.

Four camshafts actuate the engine's four valves. This unusual design is employed for better arrangement of tappets and valves, and to provide positive drive for the generator located at the end of the cam gear train.

The connecting rods run on roller bearings at their big (crankshaft) ends. Because there are only two of them, eccentric loading on the crankshaft would occur and cause vibration if conventional design was used. To eliminate this possibility a male-female connecting rod arrangement is used where one (of regular design) actually fits inside the other—between the two bearing surfaces of the female rod.

A single Linkert carburetor between the cylinder barrels provides the fuel-air charge. The air cleaner with a wire mesh arrangement filters out dust particles carried in the air.

Chain drive transmits power from crankshaft to transmission and from transmission to rear wheel. It is used in place of gears because there is less power loss. Since stretching of chain does occur, a sliding shoe having an adjustment screw is used to make correction possible. In addition, the shoe prevents flexing of the slack side of the chain.

The KH model has a smooth-acting multiple disc clutch which permits hand clutch action even though 30 h.p. must be transmitted through it. The foot shift-hand clutch design permits very fast shifts, allows the rider to keep his eyes on the road, and both hands on the handlebars.

Lubricating oil is held in a three quart oil tank placed under the saddle. Gear type pressure and scavenging pumps move oil to and from the engine. The

(Continued on page 54)

Long-Range Development Program Provides for New Engineering Test and Research Facilities

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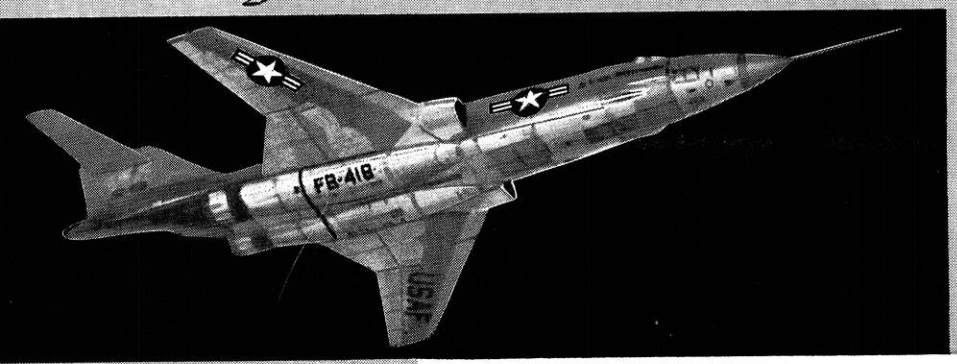

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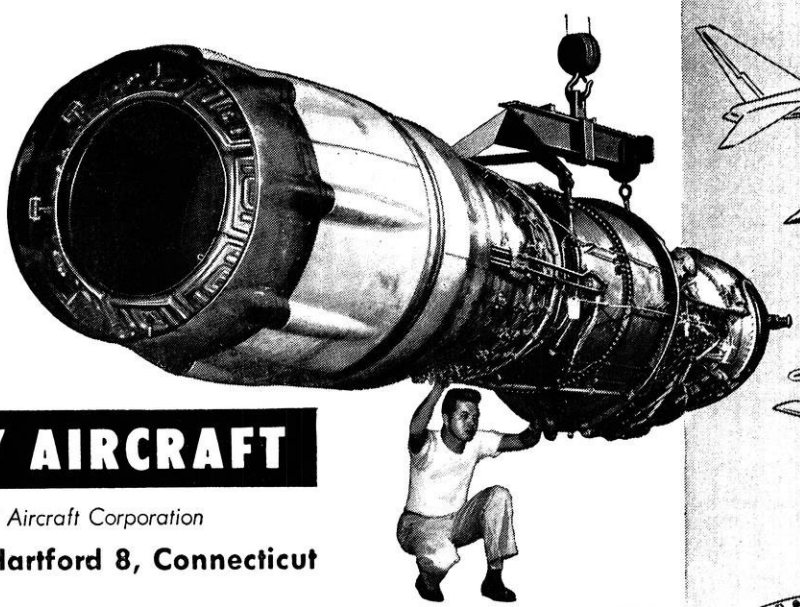
Today the J-57 is still unmatched anywhere — an important factor in this country's supremacy in the air.



PRATT & WHITNEY AIRCRAFT

Division of United Aircraft Corporation

East Hartford 8, Connecticut

RADIOISOTOPES

Radioactivity has been put to good use in industry by means of radioisotopes. Their use was one of the first important peace-time developments in the atomic era

by Thomas N. Johnson, ch'56

On the morning of July 16, 1945, a mushroom shaped cloud rose over the New Mexico sands. With this cloud, a new era in our history was ushered in. This was the beginning of the Atomic Age. With this era came all types of advancements in science, both peaceful and otherwise. This article is on one of the peaceful applications of nuclear energy, that of radioisotopes and their industrial applications.

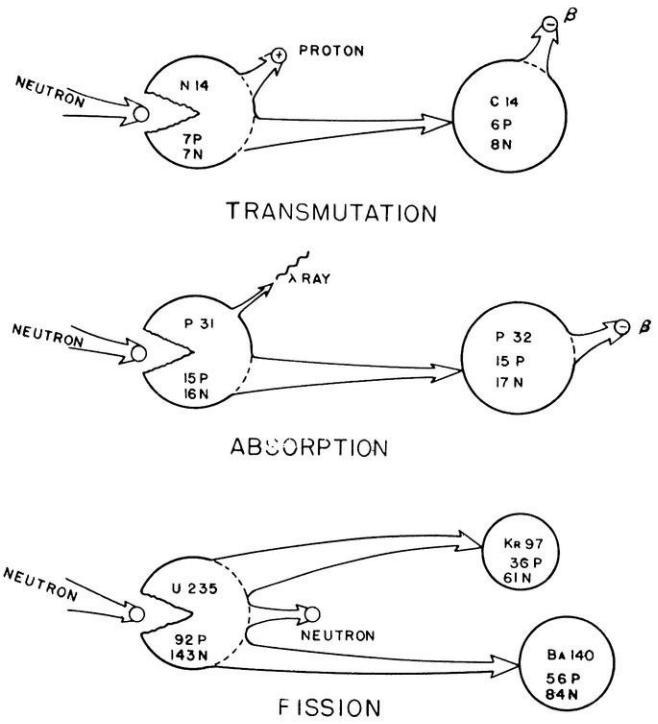
The use of radioisotopes in industry is relatively new, so a definition of radioisotopes should first be given. A radioisotope is "one of two or more species of an element having the same number of protons and electrons in its atoms, that is identical in chemical behavior and distinguishable only by radioactive transformations or by small differences in atomic weight".[1] This difference in atomic weight is due to the different number of neutrons in the nucleus.

These radioisotopes differ from a stable isotope in that they emit a continuous stream of rays which cannot be stopped until the element has been completely transformed. These emissions that a radioactive isotope gives off are of three main types. The first type of emissions is the alpha (α) particle, or Helium nucleus. This is the least powerful of the emissions and can be stopped by a sheet of paper. The second is the beta (β) particle, electron, or positron. This is the second most powerful of the emissions and can be stopped by 1/3 inch of aluminum. The third and most powerful of the emissions is the gamma (γ) ray, which is a short x-ray, or electromagnetic ray.[2]

One of the more important things that has to be taken into consideration in the selection of a radioisotope for a given process is the half-life. The half-life of an isotope is the amount of time required for one half of the element to be decomposed. This may be anywhere from a few seconds to thousands of years. For example, carbon has five isotopes with atomic weights of 10, 11, 12, 13, and 14. Three of these, the 10, 11, and 14 are radioactive. C^{10} has a half-life of 22 seconds, C^{11} a half-life of 21 minutes, and C^{14} a half-life of 5400 years.[3]

In industry, most of the isotopes that are used are produced commercially and are not naturally radioactive. This is because the naturally occurring isotopes are fairly rare and are mostly from elements heavier than lead. With the use of the cyclotron and the atomic pile, radioactive isotopes of all of the elements can be produced relatively cheaply.[4] In 1950, there were radioisotopes available from over sixty elements by the atomic pile method and from nine more by the use of the cyclotron.[5] The half-life of a commercial radioisotope can be regulated by the time that it is exposed in the pile. For a half-life of four days, the substance is left in the pile for a week, for a half-life of longer duration, the substance is left from several weeks to several months.[6]

In an atomic pile or cyclotron, a radioisotope can be produced by three different methods, transmutation, absorption, and fission.[7] These are probably best explained by the following diagrams.



[1] Guest, G. H., "Radioisotopes-Industrial Applications", p. 24, Sir Isaac Pitman & Sons, Ltd., Toronto, Canada, 1950.

[2] Ibid., p. 26.

[3] Ibid., p. 25.

[4] Ibid., p. 28.

[5] Calkins, C. D., "Radioisotopes In Industry", Chemical & Engineering News, Vol. 29, pp. 2456–2459.

[6] Guest, op. cit., p. 30.

[7] Ibid.

As was said previously, each radioisotope emits some form of radiation, either α, β, or γ rays. It is through these emissions that radioisotopes find their use in industry as tracers and radiation sources. Before these rays can be used, though, detecting devices had to be devised to detect them. Probably the most widely used of these is the Geiger-Mueller Counter because it is accurate and easy to operate. It "counts and registers separately the number of radioactive decay events which take place in a given interval of time".[8] They are also popular because they can be designed to be triggered by x-rays as well as the α, β, and γ rays.

Another detecting device is the ionization chamber. The ionization chamber consists of two insulated electrodes immersed in a gas, which is surrounded by the chamber. The electrodes are connected to a electrometer and are given a charge. The radiation ionizes the gas in the chamber and the charge leaks off into the ionized air. The rate at which it leaks off gives the intensity of the radiation.[9]

The last main type of detecting system is radiography. It involves the principle of exposing a photographic plate to the radiations and taking a picture of them.

Radioisotopes have two main uses in engineering processes. The first is as isotopic tracers and the second is as radiation sources. In isotopic tracing, a small amount of isotope is added at the beginning of the process and the radiation will reveal the location of the component at any specific time. The quantity of component can be determined if a known amount of the isotope is added.[10] There are six main times when isotopic tracings are used. They are used when:

1. The quantity of material to be traced is small; as little as 10^{-12} gm. can be detected.
2. The material to be traced is difficult to separate.
3. It is desired to locate a material with reference to the positions of other materials.
4. The sample must be analyzed in its place.
5. A determination must be made before some further change occurs.
6. The diffusion or reaction of a material with itself is to be measured.[11]

In general, isotopic tracers are used in tracer analysis, isotopic dilution analysis, determination of reaction mechanisms, and in mass transfer problems such as wear resistance, corrosion, and the effects of friction.[12]

Tracer analysis is the simplest type of tracer application. It is designed to follow a radioelement from one state to another in a reaction or process.[13] An example of this is in the smelting and refining industry. It was desired to know the amount of the different constituents of the metal at different stages of refining and casting. A radioisotope of one of the constituents was introduced at the beginning of the system and its path was traced through the use of a Geiger counter. In this way, the exact path of all of the material through the process could be traced. It was also desired to know the behavior of sulfur in the blast furnaces during the disulfurization process, and whether or not any of the other components were transferred along with sulfur during the process. It was shown through the use of isotopes that iron went along with the sulfur from the metal to the slag during the early part of the transfer. Radon, a radioactive gas, was also used to measure the gas velocity through the furnace.[14]

Two phases that have not yet been investigated, but very likely will be in the near future are:

1. Are fire brick and clay removed with the slag?
2. Are parts of the fire brick and clay occluded in the steel?[15]

Both of these questions can be solved by activating the clay and the surface of the fire brick and testing the slag and the steel with a geiger counter to see if any of the clay or brick has been transferred.

Isotope dilution analysis is perhaps the most important of the applications for isotopic tracers. It is different from the tracer analysis because it is used to determine quantitatively as well as qualitatively the substances that are present at any time during a process. "The technique is based on introducing an amount of radioelement mixed in a known ratio with stable atoms of the same element. Any change that takes place in this ratio is due to the dilution caused by the amount of the element already present in the system."[16] This method of analysis is important when chemical separation is not practical or possible.

Tracers are also important in corrosion, wear resistance, friction, and lubrication studies. In corrosion studies, radioisotopes were used to explore the theory on how corrosion takes place. It was found through the use of radioactive copper that copper corrodes (formation of CuO) after the first film of CuO is formed because Cu diffuses into the vacant positions in the CuO lattice at the outer surface.[17] The oxidation of the component of alloys was also studied and it was

[8] Ibid., p. 35.
[9] Fearnside, K., et. al., "Applied Atomic Energy", p. 58, Temple Press Limited, London, 1951.
[10] Calkins, op. cit.
[11] Ibid.
[12] Ibid.
[13] Aebersold, Paul C., "Radioisotopes for Industry", *Radioisotopes in Industry*, Bradford, Reinhold Publishing Corp., New York, 1953, pp. 20–21.
[14] Guest, G. H., "Review of Tracer Techniques in Metallurgy", Metal Progress, Vol. 59, pp. 366–370, 1951.
[15] Ibid.
[16] Aebersold, P. C., op. cit.
[17] Guest, G. H., Tracer Techniques, op. cit.

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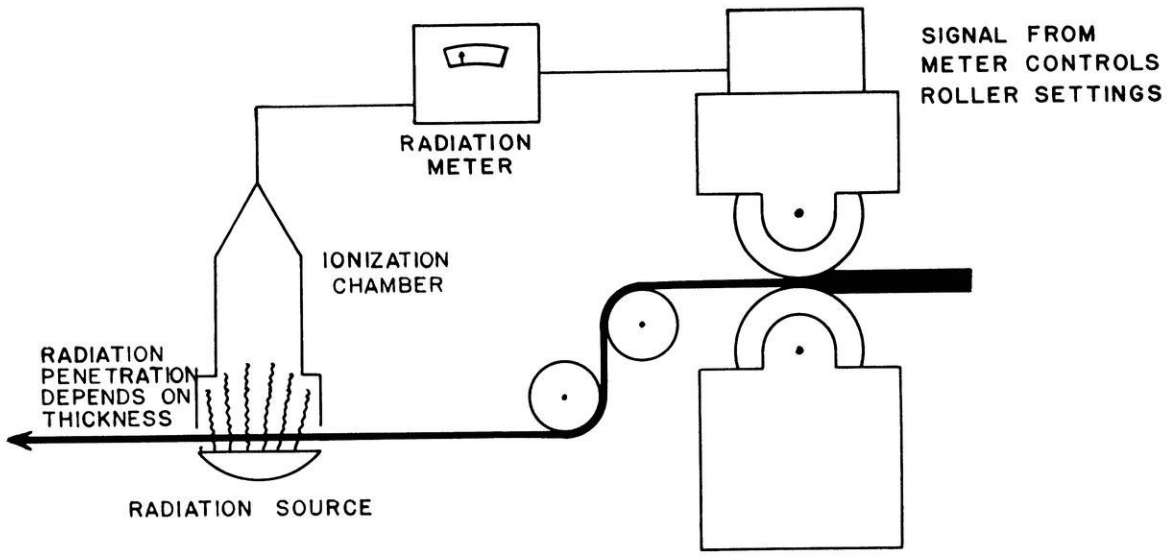


found that the rate of oxidation of the different components was not the same. Radioactive chlorine ions were used to study the pitting of stainless steel.[18]

In friction studies, the theory of adhesion in friction was proved through the use of tracers. The adhesion theory of friction is that a molecular affinity exists between two metals, no matter how smooth they are. In order for one metal to move across another, these miniture welds, or adhesions must be sheared. When this happens, a part of one metal is left behind sticking to the other.[19] This was proved by the following system. A radioactive rider was placed on top of an inert rotor. As the rotor turned, bits of radioactive material from the rider adhered to the rotor and were detected through radiographical means. Since the adhesion was in spots, it proved the theory. This was determined with varying loads placed on its rider.

The effect of lubrication on metal wear was determined by irradiating the piston rings and measuring the wear by the amount of radioactive metal in the lubricating oil. With this process, the effectiveness of different lubricating oils was measured. It was also determined that the piston ring wear increased with the increase of sulfur in the gasoline.[20]

A method has also been devised to check whether or not a bearing is getting the proper lubrication. This is done by mixing a certain amount of an isotope with the oil and checking the bearing with a detector. The number of decay events taking place would tell if the bearing was being properly lubricated. This is especially useful where the bearings are hard to check visually.[21]

[18] Ibid.

[19] Burnell and Strang, Radioactive Tracers Reveal Friction and Wear of Metal, Metal Progress, Vol. 60, #3, pp. 69–74, 1951.

[20] Guest, G. H., Tracer Techniques, op, cit.

[21] Schreiber, A. P., "Radioisotopes for Industry", Electronics, Vol. 22, pp. 90–95, 1949.

The last main use for isotopic tracers is their use in the determination of reaction mechanisms. They have been used in a number of reactions such as the oxidation and isomerization of hydrocarbons, vulcanization of rubber and the dehydrogenation of petroleum. An excellent example of its use is in the Fisher-Tropsch synthesis, a synthetic gasoline process. This process is based on having hydrogen react with carbon monoxide over a metal catalyst. It was conducted in two parts. First, hydrogen and carbon monoxide were reacted over an iron catalyst containing radioactive iron carbide and a check was made to see if the product was radioactive. Secondly, radioactive carbon monoxide and a neutral catalyst were used, and a check was made to see if the catalyst picked up any of the radioactive carbon. In both cases, it was proved that the catalyst did not react as an intermediate.[22]

Besides being used as isotopic tracers, radioisotopes are also used as radiation sources. A radiation source is a small concentrated mass of radioactive material that is used as a source for the different nuclear emmissions. Its primary uses depend on the fact that matter scatters radiation or is ionized by it.

One of the main uses for radiation sources that does not rely on these principles is their use in aiding in relocating things. This has already been done in connection with locating survey stakes. When a survey is made of an area, it is sometimes necessary to place the stakes where they would interfere with some operations, such as farming. The stakes must then be set deep enough into the ground so that they will not interfere, so a radioactive material with a long half-life (such as Cobalt 60) is placed on top of the stake to aid in its relocation.

A use that depends on the property of radioisotopes to ionize matter is an electrostatic charge eliminator. The α and β radiations ionize the air and cause the

[22] Guest, G. H., Radioisotopes, op. cit.

dissipation of electrostatic charges which collect on some materials during a process. This is already in use by the paper and plastic industries.[23]

The uses for radiation sources that depend on the scattering effect by matter are the liquid level, thickness, and specific gravity gages.

The liquid level gages are of two types, one has a movable source and the other a fixed source. The movable source type has a float containing a radioactive isotope on the surface of the liquid. A detector is located directly above the float and as the level of the liquid rises or falls, the amount of radiation received by the detector increases or decreases.[24] A gage is connected to the detector which is calibrated for liquid depth.[25]

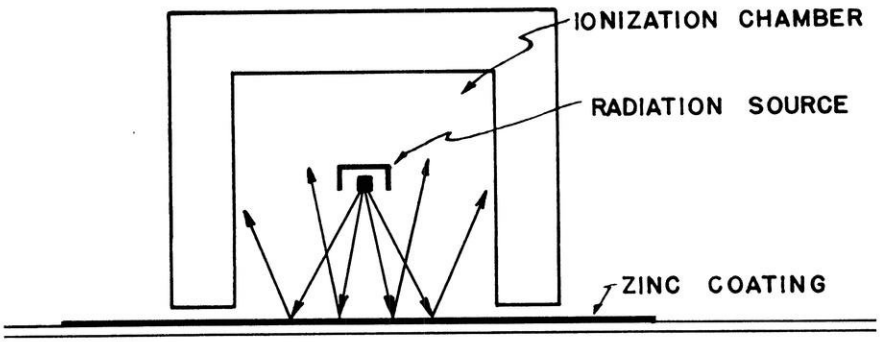
The other type of liquid level gage is designed to keep the liquid at a certain height and employs a fixed radiation source. The source is placed on one side of the container and the detector directly opposite it. As long as the liquid is between the source and the detector, the liquid absorbs most of the radiation, but as soon as the level falls below a determined height the radiations are not stopped as much. The detector picks up the increased radiations and either rings an alarm or opens a valve to let more liquid in.[26] Both of these gages are important for tanks which can have no openings or are otherwise inaccessible.

The thickness gages are also of two types. One type measures the absorption and the other the backscattering of radiation. The absorption method works on the principle that a certain thickness of material will absorb a certain amount of radiation. The material to be measured is fed between a source and an ionization chamber. This chamber controls the radiation meter which is calibrated to read the thickness of the material. This device is capable of measuring thicknesses as small as 0.000015 of an inch.[27] This is easily explained by the following diagram.[28]

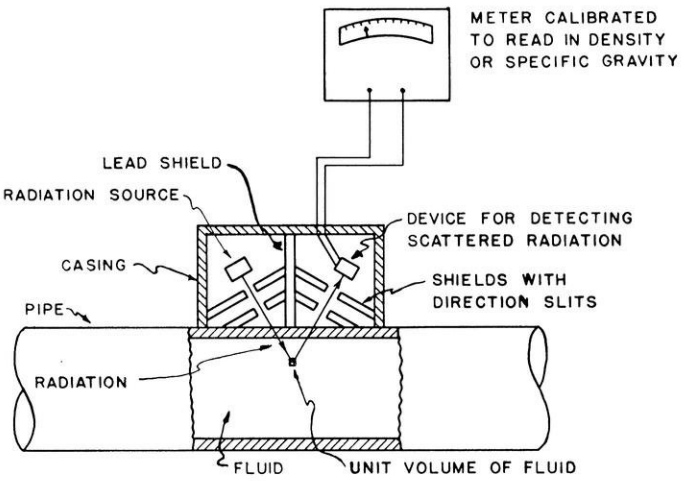
The other type of thickness gage operates on the principle of the backscattering of the β particles. It has been proved that this backscattering is a function of the atomic number and the thickness of the material.[29] The design of the apparatus is similar to that of the absorption method except that it has the source and the detector on the same side of the material and in the same housing. The following is a diagram of this housing.[30]

[23] Calkins, op. cit.
[24] Ibid.
[25] Schreiber, op. cit.
[26] Ibid.
[27] Calkins, op. cit.
[28] Guest, Radioisotopes, op. cit.
[29] Calkins, op. cit.

This type of gage is used for determining the thickness of one layer of a material on another, such as a zinc coating on steel.



The specific gravity gage operates on the principle that the amount of scattering per unit volume will depend on the density of the fluid. This gage has a meter which can be calibrated to read either in density or in specific gravity. Its only disadvantage is that it must be recalibrated every time it is changed to a different place because of the change in scattering effect due to the wall of the pipe. It is important because it will measure the specific gravity of fluids that would otherwise be inaccessible. Probably the simplest way of showing how this gage works is by this diagram.[31]

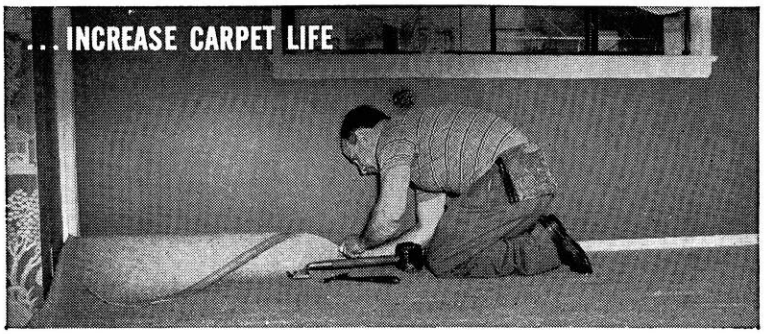


The last but not the least important use for radiation sources is their use as radiation sources for radiography. The principle behind radiography is that the nuclear emmissions will expose a photographic plate, or film. A good example of their use in radiography is the checking of castings, welds, etc., for defects. This checking is done by placing a photographic film over

[30] Guest, Radioisotopes, op. cit.
[31] Hare, Donald G. C., U. S. Patent #2,304,910, Dec. 15, 1942.

(Continued on page 44)

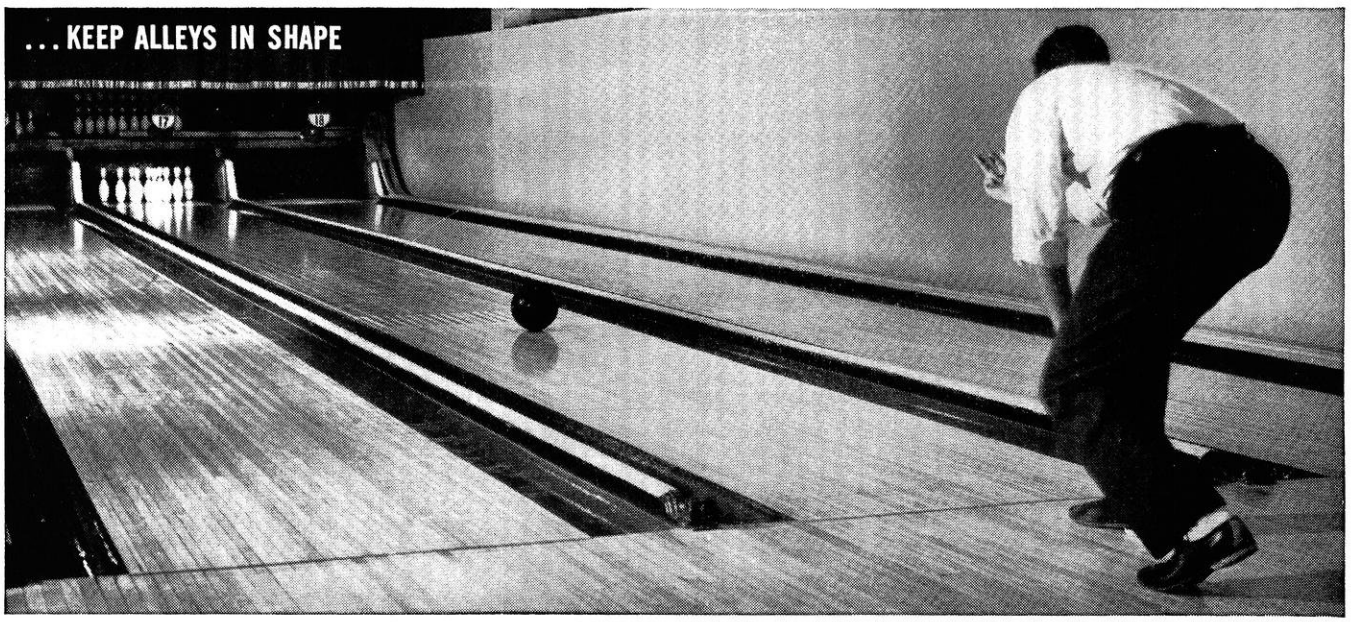
HOW HERCULES HELPS...



THE BACK COUNTS, TOO, in the manufacture of carpets. Hercules Dresinol® solvent-free resin dispersions used in conjunction with latex, starch and pigments, provide durable backings for popular-priced carpets. Dresinol furnishes either flexibility or stiffness; adds body to the carpet and improves adhesion of the backing for all types of cotton, wool and mixed fiber carpets.

NEW ANTHRACITE-BURNING BOILERS, clean and compact, make playrooms of basements the year round; even remove ashes automatically. Mining the millions of tons of anthracite used annually for residential, commercial and industrial uses would be impossible without explosives. For more than forty years, Hercules has pioneered in blasting techniques and equipment to increase the efficient and safe use of explosives in mining, quarrying, construction, and farming.

AIMING FOR THE "POCKET", this bowler wants the alley he uses highly polished and free of "ruts". That's why bowling alley surfaces are protected with nitrocellulose lacquer to keep them in top condition. The fastest drying protective coating known, lacquer makes it possible to put an alley back in play within hours after it has been refinished. This same tough finish protects bowling pins and other sports equipment.



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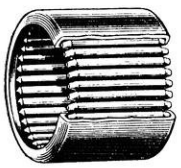
G55-4

The Torrington Needle Bearing ...designed for easy, effective lubrication



One major advantage inherent in Needle Bearing design is the ease with which the bearing can be lubricated.

The full complement of small diameter rollers continuously carries a thin film of lubricant to all contact surfaces. The turned-in lips of the outer shell retain the lubricant and effectively seal out foreign matter.

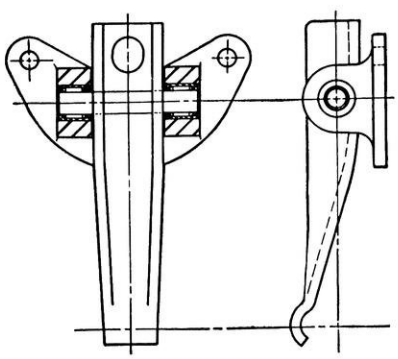
Methods of Lubrication

When Needle Bearings are shipped, they are normally protected with a high-grade slushing compound which has lubricating value at ordinary temperatures. This compound is left in the bearings in most instances. Needle Bearings in many applications run for long periods of time without further attention to original lubrication.

There are several methods of providing additional lubricant to Needle Bearings, as illustrated and described below.

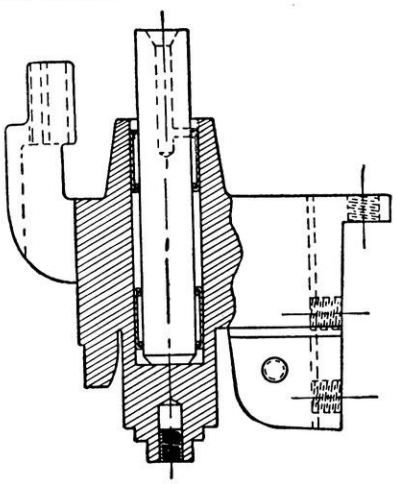
PERMANENT LUBRICATION

For low speed and light load applications, as in the fingers of the automobile clutch illustrated, the Needle Bearings are packed with grease before assembly. No additional lubrication is needed.



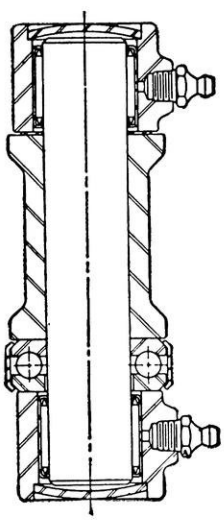
THROUGH THE SHAFT

If it is necessary to lubricate through the shaft, a hole is drilled along the shaft axis, with a cross hole leading under the lips of the Needle Bearing. This hole is located under the lip of the bearing rather than in the roller contact area. Textile machine spindle swing bracket below illustrates this method.



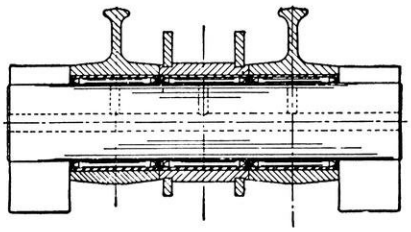
THROUGH THE HOUSING

When lubricant is to be delivered through the housing, an oil hole is furnished in the middle of the outer shell. In automobile king pin below, Needle Bearings are lubricated with Alemite fittings through the oil hole. This oil hole in the outer shell should be outside the load area.



CIRCULATING OIL SYSTEM

For high speeds and heavy loads, a circulating oil system is preferred as it aids in carrying away heat as well as in providing a continuous supply of lubricant to the bearing contact surfaces. A typical example of this method is shown in this Needle Bearing application in the valve rocker arm of a large diesel engine shown below.



Selecting A Lubricant

While oil is the best lubricant, it is difficult in many cases to retain it in the bearing housing. In general, a soda base grease is used in the absence of moisture, and a lime base grease when moisture is present. It is usually advisable to consult a grease manufacturer regarding a particular application.

These features make the Torrington Needle Bearing Unique

- low coefficient of starting and running friction
- full complement of rollers
- unequalled radial load capacity
- low unit cost
- long service life
- compactness and light weight
- runs directly on hardened shafts
- permits use of larger and stiffer shafts

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TORRINGTON NEEDLE BEARINGS

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

SCIENCE HIGHLIGHTS

Edited by Dick Tomlin, ch'56

SYNCHROPHASING TO CUT SOUND

Flight test engineers at Lockheed Aircraft Corporation recently reported they have developed a new way to make air travel 25 per cent quieter, through a scientific "synchrophasing" system which keeps propeller blades in step, with 1,000,000th of a second accuracy.

Synchrophasing actually cuts sound two ways, it reduces sound volume by 10 decibels—approximately 25 per cent in the cabin—and smooths and evens the remaining sound to make it more acceptable to the ear.

Synchrophasing is a means of controlling the propellers to turn at a specified relationship to each other and at precisely the same relative angle to the fuselage. With the blades in step, vibration forces hitting against the passenger cabin —coming from propeller tip air blast—are reduced 75 per cent.

The theory of synchrophasing is based on the fact that the human ear is selective and can refuse to hear sounds which offend it. If a noise is regular in frequency, it usually seems unobjectionable, according to acoustics experts, even though it may actually be loud.

For example, the steady croaking of frogs doesn't disturb a sleeping person; but, when the frogs stop the sudden absence of sound awakes the sleeper, scientists noted. That is why sirens—with their up-and-down pitch—command attention.

Here's how the new method works:

An electronic governor of the most precise variety keeps the propeller blades phased properly with an assist from four magnets and four coils.

Flight test engineers put a permanent magnet on each propeller's spinner and a coil on each engine nacelle. When the magnet passes the coil it sets up an electrical impulse—actually becomes a small generator.

The generated impulse travels electrically to the governor, which compares the timing of impulses from each nacelle. If the pulses differ one-millionth of a second, the difference is registered and corrected.

Correction on one type of propeller is accomplished hydraulically. An electrical message from the central electronic governor to a flyweight governor reconciles the errant blade angle with the other propellers.

AUTOMATIC FLIGHT AHEAD

Underway is a one-million-dollar-project to design comprehensive digital-computer control for high-speed military aircraft and guided missiles. Rapid advances in digital computing make possible new plans for miniature digital airborne computers that will make completely automatic all flight and tactical operations. As compact light-weight packages, these will automatically control simultaneous functions such as flight, navigation, engine and fire control.

BIG LIFT

The ROR — rocket-on-rotor — device to improve lift of helicopters requires 300 pounds of fuel for six minutes of operation.

PSYCHOLOGY TO THE RESCUE

Psychologists for the National Advisory Committee for Aeronautics had an important role in solving some very tricky problems that had the group's mathematicians stumped. Statistical techniques used by psychologists are able to handle problems that usual mathematics can't touch.

FUTURAMIC "FILL-'ER-UP"

The most revolutionary gasoline station design since the multi-pump is to be revealed next year. Having no pump islands, the stations will dispense gasoline through overhanging pumps. The elimination of pump islands, it is hoped, will permit a simple, open station that will be unusually attractive to motorists.

WORLD'S FIRST COMMERCIAL MOVING SIDEWALK BEING BUILT

The world's first commercial moving sidewalk soon will be in operation between the stations of the Erie Railroad and the Hudson and Manhattan Railroad in Jersey City, N. J. It will be capable of handling 10,400 passengers an hour through the interstation tunnel.

General Electric Company engineers, working in conjunction with Goodyear and Stephens-Adamson, developed the electrical system for the unique application. The equipment includes a fan-cooled motor, a combination reversing starter (fusible type) and a thruster brake.

The new conveyor will utilize a six-ply rubber and fabric conveyor belt, 5½ feet wide and ⅝ in. thick. It will be driven at a speed of 1½ miles per hour (about half normal walking speed). For 127 of its 227 foot length, the "Speedwalk" will carry passengers on a 10 per cent grade.

Handrails will move at the same speed as the belt and passengers will be able to step on and off as if it were an escalator. The belt will move in whichever direction the traffic is heavier.

The General Electric reversing starter and totally-enclosed 1200 rpm fan-cooled motor are both rated at 20 hp, 220-volts, 3-phase, 60 cycles. The thrustor brake is rated at 600 lb feet continuous and 800 lb feet intermittent.

INDUSTRY VERSUS DIOR

Christian Dior and his new silhouette for women may make trouble in shop safety. The "flat look" is accompanied by a trend towards long strings of beads, tassels, sashes, and other dangling and protruding gadgets, all of which are a potential threat with modern machinery.

STYLISTS PLAY OPTICAL TRICKS WITH CAR LINES

Remember the optical illusions in children's books and magazines? Eventually we learned to circle the least likely-looking answer and, sure enough, that was the right one.

Well, don't look now (you can check up later), but a small group of designing men has been playing those same tricks on us again. They are the automotive stylists whose artistry in steel, glass, chrome and color makes today's cars look longer, lower and wider than ever before.

They *are* lower—about two feet lower than grandfathr's car, which towered some seven feet above the highway. Some 1955 cars measure less than five feet tall; none goes much over that. It is the apparent length and width of the new models that is a tribute to the stylists' skill.

Automobiles have had a standard tread width for many years, with only slight variations from the norm. However, with the disappearance of running boards in the 1930s, designers were able to move side panels out several inches, thus making cars considerably roomier on the inside while affecting fender-to-fender width little, if any.

Overall lengths of the various makes will vary from year to year, but the average length of 1955 cars —taking sales percentages into consideration—is just 2.7 inches more than the 1941 average. The figures are 201.5 inches vs. 198.8 inches—a 1.4 per cent increase in 14 years.

From the purely practical standpoint, of course, garages and parking spaces must be designed to accommodate the largest car built. Interestingly enough, one of the longest 1955 models is less than three inches longer than its 1915 ancestor!

Width of the two cars varies even less, but height shows the normal downward trend. The combination of reduced height and flowing lines, however, makes the 1955 model look considerably longer.

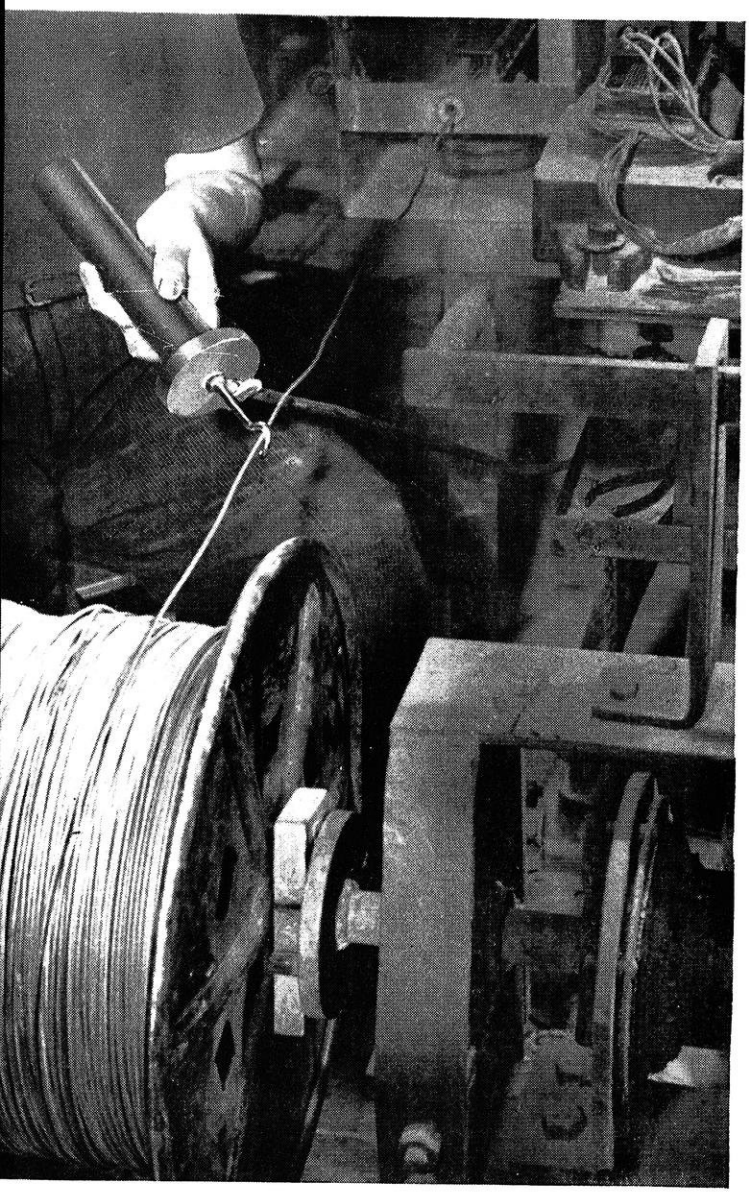
STOCKINGS IN THE SOUP

Noting the failure of a recent attempt to sell a soup mix by means of a hosiery premium, it is suggested that perhaps association of the two products gave rise to a mental picture of "the overalls in Mrs. Murphy's chowder."

MEET THE HERCULES TWINS

Both prototype YC–130 Hercules turbo-prop transports, California-built forerunners of large fleets now in production at the Georgia plant of Lockheed Aircraft Corporation, are photographed together for the first time at the U. S. Air Force jet base at Palmdale, Calif. These 95-foot-long cargo planes, which are designed to fly off cowpasture airstrips, accomplish surprisingly short landings and takeoffs, measured in hundreds of feet instead of thousands. Their four 3750-h.p. engines, Allison T–56 turbo-props, use a jet-like turbine harnessed to broad-bladed Wright Turboelectric propellers. The Hercules has more power than any operational military transport. Its short-field performance is aided by an extra-rugged landing gear, with two wheels in tandem on each side, and a slender, 132-foot-long wing for high lift. The rear end of the duck-tailed fuselage contains a door which drops down to become either a level loading dock or a ramp to the ground. The plane can carry troops, vehicles, guns, general military supplies or paratroops, as well as evacuating wounded. While prototype tests continue at Palmdale, the first production model is flying at the Lockheed-operated Government Aircraft Plant No. 6 at Marietta, Ga.

Factory testing of "U.S." electrical wires and cables



CABLE TESTING (Part I)

It has been indicated in a previous section of this series entitled "Cable Specifications" that practically every element of insulated electrical wires and cables may be covered by some specification requirements. Numerous tests are, therefore, necessary to determine the suitability of such cables for the application for which they are designed. These tests may be conducted on (a) the cable elements during manufacture, known as preliminary tests, (b) the completed cables at the factory, final tests, and (c) after installation. Some of the preliminary and final tests at the cable factory such as conductor resistance, high voltage, insulation resistance and corona level are, generally, non-destructive tests and may be conducted on each entire length of cable manufactured. Other tests, such as insulation and sheath thickness, physical, aging, moisture, resistance, ozone resistance, capacity and power factor, short-time dielectric strength and cold bending and long-time dielectric strength tests are made on short samples selected from a lot of cable.

No. 9 in a series

The following is a general description of these tests and their significance as applied to insulated electrical wires and cables. Details of the test equipment required and the specification requirements are not discussed since they are covered by industry publications such as those of the American Society for Testing Materials and the Insulated Power Cable Engineers Association.

FACTORY TESTS

Factory tests are performed for the following purposes: (1) to determine whether the materials of which the cable is made have the required quality; (2) to determine whether the manufacturing processes such as wire drawing, annealing, compound mixing, insulation extrusion and vulcanization have been performed properly; (3) to detect partial or incipient faults that may have accidentally failed to be detected in the tests indicated in (2); and (4) to determine whether the cable meets the customer's specifications.

Tests on Entire Lengths

CONDUCTOR RESISTANCE. Test is made to insure that the conductor has the required average cross-sectional area and, hence, that its resistance does not exceed the allowed maximum.

SPARK TESTING. The entire length of insulated conductor is subjected momentarily to a high potential to detect and permit the repair of imperfections in the insulation that might cause failure on subsequent voltage and insulation resistance tests.

HIGH VOLTAGE TEST. This test is conducted on each entire length of insulated cable to detect potential faults or weak spots in the insulation and to insure that the insulation will withstand the minimum voltage required by the specification for its rated voltage. The magnitude of the test voltage is determined by the type and thickness of the insulation as shown in the following table for 600 volt cables. The time of application is one minute for code grade insulation, and five minutes for the higher grades.

Insulation Thickness and Test Voltage for Rubber Insulations for 600 Volt Service

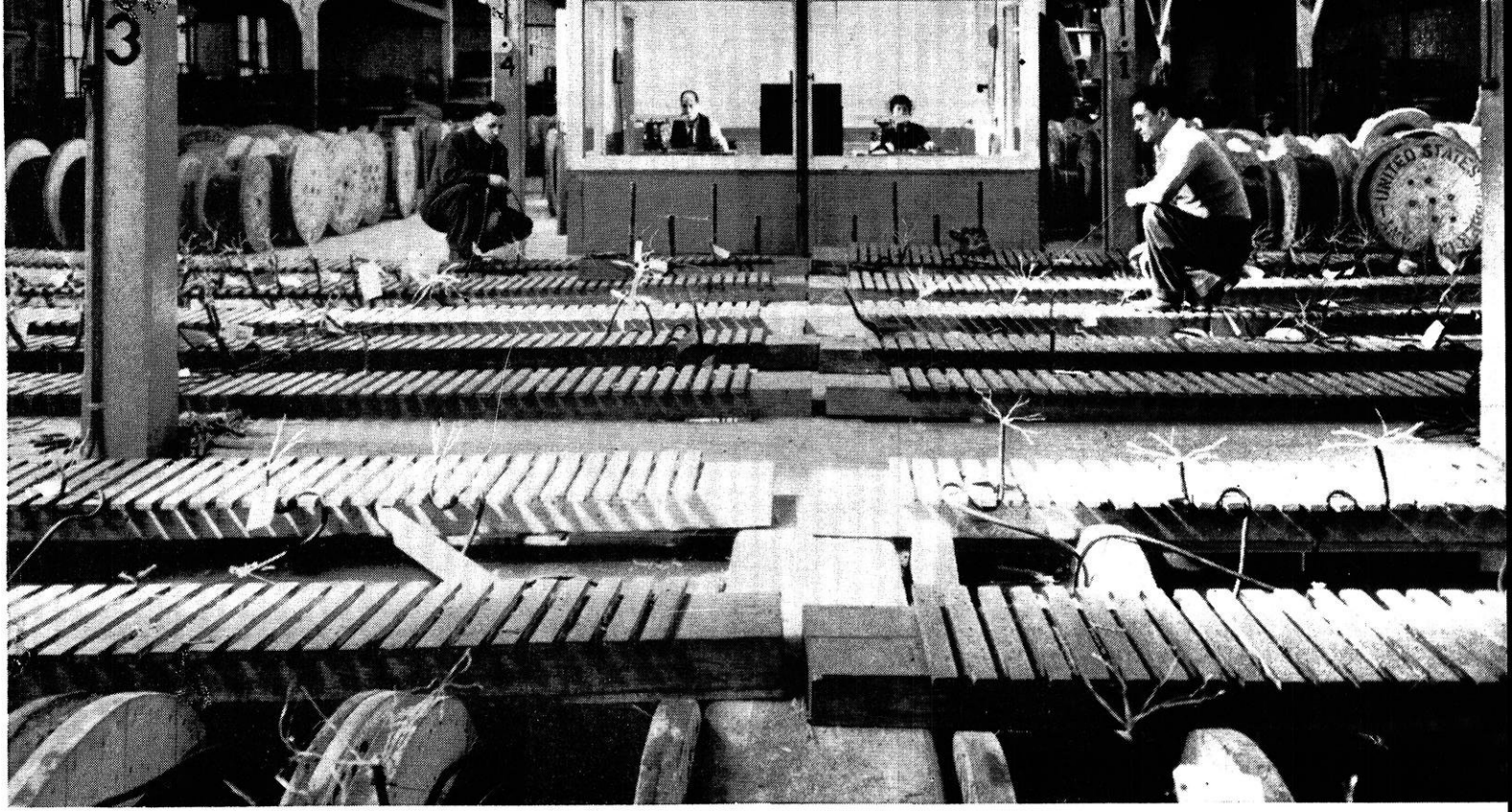
Conductor Size, Awg or MCM	Insulation Thickness, 64ths Inch	Code Grade	AC Test Voltages Performance and Heat-Resistant	(KV) Ozone-Resistant
14 to 9	3	1.5	3.0	4.5
8	4	1.5	3.5	6.0
7 to 2	4	2.0	3.5	6.0
1 to 4/0	5	2.5	4.0	7.5
225 to 500	6	3.0	5.0	8.5
525 to 1000	7	3.5	6.0	10.0
Over 1000	8	3.5	7.0	11.5

Cables designed for operation at voltages above 5001 are required to withstand a d-c test voltage in addition to the a-c voltage. This d-c voltage is three times the a-c voltage for ozone-resistant insulations and it is usually applied for 15 minutes.

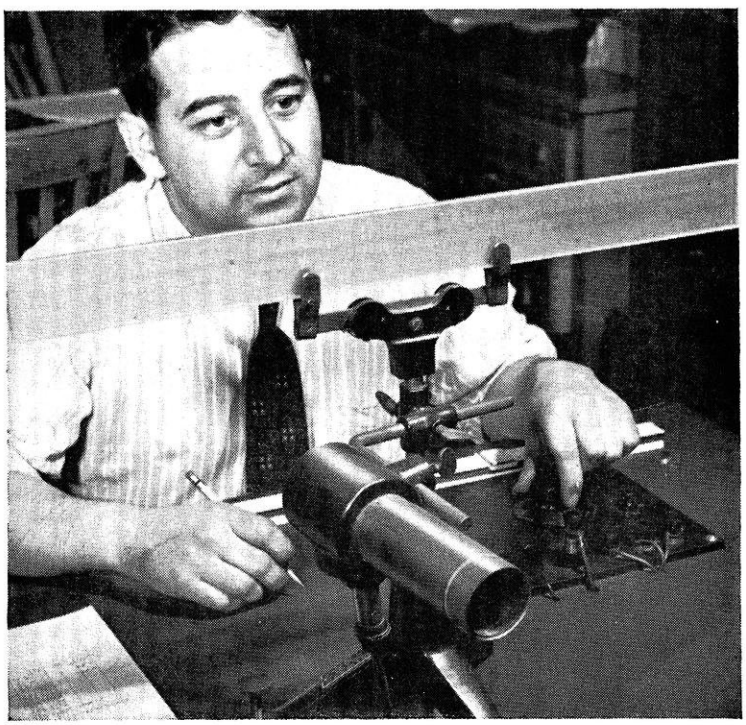
The high voltage test is made by applying the required voltage between the conductor and water in which the cable has been immersed for at least six hours. When metallic coverings are present, the voltage is applied between the conductor and such coverings. Any failures are repaired and the cable again subjected to the voltage.

US RUBBER

UNITED STATES
ELECTRICAL WIRE & CABLE DEPARTMENT



INSULATION RESISTANCE. The insulation resistance test consists of applying a direct voltage of from 125 to 500 volts, usually from a battery, between the conductor and water in which the cable is immersed, or other ground, and measuring the current that flows through the insulation after an electrification of one minute. A suitable galvanometer is generally used for this measurement. From this current and the applied voltage, the resistance of the insulation is calculated and expressed, usually, as megohms (1 million ohms). This test is conducted after the voltage tests and, hence, serves to indicate whether the insulation failed on that test. Insulation resistance also serves to indicate uniformity in processing, particularly insulation compounding, since a well-processed compound should give reasonably uniform insulation resistance. Most wire and cable specifications contain minimum requirements for insulation resistance so that this test determines whether or not the specification is complied with.



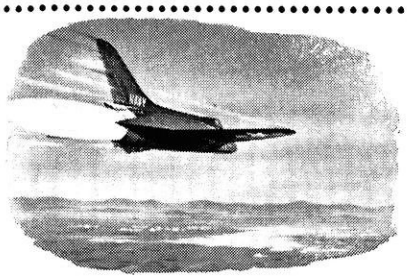
The resistance of insulations is inversely proportional to the temperature, that is, it is lower at high temperatures. It is, therefore, necessary to note the temperature at which the insulation resistance is measured and to apply a correction factor to reduce the resistance to a standard temperature. The insulation resistance varies with the type of insulation, its thickness and the size and length of the conductor. The following formula gives the relation between these factors.

$$\text{Insulation Resistance, Megohms} - 1000 \text{ feet} = K \log_{10} \frac{D}{d}$$

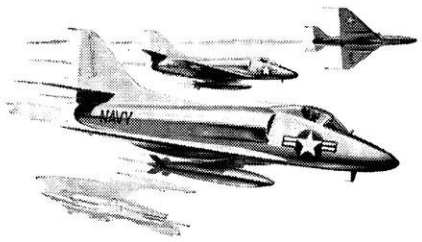
Where, D = Diameter over the insulation, inches
d = Diameter over the conductor, inches
K = A Constant for the insulation used

CORONA OR IONIZATION LEVEL. This test determines the voltage at which ionization or corona develops in a length of cable and is usually made only on cable for operation above 4000 volts. It is made by applying a gradually increasing a-c voltage between the insulated conductor and water or other ground with an oscilloscope in the circuit. Any air entrapped at the surfaces of the insulation or within the insulation will ionize when a sufficiently high voltage is applied resulting in the formation of more active oxygen or ozone. These materials are detrimental to most organic insulations particularly when such insulations are under physical tension, and thus may cause premature failure of the insulation. This ionization is indicated by the appearance of high-frequency oscillations on the charging current trace of the oscilloscope. In actual practice, the voltage at which ionization is extinguished rather than initiated is determined. For long cable life, this extinction voltage should be at least 110 per cent of the rated voltage to ground.

Wire and cable specifications generally require that these tests be made on the completed product. High voltage and insulation resistance tests are usually also made immediately after the insulation has been applied and vulcanized. This is general insurance that cables passing the test will meet the requirements when completed.

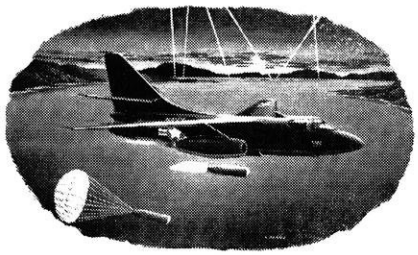


F4D, "SKYRAY"— only carrier plane to hold official world's speed record

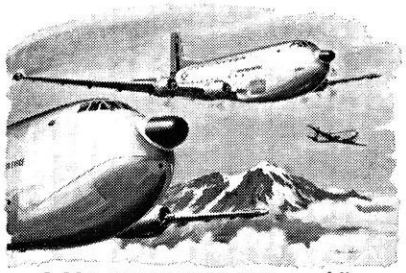


A4D, "SKYHAWK"— smallest, lightest atom-bomb carrier

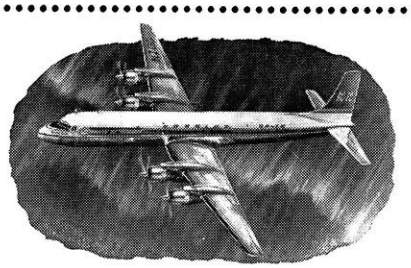
RB-66 — speedy, versatile jet bomber



A3D, "SKYWARRIOR"— largest carrier-based bomber

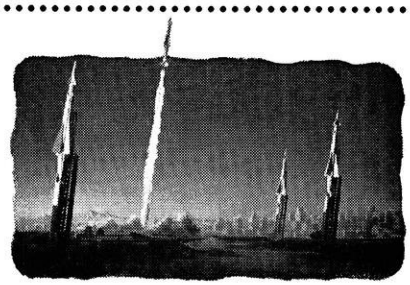


C-124, "GLOBEMASTER"— world's largest production transport

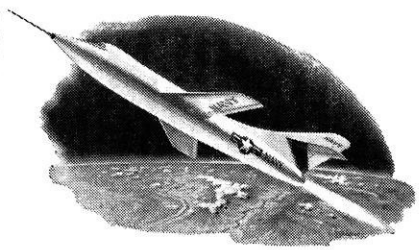


DC-7 "SEVEN SEAS"— America's finest, fastest airliner

Engineers: join this winning team!



"NIKE"— supersonic missile selected to protect our cities



D558-2, "SKYROCKET"— first airplane to fly twice the speed of sound

At DOUGLAS you'll be joining a company in which the three top executive officers are engineers... you'll be associated with men who have designed the key airplanes and missiles on the American scene today! Nothing increases an engineer's ability faster than working with other engineers of top calibre.

Not only is Douglas the largest manufacturer of commercial aircraft in the world, but it also produces outstanding aircraft and missiles for *every* branch of the armed services! This diversity, besides giving you job security, provides unequalled opportunity for the engineer with an eye to the future.

Challenging opportunities now exist in the following fields:

Mechanical design
Structural design
Power plant installation design
Weapons delivery
Aerodynamics
Thermodynamics
Electronic computers
Systems analysis
Aircraft air conditioning
Hydraulics
Stress analysis
Servo mechanisms
Acoustics
Electronics
Mechanical test
Structural test
Flight test
Process engineering
Missiles

DOUGLAS

First in Aviation

Brochures and employment applications are available at your college placement office.

For further information relative to employment opportunities at the Santa Monica, El Segundo and Long Beach, California divisions and the Tulsa, Oklahoma division, write today to:

DOUGLAS AIRCRAFT COMPANY, INC.

C. C. LaVene, Employment Manager... Engineering General Office
3000 Ocean Park Blvd.... Santa Monica, California

A Campus-to-Career Case History

"This is what I did yesterday"

"I like a job that keeps me jumping," says Bill Jermain, C.E. from Marquette, '52. "And my first management assignment with Wisconsin Telephone Company does just that. I'm Service Foreman at Sheboygan, with nine installers, and that means variety of responsibility. But judge for yourself. Here's a quick run-down of what I did yesterday, on a typical day—

8:10—"Checked day's work schedule. One of my new men was putting in a buried service wire, and I went over the job specs with him to be sure he had things straight.

8:30—"Answered mail while my clerk checked time sheets from previous day.

9:30—"Out to supervise installation of the first aluminum Outdoor Telephone Booth in my exchange. Reviewed the assembly instructions with the installers, then arranged for special tools and bolts to be delivered to the job.

11:30—"Drove across town. Made a 'quality inspection' on a telephone installed last week. Everything checked O.K.

12:00—"Lunch.

1:00—"Picked up film for next day's safety meeting. Watched the film, made notes for discussion.

2:00—"Met with moving company manager to estimate cost of telephone cable lifting for a house moving job. Drove the route he had planned and worked out schedule for construction crews.

3:30—"Returned to aluminum booth installation. Went over wiring specs with the electrician.

4:00—"Stopped at Central Office to pick up next day's orders. Met installers at garage as they checked in and assigned next day's work."

Bill has been in his present job about a year, and is looking forward to new responsibilities as his experience increases . . . as are the many young college men who have chosen telephone careers. If you'd be interested in a similar opportunity with a Bell Telephone Company . . . or with Bell Telephone Laboratories, Western Electric or Sandia Corporation . . . see your Placement Officer for full details.

BELL TELEPHONE SYSTEM

W. S. P. E.

WISCONSIN SOCIETY OF PROFESSIONAL ENGINEERS

Board of Directors Meeting Held

The Board of Directors of WSPE held a meeting at the Milwaukee Athletic Club on March 12.

Board Members Present:

George P. Steinmetz, President
A. Owen Ayres, 1st Vice President
Arthur G. Behling, 2nd Vice President
Eldon C. Wagner, Secretary
W. S. Cottingham, Treasurer
Pierce G. Ellis, Past President
Wm. F. Baumgartner, Director
Ray E. Behrens, Director
H. O. Lord, Director

National Representative:

Harold Trester

Other Members Present:

Arthur Graettinger, Harold Kingsbury, Louis Larson, J. Randall Meyer and James Trebilcock.

Minutes of the January 27, 1954 Board Meeting were sent to all members by mail. Minutes were approved as published.

Treasurer Cottingham submitted the following Treasurer's Report.

TREASURER'S REPORT

March 12, 1955

Cash Balance January 27, 1955		$12,782.55
Income Jan. 27, 1955–Mar. 12, 1955		
1955 Annual Convention	$2,384.81	
Dues	4,107.00	
Sale of Emblems	61.50	
Refund from 1954 NSPE Convention	9.01	
		6,562.32
		$19,344.87
Expenditures Jan. 27, 1955–March 12, 1955		14,243.76
Cash Balance March 12, 1955		$ 5,101.11
Plus $2.00 for check reissued to Philip S. Day —check No. 673 returned uncashed		2.00
Cash Balance March 12, 1955		$ 5,103.11

Secretary Wagner presented the following Membership Report.

MEMBERSHIP REPORT

March 12, 1955

Total Members and Affiliate Members as of January 27, 1955

Members	1087
Affiliate Members	83
Total	1170

Losses January 27—March 12, 1955

Deceased	2
Resigned	1
Transferred to other State Societies	1
	4

Additions January 27—March 12, 1955

Applications for Members	50
Applications for Affiliate Members	13
Reinstated Members	2
	65

Total additions	
Affiliate Members	13
Members	48

Total Members and Affiliate Members as of March 12, 1955

Members	1135
Affiliate Members	96
Total	1231

Secretary Wagner presented the Financial Report of the 12th Annual Meeting of the Wisconsin Society of Professional Engineers. This report was prepared by Mr. George Koresh, State Program Committee Chairman. Copies of this report are on file in the Secretary's office. Secretary Wagner pointed out that the major item of interest to the Board is that the net cost of the Convention to the State Society was $253.40.

President Steinmetz announced that 16 applications had been received from professional engineers for the position of Director of Sanitation and Safety with the State Industrial Commission. These applications were a direct result of the efforts of WSPE.

President Steinmetz reported that 1st Vice President A. Owen Ayres would attend the NSPE Presidents' Conference which was to be held at Urbana, Illinois on March 18th and 19th.

President Steinmetz called the attention of the Board to the supplement to the Waukesha Daily Freeman, honoring Engineers' Week. This was accomplished through the efforts of Mr. Joseph Kuranz of the Southeast Chapter.

President Steinmetz also called the attention of the group to the NSPE booklet, "Engineers in Industry". This contains valuable statistics concerning engineers employed by industry. The publication is available to members of the Society at a cost of $1.50 and to non-members at a cost of $3.00.

Mr. Louis Larson raised a question concerning the advisability of permitting membership in WSPE to persons not registered in the State of Wisconsin but who are registered as professional engineers in some other state. This matter was referred to the Legislative Committee for further study.

President Steinmetz called the attention of the Board to the new Non-Stock Corporation Act which becomes effective July 1, 1955. Mr. Fred Agthe had reported that the Act would require the appointment of an agent to represent WSPE, the main purpose being that a definite individual could be contacted. Action on this matter was deferred.

It was moved and seconded that the Southwest Chapter, which had graciously offered to sponsor the 1955 WSPE Summer Meeting, be authorized to do so and they are further authorized to arrange for appropriate meeting place and date, said date to be some time after September 1, 1955. Motion carried.

Mr. Harold Trester was appointed Chairman of a state committee whose purpose it is to promote the purchase of NSPE Building Bonds by WSPE members.

Mr. Charles Nagel reported that the Inter-Professional Code of Ethics was approved by the Wisconsin Architects' Association at their annual convention by a vote of 4 to 1. It is now officially adopted by both the Engineering and Architects' Association. Mr. Nagel recommended that a copy of the Inter-Professional Code be sent to all registered engineers and architects in the State of Wisconsin and that this mailing be made to both groups at the same time and suggested May 1st as the date of mailing.

It was moved by Director Behrens and seconded by Director Lord that Mr. Nagel be authorized, in cooperation with the WSPE Secretary and the Wisconsin Architects' Association, to send a printed copy of the Inter-Professional Code to all professional engineers and architects in the State of Wisconsin. Motion carried.

Mr. Rice, attorney for the Wisconsin Architects' Association, appeared before the Board on behalf of the Architects' Association to call our attention to Bill 327S, which has been introduced into the current session of the Wisconsin Legislature. He pointed out that the present so-called Safe Place Statute has been in effect since 1917. Bill 327S would amend the present Statute so that in his opinion it would place responsibility for safe design entirely on the architect and for an unlimited period of time. It was the "unlimited period of time" to which the architects were objecting.

It was moved by Vice President Behling and seconded by Director Lord that the Chairman of the WSPE Legislative Committee be instructed to appear at the Hearing before the Senate Judiciary Committee on Wednesday, March 16th, representing WSPE in support of the views expressed by the Wisconsin Architects' Association, Motion carried.

Mr. Pierce G. Ellis moved that First Vice President Ayres be authorized to engage the facilities of the Schroeder Hotel or its equivalent for the 1956 Annual Convention, to be held in January, 1956. Motion seconded and carried.

President Steinmetz requested that members of the Board give careful consideration to the advisability of obtaining an attorney for WSPE on the retainer basis or some other basis which they may deem advisable. This matter is to be an item of business at the next meeting of the Board.

After discussion of the problems facing the Southeast Chapter, mainly regarding membership, it was felt that much of the trouble stemmed from the geographic boundaries of that chapter. President Steinmetz requested Director Behrens to make a study of this situation and to report to the Board at its next meeting.

President Steinmetz requested that the members of the Board study the summary of chapter views concerning adoption of a recommendation of the Young Engineers' Committee and prior to the next meeting send to Secretary Wagner their ideas and opinions concerning these recommendations.

Mr. Frank Carlson presented the report of the Membership Committee.

It was moved by Treasurer Cottingham and seconded that WSPE use the $9.01 which was refunded to them from the 1954 National Convention, plus additional funds as needed, to send subscriptions for the Wisconsin Engineer for a period of one year commencing with the October, 1955 issue, to all schools which are members of the State College System and the Wisconsin Institute of Technology. Passed.

SPRING MEETING MEMBERSHIP ACTIONS

Two important items concerning membership were discussed at the Spring Meeting of NSPE, Charlotte, North Carolina, February 18–19, 1955. Both of these actions could have considerable effect upon our future membership progress and are briefly discussed below for the benefit of our "membership promoters."

Reinstatement of Former Members. A resolution was approved by the Board amending NSPE Bylaw 25, Section (d) to read as follows: "To be reinstated, a former member who has been dropped must pay current dues in addition to a reinstatement fee of $2.00". This amendment may assist those State Societies which have had difficulty in reinstating

(Continued on page 38)

former members due to the previous financial requirements for current dues plus one year's back dues. However, this amendment does not preclude a State Society from imposing reinstatement fees to the level it feels equitable.

This amendment applied to the members who will be dropped as of July 1, 1955 because of delinquency, means that they may be reinstated *after* that date as former members for $2.00 plus current years dues.

Refund of Portions of Dues. The Board approved in principle the Membership Committee's Omaha proposal that some part of the increase in National Society dues receipts attributable to membership gains be refunded to the State Societies for their assistance in financing sorely needed extra effort in membership activities. Some of the salient feaures of the provisions are set forth below:

1. Since we should expect a certain percentage of membership growth each year, membership activities which produce no more than a normal gain should not be considered representative of the extra effort which it is intended to encourage. Based upon the assumption that a 5% per year net increase in current and delinquent dues payment represents a normal membership gain, states would not be eligible for a refund if membership gaining and membership holding activity does not exceed 5%. Accordingly, in February 1956, NSPE will refund to each State Society the amount by which 95% of its 1955 current and back dues payment to NSPE exceed the total payment during 1954.

2. State Societies must establish their eligibility for such refund by indicating in writing to the National Society that this money will be apportioned to the Chapters of the State Society on the same basis.

3. EIT members will not be included in the total dues payments, because several states do not have this class of membership and because their total dues payments probably do not represent the out-of-pocket costs incurred on their account.

4. This program is to be considered as an experiment in urging greater membership increases and may be discontinued at the end of three years, if considered advisable.

YEARS END MEMBERSHIP ANALYSIS

How did your state do in 1954? It will be noted that the net gain of P.E.'s in 1954 was only 1677 or an increase of 5.8%. We certainly can do better than that and let us select the year 1955 to prove the point.

YEARS END MEMBERSHIP ANALYSIS

State	Members 12/31/54	Members 12/31/53	Inc.	% Inc.	Res. Reg. Eng.	% Memb.	Rank Total Members 1954	Rank Total Members 1953	Rank % of Reg. Members 1954
Ala.	212	193	19	9.8	1,096	19.3	29	30	29
Ariz.	249	228	21	9.2	688	36.2	26	26	9
Ark.	293	293			415	70.6	24	22	2
Calif.	743	697	46	6.6	21,719	3.4	13	13	38
Colo.	207	195	12	6.1	1,280	16.2	30	29	33
Conn.	339	330	9	2.7	1,718	19.7	20	20	28
Del.	202	211	—9	—4.3	658	30.7	31	28	16
D. C.	306	278	28	10.1	3,269	9.4	23	23	35
Fla.	406	372	34	9.1	1,045	38.9	19	19	7
Ga.	855	823	32	3.9	2,611	32.6	11	11	13
Idaho	214	192	22	11.5	431	49.7	28	31	3
Ill.	1,076	1,016	60	5.9	16,665	6.5	8	7	36
Ind.	609	592	17	2.9	3,327	18.3	15	15	32
Kansas	331	329	2	0.6	1,789	18.5	21	21	31
Md.	316	256	60	23.5	1,637	19.3	22	24	29
Mass.	947	941	6	0.6	4,508	21.0	10	9	26
Mich.	1,288	1,122	166	14.8	3,876	33.2	6	6	12
Minn.	851	798	53	6.6	2,422	35.1	12	12	10
Mo.	1,127	960	167	17.4	5,294	21.3	7	8	25
Neb.	174	115	59	51.3	680	25.5	34	35	21
Nev.	97	66	31	47.0	309	31.4	37	38	15
N. J.	1,746	1,787	—41	—2.3	4,428	39.4	5	5	6
N. M.	235	220	15	6.8	1,147	20.5	27	27	27
N. Y.	3,865	3,684	181	4.9	14,674	26.3	1	1	19
N. C.	286	250	36	14.4	776	37.3	25	25	8
N. D.	153	151	2	1.3	194	78.8	35	34	1
Ohio	3,423	3,398	25	0.7	13,550	25.3	3	2	22
Okla.	721	613	108	17.6	1,816	39.7	14	14	5
Pa.	3,434	3,362	72	2.1	10,777	31.9	2	3	14
P. R.	53	63	—10	—15.9	1,889	2.8	39	39	39
R. I.	176	183	—7	—3.8	671	26.2	33	32	10
S. C.	125	109	16	14.7	570	22.1	36	36	23
Tenn.	448	437	11	2.5	1,297	34.6	17	17	11
Texas	2,571	2,382	189	7.9	8,817	29.2	4	4	18
Utah	76	76			791	9.6	38	37	34
Va.	438	383	55	14.4	2,010	21.8	18	18	24
Wash.	177	173	4	2.3	4,080	4.3	32	33	37
W. Va.	579	582	—3	—0.5	1,454	39.8	16	16	4
Wisc.	1,023	867	156	18.0	3,373	30.3	9	10	17
MAL	150	117	33	28.2					
Total	30,521	28,844	1,677		148,906				

Progress Report #6

March 14, 1955

In regard to membership, action by the WSPE Board of Directors on March 12 at Milwaukee set three new records:

1. Approved applications of 52 professional engineers and 12 E-I-T's or a total of 64 new members. This is the largest number ever accepted at one time by the WSPE Board.

2. In the above total, the previous record of 14 sponsorships in one year by Lyle Kingston of Green Bay was surpassed by Foster C. Koehn of Milwaukee with 15 and tied by Art Graettinger with 14.

3. The Northwest Chapter is the first to make and exceed its quota. Bill Baumgartner and his assistants are the first to do this in eight months of the contest year.

Being 46% over last year at this time reflects healthy growth in most chapters, whether or not this is sufficient to beat Michigan we don't know. Right now they are ahead.

We are sending a copy of this report to all engineers who sponsored a new member accepted at the January 28 and March 12 meeting with the hope that you will do as well as we go down the homestretch in our race with Michigan. If we can add 116 before April 20 which is the total of the January

and March additions we can consider our year's work accomplished. See those men now who have been "thinking about it". To make them count against Michigan, get them in by April 20 so Secretary Wagner can forward them into NSPE Headquarters by April 30. Let's take 'em.

NEW MEMBERS

Milwaukee — *Sponsored by*

James Angers (Aff.) . . . . Ray Behrens
Lawrence W. Weidman (Aff.) . . . . . Robt. Claypool
John Poklar (Aff.) . . . . . Tom Weiber
Eugene Arneson (Aff.) . . Geo. Sievers
George Linn (Aff.) . . . . A. Graettinger
Richard Mallinger . . . . . A. Behling
William Atkinson . . . . Paul Smongeski
Louis C. Frank . . . . . H. Frentzel
Glenn Johnson . . . . . A. Graettinger
Leon Healy . . . . . Geo. Sievers
Irving Heller . . . . . Geo. Sievers
John Hurley . . . . . A. Graettinger
Frank Shewczyk . . . . . Tom Weiher
Louis Geiger . . . . . W. C. Lallier
John Deist . . . . . W. C. Lallier
Herbert W. Stiemke . . . . W. C. Lallier
Joseph Jacques . . . . . A. Graettinger
Halvor H. Garos . . . . . Donald Mereen
Leonard Saari . . . . . L. W. Butler
Howard Milhaupt . . . . . J. R. Meyer
Stephen A. Keidl . . . . . J. R. Meyer
Edwin T. Sherwood . . . . R. R. Ranson
Cyril A. Jung . . . . . A. Graettinger
Philip Emley . . . . . E. W. Seeger
Blakeslee Wheeler . . . . . E. W. Seeger
William Marshall . . . . . A. G. Behling
Henry A. Strehlow . . . . . Norbert Sem
Robert Prince . . . . . R. R. Claypool
Arnold Meyer, Jr. . . . Herman Frentzel
Gilbert C. Lamb . . . . . J. R. Meyer
William W. Wuerl . . . . . Paul Goudy
Weld Conley . . . . . W. D. O'Connor
Edward Korpady . . . . . Foster Koehn
Robert Kalt . . . . . Foster Koehn
Roland Adams . . . . . Foster Koehn
Howard S. Knopow . . . . A. Graettinger
George L. Elmergreen . . . . . James Van Vleet
J. Fletcher Harper . . . . . Geo. Sievers
Langdon Strong . . . . . John Born
Fremont Brauch . . . . . Foster Koehn
William Waymire . . . . . A. Graettinger

Fox River Valley — *Sponsored by*

Robt. Schindhelm . . . . . Barry Brevik
Francis Keuler (Aff.) . F. Charlesworth
Frank Charlesworth, Jr. (Aff.) . . . . . F. Charlesworth
George Simonds, Jr. (Aff.) . . . . . Robert Poss

Northwest

J. S. McMillen . . . . . W. Baumgartner
Max Tuttle . . . . . R. C. Clark
Seymour Cray . . . . . Neal Bartholomew
George Morgan . . . . . Robert Cooper
Lyman Shaffer . . . . . R. C. Clark
Martin B. Olson . . . . . R. C. Clark

Chapter	P.E.'s & E-T-T's not Members of Affiliates 7/1/54–7/1/55 P.E.'s	E-I-T's	Membership 7/1/54	Quota	Sponsors for New Members 7/1–10/23	% of Quota
Northwest	60		53	15	17	112%
Fox River Valley	275		150	50	38	76%
Milwaukee	1,600	Est. 900	411	165	90	55%
Southwest	325		229	65	30	46%
Western	20		63	20	6	30%
Southeast	260		72	30	4	14%
Wisconsin Valley	60		52	15	2	14%
Out of State	800	100	52	0	0	0%
Total	3,400	1,000	1,082	360	187	52%

Southeast

Anthony DeBlaise (Aff.) . . . . . Frank Vilen
Gilbert C. Barnes . . W. C. Lallier (M)

Southwest

Herman Holtzman . . . . . Page Johnson
Allen J. Shafer . . . . . L. Stockner
Marvin Storm (Aff.) . . . . . C. Perlman
Robert Craig . . . . . D. B. Johnson
Clarence McElmurry . . . D. B. Johnson

Western

Leon Chase . . . . . Arthur Dux
John Albright (Aff.) . . . . . D. Grunditz

Out of State

Richard Look . . . W. Schubert (FRV)
Neil Johnson (Aff.) . . . A. Graettinger

Northwest

Francis Sorrentine, Jr. . . . W. Rosenkranz
Ed Polaseke . . . . . E. Dieterling

The Board of Directors last Saturday appeared to be well satisfied with the results the membership team has produced to date. Have we got what it takes to "take" Michigan? We have about 40 days to do it.

HONOR ROLL

The following engineers have sponsored 5 or more new members since July 1, 1954:

Foster C. Koehn	(new record)	15
Art Graettinger		14
W. E. Schubert		9
George Sievers		8
Lyle Kingston		6
C. M. Perlman		5

Chapter News

FOX RIVER VALLEY CHAPTER

JOHN K. PRIMM
Reporter

The Fox River Valley Chapter met at 6:30 P. M. at the Hickory Hills Country Club in Chilton on Thursday, April 7.

Featured speaker at the steak supper meeting was Joseph Van Dyke, chief engineer, Unit Structures Inc., of Peshtigo, who talked on "Laminated Wood Construction." The lecture was illustrated with slides and a full-scale demonstration experiment was conducted to illustrate the strength of laminated wood as a building material. Samples of this structural wood were tested in a special testing machine.

MILWAUKEE CHAPTER

ROBERT J. MENDENHALL
Reporter

William E. Crawford, P.E., one of the nation's outstanding men in the fields of engineering research and patent law, retired at year end from his post as Director of Research and Development for the A. O. Smith Corporation of Milwaukee, Wisconsin.

One of Mr. Crawford's key activities in recent years has been membership on the Wisconsin Registration Board for Architects and Professional Engineers. He is currently chairman of the engineering section.

In 1952 he received a citation from the University of Wisconsin Board of Regents and from the College of Engineering in which recognition was given for his contributions to the science of welding and his consistent efforts on behalf of advancement of young engineers. Mr. Crawford is a Fellow of the American Institute of Electrical Engineers.

His earlier experiences, after graduating from the University of

(Continued on page 40)

Michigan, included teaching high school mathematics and physics and at one time he was a youthful high school principal. Later the teaching included night classes for men in industry.

Eventually, in the period from 1917 to 1920, Mr. Crawford got into the plant engineering field with a number of truck companies in Michigan and Wisconsin.

In 1920 he joined A. O. Smith, and his early work with that firm had to do with electric power. Because the company at that time was pioneering electric welding techniques, Mr. Crawford became immersed in such studies. Today he holds a number of patents in the flash welding field. Also because of the exhaustive research which his company has done in the last several decades, Mr. Crawford was led into studies of patents and patent law.

Among his important memberships are the Wisconsin Society of Professional Engineers, American Welding Society, Engineers Society of Milwaukee (past president), Milwaukee Patent Law Association (the only non-lawyer ever to be its president), American Society of Mechanical Engineers, and the American Society for Metals.

Wesley C. Lallier, P.E., has been designated president-elect by the Milwaukee chapter board of directors, according to an announcement by president George A. Sievers, P.E. This action was necessary due to the resignation from the chapter of Orrin E. Andrus, P.E., who had previously been elected to the position.

In parallel actions, Lallier has been designated vice-president to succeed Andrus for the current year and Karl O. Werwath, P.E., has been chosen vice-president-elect.

Mr. Lallier, active in Milwaukee chapter affairs for a number of years, is engineer of outside plants for the Wisconsin Telephone Company. The latest achievement in behalf of WSPE for Mr. Werwath, president, Milwaukee School of Engineering, was chairmanship of the chapter's successful 1955 National Engineer's Week committee.

Mr. Andrus' resignation was occasioned by the fact that he has taken up residency at Madison where he is completing work for a Ph.D. degree in chemical engineering. His many friends will wish him luck in this latest endeavor.

The Milwauke chapter has decided to donate $1,200.00 to the Engineers' Society of Milwaukee for equipment at their headquarters building. The WSPE board of directors had previously indicated that the money, available because of the financial success of the National Society of Professional Engineers' meeting held in Milwaukee in June, 1954, be donated to some nonprofit organization in the Milwaukee area.

The Thursday noon luncheons of the chapter have turned out very well and response has been good. The short talks delivered at these luncheons have proved to be interesting.

A meeting of the chapter was held Tuesday evening, April 12, at 8:00 P. M. in the ESM building. The meeting was preceded by a buffet supper.

Various factions competing for recognition by the engineer in his professional development were discussed at the meeting. Highlight of the meeting was the talk given by C. F. Savage, consultant in Professional Relations, of General Electric.

SOUTHWEST CHAPTER

L. W. STOCKNER
Reporter

Our regular quarterly dinner meeting was held March 9, 1955 at the Nelson Hotel in Racine. A fine beef tenderloin dinner was enjoyed by the large group in attendance. Many of the members brought guests and prospective new members along, and, of course, the Chapter was especially honored to have as their guest, Mr. George P. Steinmetz, State President, and Mr. A. O. Ayres, First Vice President, both of whom gave reports on Statewide activities.

Mr. Emerson Dannel, Patent Attorney of the Case Company was the principal speaker of the evening. His talk was very educational, particularly to those engineers with inventive aspirations. Mr. Emerson's profession is not without its humorous aspects, many of which were told.

The program was followed by the regular business meeting which was conducted by Mr. Donald Bengs, Vice President, in the absence of our President, Mr. Charles E. Pflug who is recovering from a minor illness.

All committee chairmen gave their reports, some of which precipitated lengthy discussions. However, a few important issues were passed on. The members approved the motion that our Southeast Chapter be considered as the area to have the 1956 summer conference meeting. An appropriate committee will be named to plan this meeting in the event our section is selected.

Much discussion was held relative to ethics and practice, particularly pertaining to telephone directory listings and advertising. Also, strong views were presented in regard to the present licensing procedure, particularly the written examination requirements. These subjects were referred to the appropriate committees for further study and comment.

Our next meeting will be held June 8 in Kenosha.

WESTERN CHAPTER

D. W. GRUNDITZ
Reporter

"Plans and Problems in La Crosse Public Works" was the topic of City Engineer Zenno A. Gorder at the dinner meeting of Western Chapter, Wisconsin Society of Professional Engineers Tuesday evening at the Cerise Club.

Plans for the storm sewer project, the well drilling program, the north side dock, city paving, and paving in cooperation with other governmental units were cited. On

the current 10 year storm sewer project 70,000 feet have been installed. The north side dock construction has commenced with a 30 day approximate completion time. Asphaltic carpet paving projects are being proposed for parts of Main, Clinton, and Eleventh Streets as part of the paving of other streets dependent upon completion of underground utilities, the desirability of achieving as continuous network of paved streets, and the desires of property owners. The Rose Street extension engineered under former City Engineer John Barth, in cooperation with other governmental units was commended as a most notable and valuable achievement in La Crosse public works. Prompt and wholehearted cooperation of area, city, county, and town government has resulted in a bright picture for the Losey Boulevard paving project in the near future.

Problems cited involved engineering, finance, procedures, and public relations. These types of problems are requiring close coordination in their treatment. Engineering planning to insure that all necessary underground utilities are installed before paving is particularly important. Where such paving projects are on city limits streets, it has proved particularly difficult to ascertain outside property owners plans; it is important that proper numbers and locations of services (such as sewer and water laterals) be installed ready for use in the event those properties are annexed to the city. Gorder pointed out that the property tax rate has not kept pace with the diminishing dollar value and that there has been a rapid growth in public works construction, in spite of this condition. The heavy school building program now underway, the completion of the remodeling and enlargement of the sewage disposal plant, and the storm sewer and paving projects under construction all show this growth in public works. Permanent paving proves desirable, necessary, and economical in the long run since paved streets are more attractive, result in more trouble-free vehicle operation, and result in less need for maintenance equipment and personnel and less total maintenance cost. To make paving and curb and gutter more attractive to the property owner, 55 to 60 per cent of the cost is paid from the general tax funds of the city, with the remainder assessed to the property. The assessment for concrete curb, gutter and pavement averages about two dollars per foot for curb and gutter and four dollars for pavement for interior lots.

The business meeting, presided over by president Merlin A. Eklund, featured a report by program chairman Arthur M. Moody. The next meeting of the chapter will be held jointly with the local groups of American Society of Mechanical Engineers and the American Society of Tool Engineers—Tuesday, April 19, in the Stoddard Hotel ballroom. The speaker will be Dr. Lillian Gilbreth, Knapp visiting professor of mechanical engineers at the University of Wisconsin. Engineers and their ladies will be invited.

The chapter held a meeting on Tuesday, March 15 at 6:30 P. M. Speaker at the meeting was Mr. Zenno A. Gorder, City Engineer of La Crosse. The public works projects in La Crosse was topic of an informal discussion and a film, "Rail Steel in the World of Today," was shown.

A joint dinner meeting was held by the La Crosse Group of A.S.M.E., the Western Chapter of W.S.P.E. and the La Crosse Chapter of A.S.T.E. in La Crosse at the Crystal Room in Hotel Stoddard at 6:30 P. M. on April 19, 1955. Main speaker at the meeting was Dr. Lillian M. Gilbreth, a Knapp visiting professor in the Department of Mechanical Engineering at the University of Wisconsin and who also is so well remembered as the mother in "Cheaper by the Dozen." Dr. Gilbreth spoke on "Utilization of Human Resources." The meeting was the highlight of the year's program.

NORTHWEST CHAPTER

WM. ROSENKRANZ
Reporter

The following is a report concerning the Northwest Chapter, WSPE program prior to and during National Engineers' Week, February 20–26, 1955. This chapter put a great deal of effort into the promotion of this Society endeavor. Due to past experience and cooperation, we planned a joint promotion and celebration with The Eau Claire Technical Society. Both organizations had representation on all sub-committees of the Engineers' Week Committee. A brief discussion of the activities of the various sub-committees follows:

Radio and TV. All radio and TV programs in the Eau Claire area were programmed on WEAU radio and WEAU–TV Channel 13. In addition to spot announcements during the week, we secured the following programs:

1. Sunday Feb. 20, U.S.S. Nautilus tape.
2. Monday Feb. 21, "Doctors, Lawyers and Engineers" tape.
3. Thursday Feb. 24, 15 minute live telecast—panel discussion about engineering with questions from a pre-engineering college student.
4. Friday Feb. 25, on TV—engineering movie entitled "Pipeline to the Clouds", a movie about water supply.
5. TV slides spot announcements during the week.
6. Radio spot announcements over radio stations in Rice Lake and Chippewa Falls.

Speakers. Speakers from The Eau Claire Technical Society and the Northwest Chapter WSPE spoke at the following meetings:

1. Rotary Club in Eau Claire—Feb. 14, Parker Clark of Tech. Society.
2. Lions Club in Eau Claire—Feb. 23, Ed Deterling of Northwest Chapter.
3. Exchange Club in Eau Claire —Feb. 22, Ed Holm of Northwest Chapter.

(Continued on page 50)

Opportunity Abroad

(Continued from page 15)

and to concentrate, to organize material studied easily, and to think. These are all essential. To enjoy all this learning and to enjoy using it is a great help.

Today we realize that we cannot take advantage of all that our educational system offers—but we know that the college years are only a small part, although an important part of one's whole life. We know too, that libraries, extension courses, courses in our technical and non-technical Societies can give us what we need—at any time.

During the college years—if we want diplomas, recommendations, jobs—there are many subjects we must take. But at least one can learn about other courses available—other fields of interest and what they have to offer.

Required non-technical courses—"survey courses"—contemporary trends courses, electives are not less important than the technical courses that all engineering students enjoy.

Life in the Services and in Civilian life these days can include going on with one's education and training, if there is intelligent offering and accepting of opportunities.

What of the young engineer who thinks of work in other Countries? If he has followed the learning pattern indicated in this short article, he should be an asset to any Country.

But there are certain "pluses" that may be a help. Personal dignity, respect for age and experience will do much to make him acceptable in the many countries where age and experience are assets. An appreciation of the value of "face" will be a great help. No one likes to look ineffective, ridiculous or ignorant—in his own or anyone else's eyes. Everyone likes to feel needed and important. Orientals are especially more sensitive than we perhaps realize—and great attention to "face saving" is needed, in any foreign country.

The wise engineer on any foreign job shuts his eyes to unimportant things that may annoy him—difference in manners, food, in pace of work—in availability of facilities and comforts to which he is accustomed. He keeps his attention on the assets of the people with whom he works. Does the individual have dignity and a chance to get and keep a satisfying job? Is the family life happy? Are there achievements in the field of science? Of art? These things and many others are important.

The past of any nation is apt to be dear to it. Just knowing of its history and contributions opens many doors. To be able to understand, and even better, to speak the language of a country means not only being welcomed, but belonging in a way, from the start. Some relative, some friend who came from the country where one is working—even though this was years or generations ago—assures the host of the attitude of the guest. For we are all guests—in foreign countries.

A knowledge of our own Country—a pride in it and a humility as to what we have done with our tremendous assets help. A realization that we are lucky to be able to give, and that it is hard for any proud people to receive—helps. A quick acknowledgment that a Country belongs to its people, that the best help is being a ready resource for self help; a willingness to learn as well as to teach. These are among the things we would pack with our luggage as we take on foreign assignments. Only few clothes are necessary—but books, films and other "aids" can well take up the weight allowance.

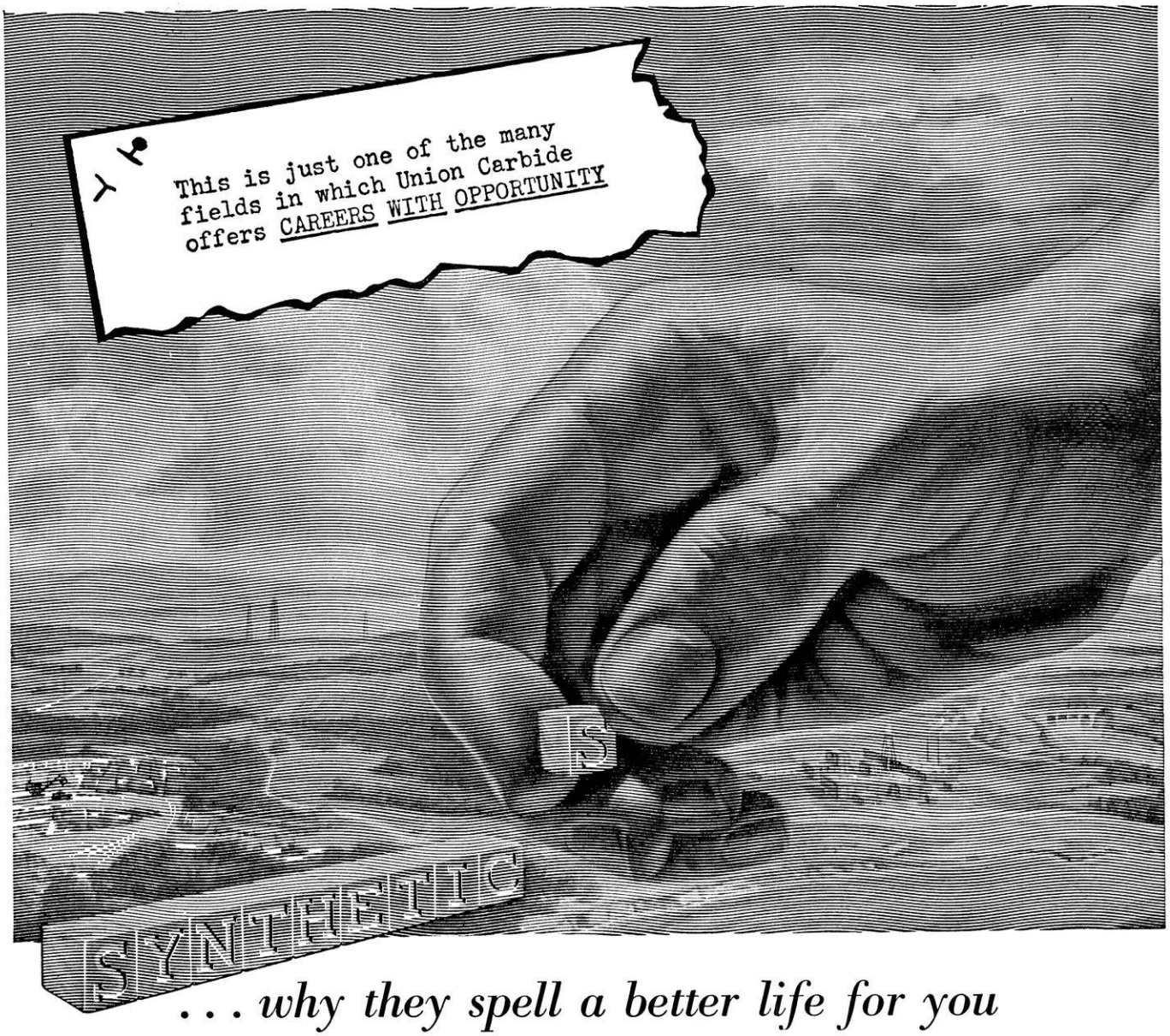
The most useful and happiest engineers and others in the foreign countries work as a part of the life of the people of the country where they are. They try to learn the ways, adopt the schedule, eat the food wherever they are. They are alert to appreciate day in and day out. To make this easier, one finds many bonds of common interest. The engineering profession is very clannish. The language of technical engineering is almost a universal speech. There are alumni of all our universities at work all over the world—one finds large associations in many countries. Some members are U. S. A. citizens, some citizens of the foreign country educated here, and people of like interests and hobbies are everywhere.

One must be prepared to be open minded. In some countries, labor saving machines and methods increase unemployment, already an important and vital problem. We must go slowly—when we long to go rapidly. In some countries, fixed habits, slow pace, climate, low estimate of work with the hands make changes of the type we are accustomed to and like, difficult or impossible. In some countries, customs that are acceptable and inbred, irritate us. We must remember that our ways of doing things may irritate the people of the country—as theirs annoy us.

But, trying to appraise and evaluate their experiences, as they look back at them, most engineers who have worked long enough in other countries to have something to evaluate, seem to feel that the time and energy spent was well spent.

As we look at the future, we know that, more and more, we must think of engineering as a world need. Of course, many engineers will do the home jobs and some of these will prefer to do these. But for those who think of work abroad as a challenge and an opportunity, it is essential to prepare for such work.

This means good health and knowing how to keep well. It means getting the right kind of education and training, and knowing what the resources are—to keep mentally alert. It means having the right attitudes, and knowing how to keep serene through difficulties. It means marrying the right person—who shares one's aims, supplements one's liabilities—one's assets—it means learning and teaching—continuously—on the job and off the job. It means measuring rewards in intangibles as well as tangible terms. It means continuous questioning and recognizing and using the answers—if and when they come. **END**



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Radioisotopes

(Continued from page 27)

the weld or suspected defect and placing a radiation source on the other side.[32] The rays emitted by this source will expose the film and a picture showing any defect or irregularity is obtained.

The uses of radioisotopes, the detectors used in detecting them, and the radioisotopes themselves have been discussed. The next thing then, is, have radioisotopes been used to their best advantage? The answer is that they haven't, and it might even be said that industry has hardly even scratched the surface of the field. Of all of the isotopes that were produced by the AEC (Atomic Energy Commission) at Oak Ridge in 1952, only 5 per cent of them went for industrial use. The rest were used for medicine and biological uses.[33]

There are three main reasons why radioisotopes have not been used to their best advantage and these are, lack of facilities and trained personnel, the general public fear of radioactivity, and the hazards involved in handling them.[34]

The field of radiochemistry is relatively new so it is only natural that it is taking a while for it to develop. Shortly after World War II, industry found itself free to use all of the techniques that had been developed in the production of the atomic bomb, but it was not prepared to use them. Trained personnel and proper facilities for handling the isotopes were not to be found. This situation is slowly being overcome through the aid of the AEC. Four week courses in Radiochemical Techniques are being given by the AEC at their Oak Ridge Laboratory. The Advisory Field Service Branch of the Isotopes Division is also assisting industry in planning the design of laboratories.[35]

The fear of radiation by the general public is a big deterrent to their use in industry. The public usually associates radiation with the atomic bomb, and base their fears of it on the assumption that all radiation is as dangerous as that emitted during a nuclear explosion. This, of course, is not true but industry is facing a big task when it undertakes the job of trying to educate the public to it.

In its first years of use in industry, many law suits were brought against the companies because a slight amount of residual radioactvity remained in the products.[36] An excessive amount of radiation can not be tolerated, but these nuisance suits brought about by a small amount of harmless radiation can be very damaging to a company's business.

The hazards involved in handling radioisotopes have also been a deterrent to their expanded use. The α ray emissions cause little concern because they are stopped by the skin. It is the β and γ rays that must be watched carefully. It has been found that any β isotopes in amounts greater than 1 millicure, and any isotope emitting γ rays equivalent to that emitted by 0.1 mg. of radium are to be considered hazardous.[37]

Smaller amounts of these isotopes are also dangerous when they are deposited in the body. They can be deposited in the body by ingestion, inhaling air containing radioactive materials, by absorbing a solution of radioactive materials into the body through a break in the skin, and by direct exposure to the rays.[38] These hazards can be practically eliminated if all of the procedures as set up by the AEC are followed closely, such as the wearing of a monotoring film to check on the possibility of exposure.

Industry's use of radioisotopes started out slowly in the beginning but gradually gained momentum as a greater understanding of them came about through increased use. The use of radioisotopes soon branched off into two distinct fields, one as isotopic tracers, and the other as radiation sources. The use as a radiation source will develop much more quickly than the use of an isotopic tracer because of adverse public sentiment toward the residual activity left by the tracers. This should be overcome as radiation and the nuclear age becomes more of an everyday affair to the public. When that comes about, only man's imagination will be able to limit the uses that will be found for radioisotopes. **END**

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[32] Guest, Radioisotopes, op, cit.
[33] McCutcheon, Don M., Metal Progress, Vol. 64, #3, pp. 105–106, 1953.
[34] Calkins, op. cit.
[35] Schreiber, op. cit.
[36] Guest, Radioisotopes, op. cit.
[37] Ibid.
[38] Ibid.

Engineer's Lament

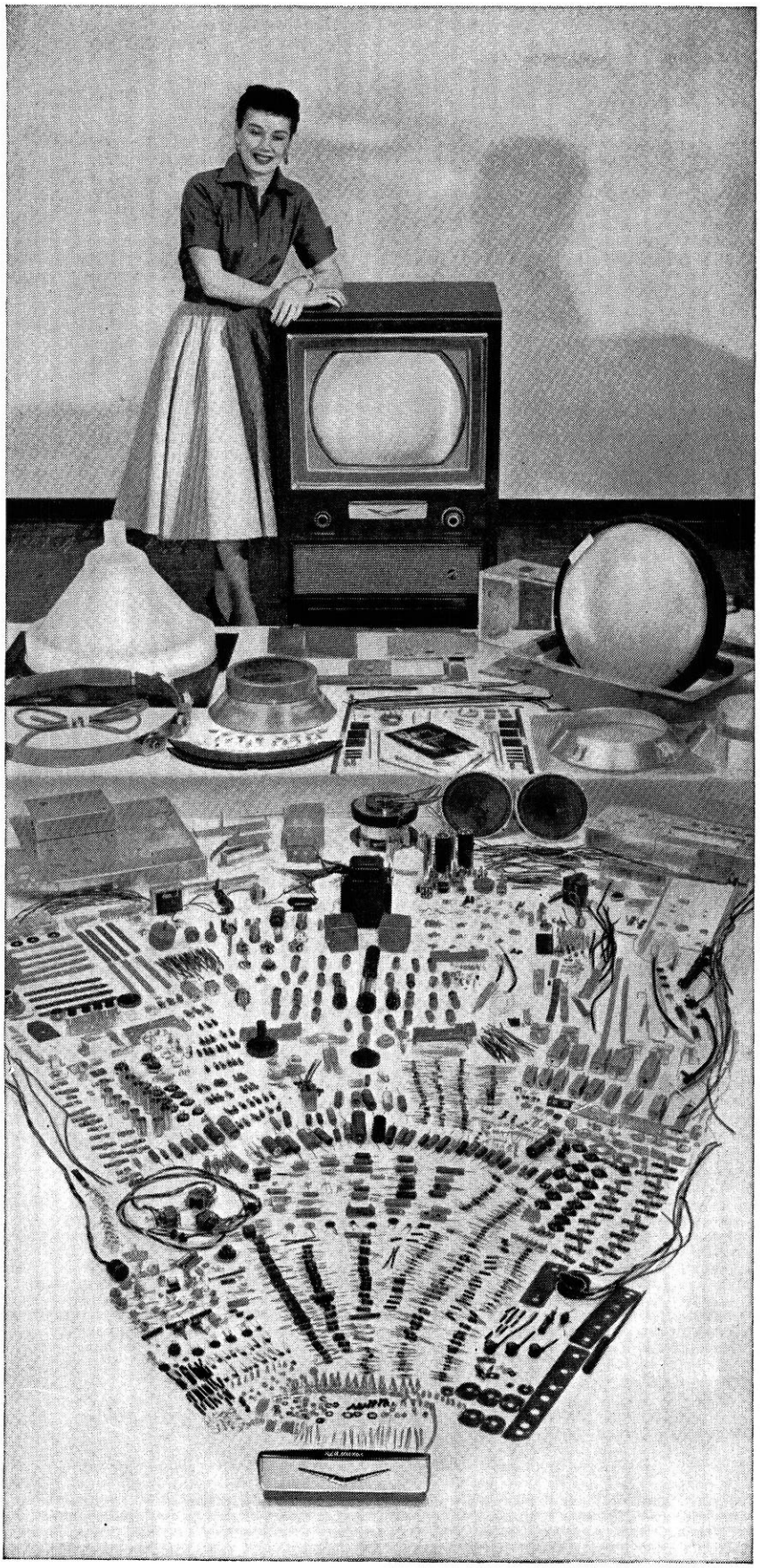
Keep on studying, get no sleep,
Soon you're looking like a creep;
Coffee flows, aspirin too,
Seems your eyes are full of glue;
Stress and strain, calculus,
Find the unknown, must not fuss,
Temper short, work with droop,
Keep on feeling like a stupe.
Paper spread upon the floor,
"Quiet Please" pinned on the door.
Books are stocks in towering pile,
Wonder if it's worth the while,
Toss a coin, decide the crams,
Heads, the army; tails, exams.

* * *

One of our brother engineers has submitted a foolproof way to eliminate car noise. Let her drive.

* * *

Two highly inebriated collegians, driving home early one morning after a football game, on a road parallel to a railroad track, when a passenger train raced by them. Said RahRah, Every house in that last village we passed was still lit up. Said Party Boy, "And didja notice that the first house was on fire.



This picture shows how RCA helps small manufacturers grow

Today the inter-dependence between manufacturer and supplier is stronger than ever in the history of American business. For in the challenging new age of electronics, hundreds upon hundreds of component parts are needed in the manufacture of new products.

For example, the superb new RCA Victor 21-inch color TV set shown here contains 2,070 parts. These are made by 600 different suppliers, most of whom are small businesses.

Indeed, more than three-quarters of all RCA suppliers are small business firms that receive nearly one-half of RCA's purchasing dollars. They, in turn, have their suppliers of raw materials. Thus through a long line of cooperative effort, employment is provided for countless people in many fields—and an entire economy benefits.

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RADIO CORPORATION OF AMERICA
ELECTRONICS FOR LIVING

So You Think You're SMART!

by Sneedly, bs'60

The tall, but stoop-shouldered man shuffled to the Western Union desk and drew a pad of blank telegrams before him. He picked up a pencil and looked abstractedly off into space. He was a thin man with wisps of white hair. He looked not unlike a dedicated and absent-minded scientist. He was. Deciding upon what to write, he hastily scribbled these words: (quoted liberally) *international committee on mathematical research: colleagues stop I have discovered the proof to Fermat's Last Theorem stop will change text of speech to include it stop.*

Upon making the necessary arrangements to have the cablegram sent, the mathematician shuffled to a waiting trans-oceanic airplane—a new thing at that time.

Upon reaching Vienna, the once obscure mathematician delivered his speech to one of the most distinguished audiences of scientists and mathematicians ever assembled. He delivered his speech, and much to the disappointment of the entire audience, he made no mention of Fermat's Last Theorem. Leaving the platform he was ambushed by his colleagues who wanted to know why he had not revealed the proof.

"The proof? The proof? O-h-h the proof. Yes. You see, I really did not discover the proof, but," he said with a twinkle in his eye, "you never know when one of these infernal flying machines is going to crash, and so just in case I were not to reach Vienna, people would mourn at having relost the proof to Fermat's Last Theorem." Needless to say, the joke was not well taken by the Austrians.

* * *

You may wonder why all this discussion about Fermat's Last Theorem. Well, His theorem was: given the following equation:

$$a^n + b^n = c^n$$

where a, b, and c, are rational numbers, there is no solution where n is an integer greater than two. Fermat wrote this theorem in the margin of a textbook and made the comment that he did not have enough room to present the entire proof. This theorem was not found until many years later and by that time the complete proof had been lost forever.

Unfortunately, no one was able to claim the $5 reward for submitting a correct proof for the theorem as printed in the March issue.

* * *

Here's a little gem of a problem that will keep you out of mischief until next September: When Sneedly was in Europe two summers ago (hint to identity of you-know-who) he heard of the legend of Pierre and his two brothers who lived in the famous Brothers Hotel, from which a common American word was coined incidently. The brothers were named Jaasac and Igor. They had conceived a plan to rob the castle on the nearby mountain. They stole a treasure chest from the tower of the castle which overlooked a river running beneath it. In order to avoid detection they had to destroy the rope ladders which they used to ascend the castle and tower walls, and their remaining means of escape was to descend from the tower by means of a crude tackel which they had brought with them. This tackle consisted of a long rope with a basket at each end and a single pulley. If the difference in weight of the contents of the two baskets should exceed twenty pounds, then the heavier basket would have descended too rapidly for the safety of the occupants; however the box was sturdy enough to withstand the fall.

Pierre weighed 170 pounds, Jaasac weighed 100 pounds, and Igor weighed 80 pounds; the treasure weighed 60 pounds, as the legend has it. When they reached the bottom safely, they divided the treasure into three unequal parts, which the largest going to Pierre, the originator of the scheme, and also the oldest of the three. Each put his portion of the treasure into a separate bag. However, there was no honor among the three and when they discover that the small boat can hold only two men or one man and a bag, none of them wants to leave his bag with one of the others. However, they decided, evidently, that the man rowing the boat would be too busy to tamper with any bags, and so they crossed the river safely.

According to the legend, however, Igor killed the other two in their sleep the following night and told his story to a jailer after he had been caught. Fortunately Sneedly took French la and was thus able to converse with a descendant of the jailer and learn of

(Continued on page 60)

ASME Diamond Jubilee

(Continued from page 14)

tion of the leading engineering organizations of those countries. Many similar trips have been taken since then, and the Society has had representatives at many important meetings of societies abroad and has participated in international conferences on codes and standards, management, and applied mechanics.

75th Anniversary Celebration

Five major national meetings are being held in 1955, to celebrate the 75th anniversary of the American Society of Mechanical Engineers. Nationally famous persons will participate as banquet speakers and panelists at these meetings. Their subject matter will concern the engineer and his relationship with the world in which he lives and works—not just the mechanical engineer, and not just his contributions to his fellow man—but all engineers.

The five meetings will be:

1. The Founding Meeting which was held on February 16. This meeting was devoted to the engineer and his communications. Four experts spoke on the following phases of communications:
   A. The engineer's communications with people outside his profession.
   B. The engineer's communications with his fellow engineers.
   C. How the engineer communicates, in speech and in writing.
   D. The engineer's contributions to communications.
2. The Organization Meeting which was held on April 16 on the campus of Stevens Institute of Technology in Hoboken, New Jersey. The theme of this meeting was The Engineer and the World of Education.
3. The Spring Meeting which was held on April 18 to 21 in Baltimore, Md. The theme for this convention was The Engineer and the World of Government. Subjects for discussion include the role of the engineer in peace and war, the engineer and the law, and representation of the engineers in local, state, and federal government.
4. The Semi-Annual meeting which will be held in Boston, Mass., from June 19 to 23. The Engineer and the World of Science will be its theme. There will be two panels. One will discuss the engineer and his fellow-scientist with emphasis on the interrelationship between engineering and the physical, social and biological sciences. The other will discuss the engineer and the scientific future.
5. The Annual Meeting which will be held in Chicago from November 13 to 18. Tentative plans call for one panel to concern itself with the economic status of the engineer; the other, with the engineer's response to the opportunities for leadership.

Honors and Awards will be presented at each of the five major meetings. Honorary memberships will be awarded. Other medals and awards will be given as is appropriate to themes of the five national meetings.

A series of news letters called *Jubilee News* serves as the clearinghouse for anniversary news and information. It is being distributed to chairmen and secretaries of sections; members of the professional divisions' executive committees; and members of the Society's administrative committees and boards.

In order to encourage special commemorative meetings in each Section and to give the membership a responsible part in the anniversary program, the Board of Honors, at the suggestion of the 75th Anniversary Committee has established a special 75th Anniversary Medal. This medal shall be awarded in each ASME Section to that member of the Section who has in the opinion of the Section, done the most to further the aims and objectives of ASME.

A 75th Anniversary Student Award will be bestowed upon the outstanding engineering student at each college at which there is a student branch. In our branch here at the University of Wisconsin, Carroll C. Rands received this award at a regular student branch meeting on April 20.

A nationwide contest was held to find a suitable symbol and slogan for ASME's Jubilee Year. First place in the symbol contest went to Andrew T. Lemmens, of Rochester, New York. His entry, (pictured on this page) symbolizes a Nuclear Energy Cycle of the present superimposed on a Carnot Thermodynamic Cycle of the past, and their effect on the world in which we live.

The winner of the slogan contest was Dr. David H. Ray of North Tarrytown, New York, for his slogan, "By Truth and By Service To Enrich Mankind." The winning slogan is incorporated on the reverse side of the medallion with the traditional globe, lever, and hand depicting Archimedes' statement, "Give me where to stand and I will move the earth."

Conclusion

In conclusion it may be said, that the American Society of Mechanical Engineers has been a vital factor in raising and maintaining our high standards of living, and in protecting and defending our freedom which has, in the past 75 years, been threatened numerous times by foreign aggressors. It has accomplished these things by bringing together the industrialists, the businessmen, and the engineers; by encouraging and supporting research; by disseminating knowledge through meetings and publications; and by developing and promulgating standards, codes, formulas, and recommended practices. Today, ASME looks forward to even greater usefulness by continuing to meet the problems of the atomic age now upon us.

END

CAMPUS NEWS

Compiled by Larry Barr, m'57 and Dick Peterson, m'57

SCHOLARSHIPS

The University of Wisconsin is one of eight colleges and universities included in an engineering and commerce scholarship program started this year by The Maytag Company Foundation, Inc. of Newton, Iowa.

The program provides $200 supplementary scholarships to students entering their senior year of study this fall.

The scholarship at the University of Wisconsin will be known as the Maytag Scholarship in Engineering. It will be awarded to a student for his senior year of study, providing the student is in the upper 25% of his class. However, scholastic standing is not the only factor. Good character, outstanding technical and administrative potential, extra-curricular activities and the need of the student are also considered.

★

WISCONSIN ENGINEER'S DAY

Harvey V. Higley, prominent Wisconsin engineer and industrialist from Marinette, now U. S. administrator of veterans' affairs, gave the address at the University of Wisconsin's seventh annual Engineers' Day banquet in Great Hall of Wisconsin's Memorial Union at 6:30 p.m., Friday, May 6.

Higley spoke on "Human Engineering" at the dinner which was attended by more than 400 engineers and industralists from all parts of the state and nation. He received his bachelor of science degree from the University of Wisconsin in 1915, and has been active in engineering, business, industry, and veteran and civic affairs.

Prof. W. Robert Marshall, associate dean of the UW College of Engineering and associate director of the University's Engineering Experiment Station, presided at the dinner, at which distinguished service citations were awarded to several outstanding engineers and industrialists. Music was provided by the UW A Cappella Choir directed by Prof. J. Russell Paxton.

The banquet climaxed the annual Wisconsin Engineers' Day program which extended throughout Friday, May 6, during which visiting engineers and industrialists inspected the UW engineering campus, its new buildings and research laboratories and projects, and attended a technical session at which engineering research and education problems were discussed.

★

NEW VACUUM PUMP BY U. W. PROFESSOR

A new type of vacuum pump invented by a University of Wisconsin nuclear physicist and patented by the Wisconsin Alumni Research Foundation (WARF) will soon be released for sale, the Consolidated Vacuum Corp. and WARF announced today.

The new, completely dry, high-vacuum pump was invented by Prof. R. G. Herb of the University of Wisconsin physics department.

It was developed to produce a vapor-free vacuum for the large high-voltage particle accelerators used in "atom-smashing," the pump is expected to play a vital part in future nuclear research programs. It will also be used to clear the path for racing electrons in radar power tubes.

Other potential applications for the Evapor-Ion pump, as it will be named, include the evacuation of electron power tubes, color TV tubes, large X-ray tubes, and mass spectrometers.

The new device combines a titanium evaporation process and ion pumping to produce low pressures (less than 10^{-8} mm Hg) without using refrigerated traps or baffles.

The pump is expected to render obsolete a number of present high-vacuum pumping techniques, Fogg and Ross pointed out.

"The Evapor-Ion pump is the first major new development in high-vacuum pumping technology since the development of the self-purifying oil diffusion pump in 1936," Fogg said. "It will provide American industry with a new way to produce high vacuum, which is fast becoming a basic process tool in many industries."

★

FACULTY NEWS

The College of Engineering is planning a retirement banquet for: Patrick Hyland, Professor of Mechanical Engineering; Edwin Shorey, Professor of Mining and Metallurgical Engineering and Jesse Kommers, Professor of Mechanics.

The dinner will be held on June 2 at the Memorial Union. Friends, faculty men, and students are welcome to attend.

Scholarly papers written recently by members of the College of Engineering faculty, are as follows:

a. "Determination of the Operating Performance of Wave Guides and UHF Transmission Lines of Arbitrary Cross Section by Hypercircle Analysis", by Prof. Higgins and Instr. W. B. Swift of the E. E. Department.

b. "Determination of the Characteristic Impedance of UHF Coaxial Rectangular Transmission Lines", by Prof. J. J. Skiles and Prof. T. J. Higgins.

c. "Microstructures of Pyrophoric Alloys", by Fellow R. D. Reiswig and Prof. D. J. Mack. This paper appeared in the Journal of Metals.

d. "Influence of Melting Variables on Properties of Malleable Cast Iron", by Prof. R. W. Heine and "The Significance of Physical Testing of Grey Cast Iron", by Prof. P. C. Rosenthal. Both of these papers were submitted at the Wisconsin regional conference of the American Foundrymen's Society.

The Drawing Department will lose the services of Mr. Ibraham El Sherbini at the end of this semester when he returns to his position at the Baghdad Institute of Technology, Baghdad, Iraq. Mr. Sherbini has been at this university for the past two years as a member of the Drawing Department while he was working toward his M.S. degree. He expects to complete his thesis in June and return to Iraq as soon as arrangements can be made.

Mr. Schwebke, also of the Drawing Department, recently completed a two-week course in Business Administration at Great Lakes Naval Training Center. Mr. Schwebke is an officer in the Naval Reserve.

HONOR SOCIETIES

TAU BETA PI

HONORARY MECHANICAL ENGINEERING SOCIETY

Spring Initiates

Frederick A. Luhman
John G. Akey
Jose A. Villalobos
Rodney G. Pike
Richard E. Birner
Delbert L. Lehto
Robert R. Carey
Donald R. Buettner
John M. Albrecht
Robert J. Ashauer
Vernon D. Coffey
Roger D. Jesse
Raymond R. DeLaat
Thomas C. O'Sheridan
Ostap Bender
Donald M. Levy
Thomas W. Hurley
Fred C. Krist
John C. Severance
Richard H. Jann
Peter H. Foss
Dennis F. Meronek
Arthur L. Morsel
Ronald L. Douglas
Danny E. Schendel
Joseph T. Oettinger
James M. Reinhardt
Paul M. Jenkinson
Oliver R. Clement

★

ETA KAPPA NU

HONORARY ELECTRICAL ENGINEERING SOCIETY

Initiates—April 28, 1955

Bruce A. Wickesberg
Thomas A. Zander
James E. Williams
Jerome F. Rolefson
Louis L. Cocsis
Robert D. Gehring
John S. Baker
James L. Brown
Jerrold L. Buss
Oliver R. Clement
Joseph A. Datillo
Gregory E. Fitzgerald
Orville R. Evans Jr.
Dennis F. Meronek
Robert J. Schauer
Wilhelm C. Steffe
Marlin H. Wagner
Allwin E. Wudell
Allan K. Schmore

★

PI TAU SIGMA

HONORARY MECHANICAL ENGINEERING SOCIETY

Spring Initiates

Robert Carey
Allan Freedy
John Misselhorn
David Schweitzer
James Smith
Milo Swanson
Wallace Yeskie

Chapter News

(Continued from page 41)

Dean Kurt Wendt, College of Engineering, University of Wisconsin, spoke at Kiwanis Club in Eau Claire, before pre-engineering students at Eau Claire State College, and before a Ladies Night joint meeting of the Northwest Chapter and The Eau Claire Technical Society on Thursday, Feb. 24.

Newspaper Publicity. Our committee obtained good cooperation from most of the papers in the area, the Superior paper being the exception. Little cooperation was obtained in Superior. The newspaper mats furnished by the National Society were published in Eau Claire, Chippewa Falls, River Falls, and Rice Lake. Articles of local interest were written and were submitted to the Eau Claire and Chippewa Falls papers. A list of items published in the Chippewa Herald–Telegram is indicated below. Most of these articles also appeared in the Eau Claire leader.

1. Announcement of Engineers' Week Dates—appeared Jan. 20
2. Article explaining features of WSPE & NSPE—appeared Jan. 27
3. Newspaper mat about Nautilus—appeared Feb. 1
4. Announcement of Technical Society Scholarship—appeared Feb. 4
5. Announcement of Mayor of Chippewa Falls Engineers Week Proclamation—Feb. 16
6. Newspaper mat about Washington and highways—appeared Feb. 18
7. Announcement about Dean Kurt Wendt's address—appeared Feb. 23

Special Projects. Due to the relatively few number of members in the Northwest Chapter WSPE, most of whom live in Eau Claire, our special projects were limited.

Committee members working with city officials in matters concerning Engineers' Week did find that the council president in Eau Claire and the Mayor in Chippewa Falls were willing to proclaim Feb. 20–26 as Engineers' Week. Accordingly, Mr. Herman White, Eau Claire council president and Harry Webb, Chippewa Falls mayor signed proclamations to that effect.

In Chippewa Falls a window display was arranged which featured a slide projector and appropriate signs indicating local projects and items of engineering interest. The slide projector used projected 14 slides, each slide being shown for about ten seconds.

The above is a brief discussion of our activities connected with Engineers' Week. Our members are spread over a large area and the number of members in any particular city is rather small, with the possible exception of Eau Claire.

SOUTHEAST CHAPTER

JOSEPH H. KURANZ
Reporter

Following is a reprint of a letter received from the National Headquarters relative to S. E. Chapter Engineering Week activities:

February 28, 1955

Dear Mr. Kuranz: I have just received your letter and special Engineering section in the *Waukesha Daily Freeman*. I must say that this special engineering section is one of the most outstanding I have ever seen, and is certainly a tribute to the efforts of your Society in observance of this year's National Engineers' Week.

We here at headquarters are so impressed with the special section that we would like to order 200 copies, if possible. If you are unable to secure this many, we would be glad to purchase any amount up to 200.

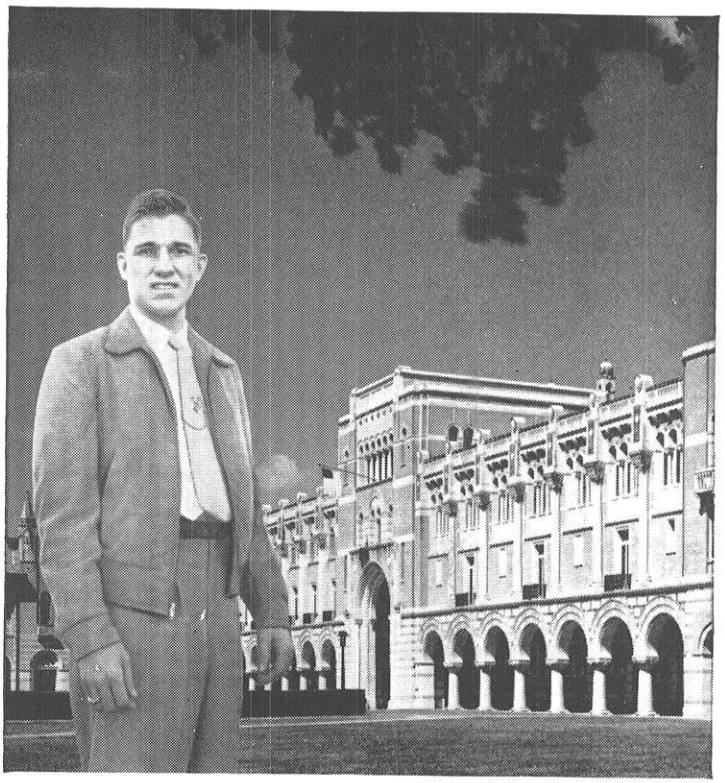
Sincerely yours,
(Signed) KENNETH E. TROMBLEY

Our next regular meeting will be held June 8 in Kenosha. However, in view of the fact that our meetings are held quarterly, a move has been inaugurated to encourage the various counties in the Southeast Chapter to hold monthly dinner meetings in their own areas.

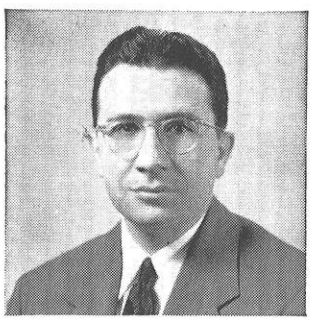
It is hoped that this will encourage greater local participation, and will also aid in the membership drives. Waukesha County has over 100 P.E.'s, and we plan to have an informal get-together this spring. If the idea is well received and a good turnout results, we shall attempt to meet once a month thereafter. It is felt that this plan will serve to fill the gap between the regular quarterly Southeast Chapter meetings and will encourage more P.E.'s to take part in Society activities. END

Cliff Litherland asks:

Would I have varied assignments at Du Pont—or would I specialize technically?



CLIFFORD LITHERLAND received a B.A. degree from Rice Institute last year, and is now working for a B.S. in Chemical Engineering. He is Business Manager of "*The Rice Engineer*," and Vice-President of the fifth-year class at Rice. By asking questions of prospective employers, Cliff is trying to get information that will help him make the best use of his training in the years ahead.



ARTHUR I. MENDOLIA was graduated from Case Institute in June 1941 and started work with the Du Pont Company that same month. In addition to handling challenging assignments at work, he also enjoys some interesting hobbies. Although he makes no claims personally, he's classed as a minor authority on golf and hi-fi music. Mr. Mendolia is Assistant Director of Research for Du Pont's *Electrochemicals Dept.*

Arthur Mendolia answers:

Well, Cliff, I'd say the answer to that question depends largely on your own preferences. In a company the size of Du Pont there are opportunities for growth along either line.

In my own case, I've followed the route of diversification—and I think you'll find that's the general procedure when a fellow is interested in administrative work.

For example, after graduation I started work in the research lab at Du Pont's Niagara Falls plant. That was followed by two years of process improvement work, and a stretch as assistant supervisor over one of the plant areas. Next, I spent a few years in liaison on the design and construction of our first full-scale plant for making nylon intermediates from furfural. Then, I had assignments on "plant start up," and production supervision before I was given my present post. I was made Assistant Director of Research for Du Pont's *Electrochemicals Department* last August.

You see, variety of assignments means contact with new men and with constantly changing problems. That keeps interest alive. It leads to growth, too, because it provides a broad base of experience for future responsibilities.

On the other hand, some fellows prefer to become specialists in a particular field—and Du Pont has many opportunities for that type of professional growth, too. In our research, development and design groups we have experts on distillation, mass transfer, thermodynamics—and most anything else you'd care to mention in the field of engineering. These men are respected throughout the whole company for their technical knowledge.

Whichever route you choose, Cliff—broad or specialized—you'll find that a job well done leads to satisfaction and advancement at Du Pont.

ALUMNI NOTES

by John Albrecht, c'56

Leon K. Kirchmayer, e'45 and Lindon E. Saline, e'45, were given Honorable Mention awards in the selection of the Outstanding Young Electrical Engineers of 1954 conducted by Eta Kappa Nu. The significance of these awards is denoted by the fact that in the nineteen years the award has been granted, a total of 306 men have been nominated and only 66 citations made. Some of the men who have received this award in past years are Dr. Donald P. Campbell, associate professor of electrical engineering at Massachusetts Institute of Technology; W. E. Ingerson, Bell Telephone Labs, Inc.; Dr. J. V. N. Granger, in charge of Aircraft Radiation Systems Lab., Stanford Research Institute, Stanford, Calif.; Edward O. Johnson, RCA Laboratories, Princeton, N. J.; and Dr. John E. Jacobs, General Electric X-Ray Research Laboratory, Milwaukee, Wisconsin.

LEON K. KIRCHMAYER

Leon K. Kirchmayer was graduated from Marquette University in 1945 and was top man in a class of 33. Upon graduation from Marquette University he became associated with the experimental research department of Cutler-Hammer, Inc., at Milwaukee.

In 1948 he joined the Analytical Engineering Section of the General Electric Company's Apparatus Sales Division at Schenectady. His Ph.D. degree in electrical engineering with minors in mathematics and physics was granted by the University of Wisconsin in 1950.

Dr. Kirchmayer's achievements have been concentrated in the development of new theories, methods, and machines related to the control, planning, and economic operation of power systems. One of his outstanding undertakings has been his contributions to the conception and general design of a penalty factor computer soon to be placed in operation by the American Gas and Electric Service Corporation.

He is affiliated with AIEE, ASME, IRE, and currently is director in the Schenectady chapter of the National Society of Professional Engineers and has written articles and papers for various organizations. At present Mr. Kirchmayer is writing a book on Economic Operation of Power Systems.

Lindon E. Saline is assigned to operations research in the analytical-engineering section of the General Electric Company's apparatus sales division. He has developed an original method of programming a quadratic function for optimum performance.

Memberships in technical organizations include AIEE, ASME,

LINDON F. SALINE

CIGRE, NSPE, and the Operations Research Society of America.

Prior to his association with G. E., Saline worked as a development engineer for Cutler-Hammer, Inc., on the analysis and development of control schemes and control components. After obtaining a leave of absence from Cutler-Hammer he enrolled as a full time graduate student and instructor at the University of Wisconsin. Saline's Ph.D. degree was granted in 1950 after he joined General Electric.

Signed articles and technical papers written by or co-authored by Mr. Saline include material for AIEE meetings, CIGRE, Electric Light and Power magazine, the General Electric Review, the *Bridge* of Eta Kappa Nu, and *The Wisconsin Engineer.*

Montrose K. Drewry, m'23, has been elevated to the rank of Fellow of the American Society of

Mechanical Engineers. In the thirty-one years in which he has been associated with the Wisconsin Electric Power Company, Mr. Drewry's work has been primarily designing larger and more efficient boilers and making the changes for operating under higher temperatures and higher pressures to attain greater economies of operation.

In this work, he received several patents, published several technical papers, and in 1948 the College of Engineering of the University of Wisconsin awarded him a citation for his contributions to power development yielding public benefits.

Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, has recently appointed **Aubrey M. Kirby** ch'47, as assistant research engineer to the staff of the Company's Metal Research Laboratories at Niagara Falls.

Mr. Kirby worked for six years as a staff assistant at the Mallinckrodt Chemical Works before joining the Metals Research Laboratories. He received his B.Ch.E. degree in 1947 from North Carolina State College, and his M.S. degree in Chemical Engineering from the University of Wisconsin in 1948. He is a member of American Chemical Society and the American Institute of Chemical Engineers.

Dr. Robert M. Ashby, chief of North American Aviation's fire and flight control section at its Downey, California plant, was awarded the grade of Fellow recently from the Los Angeles section of the Institute of Radio Engineers.

The award was made for Dr. Ashby's contribution to radar detection theory and integration of fire control-flight control system for aircraft. The honor is conferred annually to outstanding men in the IRE. Only a few have received the award during the Institute's 20-year history.

Dr. Ashby received his Ph.D. in physics at the University of Wisconsin in 1942. END

Two Wheeled Transportation

(Continued from page 21)

lubricant is pressure-fed to the cylinder walls and connecting rods. A separate supply serves the transmission and rear chain. The standard KH model has an electrical system consisting of a 10 ampere-hour battery, a generator gear-driven off the crankshaft, and an ignition coil housed in a container on the left side of the motorcycle under the seat.

Harley-Davidson has in recent years been making motorcycles for avid riders who wish to participate in reliability trials, scrambles, TT races and dirt track races. The trial is a cross-ocuntry event in which the rider is competing only against a prescribed average speed and is not trying to go as fast as possible. Scrambles are races ordinarily run over rough, hilly closed dirt courses. The TT (for Tourist Trophy, a British term) is a race over a closed road course, as opposed to a dirt track.

Dirt track racing regulations limit the Harley-Davidson K model to 45 cubic inch displacement. This engine has a stroke of 3-13/16″ in comparison to the 4-9/16″ stroke of the KH model. Camshafts on the racing K are designed to hold the valves open for a longer time than on the stock model, thus increasing the flow of air-fuel mixture per stroke, and giving greater engine power. With these special parts the Harley-Davidson racing K has a top speed of well over 100 M.P.H.

Three Harley-Davidson racing K's are shown leading the field in a 15 mile national championship expert final at Milwaukee in 1953. The leader, Paul Goldsmith, has won many national championship events, including the 200 mile Daytona event.

For long distance racing a large 6 quart oil tank is used to insure adequate lubrication at high R.P.M's.

The KH swinging arm rear suspension is replaced by a rigid frame on the KR racing model. This change cuts down weight, thereby increasing acceleration. Various transmissions and rear wheel sprocket gear ratios are available to suit the type and length of track.

The standard generator-coil setup on the KH is replaced on the KR by a magneto which is lighter in weight and provides a stronger spark at high R.P.M's. Either aluminum or magnesium pistons are available. Though the latter are lighter and increase acceleration, their wearing qualities are poor.

Wheels on the KR do not have brakes, another weight-saving feature. Some riders use alloy rims which are lighter than steel ones. However, they aren't sturdy enough in all cases. Gas tanks of either 2-1/4 or 4-1/2 gallon capacity are used, depending on the length of the race.

Tourist trophy models are available as either the KRTT or the KHRTT. The former is chosen by riders performing in a class limited to 45 cubic inch displacement. Both (and the KR model, too) have two equal length exhaust pipes "tuned" to give maximum horsepower. The TT models also employ the swinging arm rear suspension, as these models are intended for road courses, and not dirt tracks.

A final model, the KHRM, also has the "sprung" rear end, for it is designed to be used for off-the-road riding where good suspension means a lot. This model has a special high level exhaust pipe, high brake crossover shaft, and a sturdy skid plate. All help to insure that the machine will not be put out of action by a rough knock along the course.

The Harley-Davidson "K's" are perhaps the most exciting motorcycles to ride the Milwaukee firm has yet produced. Thanks to sound engineering and design they belong in the ranks of the world's best. **END**

Cybernetics

(Continued from page 19)

represents a different piece of information. As I cut down my error, the number of settings increases. If I can set the pointer with no error, I can get an infinite amount of information out of the scale. Thus information is essentially a probability distribution, the definition is parallel to that of entropy, and it may be said that information is negative entropy.

Calculating Machines. On the basis of this and other information, Wiener* developed the following theory on the ideal computing machine:

1. Central adding and multiplying apparatus of the computing machine should be numerical, as in an ordinary adding machine, rather than on a basis of measurement, as in the Bush differential analizer.
2. These mechanisms, which are essentially devices, should depend on electronic tubes rather than on gears or mechanical relays, in order to secure quicker action.
3. In accordance with the policy adopted in some existing apparatus of the Bell Telephone Laboratories, it would probably be more economical in apparatus to adopt the scale of two for addition and multiplication, rather than the scale of ten.
4. The entire sequence of operations should be laid out on the machine itself so that there will be no human intervention from the time the data were entered until the final results are taken off.
5. The machine should contain an apparatus for the storage of data which should record them quickly, hold them firmly until erasure, read them quickly, erase them quickly, and then be immediately available for the storage of new material.

The Binary System. Since an ideal calculating machine works on the binary scale perhaps we should take a look at it. The system is based upon the number two rather than on ten as in our Dewey-decimal system. We may therefore represent any number with the proper combination of 0's and 1's. We may set up addition and multiplication tables as follows:

Addition	*Multiplication*
$0 + 0 = 0$	$0 \times 0 = 0$
$0 + 1 = 1$	$0 \times 1 = 0$
$1 + 1 = 10$	$1 \times 1 = 1$

And we can convert our numbers from the Dewey-decimal to the binary system thus:

$0 = 000$	$4 = 100$
$1 = 001$	$5 = 101$
$2 = 010$	$6 = 110$
$3 = 011$	$7 = 111$

(Continued on page 56)

Cybernetics

(Continued from page 55)

To prove to the Doubting Thomas's that this system works, observe the following examples:

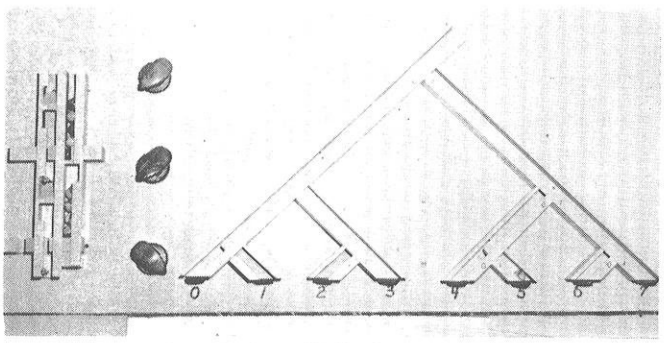
Addition

2	010	4	100
+3	011	+3	011
5	101	7	111

Multiplication

2	010	2	010
×1	001	×3	011
2	010	6	010
	000		010
000		000	
	010		110

We may readily adopt the "zero" to represent "no", and the "one" to represent "yes" and we have a logical machine. Any logical statement may be broken down into a series of yes's and no's.



A demonstration device which the author has designed to illustrate the binary system and the electronic computer. The "electrical impulses" are marbles which roll down the tracks on the right. The knobs in the middle operate switches in the track system and also actuate the "adding component" on the left. The machine has certain limitations, however: it cannot multiply, divide, or subtract; and it cannot add any two numbers whose sum is over seven.

The Nervous System and the Calculating Machine

Neuron Chains. The nervous system is also believed to operate on a binary system. The neurons carry an impulse; between neurons are synapses or triggers to fire the next neuron. Each synapse has a certain threshold or energy level below which it will not fire. It operates on an all or none principle; if the impulse summation in a given time is high enough, the synapse fires the next neuron, if the impulse summation is below the threshold, it doesn't fire and that is that. It may be compared roughly to a leaky condensor connected to a spark plug. If the condensor is charged faster than the leak discharges it, it will build up in potential and eventually fire the plug. The impulses are carried from neuron to neuron in this manner.

Memory. It seems quite probable that information in the brain is stored over long periods by a change in the threshold of the neurons and by the opening or closing of different pathways of neurons. It is also possible to change the grid bias of electronic tubes in a machine to accomplish the same purpose. Short time messages are stored by circulating them in a closed circuit of neurons. The machine can circulate its information on magnetic tape, phosphorescent substances, photographic substances, and in condensors.

Logic. All logic is limited by limitations of the human mind, when it is engaged in that activity known as logical thinking. Discussions of infinity, for example, involve no more than a finite number of stages:

1. P_n is a proposition true for n
2. P_n has been proved for $n = 1$
3. If P_n is true, P_{n+1} is true
4. Therefore P_n is true for every positive integer n.

So you see, we never really work with infinity.

By the same token a logical machine is limited and may never reach a conclusion. It may describe a pattern of increasing complexity or go into a repetitive process—similar to a perpetual check in chess. For example, consider the "So You're Smart" statement in the March 1955 *Wisconsin Engineer*. If a barber shaves all men who don't shave themselves and doesn't shave any that shave themselves, the machine will go beserk trying to figure out if the barber shaves himself—if he does he doesn't, but if he doesn't he does.

Cybernetics and Psychopathology

Checking. A single computation can involve 10^9 separate steps; so mistakes are bound to happen. In order that it doesn't slow up the computations, the checking process must work as rapidly as the original computation. In machines (and quite probably in animals) the checking involves parallel simultaneous calculations. The machine stops if a discrepancy arises, or—if three channels are used,—the machine accepts the majority report but reports the discrepancy to the operator.

Effect of Overload. For a machine to operate with an overall success probability of p, success of each individual stage in n stages $= p^{1/n}$. Thus in only ten stages, when

$p = 90\%, \quad p^{1/n} = 98.9\%$
$p = 75\%, \quad p^{1/n} = 97.3\%$
$p = 50\%, \quad p^{1/n} = 93.3\%$

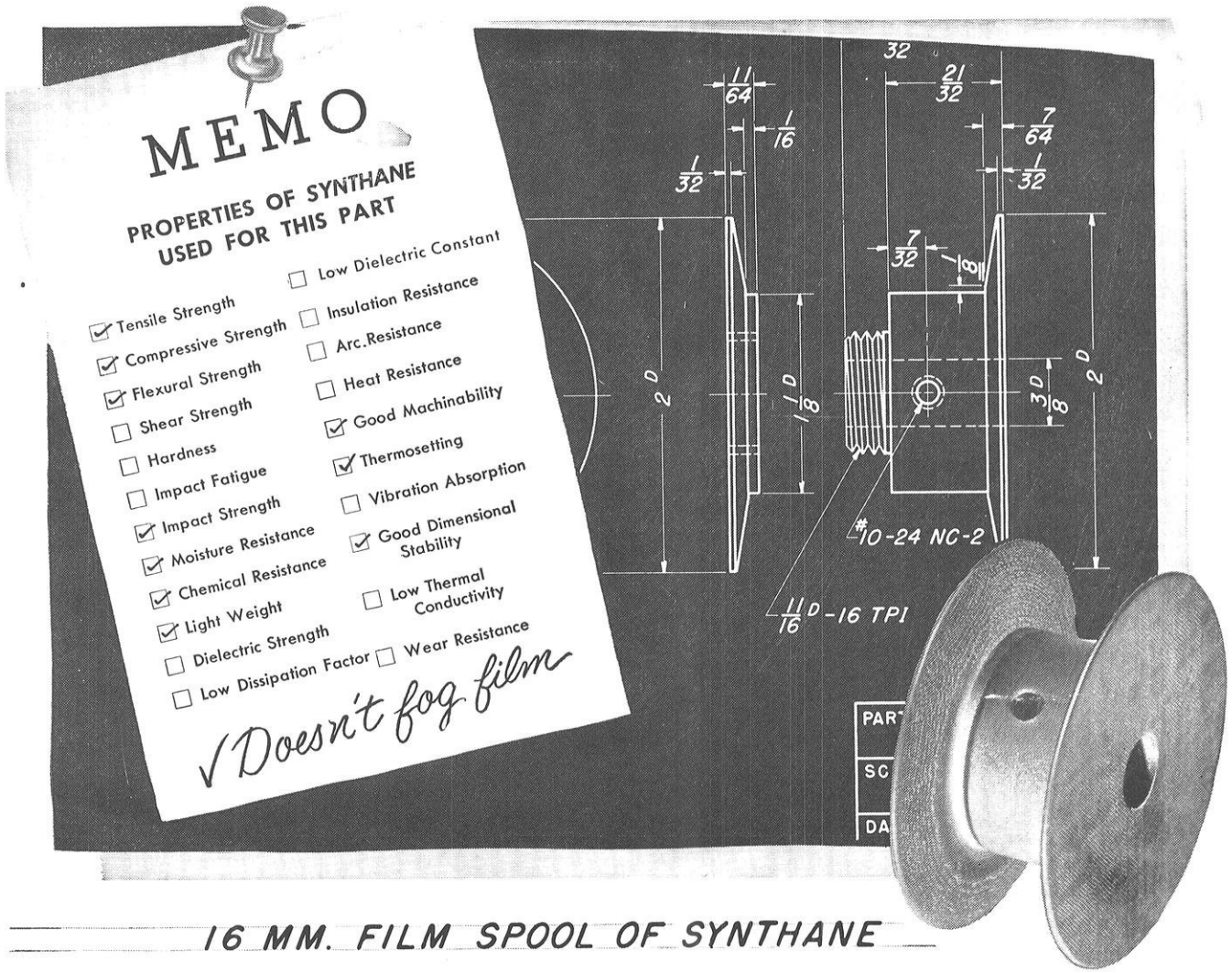
Let us assume that 90% chance of success in completing a phone call in an automatic exchange will be satisfactory. With only ten stages, each stage must operate with a success probability of 98.9%. Overload the machine by only 1.6% and the probability will drop clear down to 75%. Actually, the number of stages is manyfold larger and the failure is even more catastrophic. Similarly, a human may operate well up to his overload point, and then break down completely.

The Automatic Age

If cybernetics and automation really catch on—and it appears as if they will—our society will need to make some drastic adjustments. The advent of automation

(Continued on page 58)

YOU FURNISH THE PRINT, WE'LL FURNISH THE PART



16 MM. FILM SPOOL OF SYNTHANE LAMINATED PLASTIC RESISTS PHOTOGRAPHIC CHEMICALS, HOLDS SHAPE, DOESN'T FOG FILM.

The film spool we're talking about is one used in the processing of movie film. The material for this spool has to be light in weight, strong and easily machined. Since it is always in contact with film and photo solutions, it must also be chemically-resistant and—most important—not fog the film by chemical contamination.

This isn't an easy assignment for any material, but *Synthane* fills the bill.

Whenever you want parts requiring many properties, consider how *Synthane's* combined benefits may help you improve your product.

Synthane produces finished parts from many different grades of *Synthane* laminated sheets, rods, tubes and molded-laminated and molded-macerated parts. Service and quality characterize *Synthane* fabrication.

We can handle the whole job for you from your print to the finished part—eliminating your tooling-up, reject and machining problems—and producing parts of excellent quality at a saving of your time and money.

For more information about *Synthane* grades, properties and fabrication facilities, send in the coupon.

SYNTHANE CORPORATION, 13 River Road, Oaks, Pa.

Please rush me more information about *Synthane* laminated plastics.

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

SYNTHANE
LAMINATED S PLASTICS

SYNTHANE CORPORATION • OAKS, PENNSYLVANIA

Cybernetics

(Continued from page 56)

has been hailed by some as the "second industrial revolution" and seems destined to devalue the human brain as the first devalued human brawn. Machines to relieve humans of the slave-like repetitive, monotonous tasks will certainly be a welcome boon to humanity; however, scientists are concerned because the average human being of mediocre attainments or less will have nothing to sell which will be worth anyone's money to buy. Thought on this topic is divided into two camps, led by the National Association of Manufacturers on the one side and by labor unions on the other.

The N.A.M. claims that automation means more industries, new products and more jobs. They admit that an automated industry will reduce the labor force of that industry, but optimistically foresee new jobs and new industries created by this very mechanization. Labor admits that the total labor force will not collectively suffer by automation.

In fact, Philip Murray, president of the CIO said in 1951—"I do not know of a single, solitary instance where a great technological gain has taken place in the United States of America that it has actually thrown people out of work. I do not know of it, I am not aware of it, because the industrial revolution that has taken place in the United States in the past 25 years has brought into the employment field an additional 20 million people." The problem to labor arises because an automated industry does not *immediately* provide jobs for the workman which the machines replace. It is little reconciliation to an idle laborer to know that there will be a job for him ten years hence; he wants work—now!

Unfortunately, organized labor is not well prepared to meet the challenge of automation. "The labor union official generally comes from the ranks of labor to the exacting life of an administrator without any opportunity for a broader training; and for those who have this training, a union career is uninviting; nor quite naturally, are the unions receptive to such people." Both management and labor will have to work in close cooperation to solve this problem. A stubborn determination on the part of management to develop automation despite and without regard for labor may precipitate more problems upon management than it solves.

We must realize also, that cybernetics wrongfully used, gives the user tremendous power. A complete understanding of the human thinking process also admits an ability to control that thinking—the communists have already used thought control with moderate success. The comic book super-humans with their "automated men" may not be the farce we now see them to be. Dr. Wiener has foreseen this and has very aptly summed up his attitude with the statement, "I write in 1947, and I am compelled to say that there is a very slight hope."

END

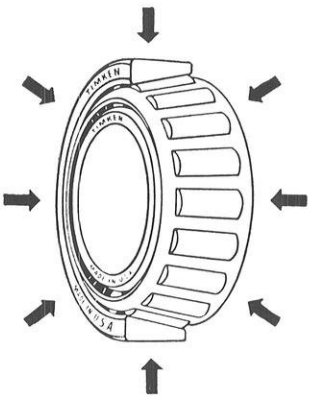
Another page for **YOUR BEARING NOTEBOOK**

How to increase gear life in a scraper

When this 13 cubic yard scraper, fully loaded, travels at 25 MPH over rough terrain, the gears in the differential, engine shaft and pinion get a workout. Realizing this, the engineers specified Timken® bearings for these vital applications. The tapered construction of Timken bearings lets them take radial and thrust loads in any combination. Gears are held rigidly in place. Perfect tooth-mesh is maintained. Gears last longer.

How TIMKEN® bearings hold gear shafts rigid

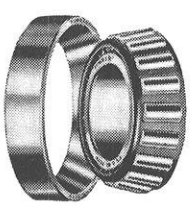
The line contact between rollers and races of Timken bearings gives shafts rigid support over a wide area. Shaft deflection is minimized. And the tapered design of Timken bearings permits them to be set up with the most desirable amount of end play or preload that gives the best performance.



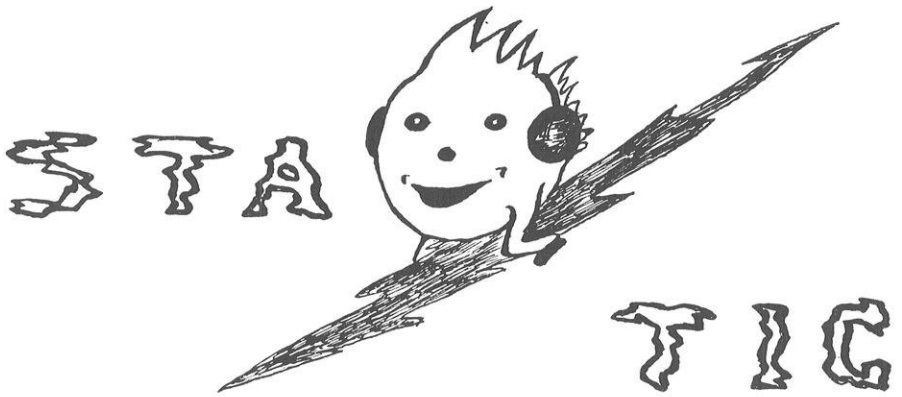
Want to learn more about bearings or job opportunities?

Some 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, O.

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



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



by I. R. Drops

It Was A Dark and Dismal Night . . .

It was a dark and dismal night in Moffett Tower. Catching up on her technical education, the tower operator was reading a thorough, well-documented treatise on the precision and clarity of naval terminology.

Our WAVE smiled complacently as she read further and agreed that, compared to the length and unwieldiness of industrial talk, the Navy had built a veritable science out of clarity and brevity.

By the time she came to the concluding paragraphs, her grin had enlarged to a smug chuckle and she thought with pride of her own role in the scheme of naval technology. Then it came over the speaker, loud and . . .

"Moffett Tower, this is Navy 34114 . . . I'm from VW–1 ferrying a WV–1 to VW–2 and picking up a WV–2 to bring back to VW–1. I need V1 and V2 for the WV–1 and WV–2 to get from VW–2 to VW–1 in the WV–2."

Miss Control gasped, dropped her article and radiod: "Say again all after Navy 34114."

The pilot responded word for word.

"This is Moffett Tower; you say you are ferrying VIP's to pick up a P2V at VP–2?"

"Negative. I'm ferrying a . . ."

"Spell out all after I'm . . ."

"Roger. I spell, ABLE WILLIAM VICTOR OBOE NAN EASY TEAR OBOE VICTOR WILLIAM . . ."

"You have a transmitter squeal."

"I'm switching from this frequency anyway. I'll take my business to Barber's Point."

And with that she put down her headset to check and see what mustering-out pay was worth these days. —*The Pointer.*

Betty Co-Ed: Do you know Judy dates her X-ray specialist?

Becky Badger: I wonder what he sees in her?

* * *

A wife of a golfer visited a fortune teller who phophesied, "Your husband will soon die a violent death".

The woman sighed and said, "Will I be acquitted?"

The vacuum cleaner salesman was demonstrating in a skyscraper apartment building. The doorbell rang.

"It's probably my husband," gasped the housewife. "He's insanely jealous. Jump out the window."

"But this is the 13th floor," said the salesman.

"Go on," she said, "this is no time to be superstitious."

* * *

Prof. "What is the Eiffel Tower?
Student: "The Empire State Building after taxes."

* * *

ROTC Sergeant: "Does your uniform fit satisfactorily?

Freshman: "Well, the jacket is okay, Sir, but the pants are a bit snug under the armpits."

* * *

Before you louse anything up
THIMK!

* * *

Don't be afraid to use your brains, it's the little things that count.

So You Think You're Smart!

(Continued from page 46)

this tale and the solution to the problems. Actually, with just a little effort, Sneedly would have been able to figure them out anyway. Can you?

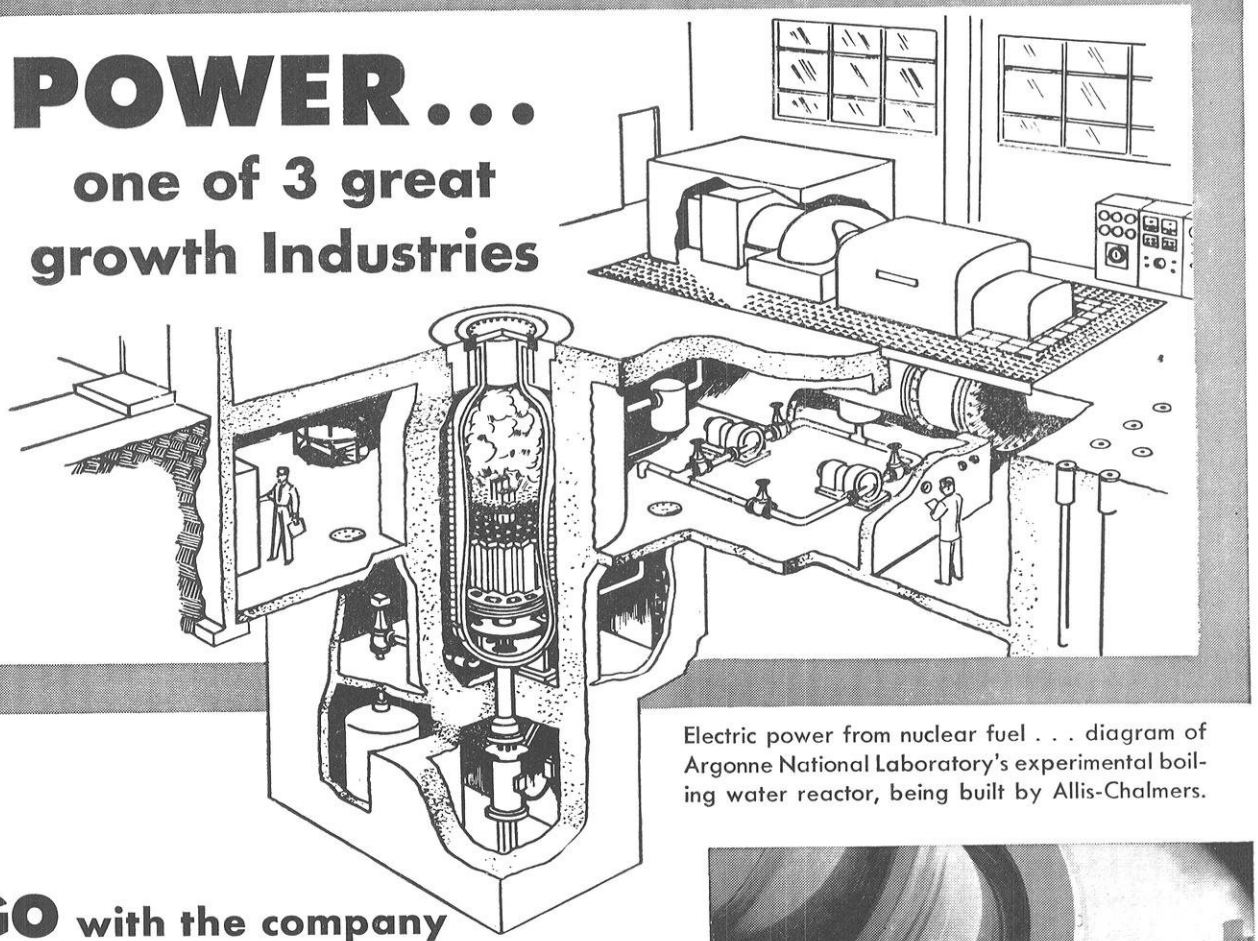
* * *

If you swell, wonderful, most considerate readers would like to follow the adventures of Sneedly throughout the summer (Remember, Sneedly will be back in the fall), you may purchase his latest book, now on sale at the *Octopus* office, or the Three Bells. The book is entitled, *The Adventures of an Egg in a Parabola.*

* * *

Here's how Sneedly was able to determine the color of the cap on his head in the problem of last issue. Since the third man in line did not know what the color of his cap was, then the two in front of him could not have been both white. They were either both red or one white and one red. Since the second man must have realized this, but still didn't know the color of his own cap, then the cap on Sneedly's head must have been red.

POWER...
one of 3 great growth Industries



Electric power from nuclear fuel . . . diagram of Argonne National Laboratory's experimental boiling water reactor, being built by Allis-Chalmers.

GO with the company that's strong in all three!

Hitch your future in engineering to the growth of the U. S. A.—and to a company that supplies the basic needs of growth!

This nation is growing at the rate of 50,000 people every *week!* To supply the needs of these people:

Electric power generation will double by 1965.

A multi-billion dollar program of new highway construction is planned within the next ten years.

Manufacturing output will have to increase by $3.5 billion by this time next year.

And Allis-Chalmers builds major equipment for all of these growth industries! Some examples are pictured here.

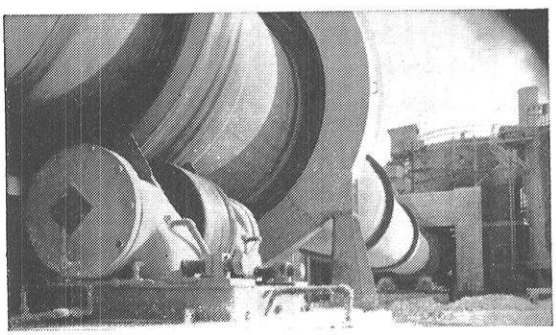
Here's what Allis-Chalmers offers to Young Engineers:

A graduate training course that has been a model for industry since 1904. You have access to many fields of engineering: electric power, hydraulics, atomic energy, ore processing.

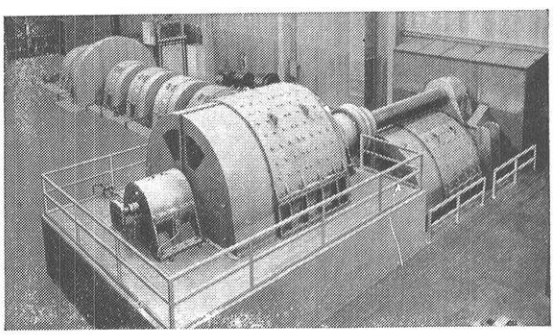
There are many *kinds* of work to try: design engineering, application, research, manufacturing, sales. Over 90 training stations are available, with expert guidance when you want it. Your future is as big as your ability can make it.

Or, if you have decided your field of interest and are well qualified, opportunities exist for direct assignments on our engineering staff.

In any case—learn more about Allis-Chalmers. Ask the A-C manager in your territory, or write direct to Allis-Chalmers, Graduate Training Section, Milwaukee 1, Wisconsin.



CONSTRUCTION demands the vast tonnages of cement produced with Allis-Chalmers rotary kilns and other processing machinery.



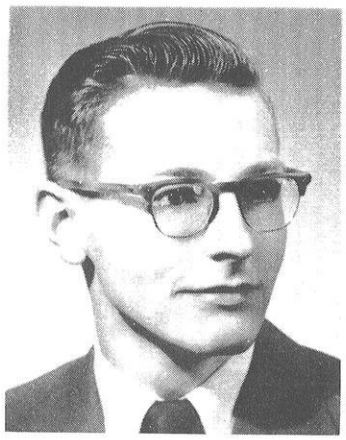
MANUFACTURING depends upon the reliable power of electric motors—like these 5000 hp Allis-Chalmers giants powering a rolling mill.

ALLIS-CHALMERS

A-4683

Meet the Authors

by Alan Black, e'57



JACK BINNING

Jack, a grad student in C. E., is no stranger to the Wisconsin Engineer, having served right faithfully and well as editor of last year's magazine. We're glad to welcome him back to the fold with his fine article, *Cybernetics*, in this months issue.

In case you're wondering what cybernetics is (as we did before reading the article), we suggest that instead of looking it up in a dictionary you turn to Jack's interesting article on the subject and see what he has to say about it. Jack has done a top notch job of presenting an enormously complex subject in clear and interesting terms. We think you'll like it.

WILLIAM E. MILLER

We were surprised, recently, when we found that a great many engineers didn't know a hoot about ASME. For those people, and for others too who would like to know more about the organization, Bill Miller has written an authoritative and interesting article.

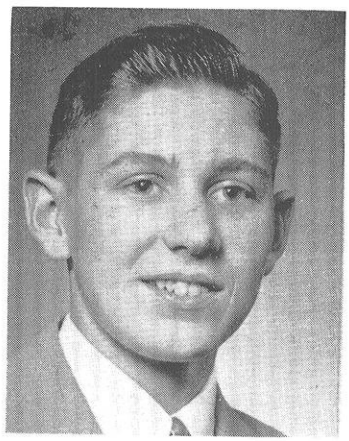
Bill is a senior in Mechanical Engineering, and hails from Milwaukee. In addition to ASME, Bill is a member of Pi Tau Sigma, Tau Beta Pi, SAE, and was recently admitted to Phi Kappa Phi. After graduation Bill tells us he's headed for the field of Industrial Engineering.

Kneeland Godfrey, Editor of the *Wisconsin Engineer*, is a senior CiE from Elm Grove, Wisconsin. He has spent four years on the *Engineer* staff, being promoted to Editor this year from his last year's position as Assistant Editor.

He is a member of the American Society of Civil Engineers and of Delta Upsilon. Extracurricular interests, besides the *Engineer*, include photography and automobiles.

Last summer Ned put his civil engineering talents to use with H. C. Webster and Son in Milwaukee, and the summer before he worked for the Heil Company. After graduation in June, he hopes to get a position with a technical or business publication.

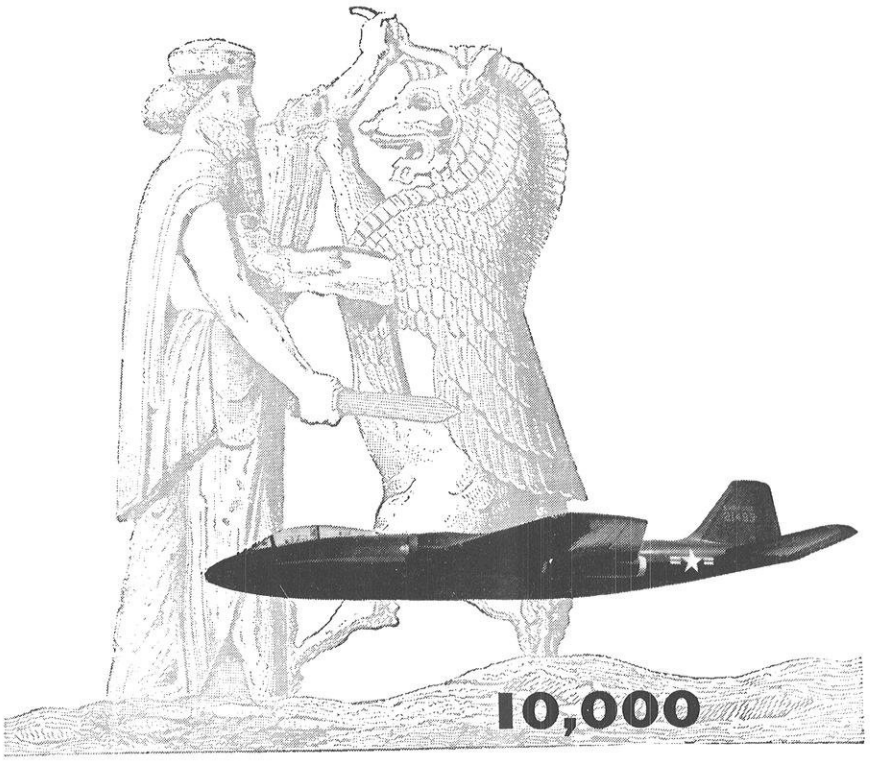
KNEELAND GODFREY



TOM JOHNSON

If you're interested in the relatively new field of radio isotopes in industry, don't miss the article "Radio Isotopes and Their Industrial Applications". We talked to Tom Johnson, the author, and he is not only a thoroughly likeable guy, but he impressed us as the kind of person who knew what he was talking about before he did any writing. In fact, if you're not interested in radio isotopes now, read the article anyway—our guess is that you'll not only learn something, but become interested as well.

Tom claims that his principal occupation for the past month has been running from library to library gathering material for his article. In his spare time, however, he's a junior in ChE, married, and a resident of Madison. A member of the Air ROTC advanced corps, Tom expects to serve his time with Uncle Sam after graduation and then enter the field of chemical engineering.



10,000 years of weapons engineering experience

If you're looking for an opportunity to work with the finest mindpower and facilities in the whole new world of aircraft development... if you want to harness the power of great knowledge to your own technical training... then you should know this:

Martin's engineering staff represents an aggregate of 10,000 man-years of engineering experience, covering every branch of the aeronautical sciences.

And there is—and always will be—a need for outstanding "new blood" in this organization.

MARTIN

BALTIMORE · MARYLAND

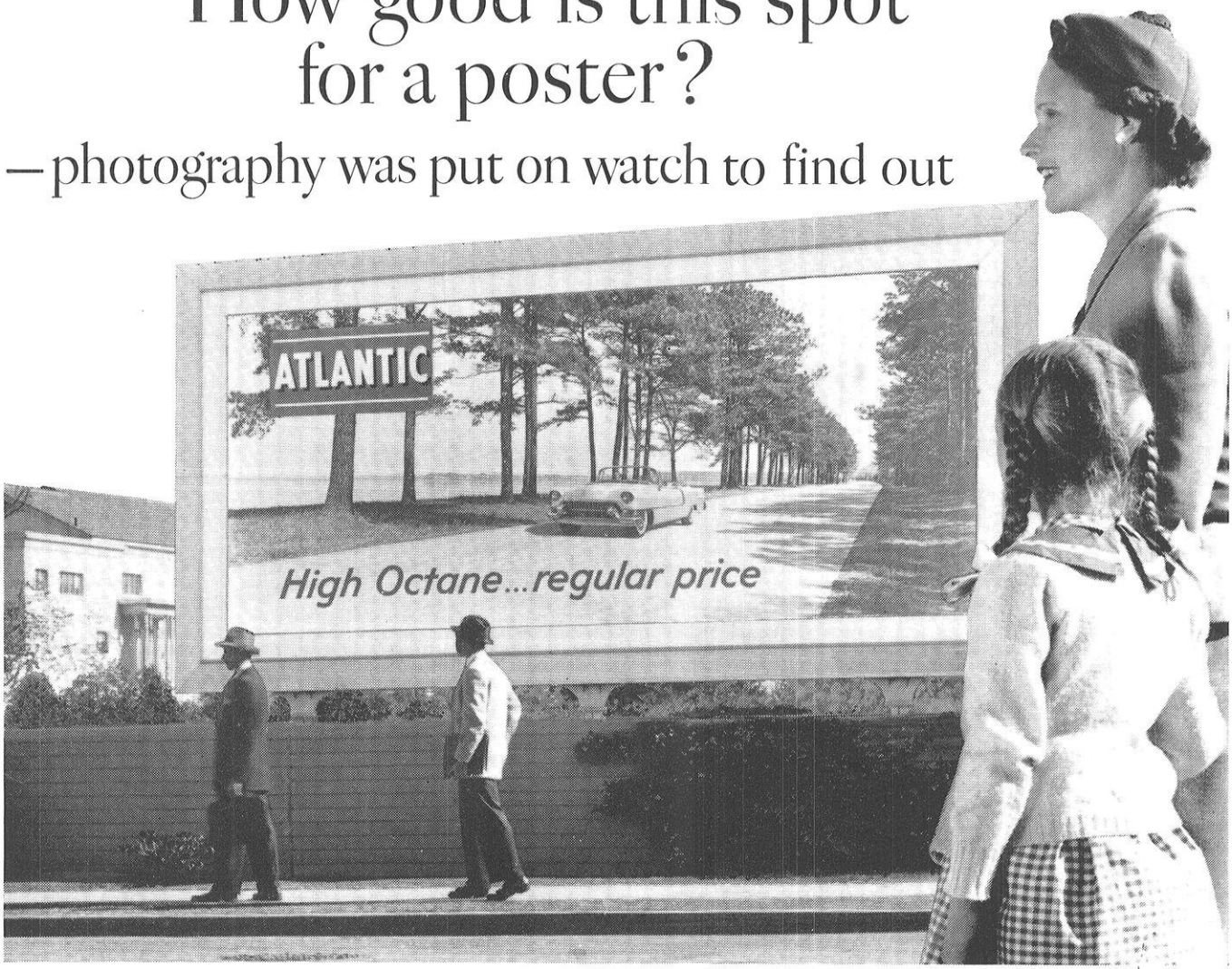
STORY INDEX

VOLUME 59—OCTOBER THRU MAY

PHOTOGRAPHY AT WORK—No. 15 in a Kodak series

How good is this spot for a poster?

—photography was put on watch to find out



Photography adds striking realism to highway poster.

In the hands of Alfred Politz Research, Inc., camera and film sampled the traffic, spaced test periods, stayed on the job, never got tired and reported with complete accuracy.

You can gauge a magazine's readers by its circulation—or a newspaper's by its daily sales. But how can you measure the potential audience of an outdoor poster?

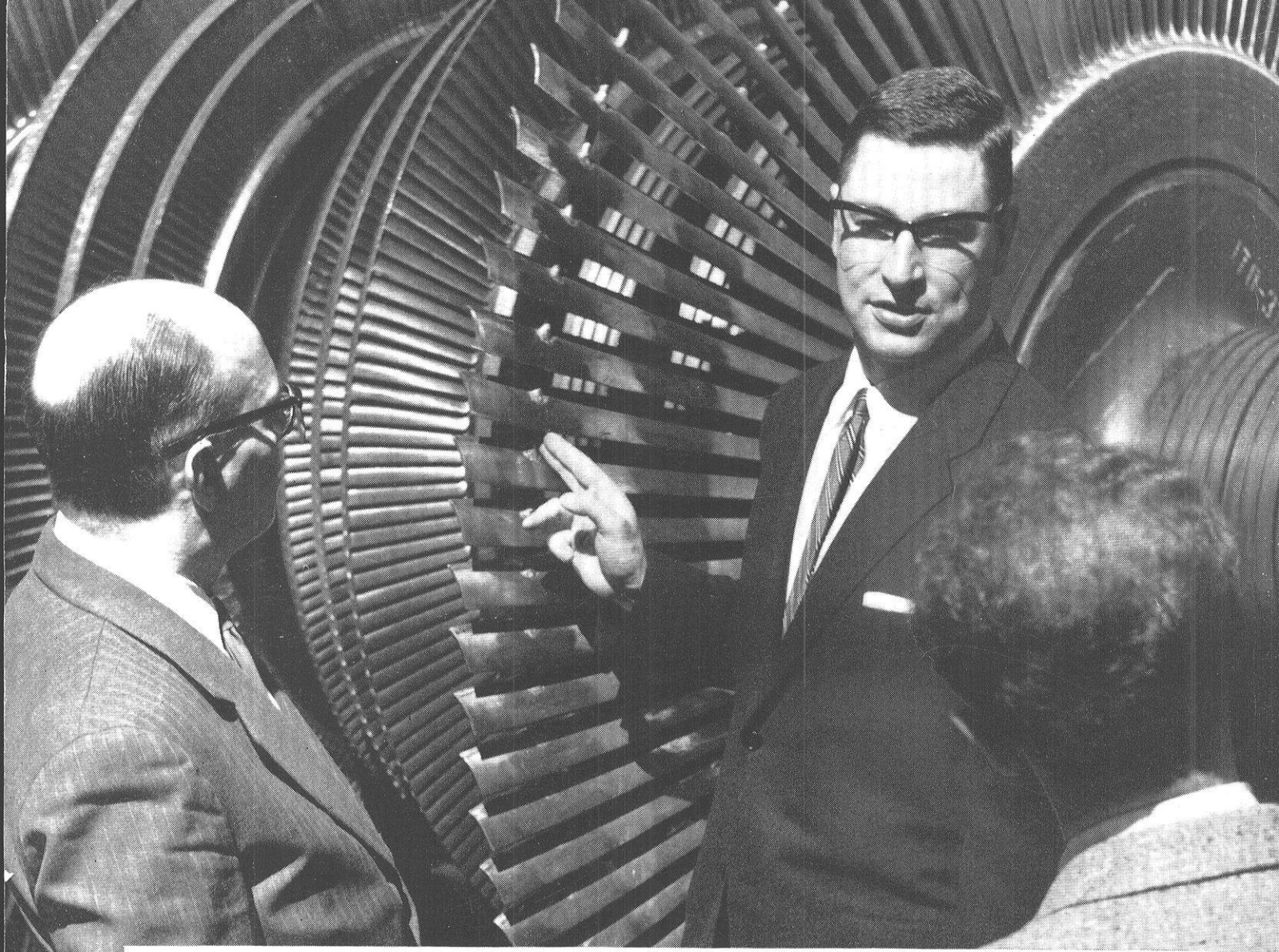
Alfred Politz Research, Inc. worked out an answer. Figuring that anyone the poster can "see" can see the poster, they set up an automatic camera which recorded periods of passing traffic at regular intervals. Counting the people and cars on the film records gave accurate figures on the viewers of the poster and made it possible to compute its gross man-hours of exposure.

Counting people comes as easily for photography as counting phone calls, metal rods or tons of coal. It is one of the many ways it is serving all kinds of business and industry. In small businesses and large it is helping to save time, cut costs, reduce error, design new products 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 serviceman, if you are interested in these opportunities, write to Business & Technical Personnel Dept., Eastman Kodak Company, Rochester 4, N. Y.

Kodak
TRADE-MARK

Eastman Kodak Company, Rochester 4, N. Y.



Challenging careers in G-E sales engineering

Combine engineering know-how with customer contact work*

For professional careers with unlimited opportunity, investigate G.E.'s Apparatus Sales Training Program. You're trained in the branch of industrial selling most suited to your interests and aptitudes, such as Sales Engineering, Application Engineering, or Product Specialization.

As a G-E representative in one of the Company's 152 Apparatus Sales Offices in key cities, you work with customers to determine what design, new development or system will best serve their needs. The program offers—in addition to exciting district work—career opportunities in the Company's headquarters marketing and sales operations. SJ-526

*ILLUSTRATION: *Sales Engineer and customers discuss turbine rotor construction. Glasses are factory safety measure.*

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Please send me your descriptive bulletin on the Apparatus Sales Training Program, GEZ-515A.

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