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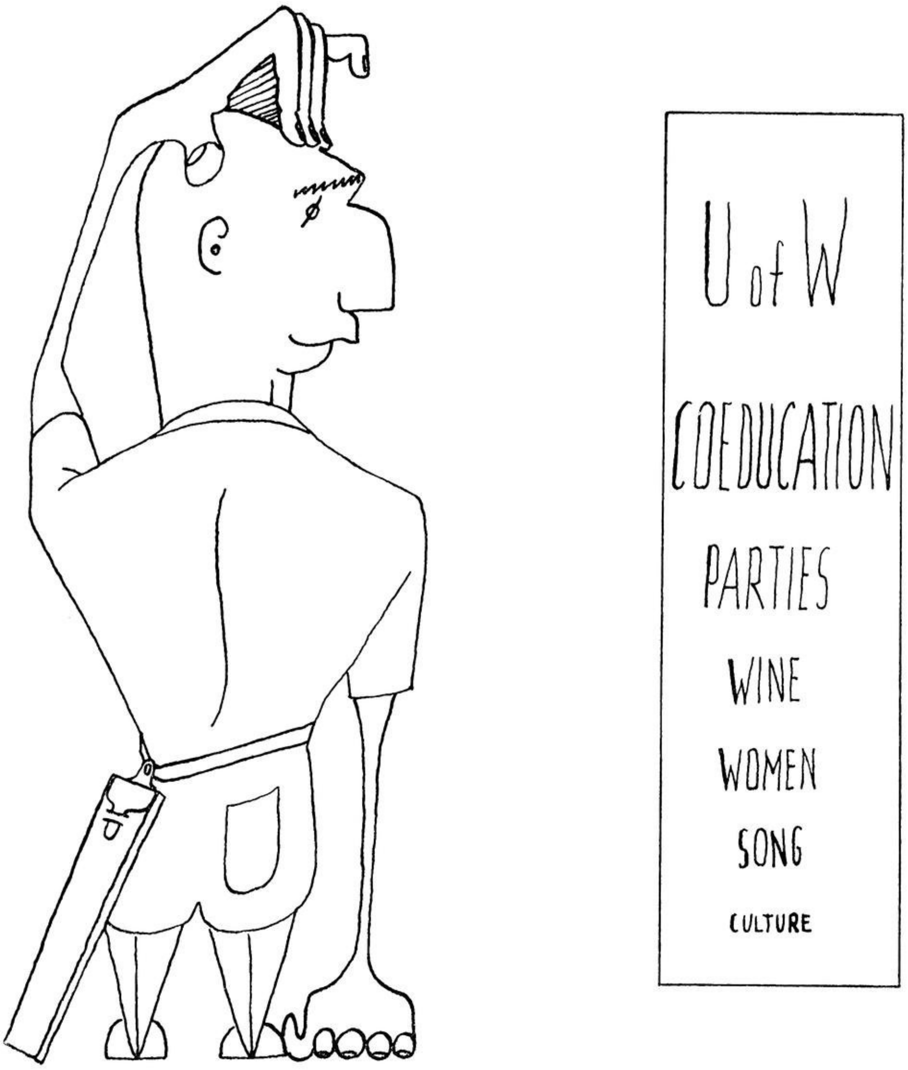
The Wisconsin engineer

NOVEMBER, 1954



THANKSGIVING—1954

(See Page 5)

25¢

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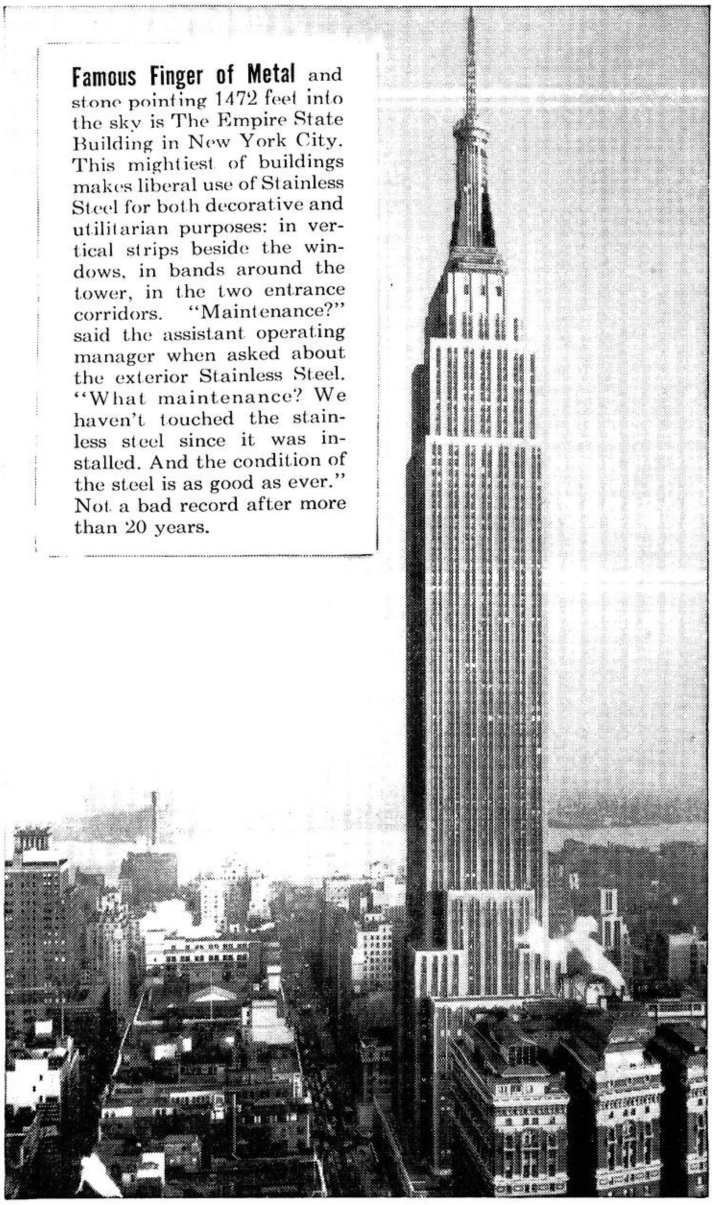

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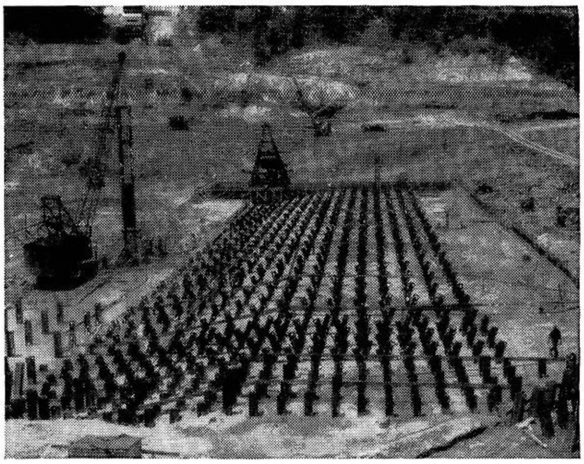

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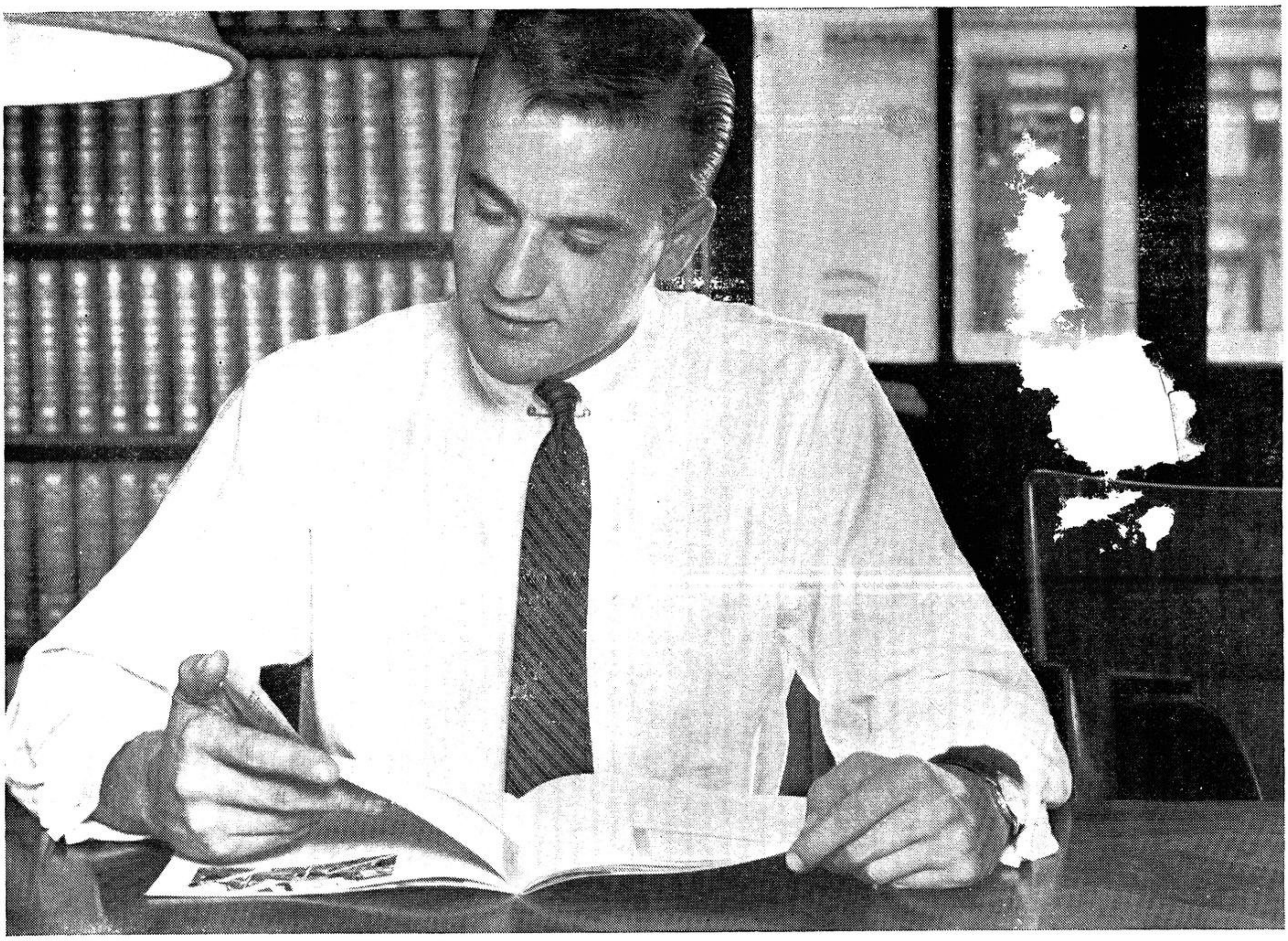

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YES, ever since our first issue—*June-July 1953*—the *General Motors Engineering Journal* has been welcomed by engineering faculties and students alike as an excellent contemporary source book.

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But—this is not a "circulation advertisement" for the *Journal.*

We mention it here—because we think a glance through any issue will give you a pretty clear picture of the high standards and advanced viewpoints of our GM engineers. And of the intellectual climate they find in which to think and to work at GM.

Certainly such standards, such viewpoints—and such a climate—must be weighed among the assets of a GM career.

So, again, may we suggest you glance at the *Journal* (copies are supplied free to all faculty members and school librarians who request them). We hope it will inspire you to write us for another important GM publication—"The College Graduate and General Motors." And to think seriously of making yours a GM career.

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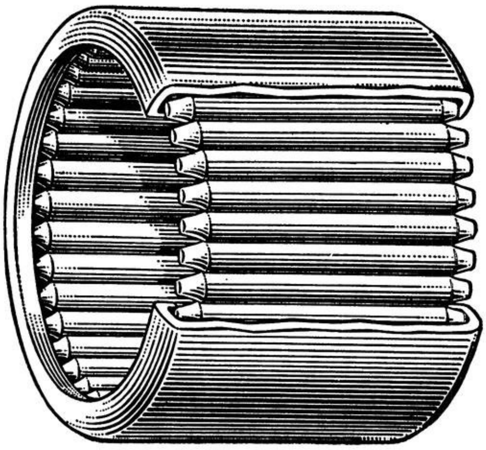

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The Student Engineer's Magazine

WISCONSIN ENGINEER

Founded 1896

Volume 59 | **NOVEMBER, 1954** | **Number 2**

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WISCONSIN ENGINEER

FOUNDED 1896

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THE COVER

Sneedly, who typifies the average Wisconsin engineer, knows he should be thankful for something.

You, the "broadened" engineer know, and are thankful for, the finer things, but Sneedly doesn't know they exist. Someday, Sneedly will awaken, then the world will be in real danger.

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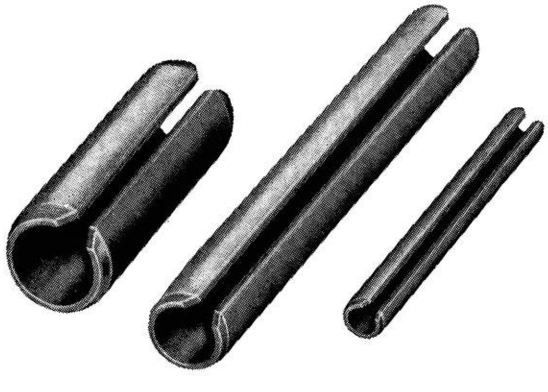

dia. from 1/16" to 1/2"

Rollpins are slotted, tubular steel, pressed-fit pins with chamfered ends. They drive easily into holes drilled to normal tolerances, compressing as driven. Extra assembly steps like hole reaming or peening are eliminated. Rollpins *lock* in place, yet are readily removed with a punch and may be reused.

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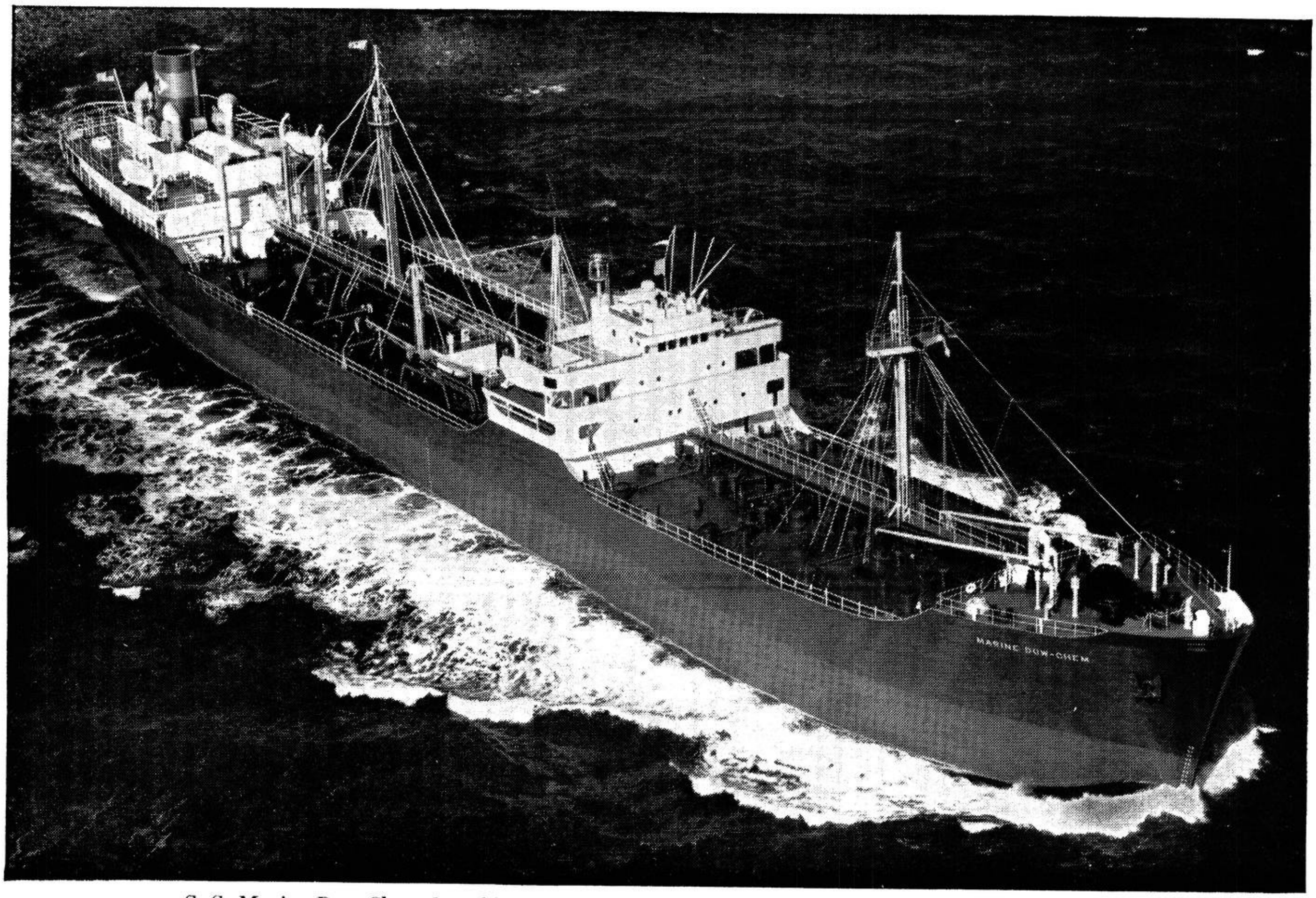

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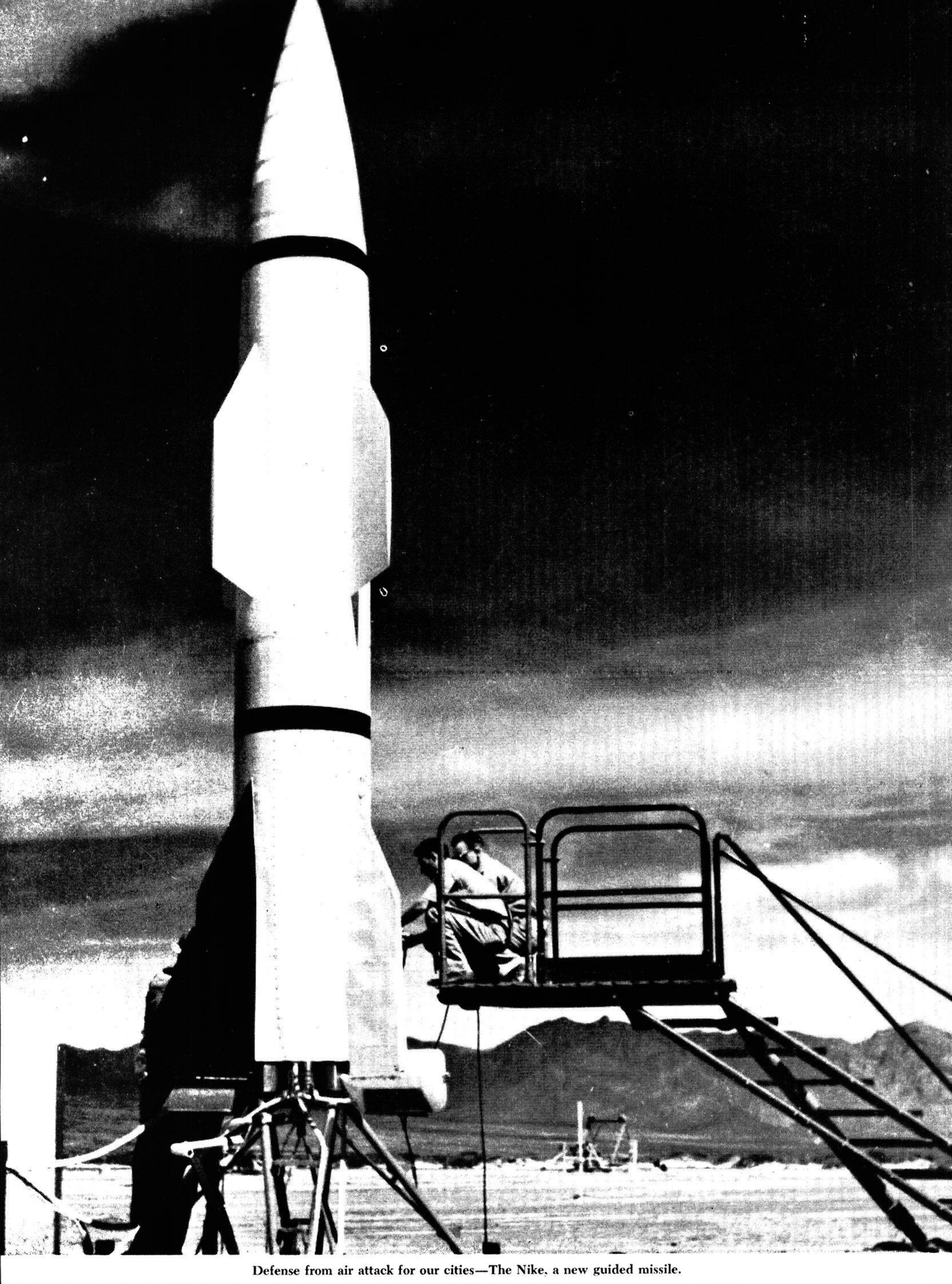
Transportation of Dow chemicals by way of water routes did not begin with this new ship. Dow has pioneered in this technique of shipment. On any given day, you may see a tanker steaming out of Freeport, Texas, steering for East Coast terminals; a powerful tug herding its charge of barges up the Mississippi to Cincinnati; and a freighter leaving California, heading through the Panama Canal toward the Atlantic coast. All have one common purpose—delivering Dow chemicals by the most convenient, most economical routes possible.

Just as Dow's research and production are making giant steps in the progress of the chemical industry, so Dow's distribution keeps pace through new techniques in transportation and service.

Whether you choose research, production or sales, you can find a challenging career with Dow. Write to Technical Employment Department, THE DOW CHEMICAL COMPANY. *Midland, Michigan or Freeport, Texas for the booklet, "Opportunities with The Dow Chemical Company"—you'll find it interesting.*

you can depend on DOW CHEMICALS



Defense from air attack for our cities—The Nike, a new guided missile.

editorial

teaching—how not what

Perhaps the prime function of a state university such as Wisconsin is the instruction given the student body—not the research done by the faculty. Therefore the faculty should be primarily teachers!

There is some variety in the quality of instruction given students in the engineering college. Most instructors, whether graduate assistants or full professors, thoroughly know the material to be taught. But there may well be ways, other than those now used, for them to improve their teaching technique.

Though the student assumedly has already developed his interests when at the secondary education level, in actual fact he often has not. He needs to be taught with the best of teaching methods.

An interesting contrast with this situation is that found in the field of secondary education. There graduates who become teachers have the knowledge on *how* to present the facts, but are often not well enough acquainted with the subject matter itself. The obvious remedy in this case is for the teacher to take courses related to the subjects he plans to teach.

Then doesn't just the opposite remedy apply to engineering instructors? Shouldn't they logically take courses in *how to teach*—how to have an effective "classroom manner" which brings out the best in the student? They might in such a course be shown why they should become good speakers, as opposed to understandable talkers. They could be shown the advantages of gaining the respect of the student—that the student would work harder and be prompter in turning in his work if he were afraid of incurring the wrath of the instructor. He would learn that the telling of anecdotes to illustrate an idea will often drive the point home.

This brings up another point often mentioned. This is that teachers invariably make better ones if they've got some practical experience behind them. Then they can see what material should be emphasized and can call on experiences to effectively illustrate a point.

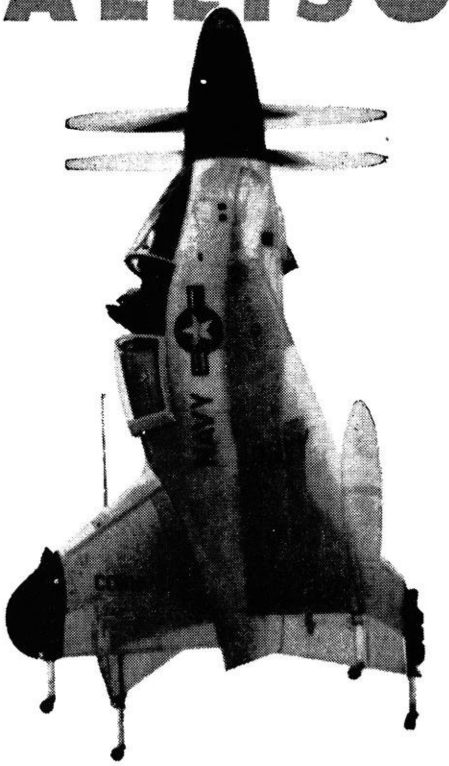
Perhaps a supplementary method of faculty training would be student appraisal. To make this idea work, students could be asked to compare their courses and tell why one was better than another. And they could be interviewed by a fellow student, with whom they might talk freely, to determine their peeves and praises concerning the teachers.

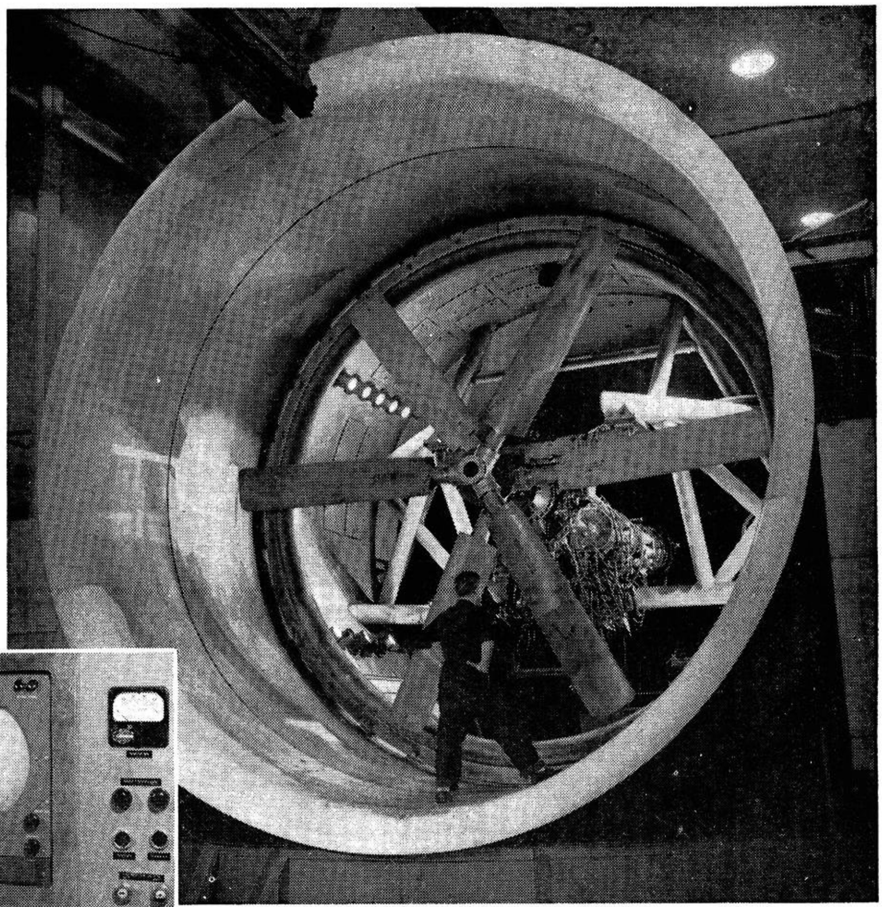
There are several ideas here—some of them probably applicable. But perhaps the most important point to be considered is this: The job of training the instructor should be done by professionals—men in the Education School who are familiar with the basic techniques of teaching.

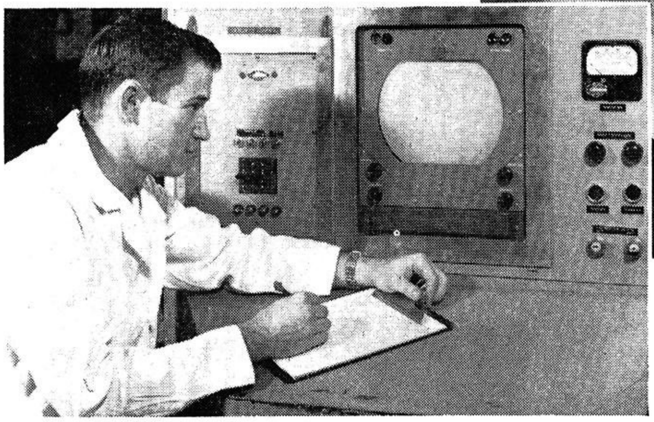
The argument finally boils down to this: Instructors need advice in *how* to teach to supplement their knowledge of *what* should be taught. After all, the student really has a lifetime of learning ahead of him, so the "teaching" he's presented with during his four year stay in Madison must be correctly planned to insure that he gets a good start on a career.

K. A. G.

ALLISON Engineers Pioneer VTO Power Plant Development







GEORGE D. KEMP, who received his B.S. in Mechanical Engineering from Colorado A. and M. last June, is shown recording data on the engineering log sheet from the industrial TV screen in the VTO test cell. George—now in the Test Operations group in the Experimental Test Section at Allison—is working on the T40 turbo-prop engine which powers the Convair XFY-1 and the Lockheed XFV-1 vertical take-off aircraft.

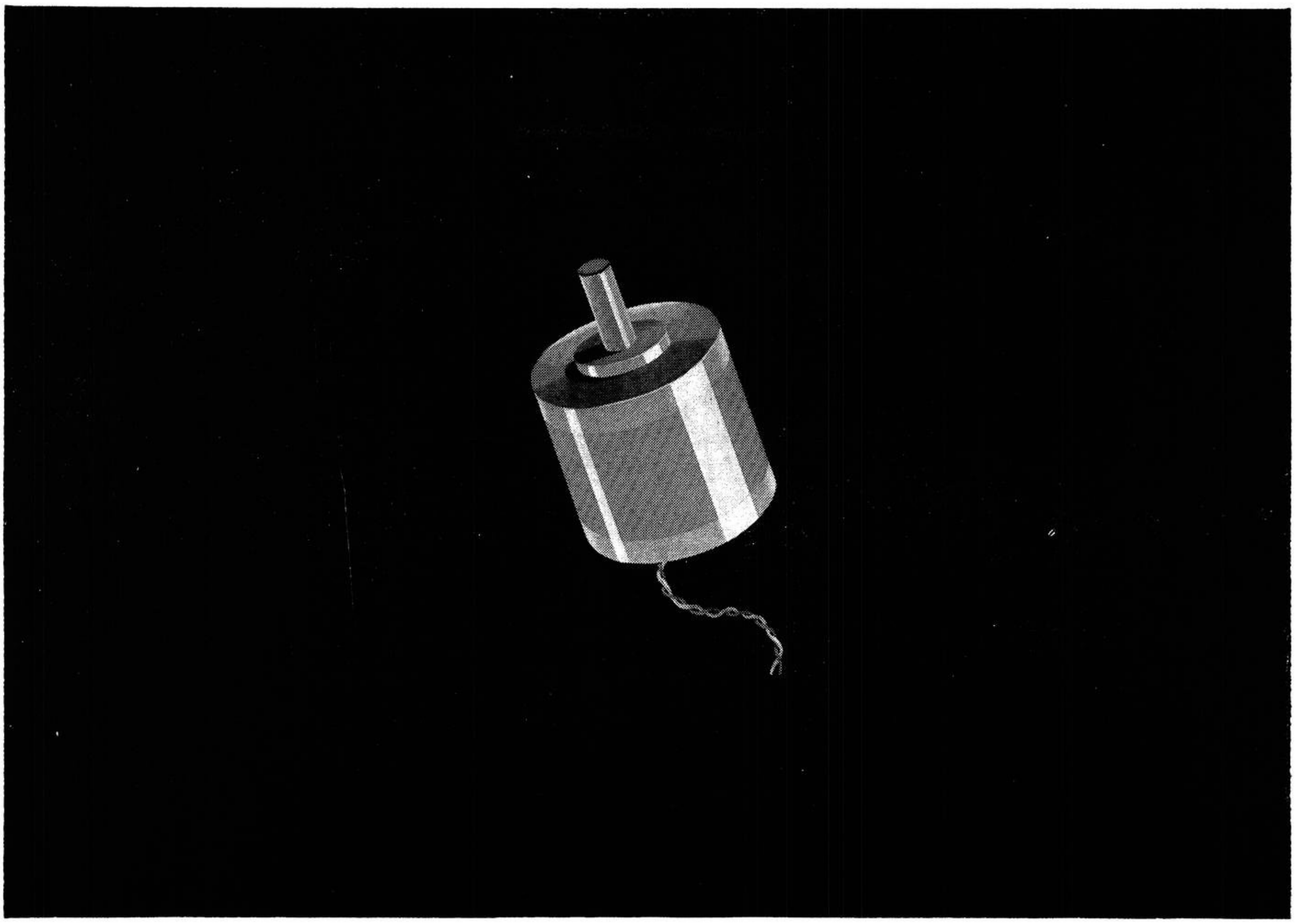
● Early in '51, Allison undertook the power plant development for vertical take-off airplanes following the Navy's request for a high-power, low-weight turbine engine which could be adapted to vertical operation.

With modifications, the Allison T40 turbo-prop engine—with its extremely high power-to-weight-ratio—was selected to do the job. The vertical operation necessitated basic design changes, such as changing the oil system so it would function in both vertical and horizontal positions. Too, it was necessary to modify the reduction gear, giving a higher propeller RPM and increased thrust. And, with the specially designed propellers required by the VTOs, the control system was redesigned.

Then, to test the engine, a radically new test stand was designed and built. Allison engineers converted a test stand previously used for low horsepower reciprocating engines to one (shown above) capable of accommodating VTO engines in the various positions from horizontal to vertical. With the huge 72,000 pound tunnel completely enclosing the engine and propeller, a television was installed in the control room so engine operation could be observed in any tunnel position.

The VTO power plant project is typical of the variety of challenging problems handled by the Allison Engineering staff. And, because it is continually pioneering in advanced engineering developments, Allison needs additional technically trained men, especially young graduate engineers. Why not plan now for your engineering career at Allison. Write for information:

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



The "SMITH-way"

by James R. Bley

1954 PRIZE WINNING PAPER ON MATERIALS HANDLING IN THE SILENT HOIST & CRANE COMPANY CONTEST. (See Page 31)

The problem of material handling has been with us since the birth of mankind. For centuries materials have been transported by manual labor, beasts of burden, or wheeled carriers. The advent of the simple wheel alone opened the door to unlimited possibilities in development. Just 23 years ago, the Elwell Parker Company of Cleveland, Ohio, put powered-fork trucks on a dock in Boston to move granite tombstones shipped down from Barre, Vermont. The moving of these stones was the beginning of applied engineering in the handling of materials according to Ezra W. Clark, a well known material handling consultant from Battle Creek, Michigan.

The field of material handling is relatively new as applied by the engineering profession. Material handling engineers have a wide and varied conception as to just what is included under the heading of "Material Handling." To some it includes only the movement of materials between production processes within a plant; to others it is all material handling, including storage, receiving, and shipping; and still others include the associated movements of the personnel connected with the handling of the material. Each in its own right is valid in its conception of material handling. James Bright, editor of the magazine *Modern Material Handling*, defines material handling on a basis that is valid for any conception of the term. His definition is as follows: "Material Handling is the creation of time and place utility in a material."

The three basic elements of any material handling problem are safety, time, and effort. Safety of personnel and product are the most important. Damaged products are costly to a company not only in dollars and cents, but in customer prestige as well. Injuries to personnel represent not only a great loss in human welfare, but also losses in man-hours and higher insurance rates. Time and effort, whether human or mechanical, must be kept at a minimum. The ultimate goal of material handling engineers everywhere is to reduce the time and effort involved to a minimum, giving the best possible efficiency, lowest cost, and greatest speed.

The A. O. Smith Corporation

In order to show how the problem of material handling as applied to transportation is coped with in modern industry, this paper will concern itself with the plant of the A. O. Smith Corporation of Milwaukee, Wisconsin. This plant produces a variety of products such as automotive frames, control arms, bomb casing, pipe, water heaters, frit, and steel storage bins. The main plant has a perimeter of two miles and covers an area of 125.6 acres. Because of the diversity and volume of products produced by the A. O. Smith Corporation, discussion of their procedures will give a concrete example of the transportation aspects of material handling.

The A. O. Smith Corporation plant is bisected by one of the main lines of the Milwaukee Railroad. A network of tracks and sidings in the center of the plant buildings provides highly accessible facilities for ship-

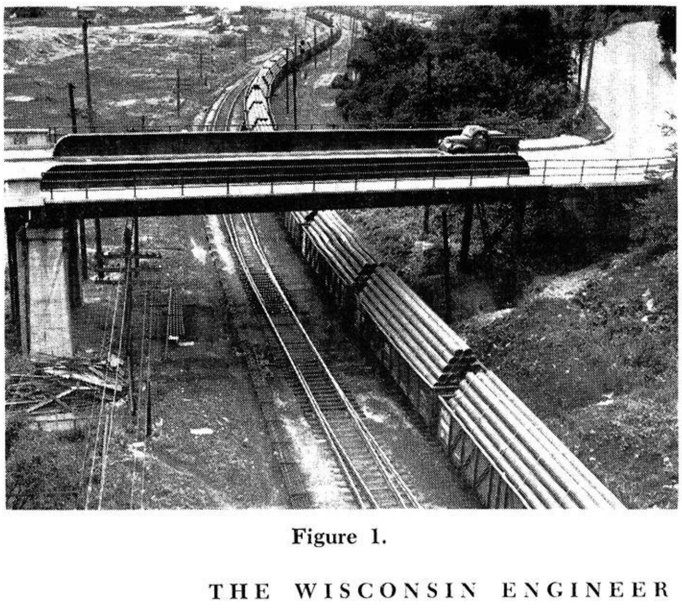


Figure 1.

ping and receiving. The corporation operates its own switch engine to insure proper and timely location of the railroad cars for loading and unloading.

The pipe shop works on a three shift basis, producing 100 carloads of pipe per day. Tracks from the main yard run into the pipe shop for immediate loading of the pipe from the production line. (See Figure 1). The pipe is handled by two overhead cranes, and an extra crane is provided in case of breakdown. Working with each crane operator are five men. Two of these men hook the pipe to the crane as the pipe comes off the production line from final inspection. When the crane sets the pipe down on the railroad cars, the other three men unhook and strap the pipe in place. The two cranes and 10 men can load 30 to 35 carloads weighing more than 50,000 lb. in a normal eight hour shift.

The track inside the pipe shop provides space for ten standard gondolas at one time. The sides of each gondola are blocked out so that there can be no side slipping of the pipe. The pipe is strapped in place on the gondolas by six steel straps, which are power fed and machine cut. The straps are 1¼ in. wide and 0.035 in. thick giving a maximum of strength with a minimum of material. There is no need for end blocking, since the outward pressure of the pipe on the straps and side blocks prevent end motion. The three-man loading gang know the respective loading requirements for each size pipe and proceed accordingly.

Automotive Frames

A. O. Smith ships on the average 5,000 complete frames for trucks and automobiles per day. All frame customers insist on a definite number of frames to be on hand at all times. To meet this special request of their customers, A. O. Smith must provide storage for a large number of frames besides handling the frames for shipment.

The frames are stored outdoors on large concrete platforms with wooden spacers placed between them. The wooden spacers are necessary to keep the frames level and to prevent sliding. They also enable the use of hi-masted, hi-low trucks to move and pile the frames without the use of pallets or bundling. These trucks pick up the frames after painting in the shop in groups of 8 to 12 frames per load. The wooden spacers provide a highly stable and strong pile, enabling the truck drivers to move and pile the frames in storage without outside assistance.

The hi-low trucks that stockpile the frames deliver them to a siding in the rear of the frame shop for shipping. These trucks deposit the frames on a dolly beside the gondola that is to be loaded; the frames are then picked up by small, mobile yard cranes and deposited upright with their wide ends down on the gondola floor. (See Figure 2). The wide end of the frames fit into special pockets provided on the floor. Each gondola has rows of bolts properly spaced between the pockets on its floor. Forty-four to 134 frames are placed on each gondola, depending upon the frame size. Once

Figure 2.

the frames are loaded, long lengths of wood are placed over their lowest crossbar. These lengths of wood are then bolted to the floor. Along the front and back of each gondola are end supports. (See Figure 3).. The frames are further secured by strapping to the supports. The gondolas are built for definite frame sizes and are not interchangeable.

The loading crew consists of 11 gangs of five men each. The crew employs the use of six hi-low trucks and five mobile cranes. This crew can load 66 gondolas every 24 hours. In addition to loading, the crew stockpiles the frames.

Frit

Frit is glass in a coarse, irregular granular form. It is made and used by the A. O. Smith Corporation to glass coat steel. Frit is made by pouring molten glass at a temperature of 2,000° F. into a bath of cold water. Steel will combine with Frit under certain conditions. A. O. Smith is famous the world over for its glass lined pipe and vessels. Besides making Frit for its own use, it sells this material to other manufacturers, and one Canadian customer uses a large percentage of the Frit manufactured. The selling of Frit presents a problem of packaging and shipping the material to distant customers.

The problem of packaging Frit was not a simple one to cope with. The glass particles must be entirely free from dust or impurities to be useable. Frit is packaged for shipping in air-tight paper bags and light-weight wooden pallets that are paper faced on both the top

(Continued on page 40)

ENGINEERING AND SANITATION

by Norman J. Petersen, c'55

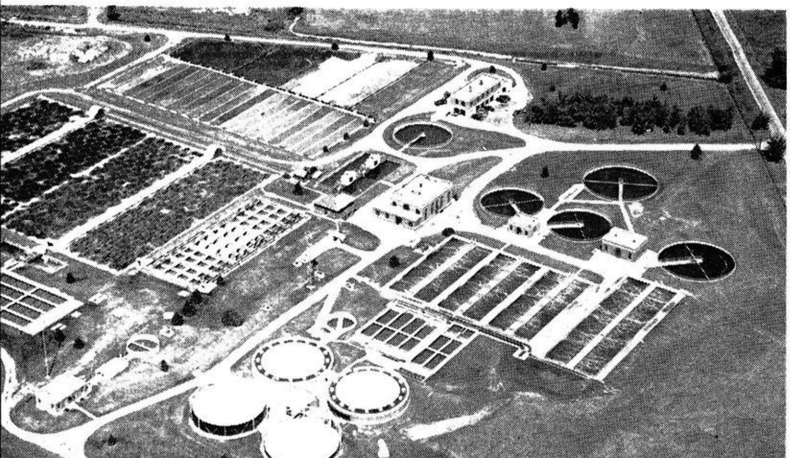
Every glass of water you drink, the waste disposal system of your community, the confidence you feel in the purity of the foods you buy: these are the products of sanitary engineering. Yet all too few people are aware of the presence of this profession. Even students of engineering may complete their college training without considering or even hearing of sanitary engineering. Let us then take a closer look at this field.

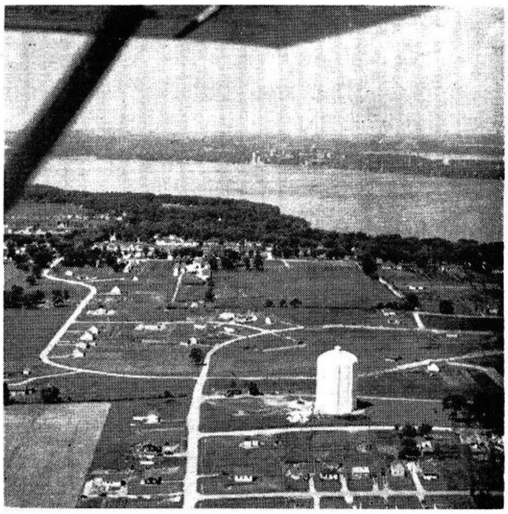
As long as there has been a need for drinking water and a need for disposing of wastes, there have been sanitary engineers in some form. Even today over half of the sanitary engineers are employed in connection with water supply and waste disposal. The remainder of the group has gone into fields of public health, industrial hygiene, and environmental sanitation. It is this group that has broadened the field to take in problems of industrial waste treatment, milk and food sanitation, pest and rodent control, stream pollution, and industrial sanitation which includes air pollution. The 50 per cent concerned with sewerage and water supply work at designing and improving water and sewage systems, supplying an adequate and pure supply of water, and reducing health-endangering sewage to a harmless state. The problems of the sanitary engineer then are unique and varied, and few can be solved by purely mechanical means.

An analysis of the sanitary engineering profession by a government committee in 1950 shows in clearcut figures what the sanitary engineers in the U. S. are doing and for whom they are working.

The following table is a breakdown into types of activity.

Madison's Nine Springs sewerage treatment plant. On the left are the large trickling filter beds; and on the right, sedimentation tanks, aeration tanks, and circular settling tanks.





A 3,000,000 gallon water supply standpipe south of Lake Monona. In the distance are Lake Monona, the Isthmus on which the central part of Madison is located, and Lake Mendota.

DISTRIBUTION, BY ACTIVITY

Activity	*Percent*
Public health	27.8
Designing	18.6
~~Consulting~~	15.3
Municipal	13.1
Plant operation	9.1
Teaching and training	4.5
Construction and maintenance	3.8
Sales	2.8
Research	1.9
Testing and analysis	.5
Editorial	.2
Other	2.4
Total	100.0

The report further shows the following breakdown into types of employment.

DISTRIBUTION, BY TYPE OF EMPLOYMENT

Type of employment	*Percent*
Consulting firm	29.0
Public health agency	26.7
Public works agency	23.6
Industrial concern	6.9
Academic institution	5.0
Other	8.8
Total	100.0

In the past a large proportion of sanitary engineers were civil engineers who had no formal training in sanitary work, but rather acquired their knowledge of

(Continued on page 32)

WHY NOT AN INDUSTRIAL ENGINEERING CURRICULUM?

by Aristotle A. Alexander, c'56

The University of Wisconsin at present does not offer training in one of the most important phases of engineering. There are both students and faculty members in the University who feel that a serious omission exists, and that the graduate who wishes to go into the management field of engineering is under a definite handicap.

The purpose of this report is to develop a curriculum in Industrial Engineering which will give the necessary training, and to point out why such a program is necessary.

The curriculum is proposed to give the Wisconsin graduate an equal opportunity which he is not now afforded. It applies only to the University of Wisconsin since it is made up of courses which are already being taught on the campus.

The Present System

In proposing an Industrial Engineering curriculum for the University of Wisconsin the present system must first be evaluated. Schools such as the University of Minnesota, Massachusetts Institute of Technology, University of Purdue, and others, offer full programs in Industrial Engineering. The only provisions the University of Wisconsin makes for those interested are a Mechanical Engineering option consisting of three courses, and any other related courses which are offered by other departments on the campus.

Under this system, the courses a student can acquire in addition to his regular program are so few that they do not provide a basis for competition in the field. By instituting all the associated courses presently offered on the campus into one separate and distinct curriculum, the necessary training can be given.

The Importance of Industrial Engineering

This training is as important to industry as any other phase of engineering. In the last fifteen years Industrial Engineering has expanded to the point where it is now, ". . . an increasingly important technical function which cuts clear across the industrial enterprise, usually at the staff or planning and analytical level."[1] Since the need for Industrial Engineers increases at a greater rate than does the size of the industry, there is no immediate limit to the expansion of the field.

Functions of the Industrial Engineer

Industrial Engineering has been defined as "the art and science of getting work done."[2] "Industrial engineers perform an essential service for manufacturing and other industries in planning and establishing the manufacture of new products, controlling and reducing the cost of existing operations, making special surveys and economic studies for management, and supervising and managing plants and departments."[3] He may find himself concerned with purchasing, personnel, inspection, quality control, stores, shipping and receiving, materials control, production planning, plant operations and organization, product design, training, materials handling, production equipment development, coordination of manufacturing, cost control, plant location, expansion, and construction. His place is at the center of the industrial production process, and he is concerned with all the factors of production.

Course Criteria

Using the above principles as a basis, courses were chosen from the University of Wisconsin Bulletins which would provide training in these fields. These were then incorporated into the complete curriculum so as to avoid additional administrative problems in setting up new courses. The program then resolves itself into being accepted in order to be offered.

Considerations in the Curriculum

Since an industrial engineer needs more than just a technical education, courses were chosen from departments throughout the university. However, general engineering was used as the basis. It is obvious that there are other courses not included in the program which would be of value to the Industrial Engineer. Time and credit considerations, however, restrict the curriculum to those courses which will give the best overall background in the work with which the graduate will be immediately concerned.

The courses are exactly those which are listed in the Bulletins, with the exception that courses which are

(Continued on page 58)

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[1] Dagget, R. L., *Industrial Engineering,* Wisconsin Engineer, April, 1954, p. 54.

[2] Alford, S. P., *Principles of Industrial Management for Engineers,* The Ronald Press, New York, 1940, preface.

[3] University of Minnesota, *Bulletin of the Institute of Technology,* Minneapolis, Minn., June 22, 1950, p. 63.

MAGNESIUM

A Big Name In Light Weights

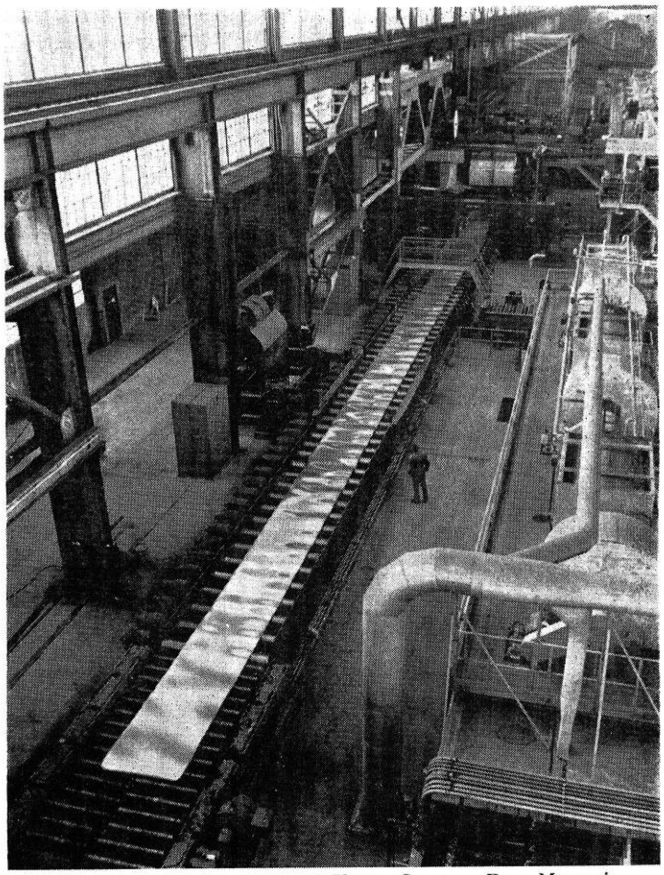
by James Selle, Met'56

The ever increasing need for strong, light weight products has resulted in a great demand for magnesium. This relatively new industrial metal has certain advantages which have been exploited very well in the past, but in order that the metal is used to the most advantage, it is best to understand its advantages and limitations.

The history of magnesium dates back to 1808, when Sir Humphrey Davy established the fact that magnesium oxide was the oxide of a new metal. Twenty years later, a Frenchman by the name of Bussy isolated the metal by fusing $MgCl_2$ with metallic sodium, and in 1833, Michael Faraday founded the modern day method of producing magnesium electrolytically. Although commercial production was attempted in Germany in 1866, American companies did not start production until World War I. Production fell off after the war, and it was not until World War II that the strategic importance of the metal was recognized. Its importance has come about through its use as an airplane material, and the production of magnesium has kept in line with airplane production. Magnesium has found many uses in industry, and with proper designing and handling, it shows promise of even wider application.

Certain inherent advantages of magnesium make it useful to nearly every industry, and probably the most important advantage is that it is available in unlimited quantities. Seawater, which contains about 0.13% magnesium is probably the most important, but not the only source of the metal. Other sources are underwater natural brines, and certain ores such as dolomite, magnesite, and carnallite.

The most important physical property that magnesium has is its light weight. It has a density of 1.74 gm/cm^3 or 0.0628 lbs/in^3, which combined with yield strengths varying from 12,000–44,000 psi, and tensile strengths varying from 20,000–55,000 psi gives the metal and its alloys a very high strength to weight ratio. The exact properties obtainable depends on the amount and type of alloying elements used. These properties are responsible for the major uses of magnesium in the transportation industry, with the aircraft industry in particular. The light weight and high strength combine to reduce operating costs, give greater payloads, and in many cases enable higher operating specifications to be obtained.



—Photos Courtesy Dow Magnesium.

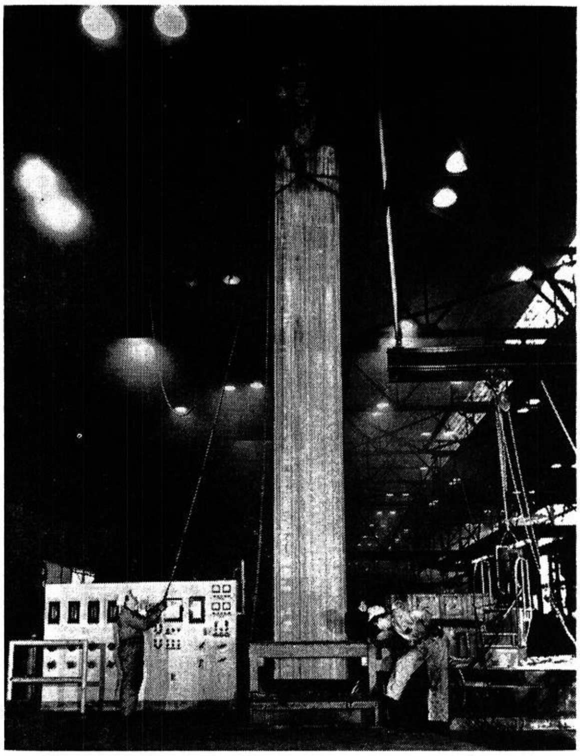
Typical of advances being made in the magnesium industry is the installation in the Dow Chemical Company's Madison Division of modern high speed, high production rolling equipment. The 84-inch coil mill breaks down 2000 pound rolling ingots and processes them into sheet magnesium for further reduction or into plate.

The materials handling industry has taken to magnesium for this same reason. It is easier to handle, and as a result the efficiency of workers is increased because of less fatigue. Many portable items are being made of magnesium, as are housings of various kinds. In this application, however, the strength is not needed because the covering is seldom part of the working structure. In many cases, the use of magnesium enables a cheaper design because of the simplicity that can be obtained by using fewer ribs and stiffeners.

It is in the aircraft industry that magnesium finds its greatest use. It is used for landing wheels, engine parts, gearbox housings, flooring, airframes, and turrets. The maximum weight of the B–36D bomber is 358,000 pounds, of which about 20,000 pounds are magnesium. About 25% of the Sikorsky S–55 helicopter is magnesium. Broken down still further this means that 400 pounds of castings of 90 different parts, and about 700 pounds of sheet and extrusions are used. Wide use is made in aircraft, but these are just a few examples.

Magnesium can be subjected to practically all processes of fabrication such as casting, extruding, rolling, forging, welding, and forming, with relative ease. By this versatility, fabricating costs can usually be reduced considerably.

The machinability of magnesium is excellent. With free cutting brass rated as 100, magnesium and its alloys are rated at about 500. Its lightness and strength enter into the picture again by removing machine vibration. Increased speeds and feeds are possible, and yet, a good surface finish is produced. This results from a free cutting action which gives well broken chips that do not clog the cutting tools, or the machine.



Continuous casting units provide the rolling and extrusion ingots. Each alloy has its own "dummy" on which new metal is cast. The alloy department crew is changing alloys and is lowering a new "dummy" into the sleeve mold.

Lightweight magnesium means durable, easily portable ladders around the house and in the shop.

Coolants are not necessary to eliminate excessive tool wear, and yet, a leading automobile manufacturer has noted that cutting tools last 3 to 10 times longer on magnesium than they do on aluminum under the same conditions. Tap life has been increased 10 to 15 times on die castings that have been changed to magnesium. Another saving is illustrated by the fact that high speed cutting tools can be used on magnesium, and have a life equal to carbides when used on other metals.

Other properties of magnesium which make it useful are that it is non-magnetic and non-sparking; it absorbs elastic energy; it possesses excellent hot drawability; and it has a certain amount of electrical resistivity.

The negative side of the picture must be analyzed so that the wrong conclusions are not drawn about magnesium. There are certain disadvantages to magnesium and its alloys which limit their use. Proper recognition of these disadvantages will make it possible to specify this metal for proper application.

The ductility is very low, so that cold working is very limited. Only simple rolling and bending operations can be performed without fracture, as the per cent elongation of magnesium in the annealed condition is only about 16%. Ductility is even lower in sand cast or hard rolled magnesium, and is not improved by alloying. Therefore the reduction must be done at tempera-

(Continued on page 32)

ENGINEERS

or

PHYSICS GRADUATES

To those interested in advanced academic study while associated with important research and development in industry, Hughes offers two separate practical programs:

HUGHES COOPERATIVE FELLOWSHIP PROGRAM

for Master of Science Degrees

A program to assist outstanding individuals in studying for the Master of Science Degree while employed in industry and making contributions to important military work. Open to students who will receive the B.S. degree in Electrical Engineering, Physics or Mechanical Engineering during the coming year, and to members of the Armed Services honorably discharged and holding such B.S. degrees.

Candidates must meet entrance requirements for advanced study at the University of California at Los Angeles or the University of Southern California. Participants will work full time during the summer in the Hughes Laboratories and 25 hours per week while pursuing a half-time schedule of graduate study at the university.

Salary is commensurate with the individual's ability and experience. Tuition, admission fees and books for university attendance are provided. Provision is made to assist in paying travel and moving expenses from outside Southern California.

HOW TO APPLY

for the Hughes Cooperative Fellowship Program: Address all correspondence to the Committee for Graduate Study

THE HOWARD HUGHES FELLOWSHIPS

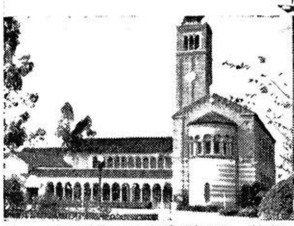
in Science and Engineering

Eligible for these Fellowships are those who have completed one year of graduate study in physics or engineering. Successful candidates must qualify for graduate standing at the California Institute of Technology for study toward the degree of Doctor of Philosophy or postdoctoral work. Fellows may pursue graduate research in the fields of physics or engineering. During summers they will work full time in the Hughes Laboratories in association with scientists and engineers in their fields.

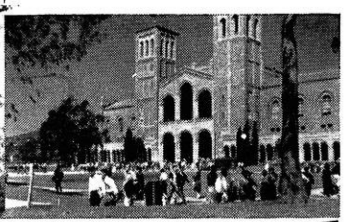
Each appointment is for twelve months and provides a cash award of not less than $2,000, a salary of not less than $2,500, and $1,500 for tuition and research expenses. A suitable adjustment is made when financial responsibilities of the Fellow might otherwise preclude participation in the program. For those coming from outside the Southern California area provision is made for moving and transportation expenses.

HOW TO APPLY

for the Howard Hughes Fellowships in Science and Engineering: Address all correspondence to the Howard Hughes Fellowship Committee



University of Southern California



University of California at Los Angeles

California Institute of Technology

HUGHES

RESEARCH AND DEVELOPMENT LABORATORIES

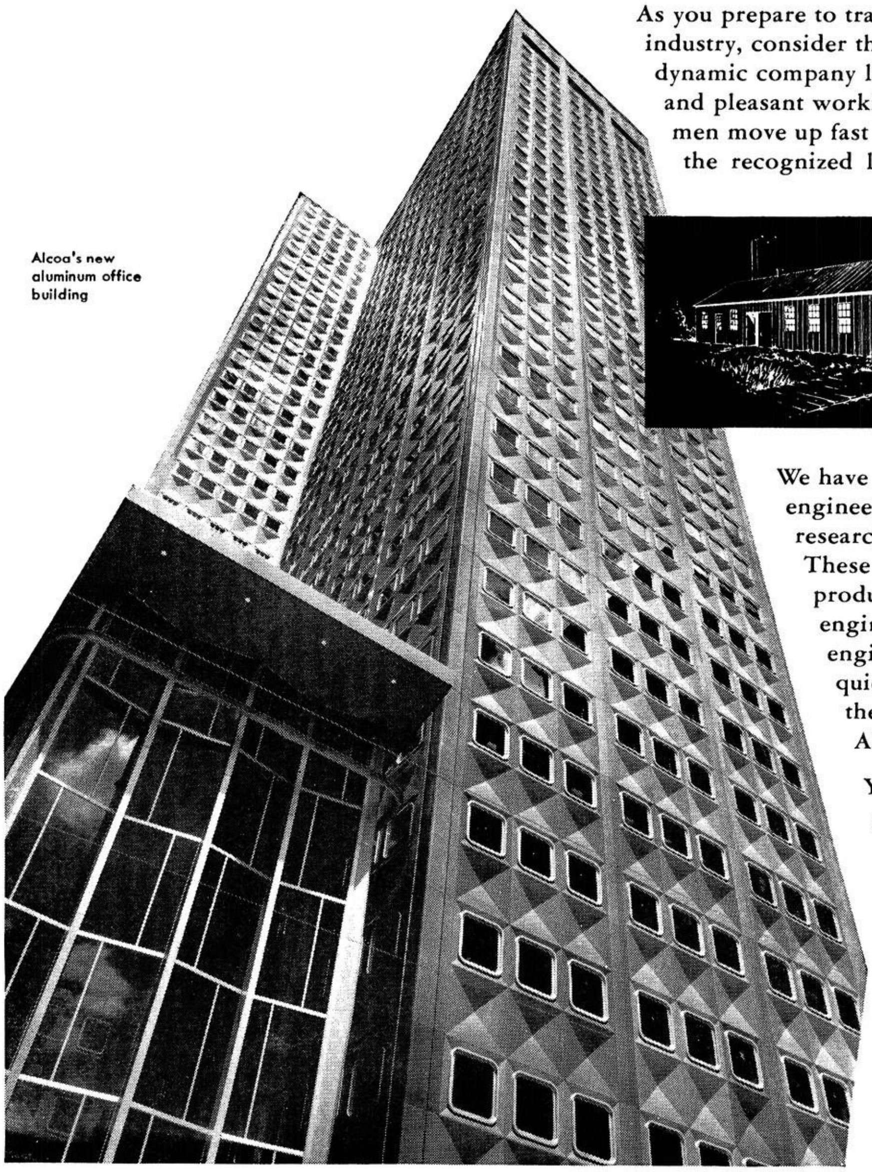
Culver City, Los Angeles County, California

THE ALUMINUM INDUSTRY WAS BORN ON SMALLMAN STREET

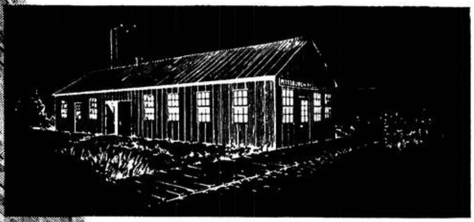
▼ In 1888, the aluminum industry consisted of one company—located in an unimpressive little building on the east side of Pittsburgh. It was called The Pittsburgh Reduction Company. The men of this company had real engineering abilities and viewed the work to be done with an imagineering eye. But they were much more than that. They were pioneers . . . leaders . . . men of vision.

A lot has happened since 1888. The country . . . the company . . . and the industry have grown up. Ten new territories have become states, for one thing. The total industry now employs more than 1,000,000 people—and the little outfit on Smallman Street? Well, it's a lot bigger, too—and the name has been changed to Alcoa. ALUMINUM COMPANY OF AMERICA . . . but it's still the leader—still the place for engineering "firsts".

As you prepare to trade textbooks for a position in industry, consider the advantages of joining a dynamic company like Alcoa—for real job stability and pleasant working conditions—where good men move up fast through their association with the recognized leaders in the aluminum industry.



Alcoa's new aluminum office building



We have fine positions for college graduate engineers—in our plants, sales offices and research laboratories from coast to coast. These are positions of responsibility in production supervision, plant and design engineering, industrial research or sales engineering. Right now it may be quicker than you think from a seat in the classroom to your career with Alcoa. Why not find out?

Your Placement Director will be glad to make an appointment for you with our personnel representative. Or just send us an application yourself. ALUMINUM COMPANY OF AMERICA, 1825 Alcoa Bldg., Pittsburgh 19, Pa.

ALCOA ALUMINUM

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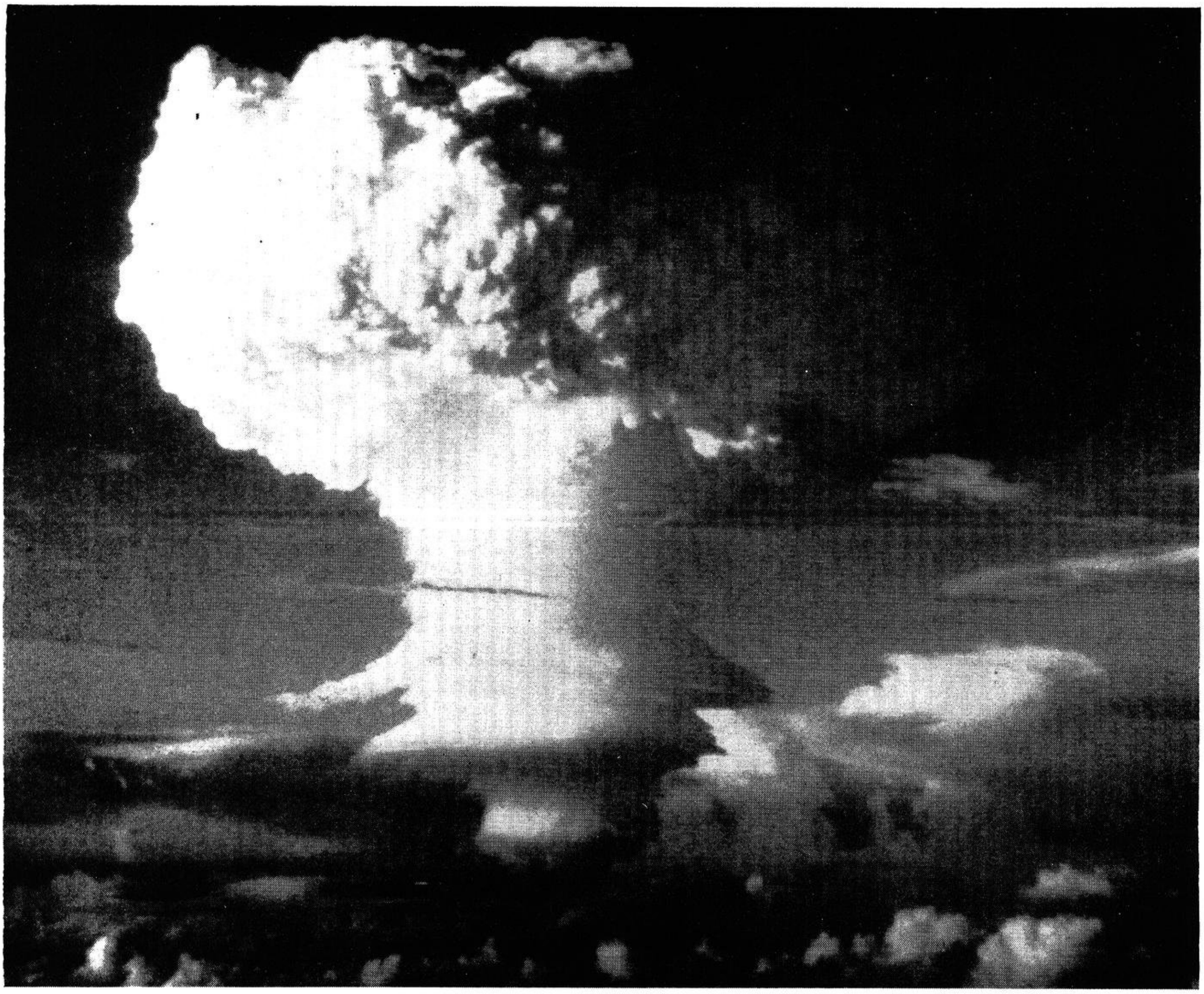


The Hydrogen Bomb

How the Bomb was Developed— and How it Probably is Put Together

This article is composed of the essential parts of a translation of an unsigned article entitled "Bombe H" in the French magazine *Atomes* for November, 1953. The illustrations are used through the courtesy of the *Capital Times*.

From the official U. S. "Smyth Report" it is known that conventional atom bombs are really nuclear fission bombs, in the sense that the nucleus of an atom of natural uranium-235 or of the artificial element plutonium-239, when hit by a neutron (an uncharged particle of mass always existing in adequate numbers in the earth's atmosphere), will break into fragments and produce two or more neutrons. The total weight of all the resulting particles is less than the mass of the original atom, and the missing weight has been converted into enormous energy. One gram (one thirtieth of an ounce) of uranium atoms, completely fissioned, would liberate 8.2×10^{17} ergs of energy, equivalent to 23,000 kw-hr., or to the heat from burning 5400 lb. of carbon. The production of surplus neutrons insures continuance of the explosive reaction in the bomb if the mass of uranium or plutonium is large enough so that at least one of the evolved neutrons strikes another uranium nucleus before it escapes from the surface, and so on in a useful series.

Hence a small mass of U^{235} is safe; the explosion occurs when two safe, subcritical masses are joined together into one weighing (it is estimated) between 20 and 45 lb. The reaction is practically instantaneous; within a half-millionth of a second the mass is blown far apart so reaction ceases; efficiency is thus deplorably low, being on the order of 1%.

Fusion Bomb

Go now from the heaviest of the elements to the lightest and we have the possibility of another series of nuclear reactions similar to that which energizes the sun and the stars—the *fusion* of four atoms of hydrogen into one atom of helium which weighs 99.3% of the original constituents; the rest emerges as energy. Since 0.091% of the uranium mass (in a 100% reaction) and 0.7% of the reacting hydrogen is converted to energy, a "hydrogen bomb" should be 7.5 times as powerful as a fission bomb, weight for weight. Reaction between atoms of ordinary hydrogen requires *very* high temperatures and pressures, such as exist in the centers of stars (and at the focus of a fission bomb), but is very slow, requiring millions of years. On the other hand, fusion of the heavier isotopes of hydrogen starts at much lower temperatures and the reaction needs only a small fraction of a second, as is shown by Hans Bethe in *Scientific American* for March 1950.

Of the six possibilities of reaction between atoms of hydrogen and its heavier isotopes deuterium ${}_1H^2$ and tritium ${}_1H^3$, the one which is the most significant to bomb makers is

$${}_1H^2 + {}_1H^3 = {}_2He^4 \text{ plus a neutron.}$$

This can be set off fastest at a relatively low temperature, and generates the equivalent of 20,000 kw-hr. of energy for 1 g. of reacting substances. It is presumed that a fission bomb will supply the required temperature and pressure to start the reaction. Furthermore, while the energy of a uranium bomb is limited by the critical mass of the metal, there is no theoretical limitation to the dimensions of a fusion bomb since it cannot react spontaneously at ordinary temperatures. But how can a sufficient amount of these gases be made and placed at the focus of the explosion?

Production of Hydrogen Isotopes

As to heavy hydrogen (${}_1H^2$), it has been made since the 1930's in Norway as a byproduct of fertilizer, manufactured by the synthesis of ammonia from its constituent gases. The hydrogen for this manufacture is derived from water by electrolysis. Water is H_2O, and has in nature about one part heavy hydrogen (sometimes called deuterium and symbolized as D) to about 6000 parts of normal or light hydrogen. The light hydrogen migrates to the anode at a faster rate than the heavy, so the electrolyte becomes progressively enriched in deuterium. In America, Urey and his associates (1932) were able to enrich water by fractional distillation; the light water boils out at 100° C. whereas pure heavy water has a boiling point of 101.4° C. and density of 1.108.

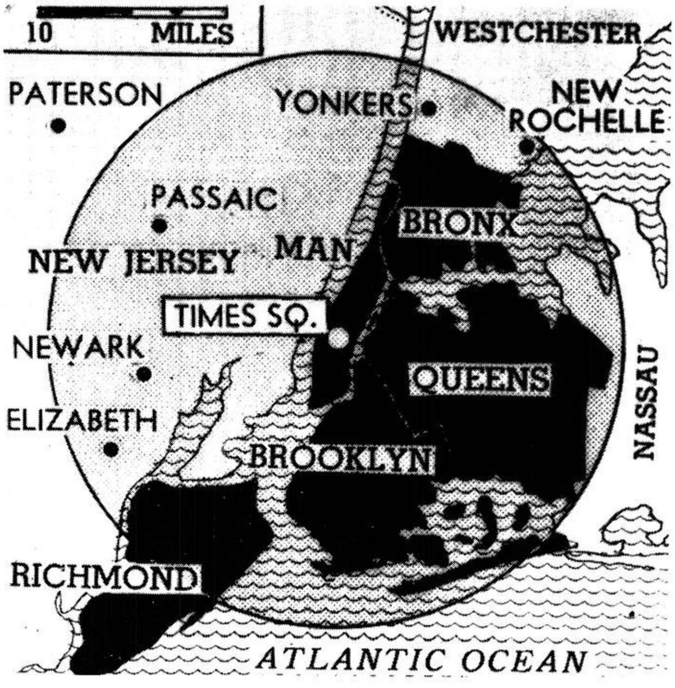
At about the same time the Farkas brothers discovered that when ordinary hydrogen gas (a mixture of much H_2 with a little D_2) is bubbled through water, about two thirds of the deuterium atoms in the gas displace the hydrogen atoms in the light water, and so enrich the liquid in "heavy" water. Since 1941 this reaction is believed to have been used on a large industrial scale in America. Water trickles down a tower through a powder metal catalyst, counter current to a mixture of hydrogen gas and very hot steam. The enriched gas reaching the end of a series of towers in cascade is then completely electrolyzed and the enriched hydrogen gas introduced again at the bottom of the tower—and so around and around until the desired concentration of heavy hydrogen has been reached.

As to even heavier hydrogen—${}_1H^3$, called tritium or T—it can best be produced by bombarding lithium (${}_3Li^6$) with neutrons in an atomic pile. (This element occurs naturally, comprising 7.5% of metallic lithium, and it is unnecessary to separate the two isotopes.) The tritium gas so obtained may escape as such and be collected, or remain dissolved in the metal as gas, or combined as a hydride. After irradiation, the metal is dissolved slowly in water, giving up half of its tritium as gas, and half remains combined as lithium hydroxide. The latter portion may be recovered by heating with an alkaline metal. It is thought that the new Savannah River plant of the U. S. Atomic Commission is primarily occupied with this process.

At least ten other reactions which form tritium are known, but have not yet passed the laboratory stage. Tritium is unstable and has a half-life of about 12.5 years, so it cannot be stockpiled for long. It decomposes into ${}_2He^3$ and a beta ray (electron).

Hydrogen Bomb

Assuming that a fission bomb should furnish the necessary heat to start the fusion of deuterium and tritium,



The circle of havoc which an H Bomb made over New York City.

how can enough of these gases be brought near the focus of the trigger-explosion to be effective additions? Even if carried in steel cylinders, say at 200-atm. pressure, the amount would still be small. If liquified at −250° C. the problem of transportation in a sort of thermos bottle would still be formidable. Mixtures of heavy water and tritium water seem a more likely combination; the oxygen would in fact give a useful inertia effect in preventing the bomb from flying apart so rapidly. Likewise, the uranium or plutonium itself might be pure hydride (half and half of $_1H^2$ and $_1H^3$).

Cobalt Bomb

Since "tampers" of high inertia are desirable to retain the reacting substances within the focus where reaction can continue for a few additional millionths of a second, it has been suggested that a thick case of cobalt or a high-cobalt alloy be used for such a casing. This cobalt would capture an important fraction of the neutrons liberated by the fission, instantaneously forming highly radioactive $_{27}Co^{60}$. This isotope, so useful when properly caged as a cheap substitute for radium, would be exceedingly dangerous when dispersed in the air. It emits very energetic gamma rays for a long time (its half life is 5.3 years). It would for the most part be brought to earth with the rain and be absorbed in the topsoil or run into the rivers.

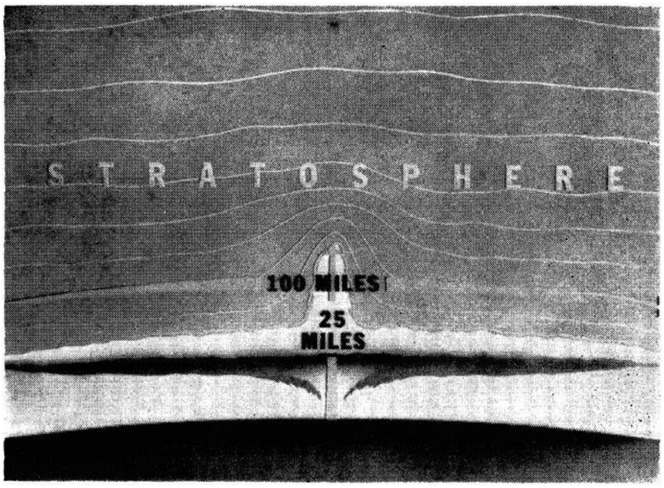
While the mathematics involve several factors which are not precisely known, Arnold has computed that complete reaction of 200 tons of $_1H^2$ plus $_1H^3$ would produce about 2 tons of neutrons which could be captured to form as much as 80 tons of $_{27}Co^{60}$. This amount, if spread out uniformly in the topsoil of the earth, would emit radiations equal to about 10 roentgens per day, which is 100 times the continuous dosage now considered to be the maximum safe exposure.†

Detection of Nuclear Explosions

The most direct and obvious method is by harvesting the air-borne products of the explosion and analyzing them.

Radioactive fission products—corresponding to the bomb-dust particles—from fission of uranium or plutonium have been intently studied. Their radioactivity plotted against time traces characteristic curves showing the rate of decay. Furthermore, the "background radioactivity" of Parisian air, to mention one example, has been continuously measured for some time by apparatus perfected by Labeyrie. A suction pump draws 200 liters of air a minute through a porous paper strip, which moves slowly past autographic instruments for

† Editor's Footnote—Even though the efficiency of conversion or reaction in a bomb is on a very low order because of the limited time—maybe on the order of 1%—it is obvious that not very many "cobalt bombs" need be exploded to eliminate *all* the Russians and Chinese, as well as all the Americans, English and French.



After the H Bomb mushroom has had time to rise to its full height, it looks something like this.

measuring accurately the alpha, beta and gamma radiation. (Tests at definite time intervals give rates of decay.)

Similar methods, which have been used since radioactivity was discovered, have been utilized in the United States to study atmospheric dusts from their own explosions. Nowadays the physicist resembles a not-too-exacting wizard who, with some invisible particles from airborne dust, announces some days afterward that a nuclear reaction took place thousands of miles away!

The hydrogen bomb, in addition, would scatter large quantities of unused hydrogen isotopes. The radioactive tritium is detectable. Neutrons, also sent out in great quantity, react with atmospheric nitrogen, giving more tritium as well as radioactive $_6C^{14}$. Here, then, are two tell-tale characteristics of the H-bomb: $_1H^3$ and $_6C^{14}$.

An airborne apparatus is suggested wherein air is drawn through a metering venturi, then through filters to remove solids (whose radioactivity can be recorded continuously), next through caustic solution to fix the CO_2 (whose proportion of radioactive carbon-14 can be measured). The air then goes through an electric furnace to oxidize the tritium to super-heavy water; all moisture is then condensed and the radioactive portion estimated. As mentioned before, rates of decay of all these fractions are quite characteristic.

If a fusion bomb, as would be likely, would produce about 220 lb. of tritium, this amount distributed over France uniformly in 1000 meters of atmosphere would produce 400,000 disintegrations per cu.m. per min.—truly an enormous amount of radioactivity. Even after transportation for great distances by the winds, the dilution would not be so much but that the rise in radioactivity above background level could be readily detected.

END

The *Unwritten* Laws of Engineering*

Edited by Robert A. Hentges

This is the first of two articles on this subject. The first, as it appears here, deals with what the young engineer should learn in relation to his work, his boss, and with associates and outsiders. The second part will deal with purely personal considerations for engineers, such as the laws of character and personality.

These articles will be of primary interest to engineering students nearing completion of their college work, but the beginning engineering student can also find helpful and applicable hints to better habits. It is perhaps needless to say that all of us can hope to profit by the rules herein listed only if we recognize their worthiness and begin to practice them NOW. Many of the rules stated here are not applicable to undergraduate training, but they are fundamental to successful engineering careers later. For that reason it is recommended that the readers save the two articles on this subject for future reference. The *Wisconsin Engineer* will make an effort to reprint these articles every three or four years, as long as the need for them exists.

What the Young Engineer Needs to Learn at Once

Some years ago the author became very much impressed with the fact, which can be observed in any engineering organization, that the chief obstacles to the success of individual engineers or of the group comprising a unit were of a personal and administrative rather than a technical nature. It was apparent that both the author and his associates were getting into much more trouble by violating the unwritten laws of professional conduct than by committing technical sins against the well-documented laws of science. Since the former appeared to be indeed unwritten at that time, as regards any adequate and convenient text, the following "laws" were originally formulated and collected into a sort of scrapbook, to provide a set of "house rules," or a professional code, for a design-engineering section of a large manufacturing organization. Although they are admittedly fragmentary and incomplete, they are offered here for whatever they may be worth to younger men just starting their careers, and to older men who know these things perfectly well but who all too often fail to apply them in practice.

Just a few points should be emphasized: None of these "laws" is theoretical or imaginary, and however obvious and trite they may appear, their repeated violation is responsible for much of the frustration and embarrassment to which engineers everywhere are liable. In fact this paper is primarily a record, derived from direct observation over a period of seventeen years, of the experience of four engineering departments, three of them newly organized and struggling to establish themselves by the trial-and-error method. It has, however, been supplemented and confirmed by the experience of others as gathered from numerous discussions, lectures, and the literature, so that it most emphatically does not reflect the unique experience or characteristics of any one organization.

Furthermore, many of these rules are generalizations to which exceptions will occur in special circumstances. There is no thought of urging a slavish adherence to rules and red tape, for there is no substitute for judgment, and at times vigorous individual initiative is needed to cut through formalities in an emergency. But in many respects these laws are like the basic laws of society; they cannot be violated too often with impunity, notwithstanding striking exceptions in individual cases.

In Relation to His Work

However menial and trivial your early assignments may appear give them your best efforts. Many young engineers feel that the minor chores of a technical project are beneath their dignity and unworthy of their college training. They expect to prove their true worth in some major enterprise. Actually, the spirit and effectiveness with which you tackle your first humble tasks will very likely be carefully watched and may affect your entire career.

Occasionally a man will worry unduly about where his job is going to get him—whether it is sufficiently strategic or significant. Of course these are pertinent considerations and you would do well to take some stock of them, but by and large it is fundamentally true

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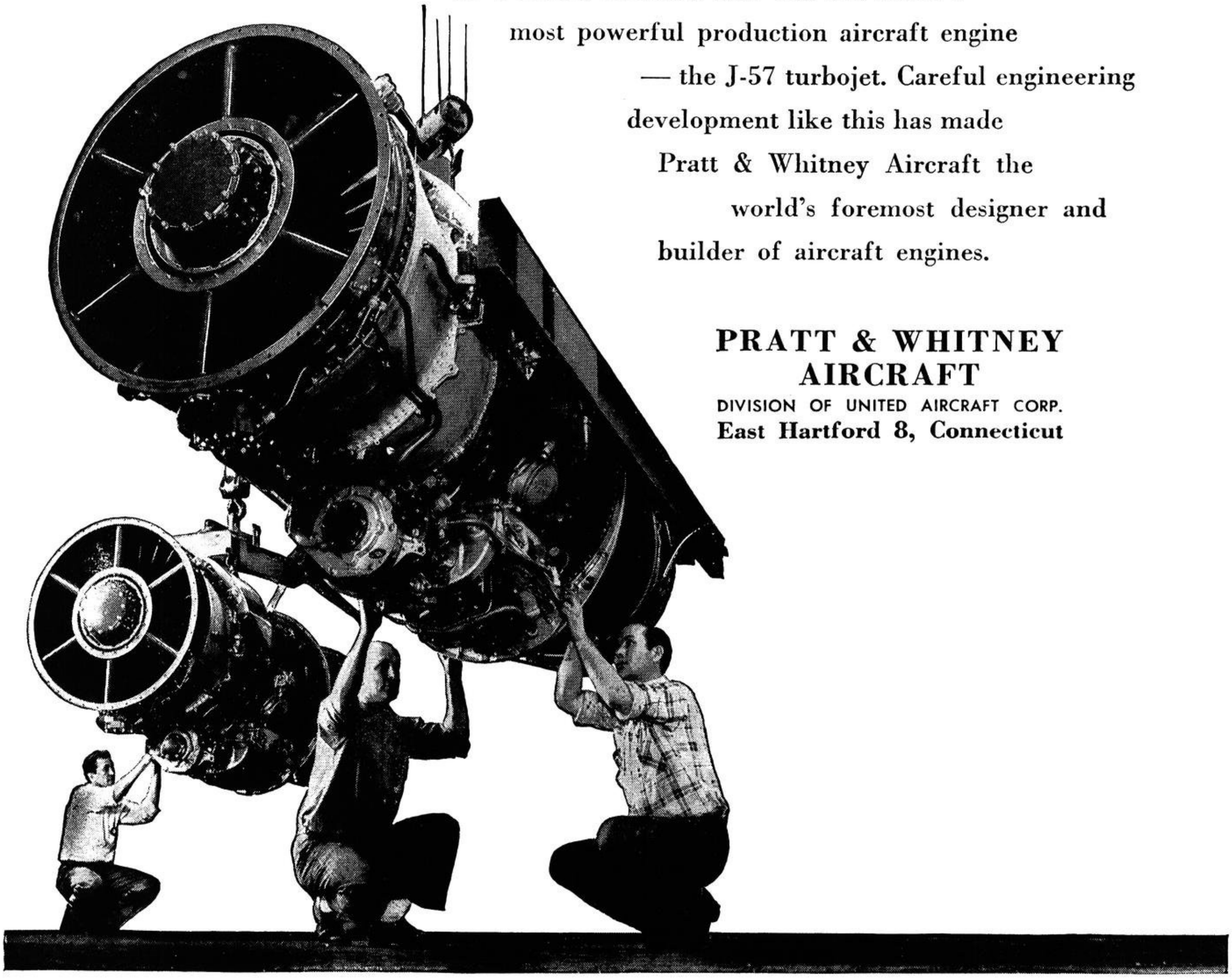


WHO ARE INDUSTRY'S TOP YOUNG SCIENTISTS?

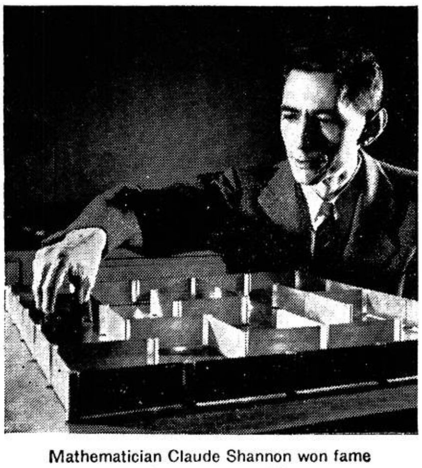
Ten men between the ages of 26 and 40 were featured in a recent national magazine article which presented a portrait of the young scientist in America today. These particular men are a sample of the most brilliant young scientific minds in industry.

It's interesting to note that three of the ten are with Bell Telephone Laboratories, three with General Electric and one each with four other companies.

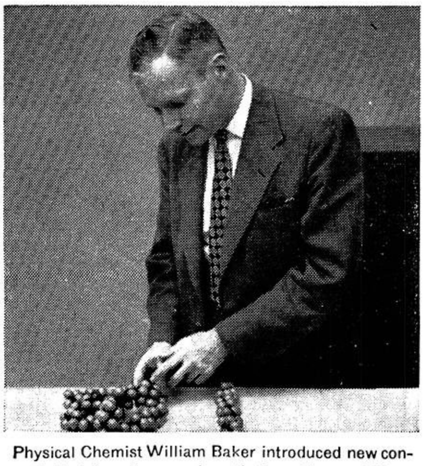
The variety of opportunity in research and other phases of telephone work has always attracted an unusually high percentage of the nation's best young men.

Consult your Placement Officer about opportunities with Bell Laboratories . . . also with the Bell Telephone Companies, Western Electric and Sandia Corporation. Your Placement Officer will be glad to give you details.

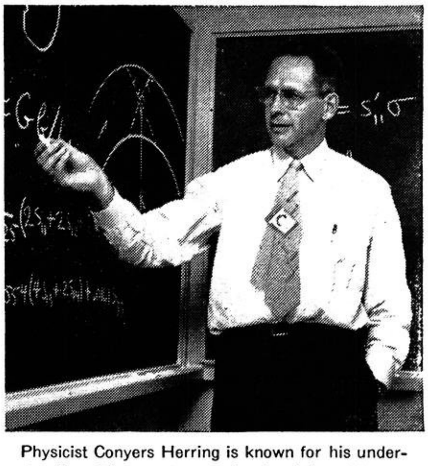
THREE OF THE TEN ARE AT BELL TELEPHONE LABORATORIES—



Mathematician Claude Shannon won fame for his Communication Theory



Physical Chemist William Baker introduced new concepts that have improved synthetic rubber and fibers



Physicist Conyers Herring is known for his understanding of the quantum mechanics of the solid state

BELL TELEPHONE SYSTEM

Schroeder's

ENGINE-EARS

by Ron Schroeder m'57

ASME

Leading off the parade of engineering societies this month is the student branch of ASME. Their first meeting was held on October 13 at 8:00 P.M. in the Topflight room of the Wisconsin Union. A short talk and two films highlighted the kickoff gathering. Professor B. Elliott opened the meeting with his informal talk and the films, "The Why of Lubrication" and "The Story of Lubrication", followed. Refreshments, an engine society standard, were served on completion of the films.

Officers of the ASME Student Branch this year include Chairman, William E. Miller; Vice-chairman, Frank Kehrberg; Corresponding Secretary, Gunter Gersbach; Recording Secretary, Dale Haack; Treasurer, Carroll C. Rands; and Polygon Representatives, Joe Murray and Alfredo Menendez-Abarca. The Honorary Chairman is Professor Ralph J. Harker.

ASME's next meeting will be held in conjunction with the ASME Rock River Valley Section. The group will meet on Thursday, November 18, 1954 in the Old Madison Room of the Wisconsin Union. A cost dinner, to which all student members are invited, is scheduled at 6:30 P.M. The dinner will be followed by a talk at 7:45 given by Dr. Hal E. Furth. Dr. Furth will speak on (1.) Distinguishing Characteristics of Engineers and Scientists, and (2.) Mental Processes of Inventions. Students that find they cannot attend the meeting are invited to hear the talk at 7:45 P. M.

ASCE

ASCE is carrying on this year with a slate of officers that were elected last spring. The President is Dick Gilbertson; Vice-president, Ron Fiedler; Secretary, Edward Arnold; and Treasurer, Carl Burnard. The big event on their calendar is the American Society of Civil Engineers Dance to be held on November 19, at 9:00 P.M. at the Union.

KAPPA ETA KAPPA

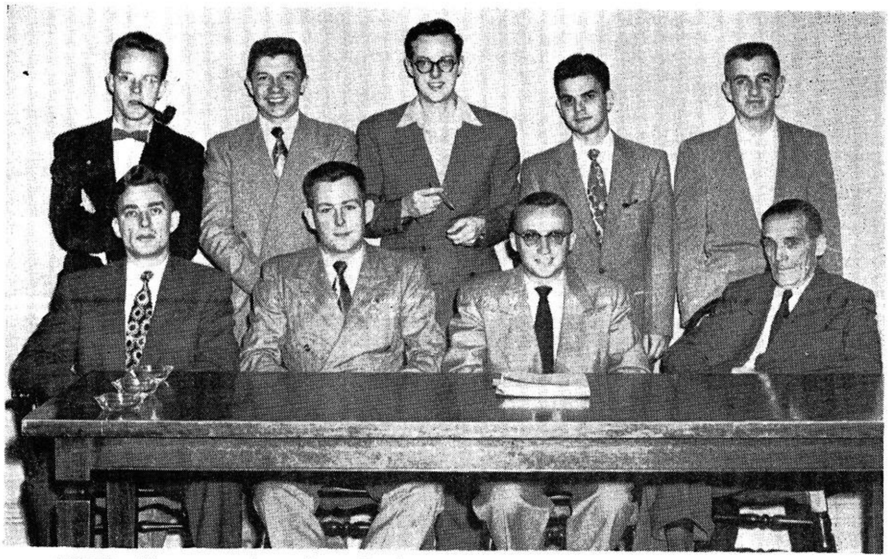
Two smokers for new pledges were held recently by Kappa Eta Kappa, electrical engineering fraternity. The first, held on September 27, was attended by 23 new men and served as an opportunity for new students to become familiar with the men and organization of the fraternity. Professor Peterson of the EE department spoke on the advantages of the fraternity for students in electrical engineering. On Friday, October 8, a second informal get together was held. Card playing and television provided entertainment for prospective pledges.

The national convention of Kappa Eta Kappa is going to be held in Madison on November 26 and 27. Wisconsin's chapter will play host to chapters from the University of Kansas and the University of Minnesota. A big party on the 27th will round out the festivities.

POLYGON BOARD

The group on which the student chapters of all professional engineering societies are represented is Polygon Board. The Board each year sponsors Engineers' Week, at which time St. Pat buttons are sold to students to publicize the week, a lawyer-engineer basketball game is held to determine which of the two schools has the bigger and better men, and the big St. Pat's Dance is held at the Union. Here St. Pat is chosen from candidates representing the engineering departments. The winner is the man judged to have the best developed beard. Last year's winner was Bill Huegel, a civil engineer with a bushy red growth at his chin. Dur-

(Continued on page 52)



ASME officers are (standing (l–r) Dale Hack, Carroll Rands, Gunter Gersbach, Alfredo Menendez-Abarca, Joe Murray, (seated l–r) Prof. R. J. Harker, Frank Kehrberg, Bill Miller, and Prof. Elliott.

CAMPUS NEWS

The results of our last year's efforts.

CASH PRIZES IN WELDING ARTICLE CONTEST

The American Welding Society will award $700.00 in prizes for the two best articles on welding to appear in undergraduate publications during the current school year. The authors of the best articles will receive $200 and $150 respectively, and an equal amount will go to the magazine in which the features appear.

Articles on any type of welding or its application to design and construction will qualify. To be eligible, the article must be published by June 1, 1955. In 1953, Wayne Jacobs and Charles Marschall of the University of Wisconsin won the $150 award for their article on comparison of quality of weldments prepared by different methods. Perhaps some effort on a similar project will pay important dividends to a U. of W. student (and to us) again this year.

Well, why not try?

WISCONSIN ENGINEER OFFERS PRIZES FOR GOOD ARTICLES

Your publication, the *Wisconsin Engineer,* solicits articles written by students in the College of Engineering. The best and most appropriate articles on hand at press time each month will be published. It is of course not necessary that the student be a member of the magazine staff. Those who are now taking English or technical writing courses will find it easy to adapt assigned topics to material suitable for publication.

To facilitate editing and setting articles in type by the printer, the following form for stories submitted is suggested:

1. Typewritten—57 stroke line.
2. Double space.
3. Carefully proof read—by author.

Articles submitted in the above form will receive favorable consideration by the staff for the Edward M. Kurtz Award of $35.00, and the Jesse B. Kommers Award of $20.00, as a first and second prize for the two best papers worthy of publication. These prizes are awarded every year, and each article included in the magazine will be considered for the award solely on a basis of topical interest and clear, concise style. One word of caution—don't conceal an interesting subject in flowery and verbose phrasing. The reader hopes to be entertained and informed, not overwhelmed by vocabulary.

★

U. OF W. STUDENTS AT PROCTER AND GAMBLE

Three Wisconsin students, Erick Laine, James Molnar and Armen Fisher, completed a unique and entirely new two week career survey program this summer.

For two fast-moving weeks Erick, James and Armen, with 42 other students selected from 48 top colleges and universities, worked in plants and laboratories of the Procter and Gamble Company. From practical experience, actual on-the-spot problems, seminars and discussions, the workshop students got a comprehensive view of industry.

The purpose of the program is to give students a chance to work in whatever branch of industry they are considering so that they can put their "book learning" to use and learn whether they like or are fitted for the career they are considering.

The program is unique in that it takes only two weeks, thus not interfering with summer jobs, vacations or summer military obligations.

Magnesium

(Continued from page 21)

So extensive is the use of magnesium on the Sikorsky S-55 helicopter that areas not in magnesium are cross-hatched.

tures between 450° F and 900° F. The plasticity is very good in this range, but even then the maximum reduction between anneals is only 50–60%. Of course, this heating and annealing adds to the cost of the finished product.

Magnesium has very low strength at elevated temperatures, especially above 200° F. It can be used at temperatures up to 350° F if the operating stresses are not too high. For temperatures between 350 and 500° F, casting alloys containing zirconium or the rare earth elements can be used, but these alloys are good only as casting alloys, and are not hot worked.

Corrosion has always presented a big problem. A protective coating is formed on the surface of the metal, which makes the metal appear dull, and almost black in color, so that for an appearance application, magnesium is not too good. However, the resistance to tarnish can be improved greatly by building up supplementary coatings on the surface with either chemical or electrochemical treatment, in either acid or alkaline solutions. Good drainage and ventilation are necessary in enclosed surfaces so that entrapped moisture and condensation is avoided, for these provide corroding media. A zinc chromate primer or paint is used on enclosed surfaces if the service conditions are especially severe.

The corrosion of magnesium is apt to be severe when dissimilar metals are in contact with each other, because of the galvanic action produced by differences in electrode potential. For this reason, sealing compounds or gaskets should be used between the dissimilar metals, in addition to priming. Whenever steel bolts, screws, studs, or rivets are used, they should be plated with zinc or cadmium.

END

Sanitary Engineering

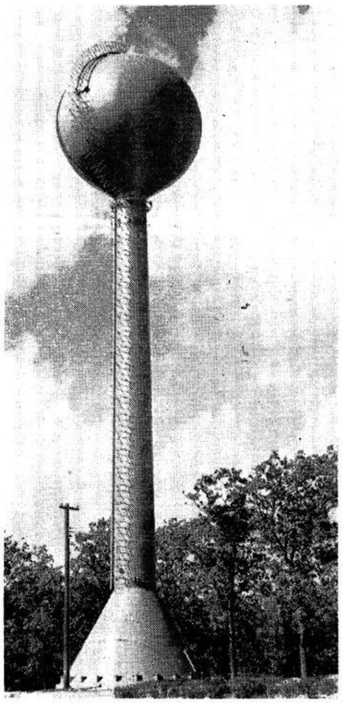
(Continued from page 18)

the subject through experience. However, with the recent broadening of the field bringing with it more technical problems, a formal education is fast becoming a necessity. In fact, 1950 figures show that 23% of practicing sanitary engineers have master's degrees in their field. The increased importance of chemistry in sanitary work has produced an influx of chemical and biochemical engineers also. The most common type of educational preparation, however, is still the B.S. degree in civil engineering with a sanitary engineering option, or a B.S. degree in sanitary engineering.

This then is the picture of the sanitary engineering field today. What may be expected in the future? Design engineers will find a need in the U. S. for 5,000 new water systems and the extension of 6,500 more. Also, 10,500 communities lack adequate sewerage facilities. Large food processors, chemical plants, and their allied industries need full-time consultants for their sanitation problems. Industrial plants and municipalities in complying with the general swing toward health consciousness of the public need sanitation engineers. Increased restrictions on stream pollution also open a field to the engineer with our education in sanitation.

Unlike the structural or mechanical engineer's contributions to the modern world the sanitary engineer's work lies buried under streets, or stands in an isolated section of a city, or is accepted without thought as pure water in our homes. Yet the health, happiness, and general well-being of our society today are directly dependent on the contributions of the sanitary engineer.

END



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This is a 100,000 gallon water sphere located in the city of Madison.

★

W. S. P. E.

WISCONSIN SOCIETY OF PROFESSIONAL ENGINEERS

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Madison 5, Wisconsin
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Edwin J. Kallevang
Harold Trester

Your Column—Your News

The importance of receiving new material for *your* column cannot be over-emphasized. As the District of Columbia chapter expressed it,

"All members are urged to use the pages of this publication to express their views, criticisms or comments on any subject upon which they wish to 'sound off.' If you don't like the Society's policy, give 'em hell, and if you do, a written pat on the back won't hurt any. . . . You may rest assured that your opinions will be given space. Only with the cooperation of the Society's membership can this column be a real success and an asset to the organization. We are also interested in receiving personal items."

In an effort to unearth more news items from the local chapters and individuals, Mr. John R. Frederick, chairman of the publications committee, has personally addressed four of the chapters. He expects to visit the other three chapters in the near future. The principal objectives of these talks are to explain what and how to report, and to point out the necessity for an active and vital series of publications. It is hoped that each member will assign to himself the task of getting at least one news story to his chapter reporter this year.

John Weldon Dies

John T. Weldon, 64, who supervised construction of many of Milwaukee's major harbor facilities, died September 10 in his Milwaukee home. Mr. Weldon had suffered from a heart ailment for many years.

He was field engineer in charge of such projects as construction of the municipal car ferry terminal, the open dock terminal, the first of the outer harbors, and drew up plans for the harbor railroad system.

Mr. Weldon, a University of Wisconsin graduate, belonged to WSPE and the Catholic Order of Foresters.

Engineering Examinations

The Wisconsin Registration Board of Architects and Professional Engineers have announced the dates of their next Engineering Examinations as January 31 and February 1, 1955. To be eligible for those examinations, application must be on file in the Board's office on or before December 1, 1954. Application forms and information may be obtained at or by writing to the Board's office, 1140 State Office Building, Madison, Wisconsin.

Examinations will be conducted January 31, 1955 at Madison and Milwaukee, Wisconsin for those desiring Certification as an Engineer-in-Training. To qualify for certification as an Engineer-in-Training the applicant must in addition to passing the one-day, 8 hour, examination on the fundamentals of engineering have a record of 4 years of satisfactory engineering experience. All of the required 4 years of experience may have been gained by formal education.

Examinations will be conducted January 31 and February 1, 1955 at Madison, Wisconsin for those desiring registration as a Professional Engineer. Holders of certification as an Engineer-in-Training in Wisconsin will be required to appear for examination only on February 1, 1955 while those who are not holders of such certification will be required to appear on both January 31 and February 1, 1955. The examination on January 31, 1955 will be on the fundamentals of engineering. The examination on February 1, 1955 covers in the forenoon a field of engineering and in the afternoon a sub-field of the field selected by the applicant for the forenoon's examination. The applicant must choose a field and subfield which has been established or approved by the Board. Fields and subfields for each have been established by the Board as follows:

1. Chemical with the established sub-field of Sanitary and others to be approved by the Board.

(Continued on page 36)

Meet the President

MELVIN R. CHARLSON
Northwest Chapter President

Melvin R. Charlson, northwest chapter president, was born in Eau Claire, Wisconsin, and received his preliminary schooling there. He entered the University of Wisconsin in the fall of 1914, but left in 1917 to serve with American Forces in France, advancing to the rank of Lt. (j.g.) in the USNRF. He returned to Wisconsin to receive his bachelor's degree in civil engineering in 1920.

During the first five years following his graduation, Mr. Charlson worked for the Wisconsin Highway Department in the Eau Claire office. Subsequently, he spent fifteen years in the Chicago area working on municipal improvements in suburban communities, chiefly with Carson Townsend and Associates. He was also employed by the U. S. Department of Interior in connection with a drainage and road building project in the Skokie Lagoon area. In 1940 Mr. Charlson returned to Eau Claire to assume the vice-presidency of the Charlson Manufacturing Company. After serving from 1943 to 1945 as a lieutenant commander in the seabees, he resumed his position with the Charlson Co.

Mr. Charlson and Myrtle Roeckler were married in 1933 and have three children. Nancy, 20, is a junior at Northwestern University. Charles, 18, is a sophomore in civil engineering at Madison, and Karen, 15, a sophomore in high school at Eau Claire. For recreation Mr. Charlson enjoys golf and fishing.

(Continued from page 34)

2. Civil with the established sub-fields of Highway, Hydraulics, Municipal, Sanitary, and Structural.
3. Electrical with the established sub-fields of Electrical Machinery, Electric Power-Generation and Distribution, Illumination, Industrial Electronics, and Communications.
4. Mechanical with the established sub-fields of Air Conditioning-Heating-Refrigeration, Heat Power and Heat Engines, Industrial, and Machine and Tool Design.
5. Metallurgical with the sub-fields to be approved by the Board.
6. Mining with the sub-fields to be approved by the Board.

To qualify for registration as a Professional Engineer the applicant must in addition to passing the 2-day examination have a record of 8 years of satisfactory engineering experience, 4 of which may have been gained by formal education.

The next engineering examination after the January 31–February 1, 1955 examination will be conducted by the Board about the middle of June 1955 with April 15, 1955 as the closing date for filing application to enter it.

Price Correction

In the society's September News-Letter, the initiation fee was erroneously listed as $3.50. The correct amount is $3.00.

In addition, a new price list has been received for emblems and pins ordered from the national society in quantities of twenty-five or more. These prices are as follows:

Emblem mounted as charm	$3.50
Emblem mounted as pin	$3.50
Miniature emblem	$1.50
P.E. auto emblem	$1.50

On an individual basis, the prices are $5.00 and $2.50 respectively. Address orders to the National Society of Professional Engineers, 1121 Fifteenth St., N. W., Washington 5, D. C.

Board of Directors Meeting

September 18

MEMBERSHIP REPORT

September 17, 1954

June 11, 1954–Sept. 17, 1954

New applications approved for membership	25
New applications approved for aff. membership	7
Reinstated members	1
Reinstated Aff. Members	0
Affiliate Members transferred to Members	2
	35

Losses June 11, 1954–Sept. 17, 1954

Members resigned	1
Members transferred to out of state	1
Affiliate members transferred to Members	2
	4

Summary

	June 11	*Sept. 17*
Members in good standing	985	1,011
Members delinquent	23	23
Aff. Members in good standing	70	76
Aff. Members delinquent	2	1
	1,080	1,111

Secretary Wagner presented for Treasurer Cottingham the following Treasurer's Report:

TREASURER'S REPORT

September 18, 1954

Cash Balance June 11, 1954		$4,695.56
Income June 11, 1954–Sept. 18, 1954		
Dues	$1,575.50	
Western Chapter	35.00	
		1,610.50
		$6,306.06
Expenditures June 11–Sept. 18, 1954		2,684.21
		$3,621.85

It was moved by Director Lord and seconded by Director Genisot that the office of Secretary and Treasurer be combined, effective July 1, 1955.

The next Board Meeting is to be held at the Milwaukee Athletic Club at 12:15 p.m., October 23, 1954.

Chapter News

MILWAUKEE CHAPTER
ROBERT J. MENDENHALL
Reporter

The Milwaukee chapter met on Tuesday, October 12, to hear John Gammel, Director of Graduate Training at the Allis-Chalmers Manufacturing Company. He spoke on the vital subject, "Are We Keeping Ahead of Russia in Science and Technology." The meeting was preceded by a dinner in the E.S.M. building.

SOUTHEAST CHAPTER
JOSEPH H. KURANZ
Reporter

No chapter news received.

NORTHWEST CHAPTER
WM. ROSENKRANZ
Reporter

The October meeting of the Northwest Chapter of WSPE was held on Wednesday evening, October 6, at the Eau Claire Hotel. The program committee secured Mr. Glen Rork, who is one of the governor's committee investigating the feasibility of the Wisconsin Toll Road. Mr. Rork spoke in his own exceptional manner on this subject. Mr. J. R. Frederick, Chairman of the Public Actions Committee of WSPE also was in attendance at our meeting to discuss WSPE publications for the year.

We had a very interesting and enjoyable meeting at the Glen Park Lodge in River Falls on September 8. The meeting was called to order by President Charlson who asked for introductions of members and guests. The speaker, Dr. Walker Wyman spoke on his book, "Nothing But Prairie and Sky," which is a story of the experiences of a South Dakota Settler of 1900.

The financial report was read by the Secretary showing a bank balance of $216.60.

President Charlson asked for nominations for a chapter representative on the state nominating committee. Mr. E. H. Nelson of Amery was nominated by Al Lokken and seconded by Rod Bott. Mr. Ed Holm was nominated by Bill Baumgartner and seconded by Bill Gohn. The voting was done by ballot and Mr. Nelson was elected.

John Hoeppner reviewed the history of the difficulties he has had with the Registration Board in licensing registrations as an Architect even though he has taken and passed the necessary exams. He also told of difficulties he has had in getting approval of building plans leaving his Professional Engineer's Stamp.

He said that the Attorney General had presented an opinion that the Registration Board had the power to rule on all plans and further that Professional Engineers could design only Industrial Buildings. Mr. Hoeppner stated that he was going to start suit against the Registration Board for his Architect's registrations. He asked the Chapter to inquire of the State Society if they want to enter into the dispute with the Industrial Commission. Mr. Baumgartner asked Mr. Hoeppner to submit a written report of his case so it could be presented at the next State Board of Directors' meeting. Several members of the Chapter discussed the general problems confronting Professional Engineers of the State by the action and opinion of the Registration Board. All were of the opinion that it was time the State Society should put forth some effort to raise the station of engineers to a point equal to Architects in the eyes of the Board. Mr. Ayres reported that the State Society was already planning some action on this matter.

Mr. Boyd reviewed the questionnaire on the Surveyors' Licensing law sent out recently by the State Society.

Bill Gohn reported on the dispute between the City of Superior and Mr. Thomas Basterash, which was handled for the Chapter by the Fees and Salaries Committee. Final action was taken by the State Society. Mr. Gohn pointed out that there was need for more co-operation and a definite statement of procedure between Chapter, State and National Societies on matters of this type. Mr. Baumgartner asked for help from the members in increasing the chapter membership. Bill Rosenkranz, chairman of the Public Relations Committee, asked that an Engineer's Week Committee be set up to start work.

SOUTHWEST CHAPTER

L. W. STOCKAUS
Reporter

The organizational or "kick off" meeting of the Southwest Chapter was held on Wednesday, Sept. 29, 1954 at the Nakoma Country Club, Madison.

The meeting was attended by the officers, directors, and committee members of the chapter. There were a total of 65 members at this meeting.

R. E. Burmeister, President of the Southwest Chapter, presented his resignation because of a transfer of his work from Madison to Milwaukee. Harvey E. Wirth, Asst. State Sanitary Engineer, the Chapter Vice President succeeds Mr. Burmeister as President.

A Discussion of Publications and "Reporting the News" for the coming year was held with John R. Frederick, Chairman of State Publications Committee. Everyone agreed to help the chapter reporter in getting news items in for publication.

After general discussion the group broke up into Committee meetings for planning the various Committee activities. Much enthusiasm was evident which should mean a very active year for Southwest Chapter.

FOX RIVER VALLEY CHAPTER

JOHN K. PRIMM
Reporter

Professionel engineers of the Fox River Valley chapter, Wisconsin Society of Professional Engineers, on October 6 held their first fall dinner meeting at the American Legion Club in Oshkosh. Guest speaker Arthur Guise, Chief Engineer in charge of research and development, Ansul Chemical Co., Marinette, spoke on "Fire Extinguishment with Chemicals", illustrating his remarks with color movies of typical "difficult" oil and gas fires compiled in tests by his company.

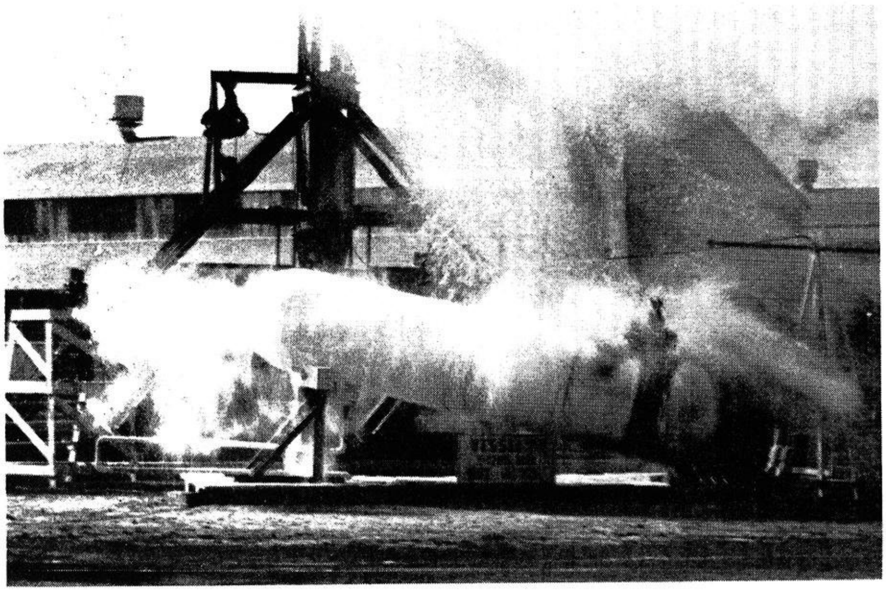
Mr. Guise traced the use of baking soda as a fire extinguisher, from its first use about 1890 to the present. The disastrous 1903 Iroquois Theater fire showed grave faults in early extinguishers, and intensive research and experiment, begun then, has since been carried on continuously. Greatest major improvement came in 1943 when Ansul introduced a mixture of dry baking soda and other chemicals fired in a high-pressure stream through nozzles of improved design. This system has been used with success against burning ether, benzol and gasoline, synthetic rubber, and natural gas. In one test, the famous Big Inch pipeline was opened and the test "leak" ignited. Flames 187 ft. high were quenched by injecting dry chemical into the pipeline.

"Fire prevention and fire control", stated Guise, "cannot be limited to Fire Prevention Week. They must be continuous. The major recognized companies nowadays all sell good equipment, but if your equipment is not kept up well it cannot be expected to work. Following maintenance instructions

(Continued on page 53)

SCIENCE HIGHLIGHTS

Edited by Carl Burnard, CiE'57



BURST TEST ON STEEL TANK

Geyser of icy calcium chloride brine rises as big steel tank, frozen at 45 degrees below zero, is burst from internal pressure of 2,850 pounds per square inch. Steel is a new type developed by United States Steel Corporation. Burst test was one of a series made on Chicago Bridge & Iron Company plant site in Birmingham, Ala.

HIGH-FREQUENCY LIGHTING SYSTEM

The nation's most modern and efficient general lighting system, in which the individual fluorescent lamps used will produce about one-fourth more light than normally, will be installed here in Union College's Alumni Memorial Field House.

This was announced today by the General Electric Company, which has designed a system of high-frequency fluorescent lighting for the new building. The field house is now under construction as a memorial to the 76 Union men who lost their lives in World War II. Work is expected to be completed by December of this year.

G. E. reports that the lighting system will represent the first application anywhere of this principle of high-frequency fluorescent lamp operation to the general lighting of a large area.

Because of its anticipated economic advantages as a method of obtaining higher levels of light, John H. Campbell, G-E illuminating engineer, predicts that the new lighting technique eventually will find widespread application in commercial, industrial and institutional buildings.

The new lighting technique involves a coordinated system in which all components are designed to contribute maximum advantages to lamp and fixture operation. Fluorescent lamps operated under the system can produce from 20 to 50 per cent more light than they do in conventional lighting installations.

In the Union College Alumni Memorial Field House the fluorescent lamps will be operated on 400-cycle power. Increasing the current to 400 from the standard 60 cycles will be accomplished by means of a low-cost rotating-type frequency converter. This unit consists of a high-frequency generator driven by a 60-cycle electric motor. The 400-cycle ballasts used to control current in the lamps are much simpler, more efficient, and 80 per cent lighter in weight than conventional ballasts.

More than two-thirds of a mile of fluorescent lamps will be employed in the structure. A unique feature of the lighting job will be a new-type fixture, designed by Carl J. Allen, G-E school and indoor sports lighting specialist. Each of the 35 fixtures, eight feet square and having less than half the weight of comparable fixtures in conventional installations, will contain 14 eight-foot-long slimline fluorescent lamps. Each lamp will produce over 6000 lumens, or units of light, giving the entire lighting job a total output of about three million lumens.

The 400-cycle power will be distributed to the fixtures at 600 volts, with 300 volts to ground. This distribution system is said to result in a considerable saving of initial cost. Wiring layout for the installation was made by Howard D. Kurt, G-E electrical engineer, who also helped design the power system.

Although somewhat similar systems have been developed by G. E. for airplane and bus lighting, the Union College lighting job will be the first of its size to be lighted by means of 400-cycle power.

NEW SILICONE RUBBER TUBING

Waterford, N. Y.—A lightweight, flexible tubing, highly resistant to wide temperature and pressure ranges, has been developed from General Electric's SE–100 silicone rubber compound as part of the de-icing system of the new Grumman S2F–1 Sub-Killer aircraft.

Designed and fabricated by Flexible Tubing Corporation of Guilford, Connecticut, the ducting is strong, exceptionally light in weight, easy to handle, and has been quickly and economically installed by the Grumman Aircraft Engineering Corporation in the wings of each plane. It can be used without fear of collapsing in situations where bends up to 180 degrees must be made, and is capable of withstanding temperatures ranging from 250 degrees F to minus 65 degrees F.

The new tubing, which has exceptionally high heat and abrasion resistance, is used to duct negative and positive pulsating air pressure to the leading edge of the wings for de-icing. It must remain flexible in arctic and high altitude cold as well as tropical heat. Because of its combination of unusual characteristics, SE–100 silicone rubber compound has made possible the production of tubing that requires practically no replacement for the life of the plane—thereby making it possible for the "hunter-killers" to operate under the severest weather conditions in all parts of the world.

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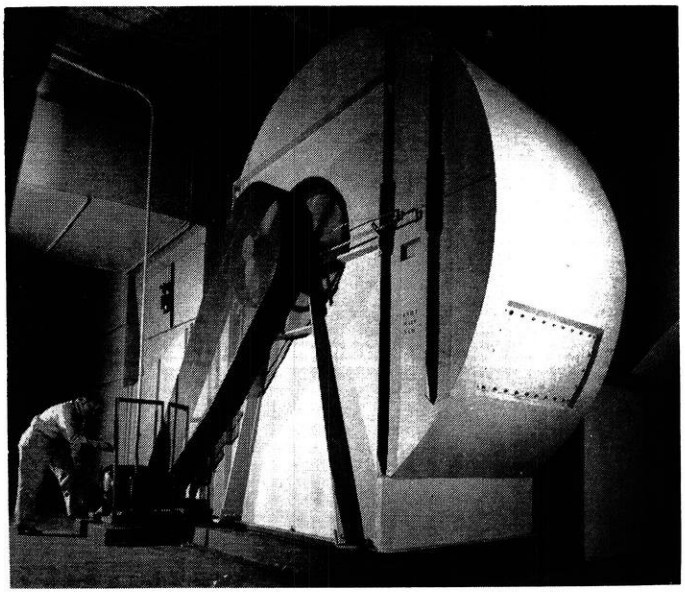
WESTINGHOUSE STURTEVANT FANS VENTILATE PITTSBURGH GATEWAY CENTER



One of 54 fans used to ventilate the three buildings of Pittsburgh's new Gateway Center.

Moving over $1\frac{1}{2}$ million cubic feet of air every minute through the three buildings of Pittsburgh's new Gateway Center is handled by 54 major fans built by Westinghouse Electric Corporation's Sturtevant Division at Hyde Park, Massachusetts. The tremendous volume of air is necessary to provide year-round air conditioning and ventilation comfort for Gateway tenants who occupy the buildings' 940,000 sq. ft. of rentable space.

Completely air conditioned, each building has ten main air supply fans and eight major exhaust fans in addition to a number of supplementary heating and ventilating fans. The fans range in size from a little over one foot high to some with housings 13 ft. high. The smallest is driven by a 1/6 hp motor and the largest by a 75 hp motor.

Outside air drawn through the vents mixes with a percentage of air being returned from the building. Control dampers determine the amount of returned air for exhaust and the amount to be reused. The air mixture is preheated and passed through Precipitron air cleaners, which electrostatically remove dirt and impurities. After passing through Westinghouse surface dehumidifiers to remove or replenish moisture, the cleansed air then enters either the conventional or high-pressure duct systems.

The high-pressure air is directed into under-window units in the exterior rooms. These units also draw in room air which passes over coils filled with circulating water. Air entering the units operates a thermostat which governs a water coil valve. This valve, in turn determines the flow of water through the unit coils and consequently, the degree of heating or cooling.

The water moving through the unit coils is in a closed system which serves all three buildings. The system contains over 25,000 gallons of water and is pumped by three chilled water pumps rated at 2500 gallons per minute each. Refrigeration and heating equipment for this primary water system is located in the basement of one of the buildings.

Condensers for the closed system are cooled by another water system. This water is pumped, at the rate of 14,000 gallons per minute, from a tunnel that brings water directly from the nearby Allegheny River. The river water is filtered and chlorine-treated before use.

Twelve additional Sturtevant air-handling units, independent of the building systems, ventilate the large underground garage. Some of these units send cooled or heated fresh air into the garage, while others exhaust foul air and prevent the accumulation of noxious gases.

★

NEW COMBINATION COLORIMETER–SPECTROPHOTOMETER

A combination colorimeter and spectrophotometer which produces high wavelength accuracy and

(Continued on page 44)

The "Smithway"

(Continued from page 17)

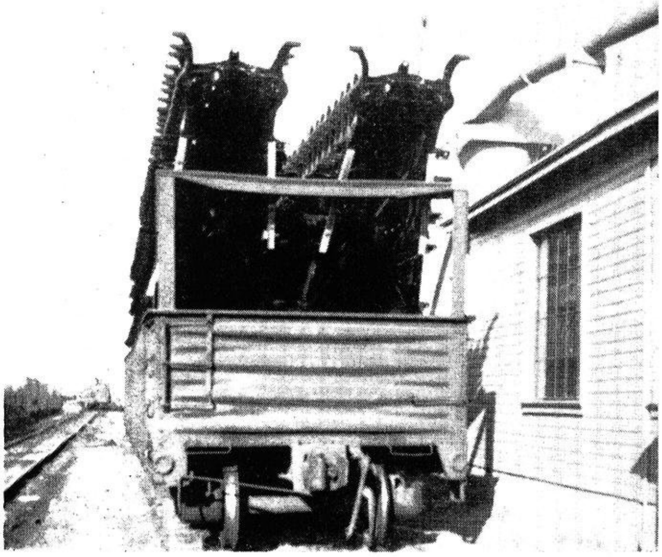


Figure 3.

and bottom. A tough paper must be used, since a tear anywhere on the package could mean a total loss of the material contained. The bags used are five ply, self-sealing bags, 7 in. wide and 14 in. long. Each bag holds 100 lb. of Frit. The palletized bags are 28 in. wide and 42 in. long on all four sides and weigh about 1,500 pounds. The palletized bag requires no extra pallets for handling and moving as do the paper bags.

The paper bags are usually shipped by railway boxcar. Each boxcar must be clean on the inside, so paper is placed on all four sides and on the floor. The bags are loaded by hand on wooden pallets in the shop; and a lift truck then picks up the loaded pallets and delivers them to the waiting boxcar in the yard. The pallets are again unloaded by hand and placed four deep wall to wall inside the car. This procedure is time consuming, since each car contains 800 bags of Frit. Palletized bags are not shipped too often by rail, as the pallets require too much space. Each car after loading is inspected and sealed by an agent of the railroad.

Shipping of Frit by Truck

Until recently most of the Frit was shipped by rail; today at a great saving in shipping costs, Frit is shipped by truck. The palletized bags are transported by lift trucks from the shop directly onto the semi-truck carrier. It takes only 20 minutes to load a semi with 13 to 15 bags weighing 25,000 pounds. Very little fastening to the carrier back other than end supports is required, as the weight of the palletized bags keeps them in position. Loading requires only one lift-truck operator. The forks on this lift truck were cut to 28 in. in length to prevent any damage to the bags already loaded. The operator positions each bag and stows it on the truck properly, knowing by experience the best way to pack the bags securely. Unloading of the semi upon arrival requires only ten minutes. This saving in time and money has eliminated all but long distance hauling by the railroads.

Control Arms

A. O. Smith produces 6,000,000 control arms per year for the operating levers of knee-action automobile assemblies. The majority of control arms produced are shipped by rail to Detroit, Michigan. There are two different types of control arms, uppers and lowers. The lowers weigh 10 to 12 lb. and are relatively flat. The uppers weigh 5 to 6 lb. and are more complex than the lowers. Because of their flat and simple design, the lowers can be readily stacked. Control arms are shipped according to customer specification; since some customers request bulk loading, and others request packaging in expendible pallet boxes.

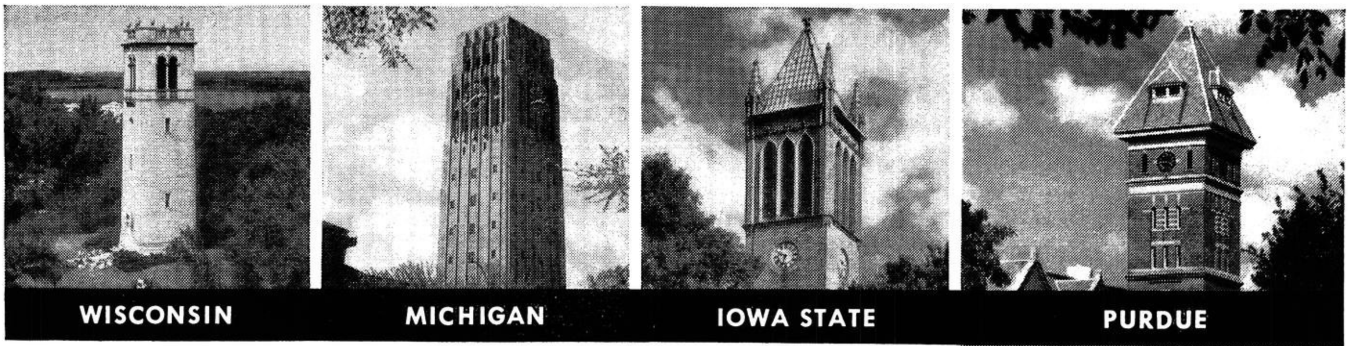
It costs more to package control arms in palletized boxes for shipping than to bulk load the arms, and the customer is billed accordingly for the extra cost. An overhead conveyor carries the control arms from process to process, on hooks throughout the shop. The palletized boxes are packed by hand immediately after final inspection. The loaders select the proper arms from the hooked conveyor as it passes, and pack them in their respective boxes. Different type control arms are recognized by the loaders at a distance of 12 feet. The boxes are 42 in. long by 48 in. wide by 26 in. deep, and are made of group 4 hardwood. Three hundred uppers or 108 lowers fill a box. The boxes when packed are moved by hi-low trucks into the waiting boxcars, 67 boxes to a car. The 67 boxes increase the shipping weight by about 5,000 lb., which increases the handling cost by $55.62 per boxcar.

The overhead-hooked conveyor passes by the boxcar door; the unloaders take the arms of the hooks as they pass by the car's door, and stack the arms inside. An average carload holds 7,200 lower arms or 4,800 lower and upper arms weighing approximately 72,000 pounds. When upper arms are included in a load, a bulkhead is constructed of wood across the car, enclosing about one third of the total floor space. The unloaders are paid by piece work, earning a take-home-pay of $26.00 per carload. The time for stacking and loading the arms decreases as the carload increases, since the unloader travels a shorter distance to the stacks. Once the boxcars are loaded, they are inspected and sealed by the railroad agent. Bulk loading saves $55.62 per carload on shipping costs. Here is a definite example of how conveyor bulk loading cuts down on shipping costs.

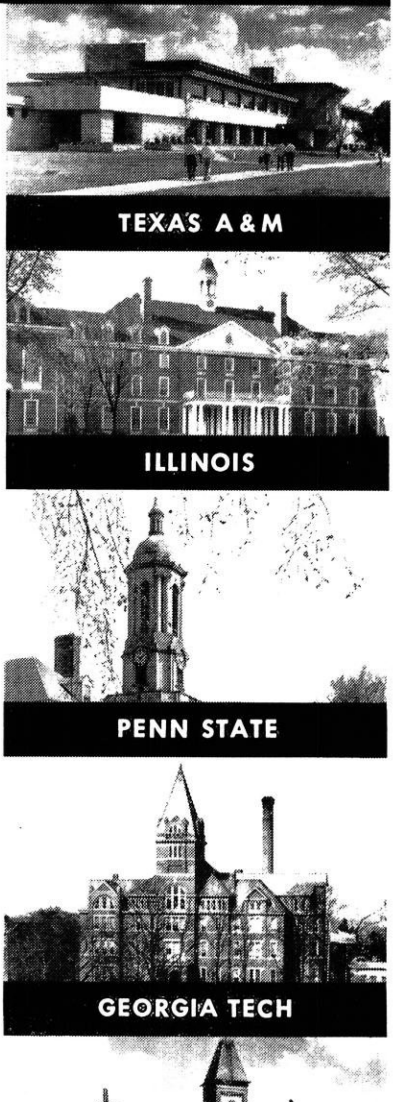
Water Heaters

A. O. Smith produces glass lined gas and electric-operated water heaters in a variety of sizes, including 40, 80, and 120 gal. capacities for home use. All water heaters are wood crated singly or in groups of two to four for shipping. No pallets are needed for the movement or handling of crated heaters.

(Continued on page 42)



these are Mighty Good Hunting Grounds!



Year in and year out, we limit our search for electrical, mechanical, industrial and general engineers to these nine schools. Experience has taught us that it's unnecessary to look beyond these nine in our search for our design, production and sales engineering talent.

Experience also has shown that those who join us find Square D a mighty good company to be with. Most of these men are still with us, growing and prospering with the constantly expanding electrical industry.

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City_______ Zone____ State______

The "Smithway"

(*Continued from page 40*)

A. O. Smith developed its own fingerlift attachment for lift trucks handling crated water heaters. The fingers attached to the lifting mechanism are pivoted on a shaft on 2½ in. centers. When the fingers strike a wooden crate they are pushed back, activating other fingers which enter the open spaces of the crate to a depth that is always less than 1½ inches. In this way, the heater contained in the crate is never touched by the lift truck. When the carriage of the lift truck is raised, the fingers strike against cleats on the crate raising the crate. The mast of the lift truck is tilted back as the crate is raised. The crate is then rested on the lower apron of the fingerlift attachment. With the crate held in this manner, the lift truck can move and maneuver the crate as desired. In setting the crate down, the exact reverse of lifting the crate is employed by the lift-truck operator. This fingerlift adaption has eliminated all use of pallets in the handling of water heaters.

When the heaters are crated, they are picked up by special lift trucks. The lift trucks move the crates directly to the waiting boxcars. Two lift trucks can stow, and double deck where needed, 1,600 crated water heaters in ten boxcars in 7½ hours. After a boxcar is loaded by the lift trucks, the crates are strapped in place, and the boxcar is sealed for shipment. Here is an example of how a small adaptation on a material handling device has eliminated all use of pallets resulting in a savings in effort, time, and money.

Harvestores

The Harvestore is a glass-lined steel storage bin for farm produce. (See Figure 4). Harvestores come in two sizes, one, 14 feet in diameter, the other 17 feet in diameter. Both are 45 feet high. Each Harvestore has a mechanical unloader at its bottom for removal of the produce contained. The smaller bin weighs five tons and has an unloader that weighs 2,000 pounds. The larger bin weighs six tons and has an unloader that weighs 2,400 pounds. Harvestores are shipped by truck to farms in Wisconsin and neighboring states. All Harvestores are erected on location by the A. O. Smith Corporation on foundations provided by the customer.

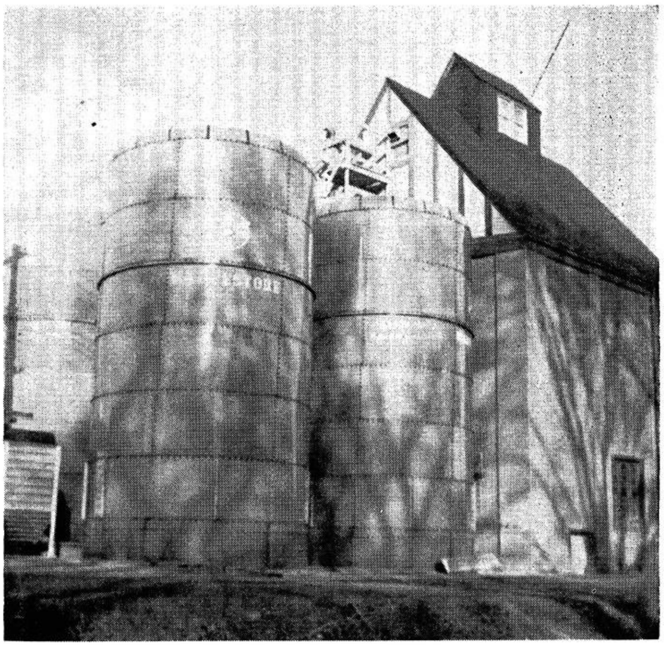


Figure 4.

Because of the bulk, weight, and unloading needs of the Harvestores, they are transported by a specially designed truck. The semi-truck used has an oil-float trailer, which is highly adaptable to the rough surface conditions found on most farms. Besides carrying the dismantled Harvestore, the oil-float trailer is equipped with a boom and winch to unload the Harvestore upon arrival. A special tote box that weighs 860 lb. and costing about $150.00 was designed to carry the dismantled Harvestore in one compact package. A large plastic bag enclosed in a carton contains the small parts that may be lost or damaged when exposed. This special truck contains the steel bin, unloader, and equipment necessary to unload the Harvestore. The truck can be loaded in one hour and unloaded next to the foundation in 40 minutes. The truck has a sleeper cab and is manned by two drivers. Two drivers will cover 700 miles in 24 hours. Four men can erect the Harvestore without scaffold in 64 manhours. Tote boxes are always picked up on succeeding trips because of their cost and special design.

The procedures of the A. O. Smith Corporation in the transportation aspects of material handling is an example of the problems that confront engineers in this relatively new field. Until recently, the problem of preparing and packaging materials for shipping and receiving were considered one of those intangibles of overhead that would be a direct burden on a company. Today the Corporation and others like it the world over realize that economy in effort, time, and money can be attained by applying the principles of engineering to material handling. **END**

Science Highlights

(Continued from page 39)

spectral purity through use of a diffraction grating was announced diffraction was announced recently by the Bausch & Lomb Co.

The Spectronic 20 analyzes any liquids or solids which transmit light by subjecting a sample to light of specified wavelengths. The degree of light transmittance is registered on a double scale, where readings may be taken in terms of either transmittance or optical density.

The operator can adjust the diffraction grating for any wavelength in the entire range of the instrument by turning a control knob, without being limited to available filters.

Effective range is from 375 mmu (near ultra-violet) to 950 mmu (near infra-red), according to the company.

For the range from 650 mmu to 950 mmu, an infra-red tube and filter are quickly substituted for the standard tube.

As a colorimeter, the instrument makes possible quick routine tests by subjecting the sample to fixed wavelength settings. Resulting readings can be readily interpreted as concentration values from predetermined calibrations supplied with the instrument.

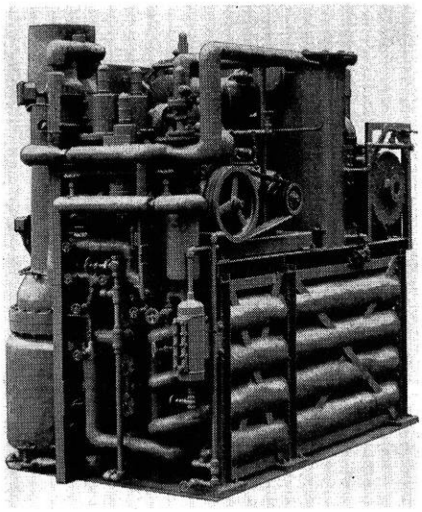
More intensive study is possible by using the instrument as a spectrophotometer. Here the sample is subjected to light of the desired wavelengths to get transmittance and density readings for interpretative analysis and the construction of transmission and/or absorption curves.

Basic components are a built-in grating monochromator; a photoemissive detector to pick up the light which passes through the sample and transmit it in the form of photo-electric current; and a printed-circuit electronic amplifying system to build up the current so it will register on the scale.

To eliminate vibration problems and insure accuracy of readings, a rigid, die-cast base is used, together with a one-piece housing.

★

AIR PURIFIER FOR ATOMIC SUBMARINE



When the Navy's atom-powered submarine, the Nautilus, is buttoned up for diving its crew must, of course, work in a non-toxic atmosphere. So a carbon dioxide removal unit, built by The Girdler Company, Louisville, Ky., is among its facilities.

When the unit is placed in operation, the air of the submarine is passed through an absorber column. There it meets a countercurrent stream of the absorbing medium, which removes the carbon dioxide. Then the absorbent is reactivated in a separate vessel and recycled. Thus, excess carbon dioxide is continuously extracted from the atmosphere.

The carbon dioxide is released from the reactivator, with some rejected steam, by the application of heat in the reboiler. Compressed, it is exhausted into the sea where it dissolves and leaves no bubbles to reveal the submarine's position. The heat of compression is recovered in the reactivator boiler before the carbon dioxide is expelled. The effect is to reduce appreciably the outside heat load needed for continuously reactivating the absorbing solution.

The Girdler-built unit has a high capacity for absorption of carbon dioxide in relation to its size and weight and the volume of absorbent employed. It is fabricated mainly of thin-wall stainless steel. The small remaining portion is of copper-nickel alloy.

★

"BIG SQUEEZE" IN OPERATION

The world's largest press for the extrusion of metal has begun squeezing out giant aircraft parts at Alcoa's Lafayette, Indiana, Works.

Two and one-half times as powerful as existing extrusion presses in this country, the 14,000-ton press will form four times the weight of aluminum previously possible in one "squeeze." Producing the same extrusion, the new giant will extrude two to four times as many pounds per hour as the largest previously existing press.

Built in Germany, the press was brought to this country by the U. S. Air Force and leased to Alcoa.

Teaming up with the giant extrusion press will be the world's largest stretcher which will exert a pull of 3,000,000 pounds. This stretcher, 180 feet long, will straighten extrusions as long as 110 feet, with the force of 38 diesel locomotives in a tug-o-war.

Together, these two pieces of machinery open up new horizons for aluminum extrusions. Large extruded shapes will someday be available for railroad, car, bus, ship, truck and trailer construction. In addition, pipe up to 20 inches in diameter can be extruded on the press for big pipelines.

★

"SANDWICH WALL" SAVES "DOUGH"

By using a new, easy-to-erect aluminum "sandwich" curtain wall, which has twice the insulation value of a 12-inch masonry wall, U. S. Air Force was able to save time, money

(Continued on page 52)

STATIC

by I. R. Drops

Sing a song of sulfides,
A beaker full of lime,
Four and twenty test tubes
Breaking all the time.
When the cork is taken out,
The fumes begin to reek.
Now isn't that an awful mess
To have five times a week?

* * *

Bachelor: A guy who is foot-loose and fiancee free.

* * *

"Mech. Eng.: I hear the Student Council is trying to stop necking.

Chem. Eng.: That so? First thing you know they'll be trying to make the students stop, too.

* * *

"Beg your pardon, but aren't you an engineering student?"

"No—it's just that I couldn't find my suspenders, my razor blades were used up, and a car ran over my hat."

* * *

A bee stinger is .03125 inch long. The other 24 inches is your imagination.

* * *

Old Navy man, leaning over rail of ship: "I see you have a weak stomach."

Seasick Oliver: "I don't know about that. I'm getting pretty fair distance with it!"

* * *

An EE stared into a mirror one morning and, noting his bloodshot eyes, resolved never to go into a bar again. "That television," he muttered, "is ruining my eyes."

Girls are like newspapers: They all have forms, they always have the last word, back numbers are not in demand, they have great influence, you can't believe everything they say, they're thinner than they used to be, they get along by advertising, and every man, should have his own and not try to borrow his neighbors.

* * *

"Watt-hour you doing there?"

"Eating currents," the apprentice said, "anode you'd catch me at it."

"Wire you insulate this morning?" asked the boss.

"Leyden bed. Wouldn't that jar you?"

"Can't your relay-shunts get you up?"

"Amperently not."

"Fuse going to do that every day you can go ohm," said the boss, and the circuit was broken right there.

* * *

Once upon a time, as the story goes, the fence between Heaven and Hell broke down. Satan appeared at his side of the broken section and called out to St. Peter; "Hey, St. Peter, since all the engineers are over on your side, how about sending a few to fix the fence?"

"Sorry," replied St. Peter, "my men are too busy to fix fences."

"Well, then," said Satan, "I'll have to sue you if you don't."

St. Peter: "Guess you win; you've all the lawyers on your side."

Men are peculiar, as women have long suspected. For instance, a man who had not kissed his wife in five years just shot a fellow who did.

* * *

Blonde: "I'm going on a hayride with a sailor, what do you think I should take?"

Friend: "Precaution."

* * *

They say that things are so dry in Arizona that even the trees are going to the dogs.

* * *

A kiss is a peculiar proposition. Useless to one, it is absolute bliss to two. A small boy gets it for nothing, a young man has to lie for it, and an old man has to buy it. The baby's right, the lover's privilege, and the hypocrite's mask. To the young girl, faith; to the married women, hope; and to an old maid, charity.

* * *

He was a rather under-sized freshman at his first college dance, but despite his smallness and bashfulness he was sure of himself in his own way. He walked over to a beautiful and over-sophisticated girl and said, "Pardon me, Miss, but may I have this dance?"

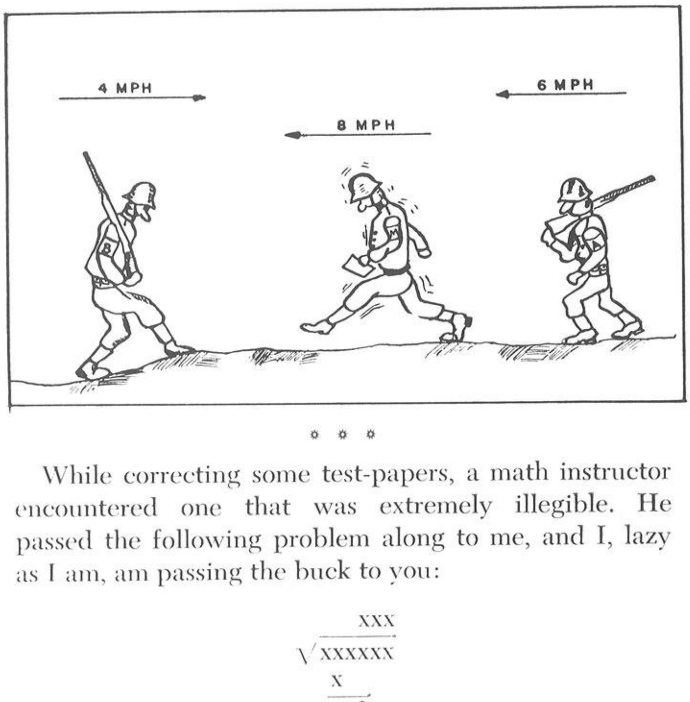
She looked down at his small size and lack of fraternity pin and said, "I'm sorry, but I never dance with a child!"

The freshman bowed deeply and said, "Oh, I'm sorry, I didn't know your condition."

So You Think You're SMART!

by Sneedly, bs'59

At R.O.T.C. camp during the last summer, the following problem was given to a number of cadets, among whom was an engineer: Two columns of infantrymen marching at uniform rates of 6 MPH (column A) and 4 MPH (column B) were approaching each other on a straight road. When they were exactly ten miles apart, a messenger started from the head of column A and ran at a rate of 8 MPH to meet column B. Upon reaching column B he turned and ran back to the head of column A; he continued to run back and forth between the columns until the two met. When asked how far the messenger had run, assuming he lost no speed in making the turns, the engineer turned to his slide-rule and algebraic ingenuity and solved the problem in two minutes. However, a few intelligent non-technical cadets reported the correct answer in less than five seconds, without the aid of calculations. Therefore, I ask, which are you—an engineer or an intelligent person? I'll give the answer next month for the other readers.



* * *

While correcting some test-papers, a math instructor encountered one that was extremely illegible. He passed the following problem along to me, and I, lazy as I am, am passing the buck to you:

```
      xxx
  √xxxxxx
    x
    xx3
    xxx
    xxxx
    xx3x
```

The x's represent numbers too illegible to be read. Fortunately this person, who, incidently, could hardly have been an engineer, was able to write 3's which *could* be read. The x's can represent any numbers—it is up to you to determine them. Answer next month, I hope.

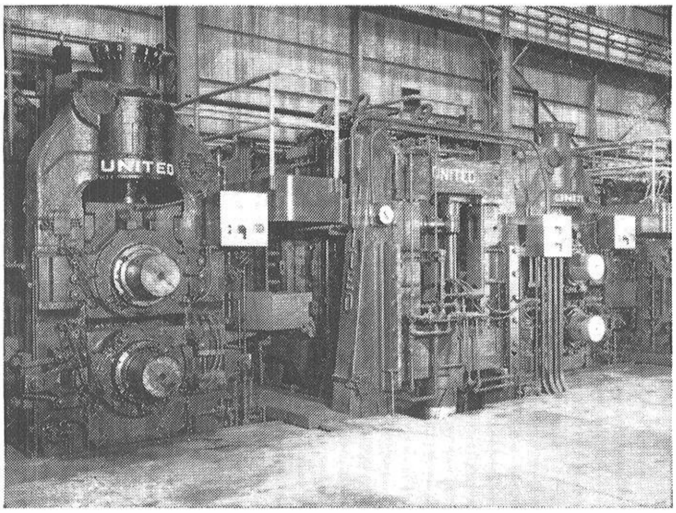
* * *

On a recent trip I encountered a seedy-looking individual who presented himself to a motel-keeper as a young mechanical engineer who had just graduated from college, but had not yet found a position (not an unlikely story, even during this era of great shortages of engineers). He had no money with which to pay for a room; however, he offered, in return for a room, a solid gold key chain which had been given him for the purpose of hanging honorary keys (I noted that the chain was noticeably devoid of keys).

After appraising the chain, which contained twenty-three links, the clerk offered the M.E. lodging for twenty-three nights. After asking for the entire chain in advance, the motel-keeper was presented with the following proposition: The distrustful engineer offered to pay for the room by breaking up the chain and paying each day. He wanted to redeem the key chain at a later date, but he did not want the keeper to have more than he was entitled to at any one time, nor did the equally distrustful motel-keeper want to be cheated by allowing any payments to be missed. Thus, the M.E. came to me, a Ch.E., to determine the fewest number of cuts necessary to divide the chain into portions of various lengths to be exchanged under the terms of the agreement. (i.e., he might pay on the twelfth night by exchanging a twelve-link portion for one of eleven links—this is obviously impossible, but it serves as an example.) On the first day he cut the chain according to my instructions, and was thus able to meet his obligations for the full twenty-three days.

Can you determine the fewest number of cuts necessary to meet the terms set forth? It is, of course, necessary to determine also the links which were cut. [Very helpful hint: he gave the motel-keeper a single link on the first day.]

Another page for **YOUR BEARING NOTEBOOK**

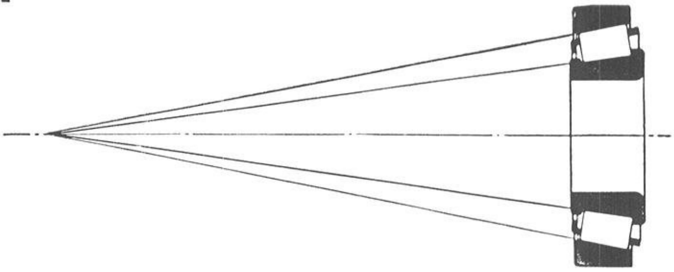


How billet mill gets extra bearing capacity in same space

Engineers who designed this 10-stand billet mill specified that the roll necks be mounted on Timken® Balanced Proportion bearings. That's because Timken Balanced Proportion bearings have load ratings up to 40% higher than same-size bearings of older designs. And they make possible a 50 to 60% increase in roll neck strength which means greater rigidity and higher rolling precision.

True rolling motion, high precision practically eliminate friction

All lines drawn coincident with the working surfaces of the rollers and races of Timken bearings meet at a common point on the bearing axis. This means Timken bearings are designed to give true rolling motion. And they are precision manufactured to live up to their design. Result: Timken bearings practically eliminate friction, save power.



TIMKEN

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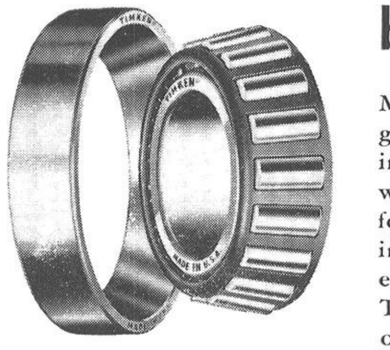
TAPERED ROLLER BEARINGS



Want to learn more about bearings or job opportunities?

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

NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Laws of Engineering

(Continued from page 27)

that if you take care of your present job well, the future will take care of itself. Success depends so largely upon personality, native ability, and vigorous, intelligent prosecution of any job that it is no exaggeration to say that your ultimate chances are much better if you do a good job on some minor detail than if you do a mediocre job as section head. Furthermore, it is also true that if you do not first make a good showing on your present job you are not likely to be given the opportunity of trying something else more to your liking.

There is always a premium upon the ability to get things done. This is a quality which may be achieved by various means under different circumstances. Specific aspects will be elaborated in some of the succeeding items. It can probably be reduced, however, to a combination of three basic characteristics, as follows:

(*a*) Energy, which is expressed in initiative to start things and aggressiveness to keep them moving briskly.

(*b*) Resourcefulness or ingenuity, i.e., the faculty for finding ways to accomplish the desired result, and

(*c*) Persistence (tenacity), which is the disposition to persevere in spite of difficulties, discouragement, or indifference.

This last quality is sometimes lacking in the make-up of brilliant engineers, to such an extent that their effectiveness is greatly reduced. Such dilettantes are known as "good starters but poor finishers." Or else it will be said of a man: "You can't take him too seriously; he'll be all steamed up over an idea today but tomorrow he will have dropped it and started chasing some other rainbow." Bear in mind, therefore, that it may be worth while finishing a job, if it has any merit, just for the sake of finishing it.

In carrying out a project do not wait for others to deliver the goods; go after them and keep everlastingly after them. This is one of the first things a new man has to learn in entering a manufacturing organization. Many novices assume that it is sufficient to place the order and sit back and wait until the goods are delivered. The fact is that most jobs move in direct proportion to the amount of follow-up and *expediting* that is applied to them. Expediting means planning, investigating, promoting, and facilitating every step in the process. Cultivate the habit of looking immediately for some way around each obstacle encountered, some other recourse or expedient to keep the job rolling without losing momentum. There are ten-to-one differences between individuals in respect to what it takes to stop their drive when they set out to get something done.

On the other hand, the matter is occasionally overdone by overzealous individuals who make themselves obnoxious and antagonize everyone by their offensive browbeating tactics. Be careful about demanding action from another department. Too much insistence and agitation may result in more damage to a man's personal interests than could ever result from the miscarriage of the technical point involved.

When sent out on any assignment stick with it and see it through to a successful finish. All too often a young engineer from the home office will leave a job half done or poorly done in order to catch a train or keep some other engagement. Wire the boss that you've got to stay over to clean up the job. Neither he nor the customer will like it if another man has to be sent out later to finish it up.

Avoid the very appearance of vacillation. One of the gravest indictments of an engineer is to say: "His opinion at any time depends merely upon the last man with whom he has talked." Refrain from stating an opinion or promoting an undertaking until you have had a reasonable opportunity to obtain and study the facts. Thereafter see it through if at all possible, unless fresh evidence makes it folly to persist. Obviously the extremes of bullheadedness and dogmatism should be avoided, but remember that reversed decisions will be held against you.

Don't be timid—speak up—express yourself and promote your ideas. Every young man should read Emerson's essay on "Self Reliance." Too many new men seem to think that their job is simply to do what they're told to do, along the lines laid down by the boss. Of course there are times when it is very wise and prudent to keep your mouth shut, but, as a rule, it pays to express your point of view whenever you can contribute something.

It frequently happens in any sort of undertaking that nobody is sure of just how the matter ought to be handled; it's a question of selecting some kind of program with a reasonable chance of success. This is commonly to be observed in engineering-office conferences. The first man to speak up with a definite and plausible proposal has better than an even chance of carrying the floor, provided only that the scheme is definite and plausible. (The "best" scheme usually cannot be recognized as such in advance.) It also happens that the man who talks most knowingly and confidently about the matter will very often end up with the assignment to carry out the project. If you do not want the job, keep your mouth shut and you'll be overlooked, but you'll also be overlooked when it comes time to assign larger responsibilities.

Be extremely careful of the accuracy of your statement. This seems almost trite, and yet many engineers lose the confidence of their superiors and associates by habitually guessing when they do not know the answer to a direct question. It is certainly important to be able to answer questions concerning your responsibilities, but a wrong answer is worse than no answer. If you do not know, say so, but also say, "I'll find out right away." If you are not certain, indicate the exact degree of certainty or approximation upon which your answer is based. A reputation for dependability and reliability can be one of your most valuable assets.

(Continued on page 50)

Laws of Engineering

(Continued from page 48)

This applies, of course, to written matter, calculations, etc., as well as to oral reports. It is definitely bad business to submit a report to the boss for approval without first carefully checking it yourself, and yet formal reports are sometimes turned in full of glaring errors and omissions.

In Relation to the Boss

Do not overlook the fact that you're working for your boss. This sounds simple enough, but some engineers never get it. By all means, you're working for society, the company, the department, your family, and yourself, but primarily you should be working for and through your boss. And your boss is your immediate superior, to whom you report directly. As a rule, you can serve all other ends to best advantage by working for him, assuming that he's approximately the man he ought to be. It is not uncommon for young engineers, in their impatient zeal to get things done, to ignore the boss, or attempt to go over or around him. Sometimes they move a little faster that way, for a while, but sooner or later they find that such tactics cannot be tolerated in a large organization. Generally speaking, you cannot get by the boss; he determines your rating and he rates you on your ability to co-operate, among other things. Besides, most of us get more satisfaction out of our jobs when we're able to give the boss our personal loyalty, with the feeling that we're helping him to get the main job done.

Be as particular as you can in the selection of your boss. In its effect upon your engineering career, this is second in importance only to the selection of proper parents. In most engineering organizations the influence of the senior engineer, or even the section head, is a major factor in molding the professional character of younger engineers. Long before the days of universities and textbooks, master craftsmen in all the arts absorbed their skills by apprenticeship to master craftsmen. It is very much as in the game of golf; a beginner who constantly plays in company with "dubs" is very apt to remain a "dub" himself, no matter how faithfully he studies the rules, whereas even a few rounds with a "pro" will usually improve a novice's game.

But, of course, it is not always possible to choose your boss advisedly. What if he turns out to be somewhat less than half the man he ought to be? There are only two proper alternatives open to you; *(a)* accept him as the representative of a higher authority and execute his policies and directives as effectively as possible, or *(b)* transfer to some other outfit at the first opportunity. A great deal of mischief can be done to the interests of all concerned (including the company) if some other alternative is elected, particularly in the case of younger men. Consider the damage to the efficiency of a military unit when the privates, disliking the leader, ignore or modify orders to suit their individual notions! To be sure, a business organization is not a military machine, but it is not a mob, either.

One of the first things you owe your boss is to keep him informed of all significant developments. An executive must know what's going on. The main question is: How much must he know—how many of the details? This is always a difficult matter for the new man to get straight. Many novices hesitate to bother the boss with too many reports, and it is certainly true that it can be overdone in this direction, but in by far the majority of cases the executive's problem is to extract enough information to keep adequately posted. For every time he has to say, "Don't bother me with so many details," there will be three times he will say, "Why doesn't someone tell me these things?" Bear in mind that he is constantly called upon to account for, defend, and explain your activities to the "higher-ups," as well as to co-ordinate these activities into a larger plan. In a nutshell, the rule is therefore to give him promptly all the information he needs for these two purposes.

Whatever the boss wants done takes top priority. You may think you have more important things to do first, but unless you obtain permission it is usually unwise to put any other project ahead of a specific assignment from your own boss. As a rule, he has good reasons for wanting his job done *now*, and it is apt to have a great deal more bearing upon your rating than less conspicuous projects which may appear more urgent.

Also, make a note of this: If you are instructed to do something and you subsequently decide it isn't worth doing (in view of new data or events) do not just let it die, but inform the boss of your intentions and reasons. Neglect of this point has caused trouble on more than one occasion.

Do not be too anxious to follow the boss's lead. This is the other side of the matter covered by the preceding rule. An undue subservience or deference to the department head's wishes is fairly common among young engineers. A man with this kind of psychology may:

1. Plague the boss incessantly for minute directions and approvals.
2. Surrender all initiative and depend upon the boss to do all of his basic thinking for him.
3. Persist in carrying through a design or a program even after new evidence has proved the original plan to be wrong.

This is where an engineering organization differs from an army. In general, the program laid down by the department or section head is tentative, rather than sacred, and is intended to serve only until a better program is proposed and approved.

The rule therefore is to tell your boss what you have done, at reasonable intervals, and ask his approval of any well-considered and properly planned deviations or new projects that you may have conceived.

[The second of these articles will appear in the next issue of the *Wisconsin Engineer*.]

Science Highlights

(Continued from page 44)

and future maintenance costs on the Heavy Press Plant now being built adjacent to the Cleveland Works of Alcoa.

A total of 157,711 square feet of the new cost-saving siding has been used on the big plant, first to use this type of construction. The curtain wall sandwich is fabricated from two "slices" of corrugated aluminum sheet between which is a one-inch thick layer of glass fiber insulation. The "U" value of the wall, a factor by which insulating qualities of a wall are expressed, was recently established by college laboratory tests to be 1.55, which represents twice that of a 12-inch brick wall.

The aluminum sandwich wall was easily constructed right on the job. First, one layer of .024-inch thick Alcoa corrugated aluminum siding was applied directly with self-tapping screws to the siding girts of the structural steel framework. The fiber glass insulation was then temporarily fastened to the sheet. In the last step, the outer layer of .032-inch thick sheet was secured to the structure with self-tapping screws that also permanently hold the insulation in place.

Aluminum was selected for the building through competitive bidding as the most economical for sandwich wall construction. Average bid for erection of an aluminum sandwich wall from six contractors was $1.11 per square foot. Average bid for painted galvanized steel wall was $1.45 per square foot; for an asbestos wall, $1.32 per square foot.

Two giant forging presses—one of 35,000 tons and one of 50,000 tons—will be housed in the plant.

END

Engine Ears

(Continued from page 30)

ing Engineers' Week all students who have grown beards register, and from among this group several more winners are chosen at the Dance. Prizes are awarded for the longest, puniest, fullest, and for other beard types.

Sometimes events occur during Engineers' Week which are unplanned—and occasionally even uncalled for. Last year, for instance, a resounding roar came from the Camp Randall Civil War Memorial site late one night. Three windows in the nearby fire house were shattered by the concussion from the blast of the old cannon atop the hill.

Polygon is also planning a program to explain the activities of the student engineering societies to the freshmen in their Freshman Lectures course.

Officers for this fall are:

President........James P. McNaul
Secretary........D. Harvey Ulrich
Treasurer...........John W. Pugh

LINCOLN AWARDS

This year, as for the past seven, the Lincoln Arc Welding Awards will be offered to students writing the best papers showing uses of welding processes in both the Structural and Mechanical fields.

The contest, which last year awarded prizes totaling $6,700, has been well received here at Wisconsin. Last year Wisconsin students won more prizes in the mechanical divisions than did any other school. Those interested in entering the contest are invited to see Professor Adkins about contest rules.

Winners from Wisconsin are:

Frank Kehrberg, "Design of a Welded Vise," $50.

William Chancellor, "Design and Construction of a Pickup Windrowel," $50.

Gordon Ullenberg, "Design of Welded Worm-Gear Reducer," $50.

Carl A. Schauer and Joe G. Murray, "Rotary Jig Design for Production Welding," $25.

END

W.S.P.E.

(Continued from page 37)

exactly is extremely important. And don't use your pyrene extinguisher to clean clothes or kill insects—empty extinguishers are worse than useless."

The chapter met Nov. 4 at Kaukauna, and a Ladies' Night meeting is being planned for Dec. 2 at Green Bay.

WISCONSIN VALLEY CHAPTER
JESS HOLDERBY
Reporter

The Wisconsin Valley Chapter of the WSPE combined their meeting on Sept. 19 with the Cranberry Jamboree at Wisconsin Rapids. The meeting was held at the Bulls Eye Country Club. John R. Frederick, Publication Committee chairman, addressed the meeting concerning chapter news and other news of interest about engineers. The WISCONSIN ENGINEER will again carry the WSPE's news. After the banquet, which was attended by members and their wives, a color movie about the new dirt moving machinery in the construction of a dam in British Columbia was shown. The next meeting of the chapter will be in Rhinelander Dec. 11 at which time new officers will be elected.

WESTERN CHAPTER
D. W. GRUNDITZ
Reporter

M. B. Monsen, Superintendent of Inspection and Safety for the Northern States Power Co. (Wis.), was the speaker for the opening fall meeting of Western Chapter, Wisconsin SPE Tuesday evening, September 21, at the Linker Hotel, La Crosse. The theme of "Safety" was dramatically presented with an ample supply of ingenious props demonstrating the necessity for safety devices, training, and consciousness, the realization of calculated risks, and the suddenness of accident occurrence.

R. G. Miner, Jr. was the first recipient of an NSPE lapel pin in the current two-year program of providing recognition of new members. A resolution authorizing the award was passed earlier in the evening. The chapter hopes that this will help in meeting its quota of 20 new members for the year ending next June 30. F. L. Carlson, WSPE membership chairman, set his home chapter quota high enough to give the other chapters a chance at the quota title after Western's 140 per cent title-winning results last year. Since about 70 per cent of the P. E.'s in the chapter area are members and there are only 13 known P. E. nonmembers and less than a handful of EIT's, the chapter has both a membership and registration promotion task to accomplish in order to meet the 20 member quota.

END

ALUMNI NOTES

by Dick Paske, ee'56

Warren E. Racine, B.S. Civil '51, structural engineer of Milwaukee, Wisconsin, has been appointed manager of the Chicago regional office of Timber Engineering Company, wood industry service organization affiliated with the National Lumber Manufacturers Association. Mr. Racine will provide architects, engineers and builders, in the area, with technical data on the Teco system of engineered timber construction for light and heavy structures.

•

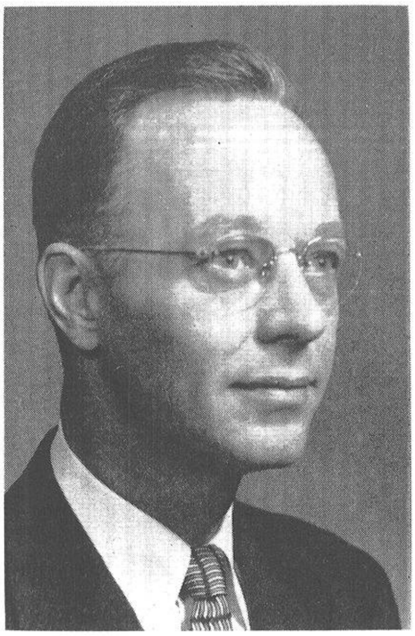
Election of **LeRoy A. Petersen,** President of Otis Elevator Company, as a Director of the Commerce and Industry Association of New York, Inc., was announced today by Thomas Jefferson Miley, Executive Vice President of the Association.

Mr. Petersen, who joined Otis Elevator after graduating from the University of Wisconsin and subsequent service as an Army officer in World War I, rose from the ranks to become President in 1945. He also is Chairman of the Board of Otis Elevator Company Limited, Canada.

In addition, he is a Director of Irving Trust Company, American Locomotive Company and the Metropolitan Life Insurance Company, among others; a Trustee of Consolidated Edison Company of New York, Inc., and a member of the Executive Committee of Employers' Liability Assurance Corporation Limited.

A native of Amery, Wisconsin, Mr. Petersen's home is in West Brother Drive, Greenwich, Connecticut.

Sylvester K. Guth, head of Lighting Research for General Electric Lamp Division, Nela Park, Cleveland, accepted an invitation from Iceland to assist in founding an "Icelandic Lighting Society." He has been in Reykjavik, the capital of Iceland, from October 17



DR. SYLVESTER K. GUTH

through October 29. Dr. Guth attributes Iceland's great interest in artificial lighting, not to its lack of daylight, for nine months of the year, but to the fact that Icelanders, like Americans, spend much of their lives indoors where eyes are called upon to perform a variety of difficult tasks.

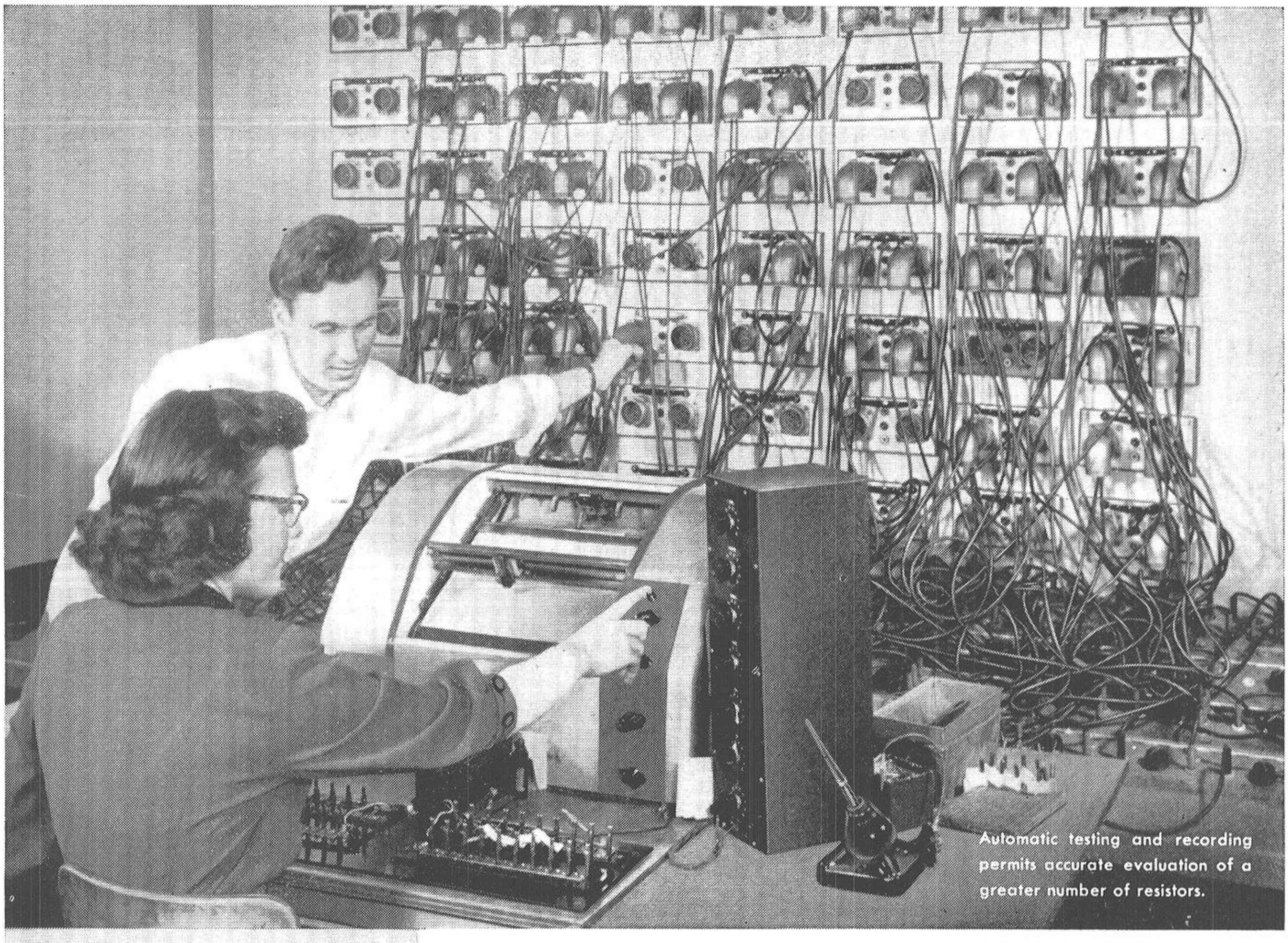
Dr. Guth joined G. E. at Nela Park in 1930. He received the honorary degree of Doctor of Ocular Science in January of 1953. Three years ago, he served as an American delegate to the meeting of the Commission Internationale D'Eclairage in Stockholm, Sweden.

Dr. Thomas J. Higgens, professor of electrical engineering was recently presented the Westinghouse Award of $1,000 for Outstanding Teaching, one of the nation's highest honors for men in the field of engineering education. Prof. Higgins joined the UW College of Engineering staff in 1948. He is a graduate of Cornell University and earned his Ph.D. degree at Purdue University. Prof. Higgens is recognized nationally for his unusual teaching ability; he has had more than 90 technical papers published in his field of analytical and experimental research in electrical engineering, and at Wisconsin he has expanded the research by graduate students in this field.

•

Three Wisconsin engineers were recently elevated to the grade of Fellow in the American Society of Mechanical Engineers. This award is given by ASME for significant contributions by members to the engineering profession, and has been conferred on fewer than 400 of the Society's total membership of 38,000. Receiving the honors were **Curt G. Joa,** president of Curt G. Joa, Inc., Sheboygan Falls, Wisconsin; **Walter C. Lindemann,** consulting engineer with A. J. Lindemann and Hoverson Co., Milwaukee, Wisconsin; and **James F. Roberts,** vice-president and director of engineering of the General Machinery Division, Allis Chalmers Manufacturing Company, Milwaukee, Wisconsin. Lindemann and Roberts are Mechanical Engineering graduates of the University of Wisconsin.

(Continued on page 56)



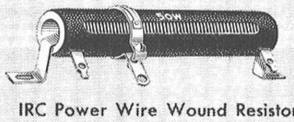
Automatic testing and recording permits accurate evaluation of a greater number of resistors.

BASIC REQUIREMENTS

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

SPECIFIC EXAMPLES

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



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

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

Sealed Precision Voltmeter Multipliers
JAN-R-29 Specification

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

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Alumni Notes

(Continued from page 54)

Robert G. Mattens, CLE'34, has been promoted to assistant director of research at the Allis Chalmers Manufacturing Company. He joined the firm in '34, and worked as a metallurgist from 1935 to 1945. He then became assistant supervisor of the chemical and metallurgical labs, and has acted as research supervisor since 1950.

Aubrey J. Wagner, . . . , has been named general manager of the Tennessee Valley Authority. Formerly an instructor here at the University, Wagner was hired by TVA in 1934 as an engineering aide. Prior to his promotion, he had been assistant general manager.

Gordon F. Focker, M.S. MinE '54, is enrolled at Pennsylvania State College as a candidate for the PhD degree.

B. L. Palsten, B.S. MinE'54, is a trainee at Shell Oil Company, Houston, Texas.

J. F. Menke, B.S. MinE'54, is with the Industrial Rubber Division at the B. F. Goodrich Company.

J. G. Menke, B.S. MinE'54, is employed as an engineer with Iron Mining Company, Virginia, Minnesota.

J. L. Wuhrman, B.S. MetE'54, is a metallurgist with Anipco Metals, Inc., Milwaukee, Wisconsin.

J. H. Walter, B.S. MetE'54, is a graduate student at the University of Wisconsin, where he holds a research assistantship.

R. W. Sievert, B.S., MetE'54, is a metallurgist with the Sunbeam Electric Company, Chicago, Ill.

W. H. Miller, B.S., MetE'54, is serving in the U. S. Army.

Robert F. Conare, B.S., MetE '54, is serving with the U. S. Air Force in Japan.

Jack C. Bakuos, B.S. MetE'54, is a research assistant, doing graduate work at the University of Wisconsin.

Professor Baldwin Retires

Leo S. Baldwin, chairman of the department of engineering drawing and descriptive geometry at the Milwaukee Extension Division, will retire this June after 35 years' service on the University of Wisconsin faculty.

Beginning with the fall semester of 1919, Baldwin organized and taught an art lettering course on the Madison campus for nine years. He joined the Milwaukee Division in 1928—the year the division's first permanent building was constructed.

Prof. Baldwin was born in Freeport, Ill. As a young man he worked for the Illinois Central Railroad where he learned the machinist and draftsman trades. At the suggestion of the railroad's divisional superintendent—who later became Illinois Central president—he enrolled in Whipple Academy, Jacksonville, Ill., to begin his high school education at the age of 25.

Three and one-half years later, Baldwin entered Illinois College and afterwards transferred to the University of Illinois. He financed his education with his drawings, and by working for the University's Materials Testing Laboratory. When he graduated in 1916, he had accumulated 204 credits and received two degrees at the same Commencement, a bachelor of science degree in drawing and a bachelor of arts degree in mathematics.

Baldwin remained at Illinois as an instructor of drawing and descriptive geometry until the outbreak of World War I, when he was named an honorary captain in the National Guard to instruct pilots in air markmanship at the Illinois Ground School.

Coming to Madison in 1919, Baldwin organized and taught a course in art lettering. In 1925 he wrote an art lettering correspondence course which is still offered by the Extension Division.

In 1928 Prof. Baldwin began teaching at the Milwaukee Division; and at the start of the spring semester, 1929, he joined the Milwaukee faculty permanently as chairman of the department of engineering drawing and descriptive geometry.

From 1942–46, Prof. Baldwin assumed additional duties as acting chairman of the engineering department. He supervised the expansion of both departments to meet the tide of veterans returning to college.

In addition to his academic duties, Prof. Baldwin has completed considerable research into problems of industrial X-ray design.

Concerning his long career as a teacher in Milwaukee, Baldwin said:

"I have enjoyed my work here tremendously. My colleagues in the department and my many friends have been a constant source of satisfaction. One advantage of living in a large city is that I frequently meet my former students."

At one time, some 20 of his former students were vice presidents of Milwaukee business concerns.

On retirement, Prof. Baldwin will reside with his wife, the former Beulah Lidey, in her home town, Effingham, Ill. There he hopes to devote time to his hobbies of hunting, fishing, hiking, motoring, high fidelity sound reproduction, and fine music.

Prof. Baldwin will be missed at the Milwaukee Division. As one of his colleagues, Prof. Webster M. Christman, commented:

"His leadership has been inspiring. He has confidence in the people under him and always has been considerate in his suggestions and criticism. It has been a pleasure to work in his department." **END**


FIRST
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Industrial Engineering

(Continued from page 19)

listed IE were formerly ME. This was done with the idea that once they were adopted into a program they would be taught from an Industrial Engineering point of view. Prerequisite and concurrence requirements have been taken into account and the final program has been checked and evaluated by faculty members and agencies of the University. The elective courses have been set up with the view of specialization in one phase, if so desired.

Completion of the curriculum will then result in the degree of Bachelor of Science in Industrial Engineering.

Purposes of the Curriculum

The objectives of the curriculum are twofold:

1. To give the student sufficient knowledge and background in industrial engineering to qualify him for subordinate positions;
2. To afford broad training in the management aspects to equip the student for future responsibilities in production management and administration.

PROPOSED INDUSTRIAL ENGINEERING CURRICULUM

First Year

	credit
Math 51—Elementary Analysis	5
Chem 2a—General Chemistry	4
English 1a—Composition	3
Draw. 12—Engineering Drawing	3
Speech 9—Extempore Speaking	3
Military	0
Physical Education	0
	18
Math 52—Elementary Analysis	5
Chem 2b—Qualitative Analysis	4
English 1b—Composition	3
Draw. 23—Descriptive Geometry	3
ME 25—Gen. Machine Practice	3
Military	0
Physical Education	0
	18

Second Year

	credit
Math 102a—Differential Calculus	4
Physics 51—General Physics	5
Mech 1—Statics	3
IE 23—Manufact. Equip. and Mater.	3
Econ 1a—Economics	3
Military	0
	18
Math 102b—Integral Calculus	4
Physics 52—General Physics	5
Mech 2—Dynamics	3
IE 41—Mechanism	3
Psych 3—Psychology for Engineers	3
Military	0
	18

Third Year

IE 12—Principles of Ind. Eng.	3
Mech 3—Mechanics of Materials	4
Mech 53—Materials of Construct.	2
IE 53—Machine Design	3
IE 52—Machine Design Lab.	2
Electives	3
	18
IE 13—Eng. & Manuf. Cost Analysis	3
IE 64—Thermodynamics	3
IE 127—Production Processes	3
IE 44—Advanced Machine Design	3
IE 99—Technical Writing	3
Electives	3
	18

Fourth Year

IE 126—Tool Engineering	3
IE 116—Motion and Time Study	3
Comm 134—Industrial Statistics	3
IE 120—Material Handling & Cont.	3
IE 115—Industrial Plant Design	3
Electives	3
	18
IE 103—Economic Selection	3
Comm 171—Personnel Management	3
IE 117—Product. Plan. and Control	3
IE 121—Indust. Engin. Practice	3
Seminar in Industrial Engineering	2
Industrial Engineering Trip	1
Electives	3
	18

Elective Courses

ME 61—Heat Power	3
ME 162—Refrigeration	3
ME 168—Heating and Ventilation	3
ME 169—Internal Combustion Eng.	3
Comm 112—Marketing Methods	3
Comm 119—Industrial Marketing	3
Comm 123—Labor Problems	3
IE 151, 152, 153—Adv. IE Projects	1–3
IE 180—Adv. Independent Study	*
Draw. 24—Adv. Engineering Draw.	2
Psych. 115—Industrial Psychol.	3
Psych. 116—Adv. Indust. Psych.	3
Psych. 129—Personnel Psychol.	3

* Determined by staff.

END

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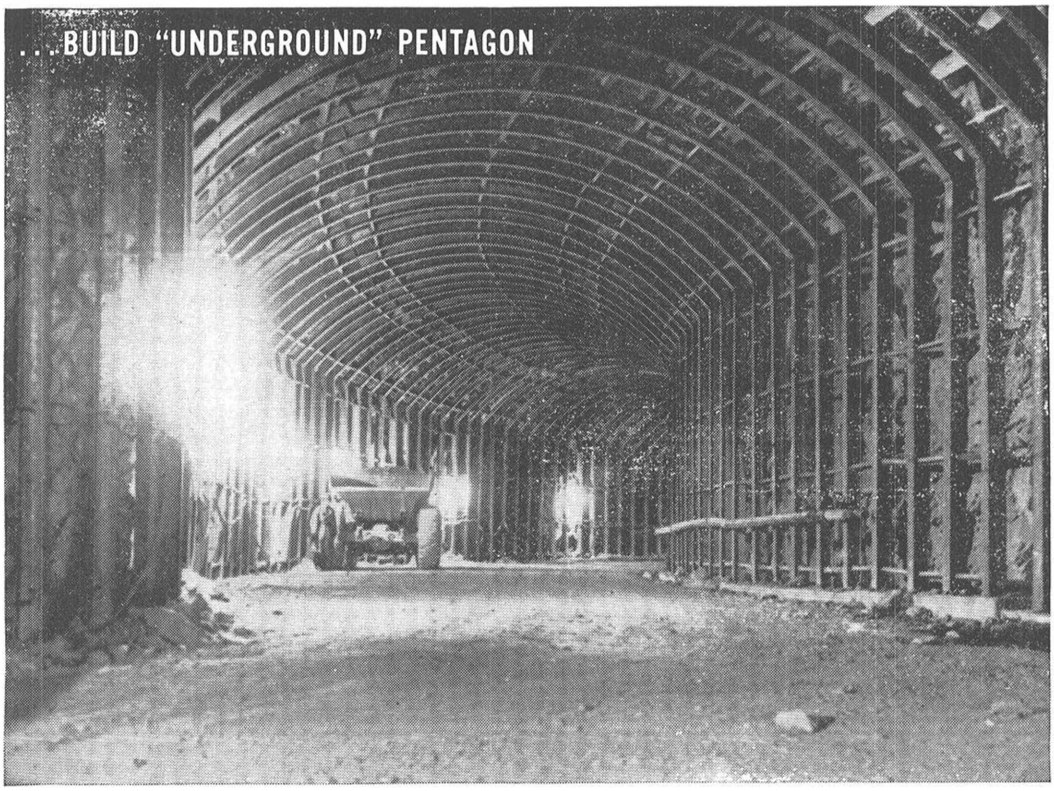
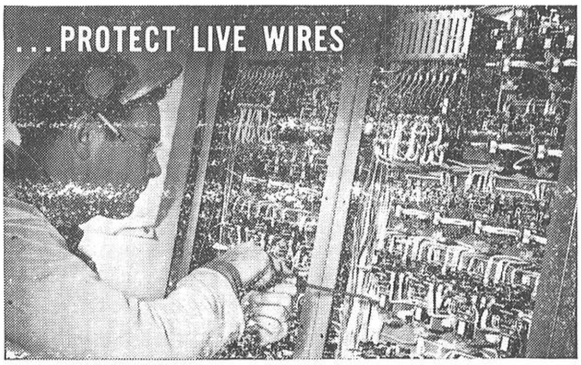


MUSCLE FOR MOUNTAIN MOVERS— More than 1,000,000 lbs. of Hercules® dynamite were used by S. A. Healy Co., Chicago, to hollow out a mountain near Washington, D. C., in the construction of an alternate global communications center for use in case present Army, Navy, and Air Force facilities are knocked out by enemy attack. The task of carving this top-secret headquarters out of solid rock would have been impossible without industrial explosives and excavating know-how.

Most businesses are helped today by Hercules' business . . . the production of synthetic resins, cellulose products, chemical cotton, terpene chemicals, rosin and rosin derivatives, chlorinated products, and many other chemical processing materials—as well as explosives. Through close cooperative research with its customers, Hercules has helped improve the processing or performance of many industrial and consumer products.



SHORT CIRCUITS STYMIED— Complicated electrical installations give longer, more dependable service when vinyl wire insulation is made with Hercules Hercoflex® 150. Hercoflex 150 is one of the Hercules family of vinyl plasticizers that are used in products ranging from toys to garden hose.

EASY TO HANDLE — These kitchen utensils not only make a woman's job easier, but their brightly colored handles add a decorative touch as well. The handles are molded with Hercules Hercocel® cellulose acetate. In sales, design, and production, Hercules' services to the plastics industry keep products on the move.

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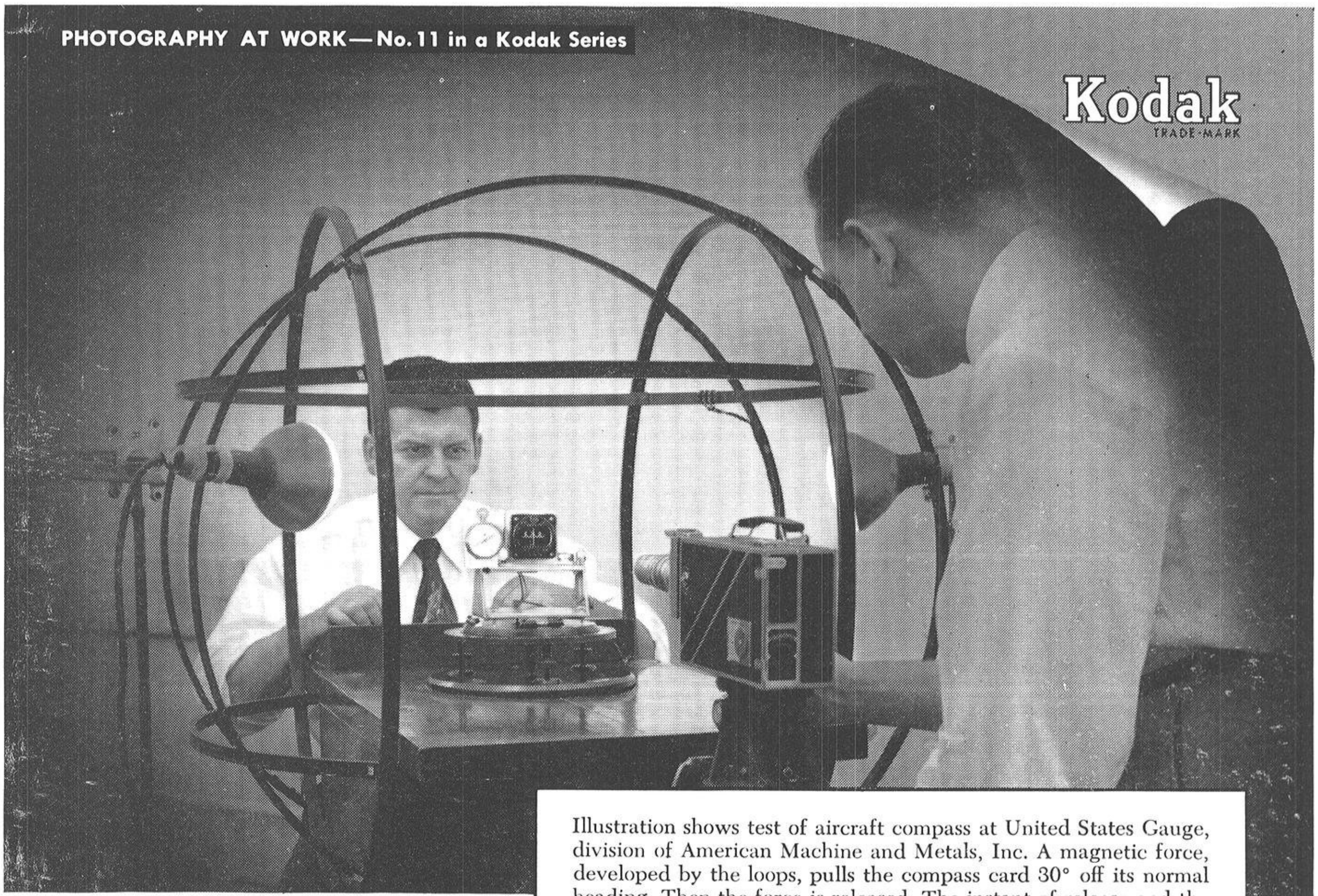

Illustration shows test of aircraft compass at United States Gauge, division of American Machine and Metals, Inc. A magnetic force, developed by the loops, pulls the compass card 30° off its normal heading. Then the force is released. The instant of release and the moment the compass recovers by 5° are both recorded on the film—become positive evidence of proper performance.

Wanted: an inspector with a split-second eye *—photography got the job*

A difference of 2/10ths of a second means the compass passes or fails. So the maker pits it against a stop watch—gets definite proof of performance with movies.

Uncle Sam said this aircraft compass must respond by 5 degrees in not less than 1 second or more than 1.2 seconds. That's only 2/10ths of a second leeway—far too little for human hands and eyes to catch the action accurately.

So, side-by-side, the stop watch and compass act their parts before the movie camera. Then individual frames along the film show the precise instant that the 5-degree mark is reached.

Product testing and quality control are naturals for photography. They are typical examples of the many ways photography works for businesses, large and small. It is improving production, saving time, reducing error, cutting costs.

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

Eastman Kodak Company, Rochester 4, N. Y.