The Wisconsin engineer. Volume 57, Number 1 October 1952

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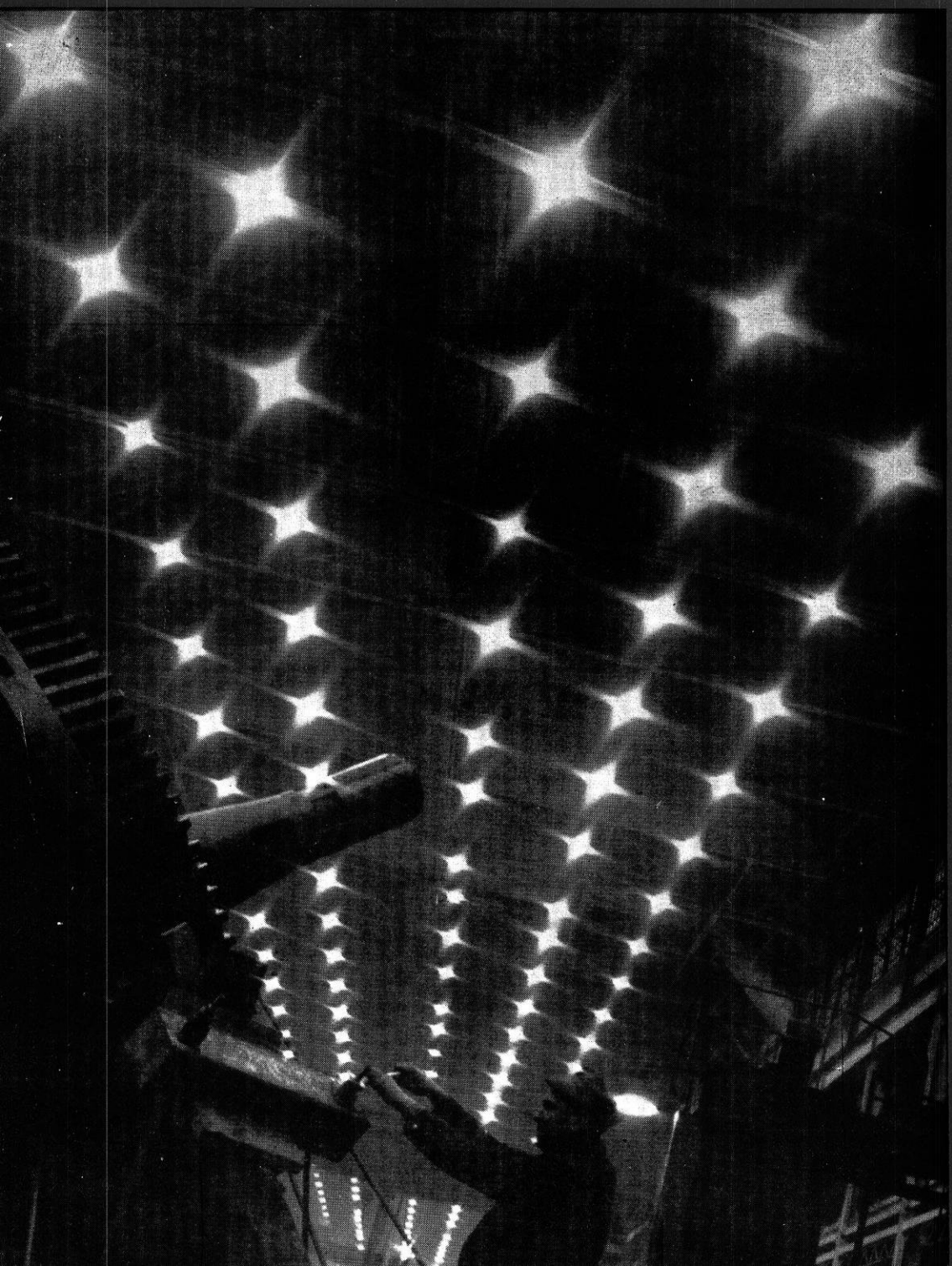
The Wisconsin

engineer

October, 1952



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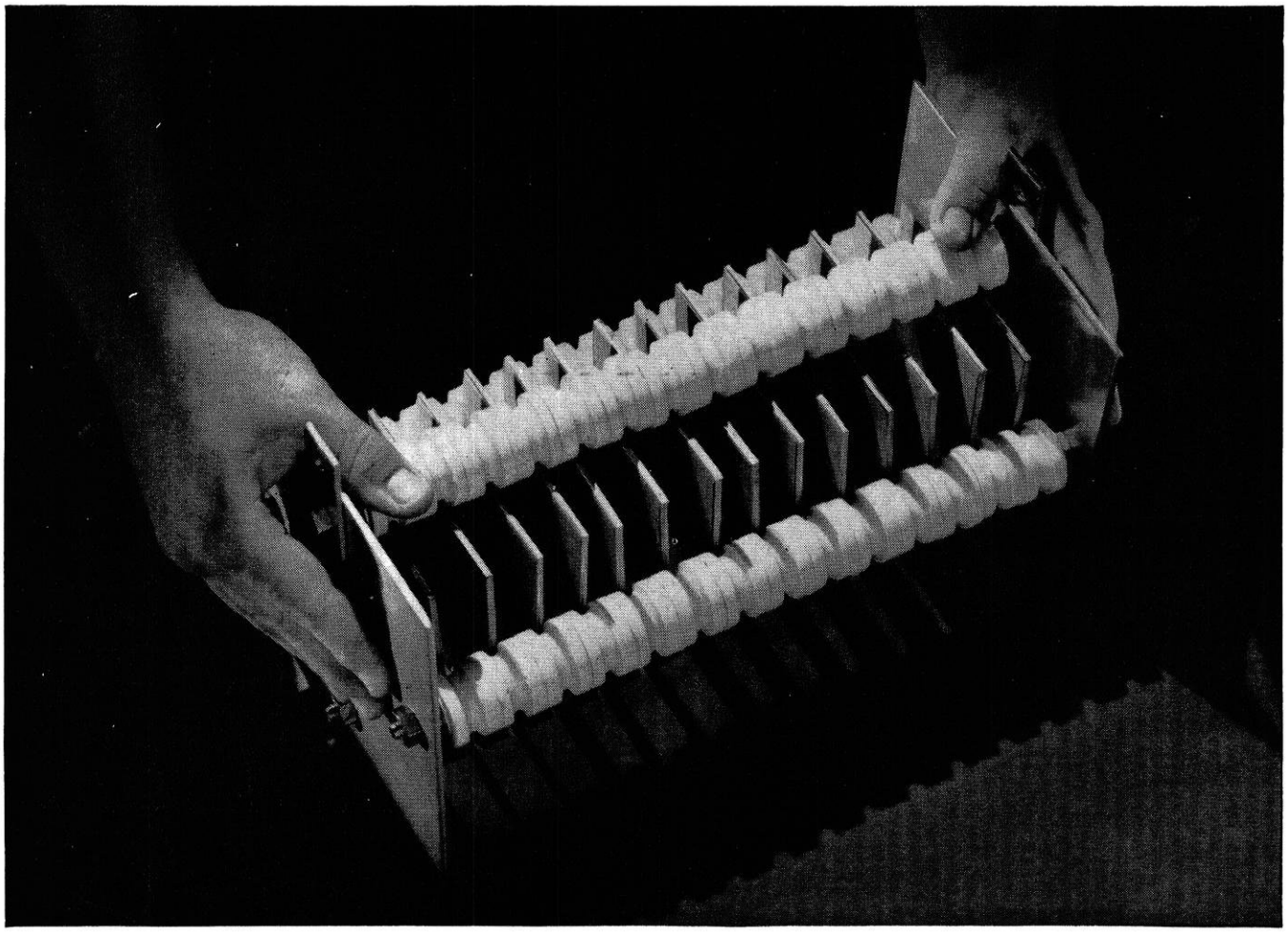


Steel guinea pig about to have a breakdown

● We've come a long way toward licking the No. 1 enemy of steel—*corrosion.*

At United States Steel, for example, we've learned a lot through exposure tests, equipment service trials, accelerated laboratory tests, and the like. But there's just one way to be sure which grade of steel will give the longest service per dollar of cost on any given job: *try it under actual operating conditions.*

That's where the steel "guinea pigs" come in. Those expendable corrosion test racks are made up from a dozen or more different grades of steel separated by porcelain insulators that prevent galvanic action. We actually put the "guinea pigs" right into the operating equipment that contains corrosive liquids or gases. Then, when the steel specimens have been exposed to the service conditions for predetermined periods of time, we remove the guinea pigs, send them to the laboratory and determine the most economical steel for that particular service. To our way of thinking, this is the most accurate way to decide what grade of steel is the best buy for a particular installation.

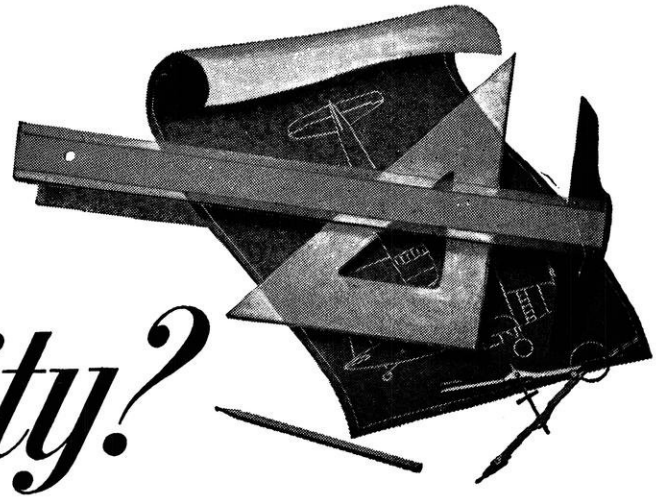
Actual on-the-job corrosion tests like these have saved many thousands of dollars for refineries, textile and paper mills, food processing plants and other manufacturers to whom corrosion is an expensive headache. For these users, the cost of steel replacement has been lowered; and our customers have had fewer hours of lost production time due to corrosive failure.

This guinea pig test is typical of the many and varied research projects sponsored by United States Steel. Trained metallurgists in the field and in dozens of research laboratories are working to develop new steel compositions, and to solve problems involving the more efficient use of steel. United States Steel Company, 525 William Penn Place, Pittsburgh 30, Pa.

USS TRADE MARK

UNITED STATES STEEL

Where will you find *A Broader Opportunity?*



IF you are looking for one of the better jobs in engineering, you certainly will want one that offers the widest scope for your talents. You will find it at Goodyear Aircraft—America's only producer of both heavier- and lighter-than-air craft, along with a wide range of aviation equipment.

You can measure your opportunity by facts like these:

Goodyear has been a pioneer in many of these fields for more than forty years.

Goodyear introduced the first airplane tire in 1910, as well as many of the landing gear improvements in use today, including Single and Multiple Disc Brakes and Cross-Wind Landing Wheels.

Goodyear was the first American manufacturer to employ Duralumin in the construction of aircraft and developed many of the processes now used in shaping and forming metal structures.

Goodyear Aircraft Corporation today is producing airships as well as numerous components for many other aircraft, including electronic and radar devices.

Thus whatever your field of engineering, you will find an opportunity for advancement at Goodyear—in one of America's largest companies that has been expanding steadily through peace and war since the earliest days of aviation and will continue to do so.

Why not investigate today?

LOOK NOW

at the opportunities for you in research, design, development and production of:

AIRPLANES ★ AIRSHIPS ★ HELICOPTERS ★ GUIDED MISSILES ★ AIRCRAFT COMPONENTS ★ ELECTRONIC COMPUTERS ★ GUIDANCE SYSTEMS ★ TRANSPARENT ENCLOSURES ★ REINFORCED PLASTICS ★ RADOMES ★ BONDED SANDWICH STRUCTURES ★ WHEELS AND BRAKES ★ RADAR STRUCTURES and many others.

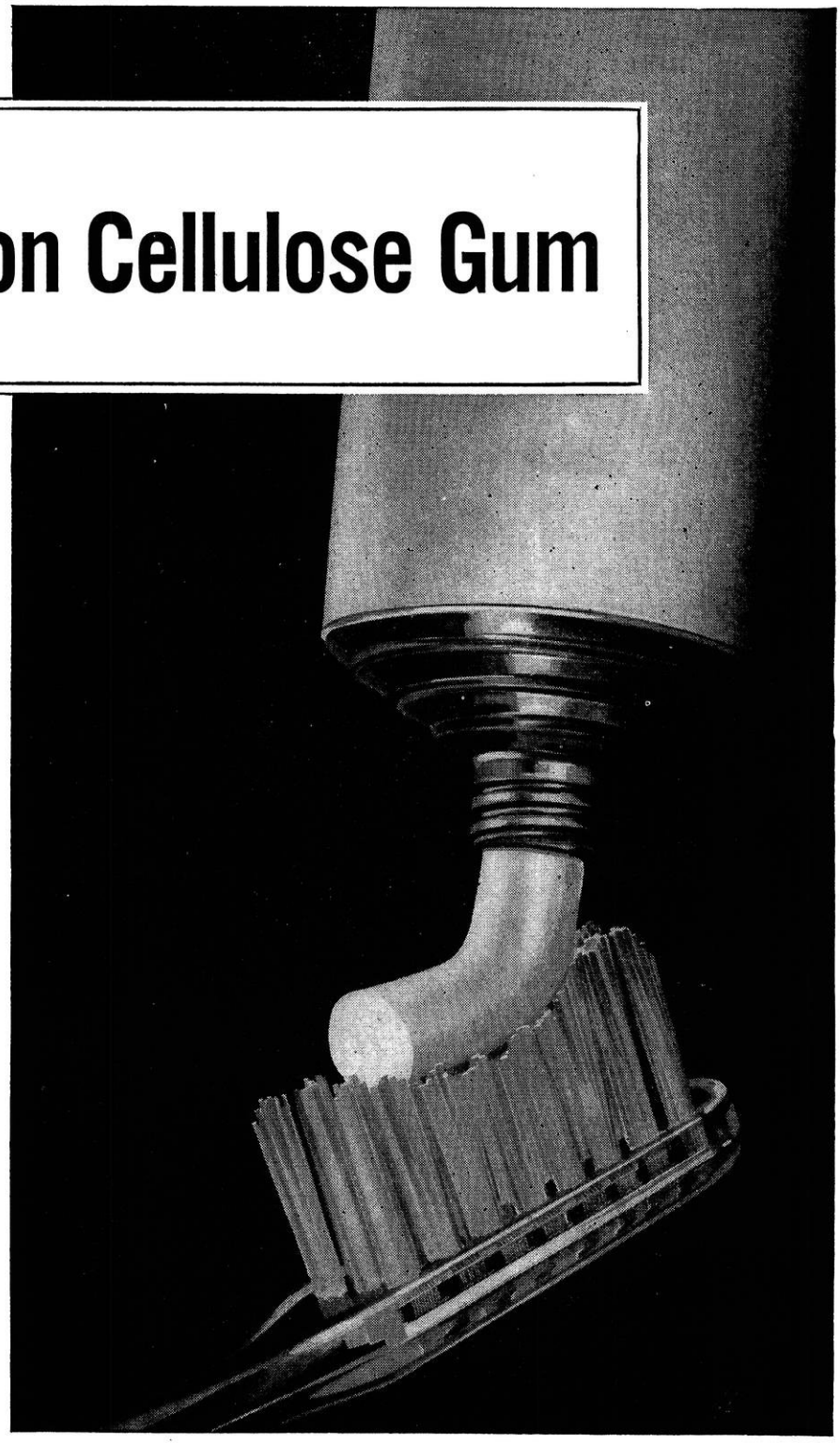
★ ★ ★

Submit a brief resumé of your experience and qualifications, or write us for an application blank and further information.

Prompt consideration is assured. Address Salary Personnel Department, Goodyear Aircraft Corporation, Akron 15, Ohio.

GOODYEAR AIRCRAFT

Brush Up on Cellulose Gum



PROBLEM . . .

. . . to discover a domestic material for blending the many ingredients of modern-day toothpastes, shampoos, lotions, and other cosmetic preparations.

SOLUTION . . .

. . . cellulose gum—pioneered by Hercules. Added in very small quantities by manufacturers to their formulations, cellulose gum simplifies production.

COLLEGE MEN . . .

This is but one example of the far-reaching chemical developments in which you could participate at Hercules — in research, production, sales, or staff operations. It suggests the ways Hercules' products serve an ever-broadening range of industries and end-uses.

Hercules' business is solving problems by chemistry for industry . . .

. . . detergents, rubber, insecticides, adhesives, plastics, paint, varnish, lacquer, textiles, paper, soaps, to name a few, use Hercules® synthetic resins, cellulose products, chemical cotton, terpene chemicals, rosin and rosin derivatives, chlorinated products and other chemical processing materials. Hercules® explosives serve mining, quarrying, construction, seismograph projects everywhere.

HERCULES

HERCULES POWDER COMPANY (INCORPORATED) *Wilmington 99, Delaware*
Sales Offices in Principal Cities

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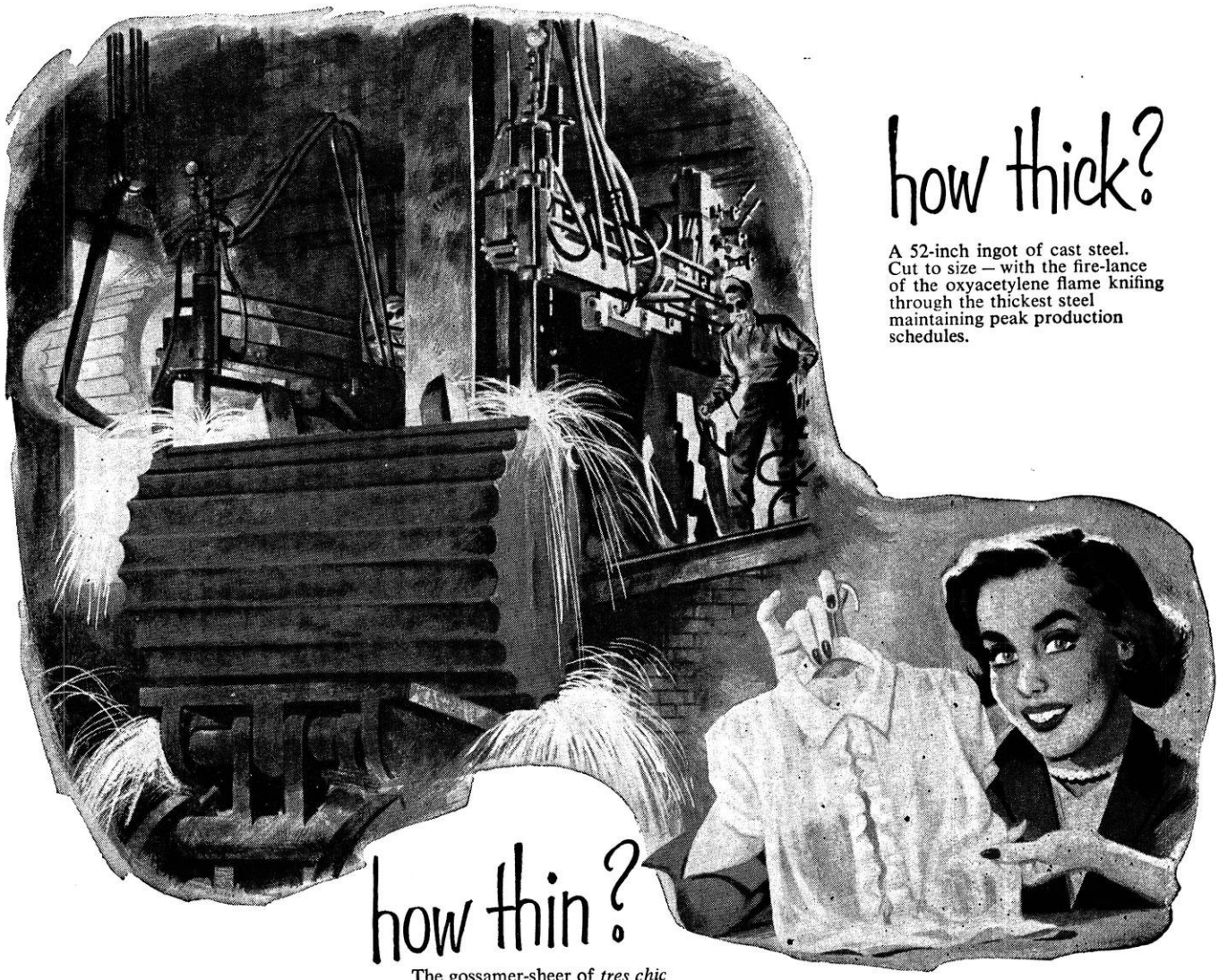

how thick?

A 52-inch ingot of cast steel. Cut to size — with the fire-lance of the oxyacetylene flame knifing through the thickest steel maintaining peak production schedules.

how thin?

The gossamer-sheer of *tres chic* Orlon blouses — from acetylene, a basic ingredient of the newest materials for clothing — insulations — plastics.

at the frontiers of progress you'll find

AN AIR REDUCTION PRODUCT

From a lance of fire — to a lady's clothes. Carbide acetylene is the basic building block of a whole range of today's — and tomorrow's — newest products.

Combined with oxygen, acetylene forms a key to our industrial progress. As metal welding, cutting, and conditioning agents carbide and carbide acetylene add their share to an economy based on high industrial production.

And these are but two of the many products of the Air Reduction Corporate family — products contributing to almost every phase of American life — and progress.

In fact, wherever progress is racing ahead to new frontiers, you will find an *Air Reduction Product.*

AIRCO®

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Divisions of Air Reduction Company, Incorporated, AIR REDUCTION SALES COMPANY, AIR REDUCTION PACIFIC COMPANY, AIR REDUCTION MAGNOLIA COMPANY... *Industrial Gases, Welding and Cutting Equipment* • AIRCO EQUIPMENT MANUFACTURING DIVISION • NATIONAL CARBIDE COMPANY... *Calcium Carbide* • OHIO CHEMICAL & SURGICAL EQUIPMENT CO., OHIO CHEMICAL PACIFIC COMPANY... *Medical Gases and Apparatus — Hospital Equipment* • PURE CARBONIC COMPANY ... *Carbonic Gas and "Dry-Ice"* • AIRCO COMPANY INTERNATIONAL... *Export* • AIR REDUCTION CHEMICAL COMPANY... *Tertiary Acetylenic Alcohols and Glycols*

8 ways up with Phillips Petroleum Company

★

Scientific and technical graduates looking for a "career with a future" will find that Phillips offers many and varied opportunities for qualified men.

Petroleum is a young and progressive industry—and Phillips is a young and progressive company. In addition to our production of motor fuels and lubricants, Phillips is an important manufacturer of such diversified products as carbon black, chemical fertilizers, synthetic rubber, and many other compounds derived from petroleum hydrocarbons.

In most phases of the company's operations we offer supervised on-the-job training for new men to prepare them for assignments of responsibility and importance.

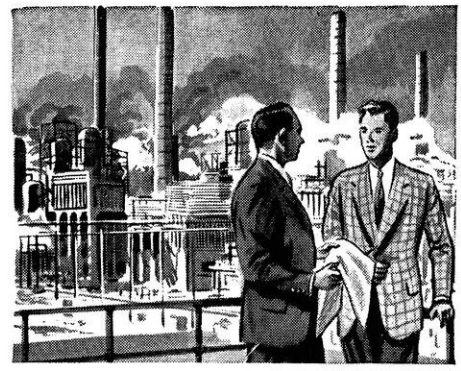
We invite qualified men to write to our Employee Relations Department for further information about opportunities with our company.

Phillips 66

PHILLIPS PETROLEUM COMPANY

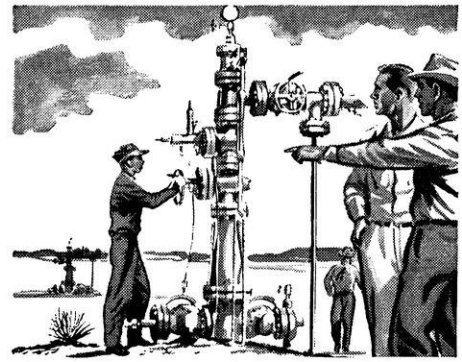
Bartlesville, Oklahoma

OIL PRODUCTION DEPARTMENT drills wells and produces crude oil. It is also the responsibility of this department to unitize oil fields for highest economic recovery.

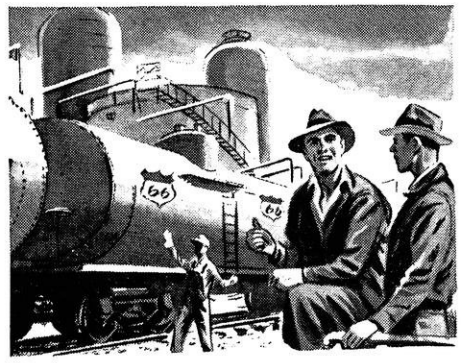


REFINING DEPARTMENT converts crude oil to finished marketable products. Utilizes advanced technology for maximum upgrading of raw petroleum.

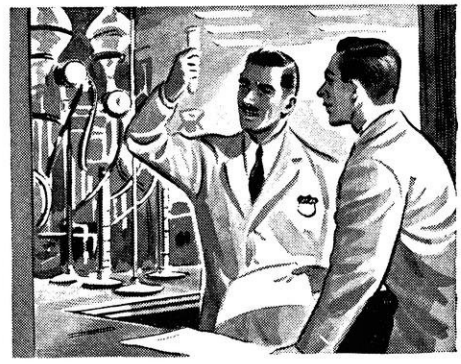
NATURAL GASOLINE DEPARTMENT extracts light hydrocarbons from natural gas. Phillips is the world's largest producer of natural gas.



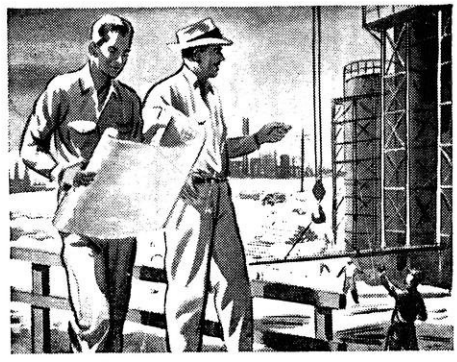
NATURAL GAS DEPARTMENT produces, gathers and sells natural gas in the development of one of the world's largest gas reserves.



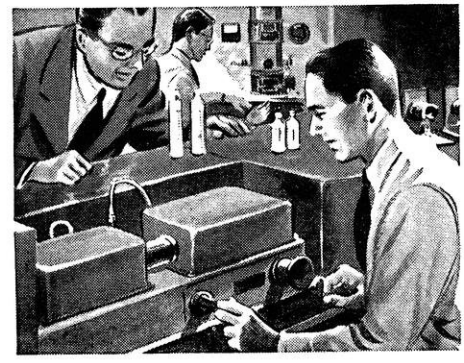
SUPPLY AND TRANSPORTATION DEPARTMENT operates pipe lines, tank cars, barges and motor vehicles . . . purchases, sells and gathers crude oil.



PHILLIPS CHEMICAL COMPANY is a leader in fast-developing field of petrochemistry . . . manufactures and sells nitrogen fertilizers, carbon black, monomers and high polymers.



ENGINEERING DEPARTMENT designs, constructs and inspects new facilities, tests materials and operates the company's communication systems.



RESEARCH AND DEVELOPMENT DEPARTMENT conducts research, pilot plant and semi-commercial development, procures patents and surveys markets for new products.

Easy way to get rich

SUPPOSE, as you enter a grocery store, you suddenly find the denomination of every bill in your pocket has doubled! You're rich! Until you find that the same "magic" has doubled the price of everything in the store.

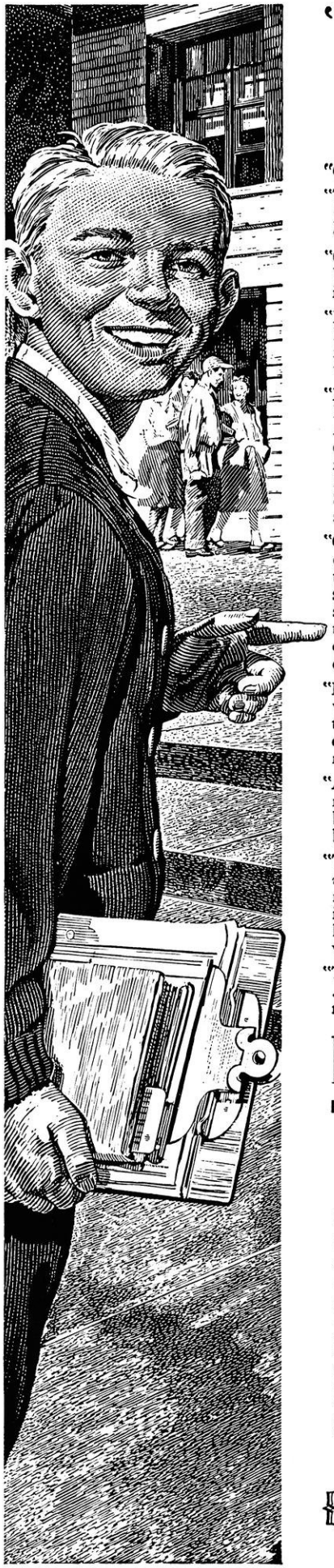
That's the sort of "prosperity" America has been "enjoying."

Most Americans feel they're worth more today than a few years ago; actually their savings have been whittled away 23% in the 7 years since the war. *More money without more goods* always bids prices up and up to the sky.

If you like what's been happening to you, if you think this is prosperity, let's make a *good* job of it; let's make every bill a *million* dollar bill—or a *billion,* as Germany did. If inflated money makes everybody happy, let's be hysterical!

But Germany didn't find it much fun, the morning after.

Source: "How to Keep Our Liberty" by Raymond Moley. Published by Knopf, 1952



"Willie wants to be President!

"Of our Student Council, that is.

"That's him over there, passing out his campaign handbills like an alderman passing out cigars.

"Our school elections used to be pretty dull. You know, a couple of funny posters put up in the halls, and that was about it.

"But our new Civics teacher, Mr. Leszczynski, has a theory that we'll learn a heck of a lot more about government and Americanism if we have less reading and more *doing*.

"He started out last year by making two school Parties . . . conventions, platforms and all that. And, while we had a lot of fun with our elections, we learned a lot about government at the same time. We've even got a regular Congress . . . with teachers in our Senate and us pupils in our House of Representatives. All elected by us, too.

"One of the things Mr. Leszczynski keeps drumming into us is the Bill of Rights of the Constitution. He's pretty hot on the subject of our Freedoms . . . religion, press, speech and the rest. He practically *begs* us to appreciate those Freedoms *every* day of our lives, not just on the Fourth of July and on Thanksgiving Day.

"He's not so dumb, either. He must've figured we'd sort of take our lessons home and pass them along to our families. 'Cause since he came to our school, our Parent-Teacher's meetings have been standing-room-only.

"And last regular Election Day in town, more'n 80% of our parents voted. I know both of mine did . . . and so did my big brothers and sisters.

"The funny part about it is . . . *Mr. Leszczynski wasn't even born an American!* But he never misses a chance to vote or take an active part in civic affairs. And he keeps reminding us he had to come to *this* country to find out what Freedom really means.

"To show you what us kids think about him . . . he's the *only* teacher we don't have a nickname for behind his back."

REPUBLIC STEEL

Republic Building • Cleveland 1, Ohio

REPUBLIC STEEL

Republic BECAME strong in a strong and free America. Republic can REMAIN strong only in an America that remains strong and free . . . an America whose people enjoy the many fine products of a modern Beverage Industry. *And, through the Beverage Industry, Republic serves America.* Many, many tons of its carbon, alloy, and, especially, stainless steels are formed into vats, tanks, mixers, bottling machines, vending machines, cans, shipping containers and dispensing equipment. Steel equipment like this makes it possible for Americans to enjoy their favorite tasty and refreshing beverages the year 'round.

* * *

For a full color reprint of this advertisement, write Dept. H, Republic Steel, Cleveland 1, Ohio.

Wisconsin Student Wins Welding Award

by

Richard Bond

Yes, Professor Howard E. Adkins of the Welding Department has had another of his students win national recognition in a contest for papers on welding. Norman A. Fletcher, M.E. '52, has been awarded second place in the 1951-52 A. F. Davis Undergraduate Welding Award Contest. Mr. Fletcher's winning paper was entitled "Design and Fabrication of Arc Welded Machine Jigs." The prize consists of twin awards of $150 to be presented to each Mr. Fletcher and the Wisconsin Engineer, in which the article was originally published. The award was made at the annual meeting of the American Welding Society, the contest sponsors, at the Hotel Bellevue-Stratford in Philadelphia on Monday morning, October 20.

Professor Adkins and his welding students have had remarkable success with the papers they have entered in the national welding contests. Although this is the first time a student from the University has received an A. F. Davis prize; Wisconsin on the average, produces 3-5 winners annually in the James F. Lincoln Undergraduate Award and Scholarship program.

This year's winner has a biography that is typical of just what can happen in the United States. Norman was born in Birmingham, England 24 years ago, and came to this country as an immigrant in 1947 after serving in the Royal Air Force during the war. Having no formal high school education, he attended the Vocational School in Sheboygan for one year. While attending the University, he worked part-time to support his family, first as a machinist, and then progressively as a toolmaker, tool designer, and production manager for Kupfer Products, Inc., where he is now employed as a tool engineer. While in school he was elected to Phi Eta Sigma, Pi Tau Sigma, and Tau Beta Pi honor societies; he was awarded the Emil Blatz and Winkly scholarships, the Pi Tau Sigma award, and the Jesse B. Kommers award of the Wisconsin Engineer. Mr. Fletcher graduated last June after receiving both sophomore and senior honors.

Professor Adkins hands the $150 check to Robert Sommerfeld as Professor Kommers, chairman of The Wisconsin Engineer board of directors, looks on.

The purpose of the A. F. Davis contest is "To encourage and stimulate interest in welding through the preparation of articles on the subject of welding by undergraduate students." The award consists of four cash prizes given annually to the authors and publications for the best and second best articles published in undergraduate magazines or papers during the preceding year.

Professor Adkins emphasizes that the student who enters such a contest is really working for and achieving three valuable goals. First, he is gaining experience in preparing a technical paper, and if he is fortunate enough to place among the winners, it looks very good on his record when he graduates and bids for a job. Second, the cash returns of the contests to the winners are sizable and very helpful in defraying college expenses. And third, it is very good publicity for the University of Wisconsin to have its engineering students make such a fine competitive record.

The contest is open to all undergraduate students, but it should be of special interest and significance to engineers. The subject matter of the paper may be on any phase of any type of welding or its application to design and construction. To enter the A.F. Davis contest, the paper must then be published in an undergraduate publication to be eligible for competition.

Those interested in entering either the James F. Lincoln or the A.F. Davis contests may contact Prof. Adkins for further information.

Takes a lot to lay a carpet in the jungle

The scene is "darkest Africa".

But Africa is lightening. Man's quest for minerals, for new areas for agriculture and trade, is slashing ultra-modern, glaring-white air strips in once impenetrable jungle.

Those pavers, portable air compressors, pumps and air tools—such as you might see working a city street—are Worthington Blue Brutes going to "lay a carpet" in that hole in the jungle.

Thus, Worthington, a major producer of equipment for public works, industry and farm, brings the fruits of American technical genius to the strange places of the world.

And illustrates, too, how the unique American talent of *diversification* helps public, employees and stockholders. For Worthington makes many things—not just construction equipment and pumps, but also engines, water works machinery, power transmission, petroleum equipment, air conditioning and refrigeration, many others.

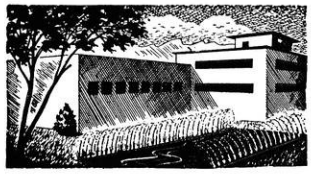
Such diversification builds *stability* . . . makes Worthington, 112 years old, a strong link in the chain of American business.

Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Harrison, New Jersey.

WORTHINGTON

The Sign of Value Around the World

1.14

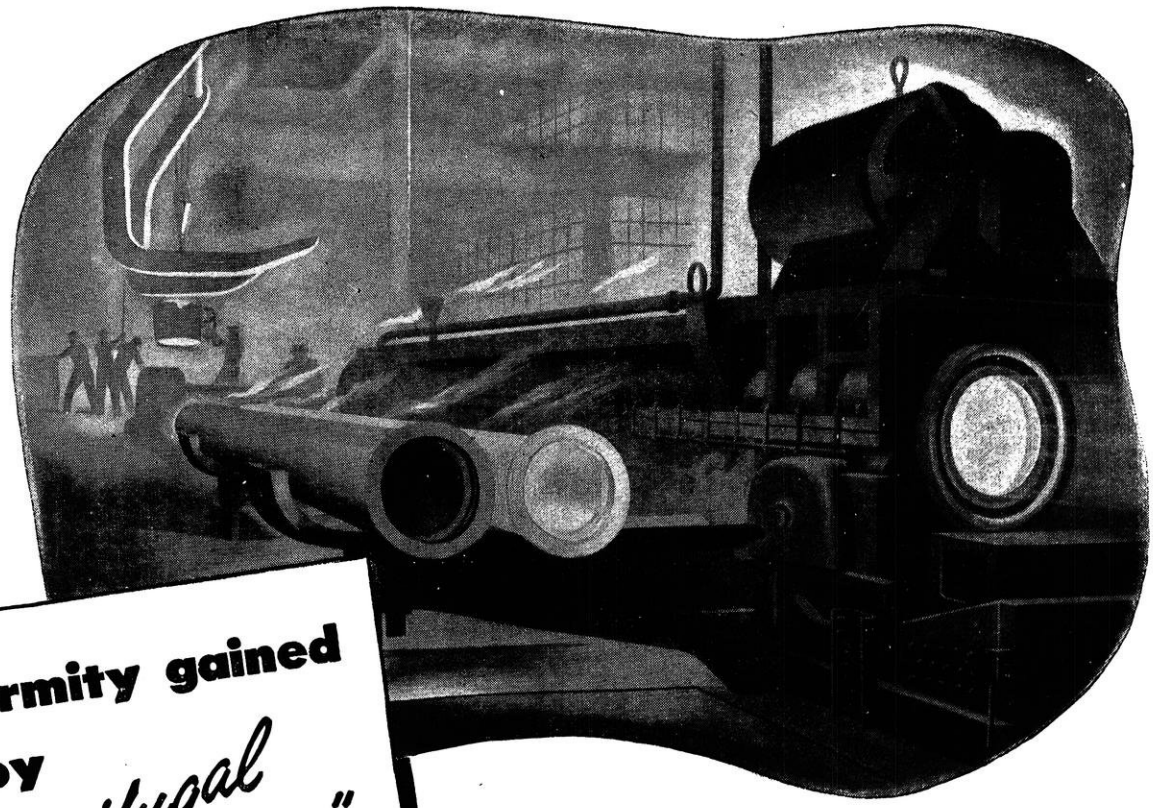


Good Water and Sanitation—engines pumps • water treatment • comminutors air compressors • air tools

Lower-Cost Manufacturing—pumps compressors • steam turbines • motors power transmission • air conditioning

Petroleum Products—compressors engines • pumps • chilling equipment refrigeration • decoking systems

More Abundant Food—compressors fertilizer mixers • air conditioning refrigeration • pumps



Uniformity gained by "Centrifugal Casting"

The great majority of cast iron pressure pipe produced today is cast centrifugally, in metal or sand-lined molds.

When this mechanized process was introduced 27 years ago, its potentialities for improved production controls were evident. For human fallibility was largely replaced by machine accuracy based on scientific principles.

The improved production controls made possible by the centrifugal casting process have long since been realized. Hundreds of millions of feet of centrifugally-cast-iron pressure pipe are now in service. All of this pipe is more uniform in metal structure, in wall thickness, and in concentricity, than pipe not centrifugally cast.

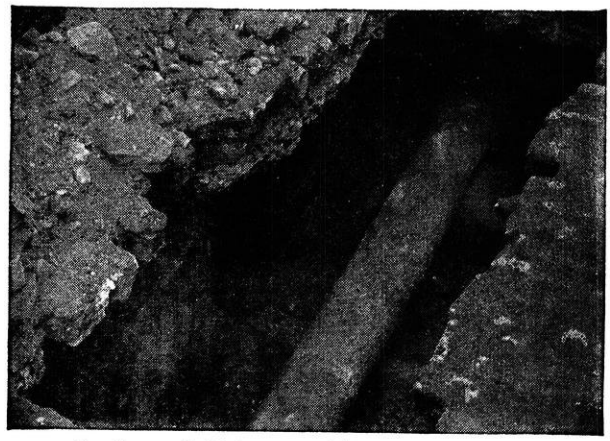
Better production control means better pipe; it results in greater uniformity of quality.

Production controls in cast iron pipe foundries start almost literally from the ground up with inspection, analysis and testing of raw materials; continue with constant control of cupola operation by metal analysis; and end with rigid tests of the finished product.

By metallurgical controls and tests of materials, our members are able to produce cast iron pipe with exact knowledge of the physical characteristics of the iron before it is poured into the mold of a centrifugal casting machine.

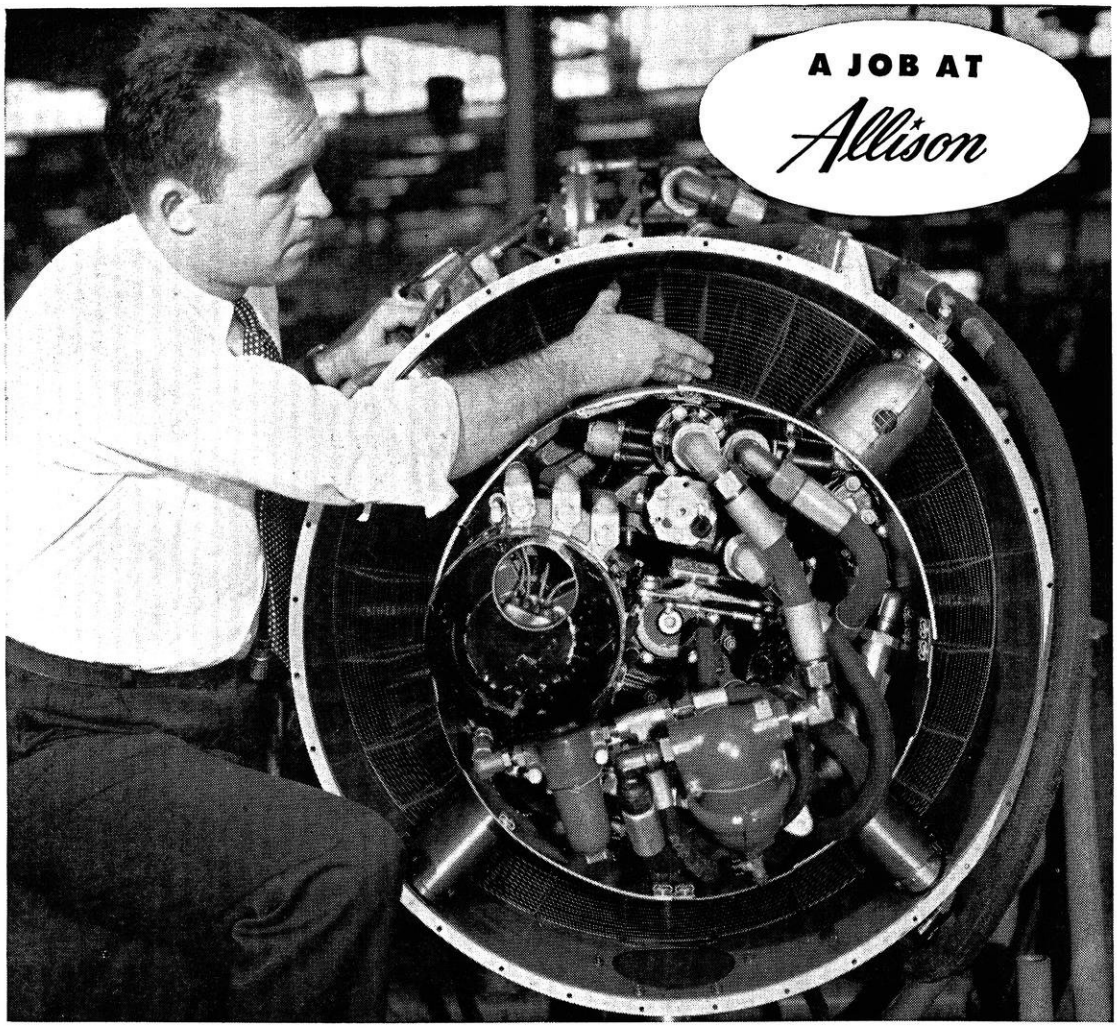
Cast iron pipe is the standard material for water and gas mains and is widely used in sewage works construction.

Send for booklet, "Facts About Cast Iron Pipe." Address Dept. C., Cast Iron Pipe Research Association, T. F. Wolfe, Engineer, 122 So. Michigan Avenue, Chicago, 3, Illinois.



Section of 114-year-old cast iron gas main still in service in Baltimore, Md.

CAST IRON PIPE SERVES FOR CENTURIES



● F. E. Haynes, who received his BS degree in Mechanical Engineering in 1948 from Tri State College, Angola, Indiana, has an important engineering assignment at Allison. He is working on the development of anti-icing systems for jet and turbo-prop engines.

This involves, among other things, a sensing device which will detect ice formation and set off automatically a de-icing system. The air inlet screen is a critical part of a jet engine in the formation of ice. These screens serve a necessary purpose in warding off foreign objects—such as stones, birds or cartridge cases—which if admitted into the air stream will do serious damage to the engine. On the other hand—even on a summer day—an airplane may encounter at altitude an atmospheric condition which, in a matter of seconds, will form ice on the one-quarter inch screens. When this happens, the supply of air to the engine is shut off, temperatures soar out of limits and critical engine parts actually "burn up" with complete failure of the engine.

Solution of this problem is a real challenge to the engineering profession. Haynes is only one of many young engineers at Allison who, by working on this and other problems, is making a real contribution to the science of jet engine design. At the same time they are adding importantly to their own knowledge of a subject which offers life-time careers for professional engineers.

Allison is looking for young men with degrees in

MECHANICAL ENGINEERING ELECTRICAL ENGINEERING AERONAUTICAL ENGINEERING

A lesser number of openings exist for majors in Metallurgy, Electronics, Mathematics and Physics

For further information about YOUR engineering career at ALLISON, discuss it with your Placement Counselor and arrange for an early interview with the ALLISON representative the next time he visits your campus. Or, write now for further information: R. G. Greenwood, Engineering College Contact, Allison Division, General Motors Corporation, Indianapolis 6, Indiana.

Allison **DIVISION GENERAL MOTORS CORPORATION • Indianapolis, Ind.**

Design, development and production—high power TURBINE ENGINES for modern aircraft . . . heavy duty TRANSMISSIONS for Ordnance and Commercial vehicles . . . DIESEL LOCOMOTIVE PARTS . . . PRECISION BEARINGS for aircraft, Diesel locomotives and special application.

A Review of

Zuce Kogan's Essentials in Problem Solving

by

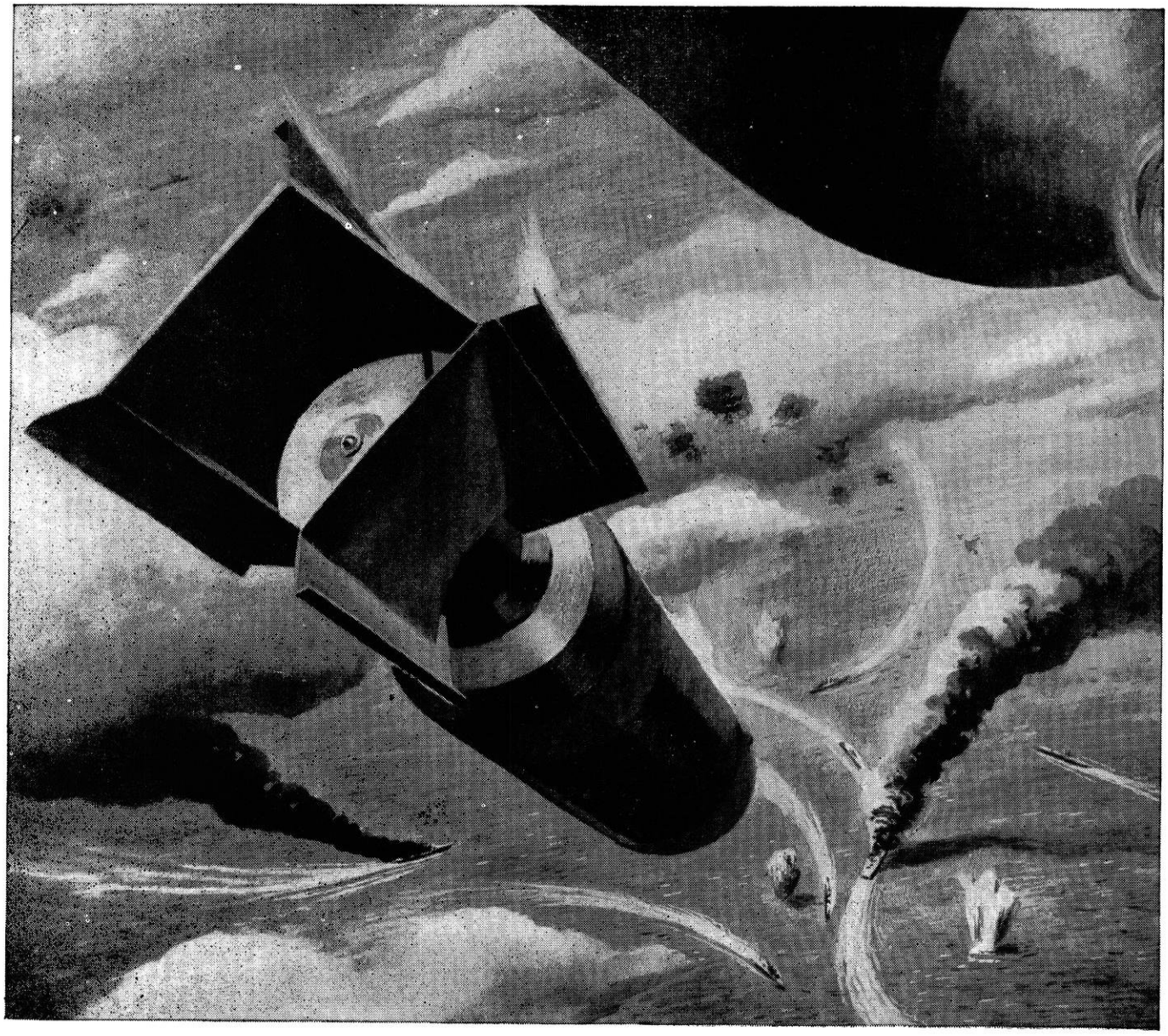
Jack Binning, Associate Editor

HERE is an interesting book with a completely new approach to a fundamental problem—that of problem solving. Although designed for the research scientist and the business executive as an aid in the solution of everyday manufacturing problems, the book is by no means intended solely for that class of thinkers. The author, a consulting engineer of long and wide experience, sets forth in lucid, straightforward style some basic principles that have long been used, either consciously or unconsciously, by those who have successfully solved the problems which they encountered in their vocations.

The author has found that solving a problem does not necessarily involve just trial and error, enhanced only by a complete knowledge of the subject, a large repertoire of similar problems and solutions, and—more important to hit-or-miss problem solving—intuition. He suggests that the way to solve a problem is to convert it into a general problem, find a general solution, then convert the general solution into a practical one.

This is one of the few books of such scope and intellectual value to be written in a readable, interesting style easily understood by the layman.

Mr. Kogan has set himself a real problem trying to explain how to solve problems. He has been highly successful in his pioneer work of problem solving. The reader will find that by Mr. Kogan's process even the most difficult problem can be broken down into a small problem. The thought provoking work is further enriched by examples that are presented not as evidence supporting his case, but rather as illustrations clarifying his "point at issue." The artful way in which he indicates solutions to the examples he cites makes all solutions appear unusually simple, if not unreasonably so. Although promising more than can be hoped to be attained, the book will be found to be a helpful force in crystalizing the readers own powers of reason, observation, and experimentation into a more effective force for the solution of particular problems with which he may be concerned. This book is suggested as worthwhile reading for everyone, especially for those who have trtuble reaching decisions.



Pin-pointed for its target...

Increasing air speeds and higher level flight pose ever tougher problems for bombing accuracy. But modern engineering takes such problems in stride. Today's bombardiers pin-point targets with bombing systems of extraordinary precision and nearly instantaneous action.

Engineering and developing these and similar complex electronic or electro-mechanical devices are the work of Arma Corporation. For 34 years Arma has collaborated with the Armed Forces—and more recently the Atomic Energy Commission—on such complex instruments. Adaptations of these systems will be readily applied to our industrial might in the future. Arma Corporation, Brooklyn, N. Y.; Mineola, N. Y.; Subsidiary of American Bosch Corporation.

If you are interested in an engineering career with challenging opportunities, we suggest you write for this booklet "Engineering at Arma." Write today to Engineering Division, Arma Corporation, 254 36th St., Brooklyn 32, N. Y.

ARMA ADVANCED ELECTRONICS FOR CONTROL

The Student Engineer's Magazine

WISCONSIN ENGINEER

Founded 1896

Volume 57 **OCTOBER, 1952** *Number 1*

In This Issue . . .

Frontispiece

Resembling a futuristic rocket about to be launched, the electronic gear has a multitude of wings, but doesn't fly. The photo is an unusual view of a television antenna on a railroad flatcar at General Electric's Syracuse, N. Y., plant, ready for shipment to Cuban television station CMQ-TV at Santiago de Cuba.

Articles

Departments

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Published monthly from October to May inclusive by the Wisconsin Engineering Journal Association, 331 Mechanical Engineering Building, Madison 6, Wisconsin.

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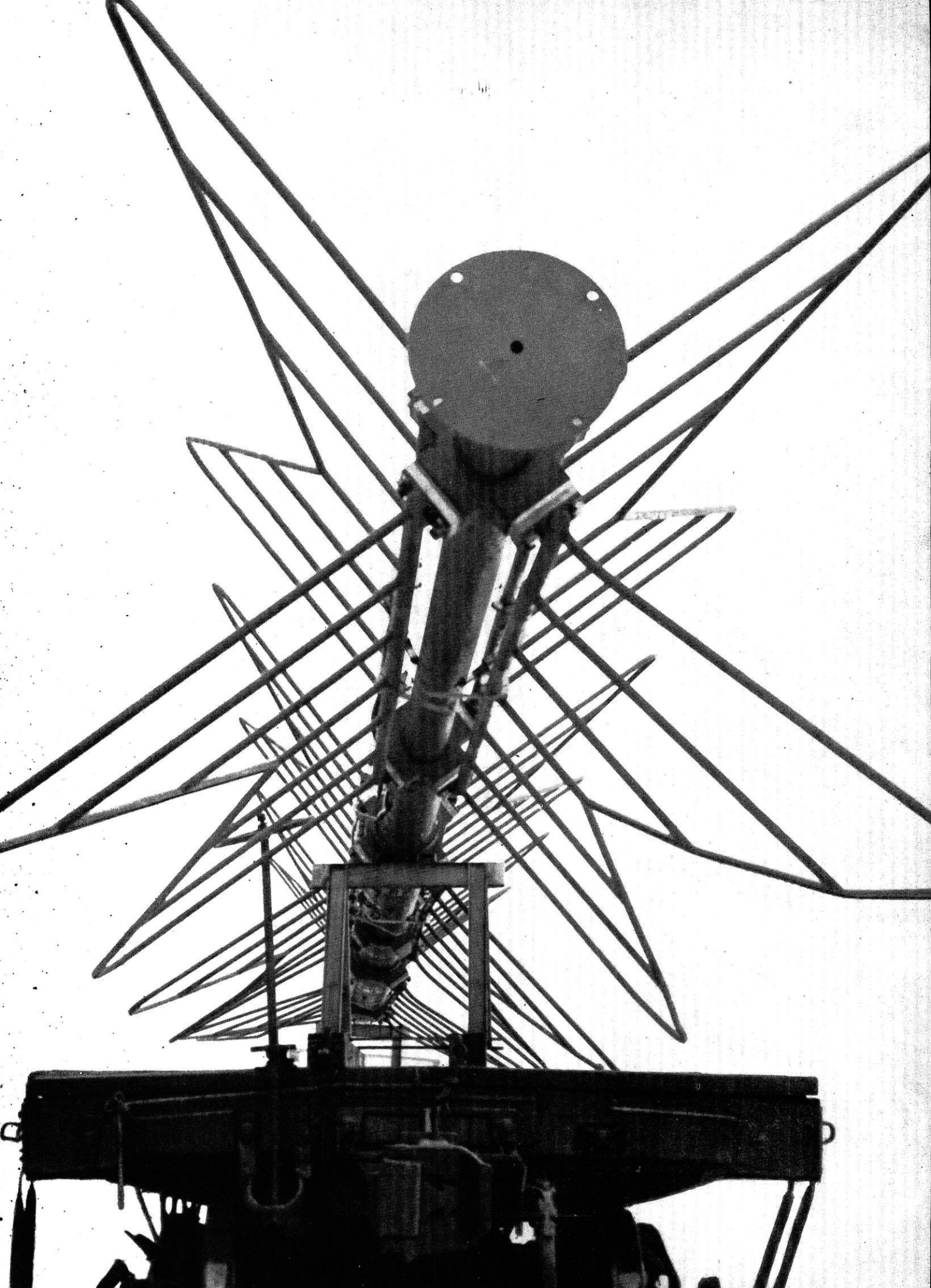


editorial

to the FRESHMEN

YOU are now started toward a career in Engineering. You are not designing bridges, boilers, or jet planes, that will come with time. Your courses now are to prepare you for the years ahead—three more at school and a lifetime as a capable adult citizen. Not only will you be expected to be handy with the drawing board and slide rule—you must be capable and willing to assume your place in a community which will expect great things of men with college degrees. That is why the liberal studies of English, speech and history are given an equal footing with mathematics and the sciences in the curriculum.

It is important to the citizens of tomorrow to master these subjects today.

R.A.L.

REYNOLDS

from

to

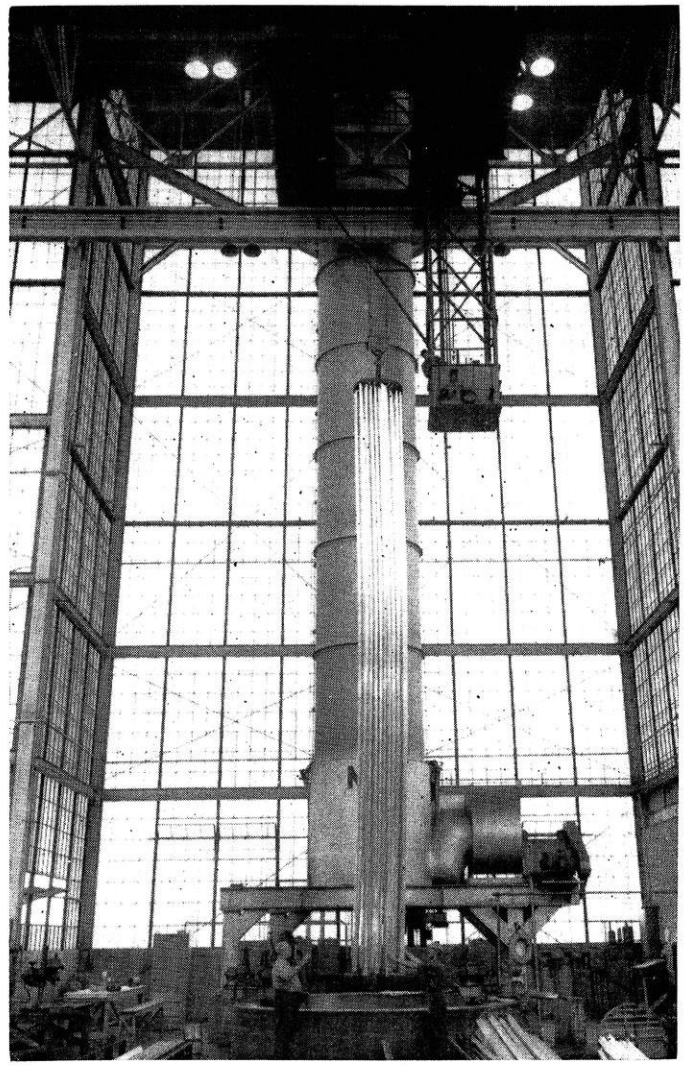
by

1. History. The Reynolds Metals Company was originally founded as the U.S. Foil Company in Louisville, Ky. in 1919 by R. S. Reynolds, Sr. In 1928, the Reynolds Metals Company was formed to provide a more flexible corporate structure for the expanding business. By 1940, the company, sound and growing, decided that aluminum production in the U.S. was not sufficient for war needs. Thus, plants at Listerhill, Ala., Longview, Wash., and Louisville, Ky. were erected and put into war production by 1942. Early in 1946, Reynolds leased six government-built plants with the belief that aluminum had a great peacetime future. The plants, located in Hurricane Creek, Ark., Jones Mills, Ark., Troutdale, Ore., McCook, Ill., Phoenix, Ariz., and Grand Rapids, Mich., were purchased in 1949 to strengthen Reynolds' position in the aluminum industry. Other Reynolds' plants are found in Richmond, Va., Harrison, N.J., Corpus Christi, Tex., Mexico City, Mex., Vernon, Cal., St. Louis, Mo., La Grange, Ill., and Sheffield, Ala., with fourteen plants in Louisville, Ky.

2. Bauxite Mining. The largest deposits of bauxite are found in Jamaica in the Caribbean. Reynolds Jamaica Mines, Ltd., formed in 1949, controls a substantial portion of these deposits. Arkansas, in the U.S., and Haiti, near Jamaica, also supply Reynolds with sources of bauxite.

In Jamaica, the ore lies at the surface, with no overburden, and is carried directly to loading docks by overhead conveyors. Specially designed self-unloading ships transport the ore from Jamaica to U.S. ports on the Gulf of Mexico. In Arkansas and Haiti, overburden must be removed and ore loosened by blasting. Grading and shipping to processing plants follows.

3. Aluminum by Electrolysis. First, the ore is screened, large lumps crushed, and the resulting powder conveyed to a ball mill where it is mixed with a hot caustic solution. This mixture is pumped through slurry tanks, where caustic liquor is added, to huge digester tanks. There it is treated with live steam under continuous agitation.



40-foot extrusions shown above the vertical electric furnace

ALUMINUM

Pit

Purchaser

Marc Momsen, me'53

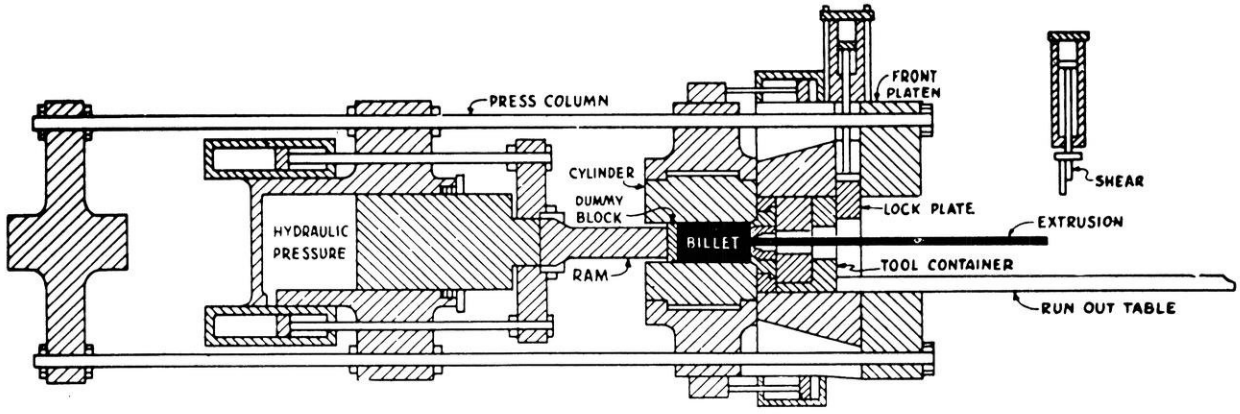


Diagram A - Extrusion press used for producing aluminum shapes is shown in this schematic illustration. Hydraulically operated ram pushes hot aluminum through die opening of desired cross sections. Extrusion tools are shown in detail in Diagram B.

following reaction takes place:

$$Al(OH)_3 + NaOH = NaAlO_2 + 2H_2O$$

Impurities are filtered out, leaving pure sodium aluminate solution which is then pumped to precipitator tanks. Fine seed particles of aluminum hydrate are added and the mixture is air-agitated for 24-30 hours while slowly cooling. The particles grow and are calcined as shown by the following equations:

$$NaAlO_2 + 2H_2O = Al(OH)_3 + NaOH$$

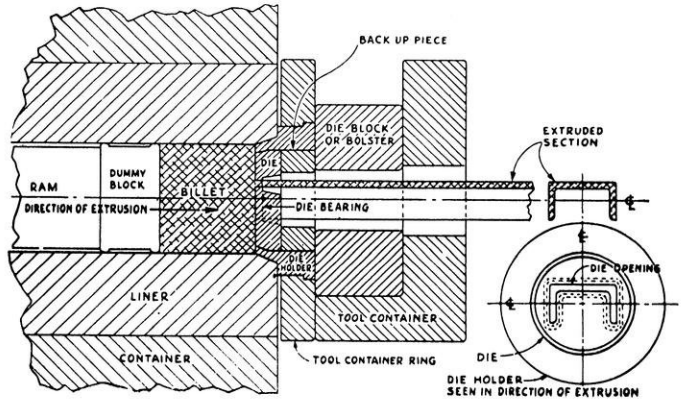
$$2Al(OH)_3 + \text{heat} = Al_2O_3 + 3H_2O$$

Aluminum oxide, or alumina, is the result.

Alumina is reduced to aluminum in an electrolytic cell lined with carbon that serves as the cathode in the electrolysis. Cryolite, or sodium aluminum floride, is melted at 1800°F by electricity and then alumina is dissolved in it. The carbon anode is lowered into the mixture, direct current applied and molten aluminum begins to collect at the bottom of the cell. Liberated oxygen combines with carbon to form carbon dioxide which escapes as a gas through the crust:

$$2Al_2O_3 \xrightarrow{\text{elect.}} 4Al + 3CO_2$$

Diagram B - Steel tools for producing aluminum shapes consist of die, back-up-block, and tool container. Extrusion billet diameters range from 6 to 14 inches.



(*please turn to page* 44)

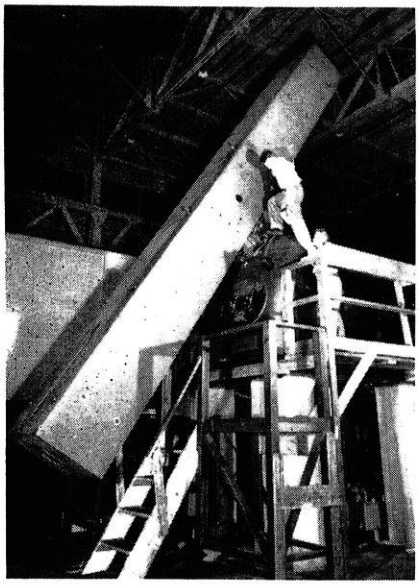
SCIENCE HIGHLIGHTS

by

Gene Worscheck

International Business Machines Corporation, 590 Madison Avenue, New York 22, N.Y., has prepared a booklet to describe the qualifications, training and opportunities of an IBM Customer Engineer, and it will be of interest to men in the field of engineering, or about to enter it.

They will be glad to supply a copy of the booklet to any readers who request it.



Telescope for which Westinghouse built special mounts.

Cuts courtesy Westinghouse, Acme Steel Co., North American Aviation.

WESTINGHOUSE COMPLETES MOUNTS FOR WORLD'S MOST POWERFUL TELESCOPES

Mechanical mounts for the two largest, and most powerful and accurate instruments ever built to study the sun's corona are now undergoing tests at the Sunnyvale, Calif. plant. The instruments are called coronagraphs.

After completion of "dry runs" on these instruments, using electronic devices to double for the missing giant lens and sun, special optical systems and instruments will be installed. The two coronagraphs will then probe the sun's secrets from high-altitudes, dust-free and haze-free observatories atop Fremont Pass in the Colorado Rockies, and on Sacramento Peak, near High Rolls, N.M. The first one completed will be located at Sacramento Peak and is scheduled to be in operation by this fall.

Scientists, through use of the two giant telescopes, hope to gain additional information about the sun's corona that will: (1) make possible highly-accurate long-range terrestrial weather forecasting; (2) enable further progress in forecasting sun-caused disturbances that often black-out or cripple the world's radio communications and interfere with radar operation; (3) unlock additional secrets of the atom; and (4) yield further keys to supersonic flight in the stratosphere and even higher—into the ionosphere and above.

ACME STEEL ANNOUNCES NEW STRAPPING MACHINE

Acme Steel Company, Chicago, is presently tooling up to produce its new power-driven strapping machine. This machine, designed to speed high-volume flat steel strapping operations and reduce operator fatigue, produces strap joints by spot welding.

Featuring a streamlined, color-coordinated housing for integration into standard-type conveyor lines, the strapping machine produces welded joints with strengths approaching the tensile strength of the size of strapping used. The machine can accommodate many different package sizes. Also, there is no limit to the amount of strap that can be fed or the amount of slack that can be taken up.

In operation, packages approach the machine on a roller conveyor from the right. After strapping, they leave the machine from the left. Roller sections in the table top of the strapping machine facilitate location of packages over the tensioning and welding unit, eliminating the necessity for manual lifting. Fourteen ball-transfer rollers, built into the table top around

the strapping mechanism, further eliminate handling operations by permitting packages to pass over this mechanism or to be turned for cross strapping with a minimum of effort.

The design of the machine assures full safety to the operator. Tensioning or welding is not possible while the operator is feeding the strap because he must first release his right hand from the strap before he can use it to actuate the cycle bar.

A full range of strap tensions up to 750 pounds can be obtained. The welded strap joint consists of two spot welds. The design and operation of the machine eliminates the possibility of strap waste on overlap around the welded joint.

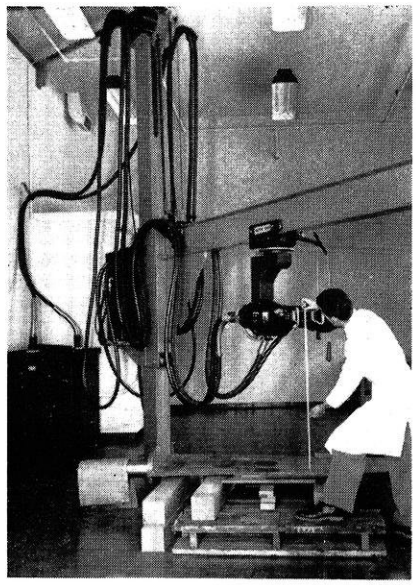
The machine is electrically powered and electronically controlled. Its welding circuit uses 230-volt, 60 cycle, single-phase current. Its control circuit uses 115-volt, 60 cycle, single-phase current.

The strapping machine.

INDUSTRIAL X-RAY UNIT SAVES TIME, MONEY FOR CALIFORNIA PLANT

A new 250-kv industrial x-ray unit recently installed in the Sunnyvale, California, plant of Westinghouse Electric Corporation is expected to pay for itself in less than five years through savings on rental of radium alone. In addition, the machine can x-ray specimens 50 to 60 times faster than was previously possible using either radium or radioactive cobalt.

The unit will be used to explore castings and weldments for internal



Testing materials with industrial x-ray unit.

defects such as shrinkage, cracks, porosity, and so forth.

Steel castings and weldments up to six inches in thickness can now be radiographed with ease. Specimens up to 2½ inches thick are x-rayed by the machine. Castings and weldments from 2½ to 6 inches thick are x-rayed using radioactive cobalt, which is much less expensive than radium.

TEACHING AIRMEN CELESTIAL NAVIGATION

The Special Devices Center of the U. S. Navy at Port Washington, N. Y., recently completed the newest installation of an adaptation of the "Spitz Planetarium." This new astronomy class trainer, primarily a navigation device, projects upon a hemispherical dome many celestial bodies of our solar system.

The Spitz Identification Trainer is a dodecahedral instrument into which precisely positioned holes are drilled, representing the stars from the first to the fifth magnitudes. All first magnitude "stars" have lenses which focus the light on the dome to give them additional brightness. Second to fourth magnitudes are projected radially through various sized holes of the trainer. A control is provided to permit setting up the latitude of the observer anywhere from the North Pole to Antartica.

Auxiliary projectors are included which may be attached to the Spitz Planetarium. In this way, images of the sun, moon, and planets of the solar system can be projected simultaneously, with the stars adjusted to depict their configuration for any date. The meridians, hour circles, ecliptic, celestial equator, parallels of declination, and an adjustable astronomical triangle are also demonstrable.

A geocentric earth projector enables the instructor to project shadows of the continents on the dome, give the class the impression of being in the center of the earth and watching the stars move across the earth's surface.

An electric motor turns the trainer on its polar axis at a definite rate of speed to illustrate passage of time. Thus, one complete revolution of the trainer every four minutes shows the rising and setting of the sun, moon, planets and stars in any 24-hour period during the year.

The Celestial Identification Trainer, as set up at the Special Devices Center, enables an instructor to demonstrate and illustrate various terms and elements used in nautical astronomy, such as: celestial sphere; celestial pole; equinoctial, hour circle and declination; polar distance; hour angles; zenith; horizon; vertical circle; altitude; zenith distance; azimuth; astronomical triangle; and meridian angle.

The trainer is a compact, portable unit standing three feet high (exclusive of console), weighing less than 25 pounds.

The plastic 20-foot diameter hemisphere, upon which the celestial bodies are projected, is considered the finest small planetarium dome ever designed. The division of the dome into 60 right- and left hand spherical triangles is an entirely new concept which permits manufacture of the dome in the greatest number of pieces (important for ease of transportation and erection) with the smallest number (two) of molds required.

(please turn to page 38)

Development and Manufacture of Elemental Fluorine

by

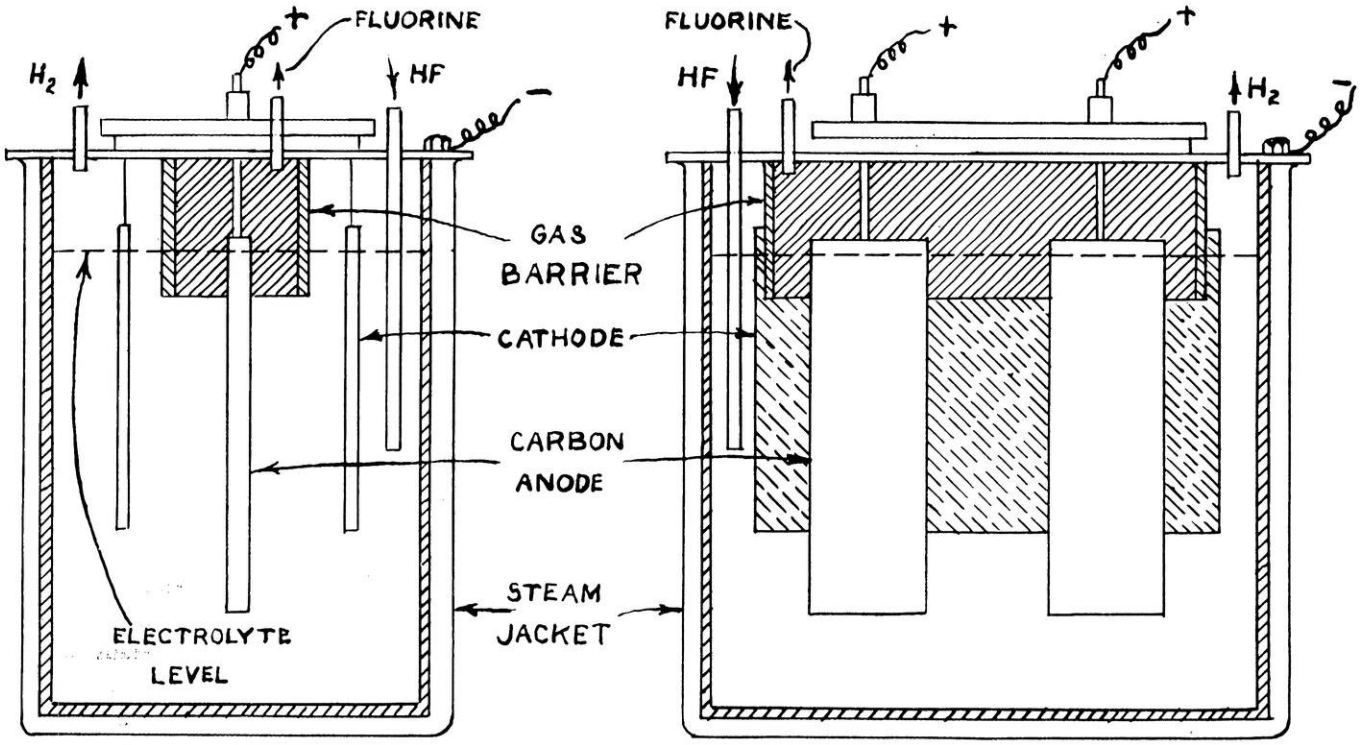
Jack Binning, ce'54

In the course of approximately a century and a half, fluorine has made remarkable progress. It has progressed from a chemical curiosity to a useful and practical chemical. It has been transformed from a chemical terror to a respectful law abiding citizen. It has changed from an element whose isolation was a mere challenge, to a chemical reagent which is vital and necessary to industry. Strangely enough, nearly all this change has taken place within the last decade. Chemists have long foreseen an important chemical future for fluorine compounds—once they learn how to handle the unruly raw material in a safe and economical way. And now scientists are beginning to learn how to handle fluorine. Just **beginning,** mind you, for our chemists still have a long way to go.

And so did the ancient alchemists have a long way to go. For centuries these early chemists sought in vain for a universal solvent. Then, years after their search had been abandoned and their efforts had been labeled as utter foolishness, fluorine—the product of their quest—was discovered. Yes, not until 1810 did two obscure French chemists discover that fluorine was an element. But they stopped here. They knew that fluorine was an element, but they did not know it in its element form. To them it was just a constituent of compounds. The chemists' laboratories of that time were quite incapable of coping with this most active of all the chemical elements. Being unable to isolate fluorine, the scientific world temporarily forgot fluorine.

Until 1886, elemental fluorine was just another one of those names, lost in a dusty chemistry volume on some professor's bookshelf. It would have compared with such elements as Virginium, Erbium, and Praseodymium of the present day world; elements which the common people have never even heard of, and just a name to most chemists. However, to Henry Moissan it was more than this; to him it was an evasive element whose isolation might open the doors to greater chemical achievement. And he intended to open those doors! He recognized electrolysis as the only means of isolating fluorine; so he proceeded in that direction. As one would suspect, he wasn't immediately successful. As soon as the free fluorine began to form, his apparatus literally went up in smoke. Fluorine was so active that it combined with the metals and compounds of which the apparatus was composed. Undaunted, Moissan looked for materials that could resist the corrosive properties of fluorine.

Moissan was not unsuccessful. Although the fluorine vapors almost killed him, he survived to win a Nobel prize for his outstanding work in research chemistry. He finally succeeded in preparing fluorine by electrolyzing a solution of hydrogen potassium fluoride, HF·KF, in anhydrous hydrofluoric acid. The actual electrolysis was conducted by means of 20 Bunsen elements connected in series. The U-shaped electrolytic vessel and the electrodes were made of an alloy of platinum-iridium, the limbs of the tube being closed by stoppers made of fluorspar and fitted with lateral exit tubes for carrying off the gases evolved. While the electrolysis was proceeding, the apparatus was kept at a constant temperature of -23°C by means of liquid methyl chloride. The fluorine, which was liberated as a gas at the anode, was passed through a well-cooled platinum vessel in order to free it from any acid fumes that might have been carried over, and finally through two platinum tubes containing sodium fluoride to remove the last traces of hydrofluoric acid; it was then collected in a platinum vessel closed with fluorspar plates.



Cross section of fluorine-producing equipment.

One would think that fluorine research would show rapid progress now. Already someone had recognized it as an element. Even the almost insurmountable task of isolating fluorine had been done. What could stop us now? Just one thing—fluorine's activity, the same thing that retarded fluorine's development after fluorine was first discovered. Man had learned how to isolate fluorine, but he had not learned how to handle it. Explosive when contained and corrosive when liberated, fluorine was a destructive demon. It was difficult and dangerous to make; and it would eat, or corrode, or burn its way out of any ordinary glass, plastic, or metal container. Too dangerous to work with, little research was done with elemental fluorine. Without much research, little use was found for fluorine in its elemental state. Of course lack of use meant lack of interest. And so it was! Elemental fluorine again sank into obscurity.

Just as surely as fluorine sank from public notice, it rose again. In 1942 all the fluorine producing facilities in the country could not have made more than a few pounds a day for experimental purposes; three years later production was measured in tons a day and flourine was available at a tenth of its former cost.

The atomic bomb project was responsible for much of this spectacular boost. A process was needed to separate uranium-235, the fissionable form, from ordinary uranium-238. It was found that a gaseous uranium-fluorine compound would allow separation of the two isotopes on the basis of density. This, however, posed a problem—before you could combine uranium with fluorine, you would have to make fluorine, perhaps a million pounds of it.

Nobody knew how to do that but everybody agreed that it would not be a pleasant occupation. How could you store a million pounds of fluorine? How could you ship it from one factory to another? What could you use for tanks, pipes, pumps, valves, gaskets, and lubricants, which, on contact with fluorine, would not burst into flame or corrode or explode? And above all, how could you protect your workers? Scientists were called on to figure out the answers to these problems. None of them showed any tremendous enthusiasm. They knew fluorine too well. But soon those men were looking for faster and safer ways to prepare fluorine. They were creating new compounds—solids, liquids, and gases—urgently needed for vital parts of the mushrooming atomic-bomb project.

Within a few weeks after work began, fluorine vapors had frosted the glass in the windows of every laboratory. They escaped into the atmosphere and corroded near-by metalwork, killed the ancient ivy on the college walls, and wrecked the fruit and vegetable crops for miles around. Inside the laboratories, equipment was demolished, clothes were wrecked, and almost every scientist got one or more minor burns. The destruction caused may have been costly, but at least it taught the scientists that one of the subjects for research had to be methods for disposal of waste fluorine.

Finally they found a comparatively economical method of producing elemental fluorine safely. The modern process is remarkably similar to Moissan's method. An electric current is passed through a melt consisting of potassium fluoride and hydrogen fluoride. The latter ma-

(*please turn to page* 48)

W.S.P.E.

Edited by

Steven Carter, m'55

With the
BOARD OF DIRECTORS

- 1954 NSPE Meeting
- WSPE Committees
- Surveyors Licensing Law
- Membership Campaign
- NSPE Nomination

Since the last report to the membership, the Board of Directors has held three meetings; on June 21 in Madison, on July 26 in Milwaukee, and on September 13 in connection with the summer meeting in La Crosse. Actions taken by the Board can be only briefly summarized here. A complete report of each meeting is sent to Chapter officers. The Board had the good fortune of obtaining extremely quick action on a resolution being adopted at the La Crosse meeting. While the wording of a resolution inviting NSPE President John D. Coleman to attend the Winter Meeting in Milwaukee was being worked out, the Board had the unexpected pleasure of having Mr. Coleman walk into the meeting. Mr. Coleman, an executive director, addressed the meeting on the following day. A full report of this meeting will be found elsewhere.

A. G. Behling, National Director, reported at the June 21 meeting that the bid of the Wisconsin Society to hold the National meeting in Milwaukee in 1954 had been accepted. Further information on this item will be found in this issue.

The full list of Committee Chairmen appointed by President R. C. Clark to serve until June 30, 1953 will be found in the new directory now in the hands of the members.

The Board appointed a committee of three to serve in cooperation with the legislative committee in carrying out the wishes of the Society in regard to the surveyors bill to be introduced into the next legislature. The bill is substantially the same as the one which failed to pass the 1951 legislature. Members of the committee are: Robert J. Poss, chm., R. P. Boyd, and Ralph Hungerford.

An expanded membership drive is being planned on a national, state and chapter level. Details will be found in the October issue of the American Engineer. Chapter membership committees have already been advised of the part they will take in the campaign. More details of the work will be explained at the fall chapter meetings. The Board of Directors has set a goal of 1000 members by the time the national meeting in Milwaukee is held.

1954 NSPE MEETING IN MILWAUKEE

A recommendation was made to the board of directors to invite the national meeting to Milwaukee for 1954. This recommendation was made by a committee consisting of Mr. Ray Behrens, Mr. Art Behling, and Harry Gute, chairman. This invitation was issued and has been accepted by the NSPE at Tulsa, Oklahoma.

A steering committee consisting of the following has been organized.

Guy Woody, Mgr. Processing Machinery Dept., Allis-Chalmers Mfg. Co.; Fred Agthe, Consulting Engr., Processing, Allis-Chalmers Mfg. Co.; E. W. Seeger, Vice Pres. & Ass't Secretary, Cutler-Hammer Inc.; Art Behling, Consulting Engineer; Ray Behrens, Planning Director and Supervising Engr., Milwaukee; Orin Andrus, Asst. Director of Research & Engineering; A. O. Smith Corp.; Pierce Ellis, Asst. to President, Wisc. Public Service

Corp.; Harry Fullwood, Gen. Engr. Bureau of Reclamation, U.S. Dept. of the Interior; Robert Tate, Executive Vice President & Secretary, Perfex Corp.; Louis Larson, Materials Engr. State Highway Commission of Wisconsin.

A letter from Harry Gute, general chairman of the 1954 NSPE meeting, follows:

While a great deal of the organizing will be done by men in the Milwaukee area, this is a state society effort and we urge members throughout the state to offer their services and to become a part of the team which will present the most successful national meeting ever put on. We remind members that, to serve on a committee for a national meeting of this type, is an honor and a privilege. Therefore it is important that all interested engineers, in Milwaukee as well as in the state, volunteer immediately so that the Steering Committee does not overlook worthy talent.

We have tentatively requested space at the Schroeder Hotel in Milwaukee, for June 9th through the 12th, 1954.

It is essential that the organizational effort for this meeting proceed immediately. Our committee appointments should be completed before the end of October and we suggest that interested members volunteer at once.

Harry Gute
General Chairman
NSPE Annual Meeting 1954

LA CROSSE HOST OF PROFESSIONAL ENGINEERS

La Crosse, the scenic center of the coulee region, proved to be a beautiful site for the sixth summer conference of the Wisconsin Society of Professional Engineers which was held here Sept. 12 and 13th and attended by over 200 engineers and their wives from all parts of the state.

(LaCrosse Tribune photo)

Standing: Carl Wahlstrom; Paul Robbins, national executive secretary; Zenno Gorder; Ed Seeger, national representative. Seated: D. Coleman, N.S.P.E. president; R. C. Clark, W.S.P.E. president.

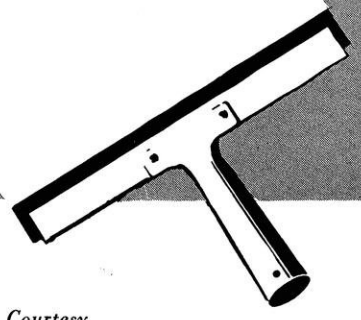
Mr. John D. Coleman, of Dayton, Ohio, president of the national organization, gave a top level report on the shortage of engineers throughout the country and the great necessity of employing the available men at their maximum effectiveness to take care of our military and civilian requirements. He believes that the shortage will get worse for some time before it gets better. Reports on the activities at the state level were presented by various chairmen. Prof. W. S. Cottingham presented a comprehensive report of the financial condition of the state society. Mr. George P. Steinmetz, of Madison, Wis., 2nd vice president of the society and chief engineer of the Wisconsin Public Service Commission, reported on the progress of the Civilian Defense committee. The conference acknowledged and praised the efforts of Mr. Harold C. Trester, Oshkosh, engineer for C. R. Meyers and Sons, for his efforts in the preparation of the 1952 directory. Mr. John Gammel, Milwaukee, Wis., supervisor of sales training for Allis Chalmers Mfg. Co., reported on engineering education in connection with his work with the Engineering Council for Professional Development. Mr. Harry Gute, owner of the Gute Co., of Milwaukee, Wis., announced that the 1954 annual meeting of the national society would be held at Milwaukee, Wis., and that preliminary arrangements were now being made for that event.

Prof. D. W. Nelson of Madison, Wis., brought the membership to date on the activities of the fees and classifications committee; Mr. George Sievers, president of the Industrial Engineers of Milwaukee,

(please turn to page 36)

New York's Washable Skyscraper

Unique Structure, Made of Glass and Stainless Steel, Requires No Paint, and Can Be Washed Completely In a Week



Unique in many ways is Lever House, New York's latest multi-storied structure. With exterior surfaces made entirely of heat-resistant glass and stainless steel, it can be readily washed down in a week. Sealed windows shut out soot and dirt. The structure is completely air conditioned.

Courtesy
INCO Magazine

Stainless steel and heat-obsorbing glass provide a significant departure in office-building architecture at Lever House, Lever Brothers' recently completed Park Avenue home in New York City.

The 24-story building was designed by Skidmore, Owings and Merrill. It features non-opening windows, and glass spandrels. The sills, mullions (framing) and heads, are encased in chromium-nickel stainless steel. The result is an efficient, easily maintained, durable outer skin, that seals air-borne dust and soot out, and keeps expensive air-conditioned climate in.

If conventional construction had been used, according to the architects, two to three times as much janitorial effort would be needed to keep offices clean, and air conditioning and heating costs would soar.

Further savings are also possible. Window sash with no moving parts are not only $200,000 cheaper to install, but require practically no maintenance. And since air-borne contaminants can't filter through or around the glass, window washing schedules inside the building are cut in half.

Engineered Scrub-Up

Since stainless and glass are easily washable materials, outside washings can be mechanized. An elevator platform, or gondola, travels around and up and down the faces of Lever House's 1404 windows, spandrels, and stainless covered mullions and sills.

Manufactured by Otis Elevator Co. (which also made the six elevators inside the building) this outdoor elevator platform rides on stainless guide rails attached to every sixth mullion on the building's exterior.

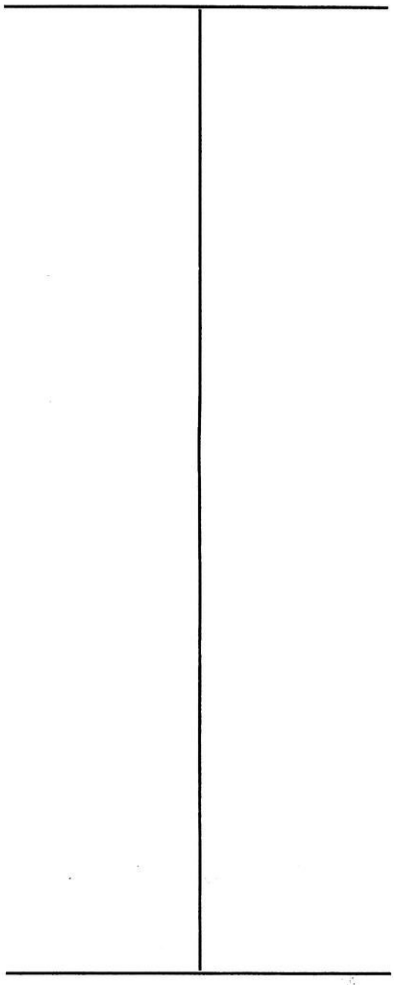
The elevator gondola is raised and lowered by a hoisting machine and adjustable framework that rides on specially designed railroad tracks on the roof of the building. When the hoist is above the area to be washed, a plunger is dropped into an indexing socket near the track. This socket is directly in line with one of the guide rails on the outside of the building.

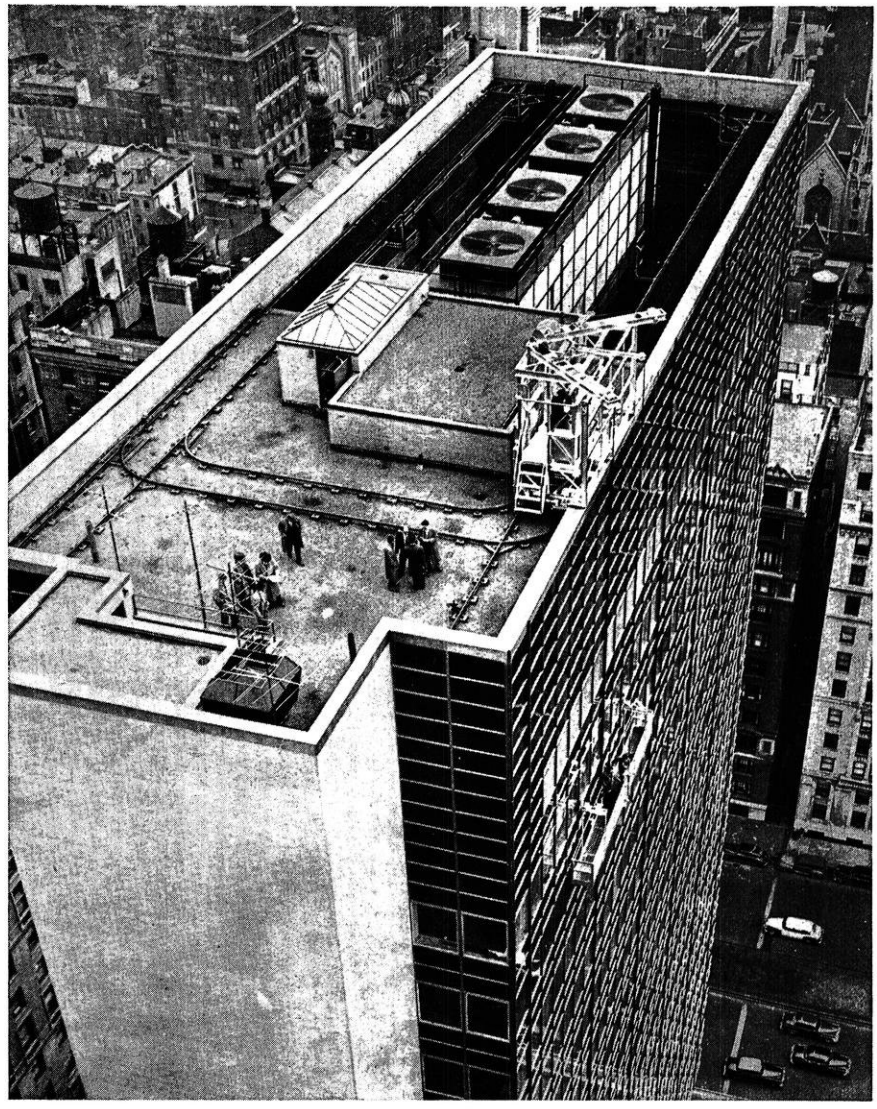
At the same time, reference pads on either side of the adjustable framework bear against the stainless coping on top of the building parapet. This coping provides an accurate, sturdy reference surface for the framework,

makes certain that the platform is exactly flush with the face of the building.

Once the adjustable framework is in position, it is impossible because of a system of interlocks for it to move laterally. The gondola, however, can move vertically. Guide shoes on the gondola slip over the guide rail on the outside of the building and the car is lowered. To steady the platform even more, two special Micarta covered wheels on either side of the gondola roll down the surface of the building along the mullions.

The guide rails themselves are welded structural stainless T sections one story in length, placed end to end down the face of the building with expansion joints between.





Here's the latest in "washing machines". It consists of a rail car, which mounts a power plant, and the elevator that carries the window washers up and down the sides of the building.

and to preclude any possibility of binding the elevator platform as it moves up and down, each guide rail installation is held to a plus and minus ⅛ in. tolerance on straighteners and plumb throughout its entire length.

With the aid of the gondola, window washers can clean a window in about 90 seconds, or less than one-third the time required to clean both sides of a conventional double-hung sash. This, the architects estimate, will cut window washing costs some $1,500 annually.

U. S. BUREAU ANNOUNCES of WORK GRADUATE

NEW ALUMINUM-PLATING PROCESS

A practical proces for electrodepositing aluminum at room temperature has recently been developed by D. E. Couch and **Abner Brenner** of the National Bureau of Standards. Dense, ductile deposits of the metal are being obtained at the Bureau from a new type of organic plating bath[1] consisting of an ether solution of aluminum chloride and a metal hydride. The new bath is expected to find important application for electroforming articles with close inside tolerances, such as waveguides, and for providing various types of equipment with a thin protective coating of aluminum.

Because aluminum is so far above hydrogen in the electromotive series of the elements, it has never been deposited from aqueous solutions, which always contain some hydrogen in ionized form. Aluminum is usually produced commercially from a bath of used cryolite and aluminum oxide. However, this process must be carried out at a high temperature, and the metal is obtained in a fused state, unsuitable for electroplating or electroforming. Electrodeposition from nonaqueous solutions has been tried in the past, with some success, but the procedure was too difficult for practical purposes, and the deposits were lacking in purity, ductility, and other desirable qualities.

The National Bureau of Standards is now conducting extensive research in an effort to develop methods for depositing in good physical form unusual metals such as molybdenum, tungsten, titanium, and zirconium. Both fused salts and baths of organic solvents are being investigated. One of the first metals studied was aluminum. The success of the aluminum plating bath, developed in the course of this work, may be expected to give added impetus to the current widespread efforts to obtain other metals in pure form from nonaqueous solutions.

The aluminum plating bath is prepared at NBS by adding either lithium hydride or lithium aluminum hydride to an ethyl ether solution of anhydrous aluminum chloride. For best results, the ether should be anhydrous and alcohol-free. The concentration of the aluminum chloride is not critical and may vary from 1 to 4 molar. Current densities may be as high as 4 or 5 amperes per square decimeter. However, if thick deposits are desired, the curent density should not be greater than 2 amp/cm_2. Because of the high concentration of aluminum chloride in the ether, the bath is not as flammable as would normally be expected.

To prevent the entrance of moisture, the bath is prepared and used in a closed container consisting of a glass plating vessel with a tightly fixed Polyethylene lid. Anodes of aluminum rod pass through the lid, and the objects to be plated (cathodes) are introduced and removed through a central hole which is ordinarily kept closed with a rubber stopper. If hermetically sealed, the bath will keep for several weeks; however, under ordinary operating conditions the solution slowly deteriorates and eventually gives streaked and brittle deposits.

No agitation of the bath is necessary. In fact, a quiescent bath is actually an advantage as the sediment from the anodes settles to the bottom of the vessel, making bagging of the anodes and filtration of the solution unnecessary. The composition of the bath is easily controlled since the only constituent that changes appreciably in concentration during the plating process is the lithium hydride. Occasional additions of lithium hydride increase the life of the bath, but in time the lithium hydride becomes insoluble and the bath can no longer be used.

When sufficient lithium hydride is used, the deposits are white, mat and quite ductile; but if the lithium hydride content is too low (less than 3 or 4 g/1), the deposits become hard, brittle, and grey. Still further reduction of the hydride content produces deposits that are dark and stressed and that often crack or peel from the cathode. Ordinarily deposits 0.01 inch or more thick are visibly crystalline, but this effect can be reduced somewhat by adding a small amount of B,B'-dichloroethyl ether. Pitting, which frequently occurs in aqueous baths, is practically nonexistent in the ether bath.

Cathode and anode efficiencies for the process are approximately 100 percent. Deposits 0.05 inch thick have been prepared at the Bureau, and thicker deposits should be possible if the sharp edges of the cathode are shielded to prevent treeing.

[1] For further details, see A Hydride Bath for the Electrodeposition of Aluminum, by Dwight E. Couch and Abner Brenner, J. Electrochem. Soc. 99, 234 (June 1952).

# of STANDARDS RESULTS BY U. W. DR. BRENNER

CONSTANT-LEVEL DEVICE FOR LIQUIDS

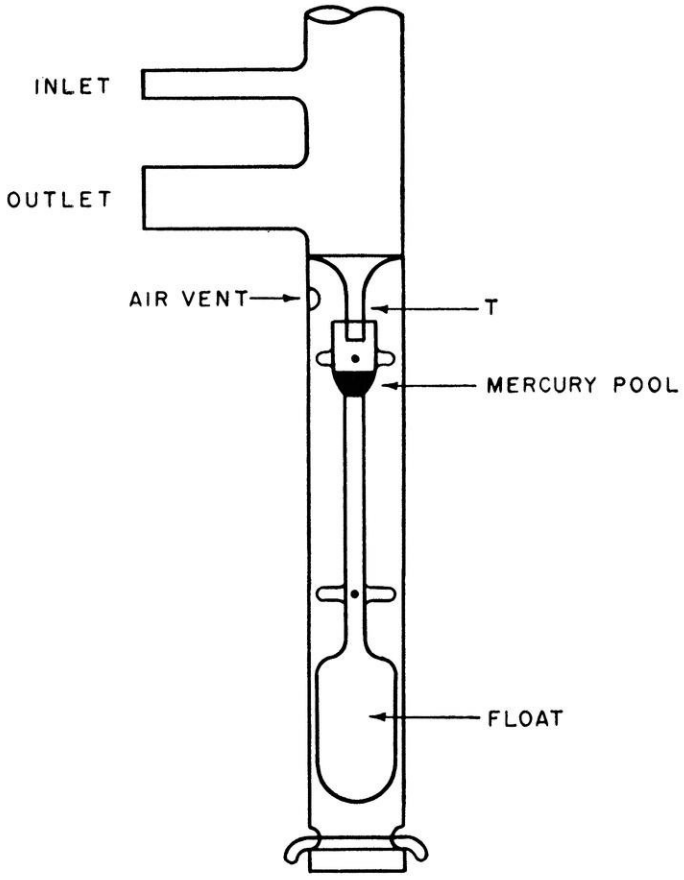
A compact, easily constructed device for maintaining a constant liquid level in laboratory apparatus has been recently developed by D. E. Couch and **Abner Brenner** of the National Bureau of Standards. Although designed primarily for small installations, the leveler should also prove useful on large-scale equipment.

While several devices for maintaining a constant level of liquid in tanks are commercially available, none of these are satisfactory for use with small laboratory setups, such as electroplating baths operated at elevated temperatures. Usually they employ a siphon arrangement or make use of an electrical circuit to operate a solenoidal valve or pump. Those siphon levelers which receive water directly from the tap are not adaptable to plating baths because they siphon off part of the bath when the level is raised by the addition of a large piece of work. The electrical devices, besides being rather expensive, are not sufficiently portable for use with small baths. The Bureau's leveler eliminates many of the disadvantages of the previous types. It takes water directly from the tap, is of inexpensive construction, and can be easily moved from one installation to another.

The NBS leveler employs a water inlet and an overflow, or outlet pipe, to maintain a constant head. A mercury valve, attached to a float, allows the water to flow into the bath if the bath level is lowered and prevents flow outward when the level of the bath rises.

The device takes the form of a vertical tube with inlet and outlet connections near the top. Just below the outlet connection the tube is sealed off except for a smaller-diameter open tube which extends below this point, connecting the upper section of the larger tube with the lower. An open cup of mercury is supported below the small connecting tube by a float which rises and falls with the liquid level in the lower section of the larger tube. When the bath level rises, the float also rises, causing the mercury cup to seal off the lower end of the small connecting tube. All of the water entering through the inlet is then rejected and is eliminated through the outlet connection. When the bath level drops, the float descends, taking with it the mercury cup, and the water runs into the bath through the small tube.

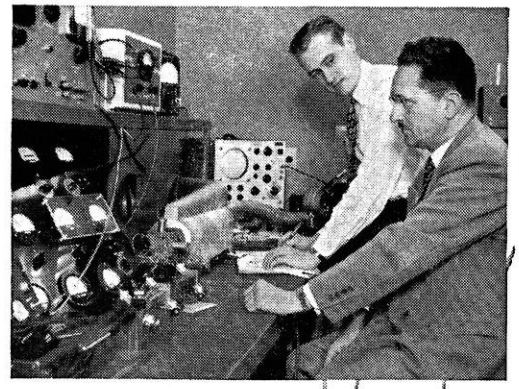
Levelers of this kind can be made in any size, for solution depths of 10 cm or more. None of the dimensions are critical; however, the tube should be of sufficient size that it will not become clogged by the small particles of sediment that may enter with the tap water, and the mercury cup must be large enough and so centered that it will slide freely up over the small tube without touching. A convenient diameter for the larger tube is 25 mm. In order for the water to flow freely, the overflow tube should be about 2 cm in diameter and the float should have about 3 mm clearance with the surrounding tube.

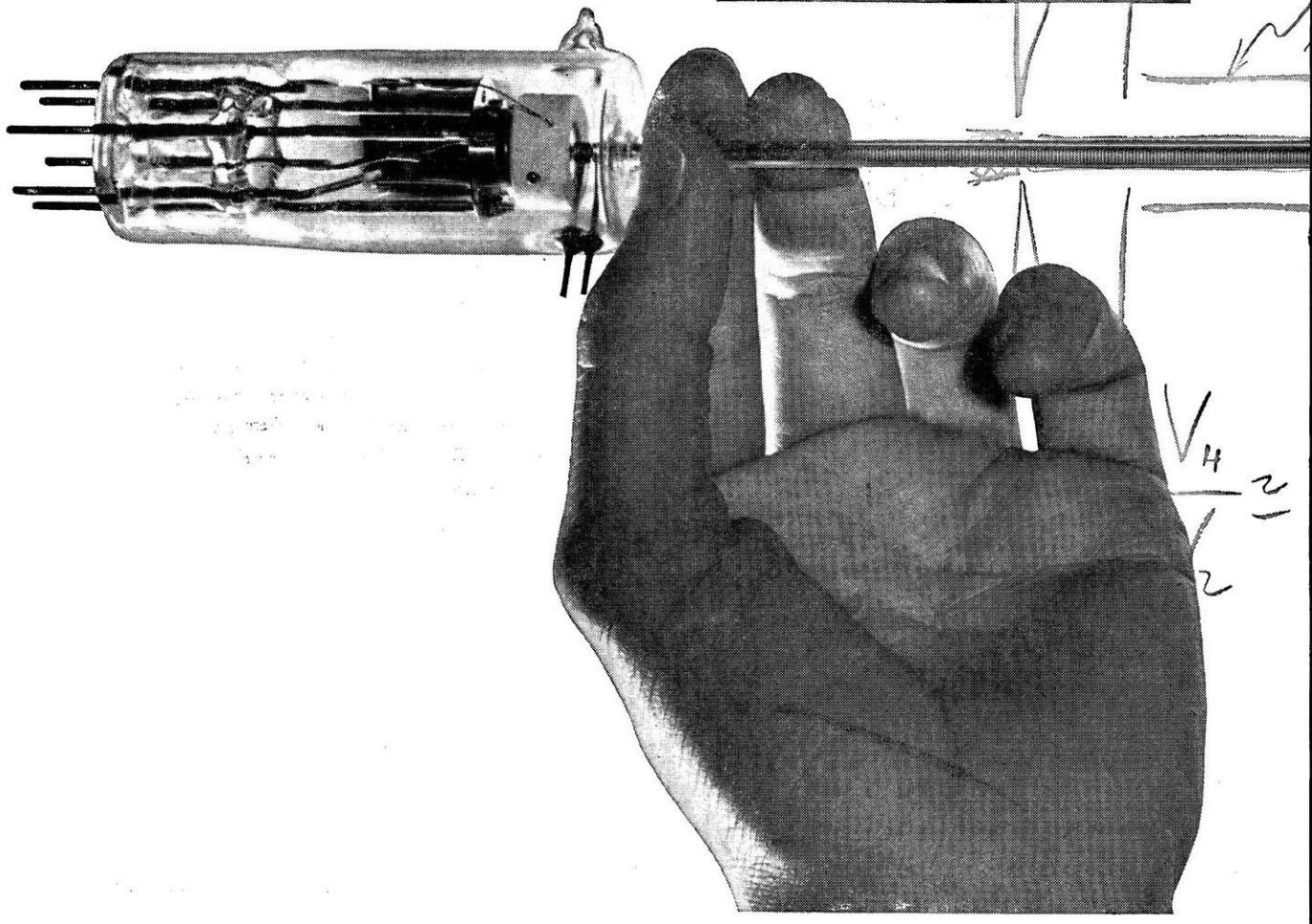


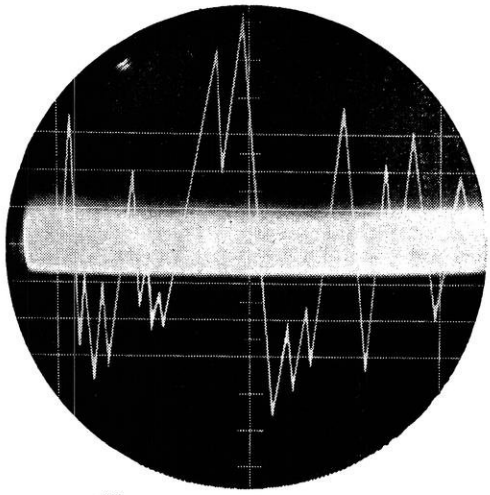
Schematic diagram of the device developed by the National Bureau of Standards for maintaining a constant liquid level in electroplating baths. Water from the tap enters through the inlet tube and flows out through the outlet tube just below. When the bath level drops, the float goes down. and water from the tap runs into the bath through the small tube T. Then, as the bath level rises, the mercury pool comes up to close off the tube T, and all the tap water passes out through the outlet. A small air vent prevents the column from flooding with water.

Reducing **noise** in radar...

Measuring the noise figure of an experimental traveling-wave tube are Dr. A. V. Haeff (right) head of the Electron Tube Laboratories at Hughes, and Dr. Dean Watkins (left) one of his co-workers.



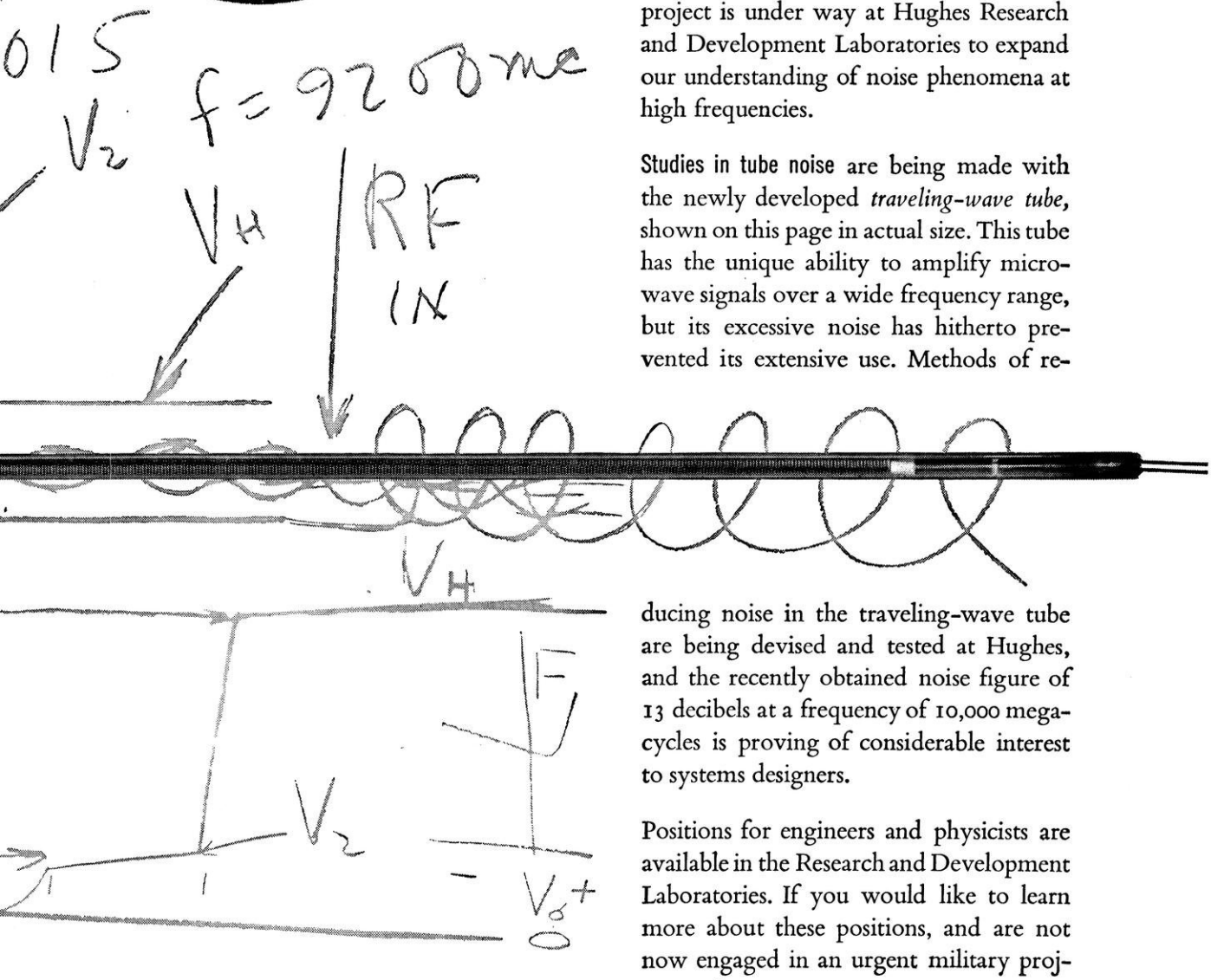




In the operation of a radar system, the amount of energy reflected from small targets is very minute. The over-all sensitivity and range of radar depend equally upon effectively generating and transmitting considerable power at microwave frequencies—and upon effectively receiving and amplifying very weak echo signals.

An important limitation in receiver sensitivity is imposed by noise that is created within the receiving tubes—and caused by random motion of electrons. Because the reduction of tube noise could make available improved techniques to the designer of many types of microwave systems, a project is under way at Hughes Research and Development Laboratories to expand our understanding of noise phenomena at high frequencies.

Studies in tube noise are being made with the newly developed *traveling-wave tube,* shown on this page in actual size. This tube has the unique ability to amplify microwave signals over a wide frequency range, but its excessive noise has hitherto prevented its extensive use. Methods of reducing noise in the traveling-wave tube are being devised and tested at Hughes, and the recently obtained noise figure of 13 decibels at a frequency of 10,000 megacycles is proving of considerable interest to systems designers.



Positions for engineers and physicists are available in the Research and Development Laboratories. If you would like to learn more about these positions, and are not now engaged in an urgent military project, write to:

Hughes Research and Development Laboratories
Engineering Personnel Department
Los Angeles County
Culver City, California

ALUMNI NOTES

by

Eugene Buchholz, m'55

Moritz, E. A. (Ernie), c '04, regional director of the U.S. Bureau of Reclamation, retired on August 31, after 31 years in government service. He was director of Region 3, with headquarters at Boulder City, Nevada. He recently received the Department of the Interior's highest honor, the "Distinguished Service Award."

* * *

Fetzner, Edward J., c '11, engineer with the State Highway Commission at La Crosse, retired on August 31 after 23 years of service with the Commission.

* * *

Vogel, Merton M., c '43, is chairman of the department of civil engineering at Loyola University in Los Angeles.

* * *

McCoy, William D., c '46, is engineer with H. Turner & Son, contractors at Boscobel, Wisconsin.

* * *

Kutchera, Ralph J., c '39, formerly chief engineer for the Consolidated Water Power and Paper Co., at Wisconsin Rapids, is now with Ebasco Services of New York City.

* * *

Homewood, Robert T., c '27, a former editor of the WISCONSIN ENGINEER, is Lt. Col. in the US Air Force, and stationed at Wiesbaden, Germany, as a ground safety officer with the 12th air force.

Matthias, Franklin T., c '31, a former editor of the WISCONSIN ENGINEER, is assistant to the project manager on a huge hydro-refinery project in northern British Columbia for the Aluminum Company of Canada.

* * *

Clark, Charles O., c '34, is hydraulic engineer with the Corps of Engineers at Tulsa, Oklahoma.

* * *

Michalos, James P., c '38, has been made full professor of civil engineering at Iowa State College. His special field is structural engineering.

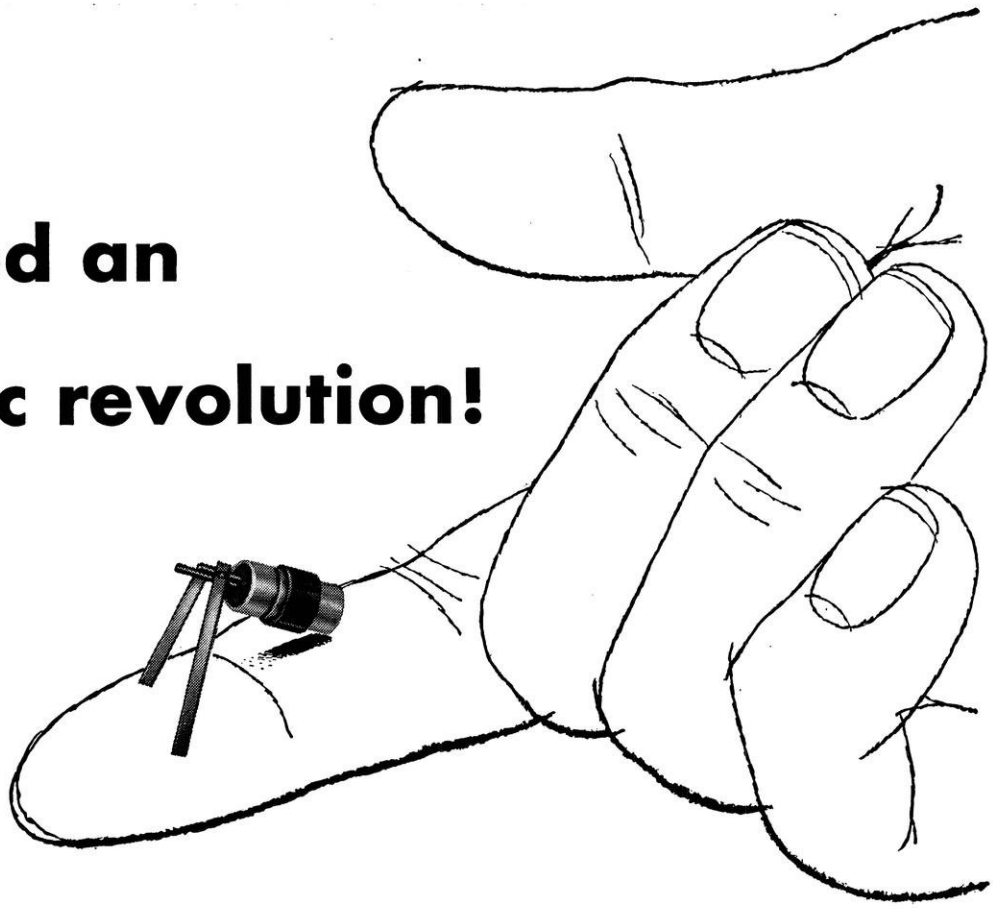
* * *

Dent, Arlie R., c '43, has succeeded Kutchera as chief engineer of the C.W.P. & P. Co., at Wisconsin Rapids.

* * *

Smith, Leon A., c '12, superintendent of Madison's water department, was honored on September 17 at a banquet in the Loraine Hotel attended by more than 500 members of the American Water Works Association. In recognition of his 25 years of service as division secretary of the association, he was presented with a floor model radio-television set and a life membership in the association.

It sparked an electronic revolution!



The 2A Transistor illustrated is designed to fit a plug-in socket. In one use in the Bell System, ribbon leads are employed as shown above.

Perhaps you've heard something about the transistor—a tiny and mechanically simple electronic device based on an entirely new principle. It can do many things a vacuum tube can do—yet its greatest possibilities may lie in applications where vacuum tubes have *not* been used.

A few years ago this revolutionary device was invented and experimentally made by scientists at Bell Telephone Laboratories. Today, several types of transistors are in production at Western Electric—manufacturing unit of the Bell System.

This didn't just happen! Its manufacture is the result of a lot of teamwork by Western Electric engineers of varied skills and training.

Transistors are unimpressive looking little things, but don't let that fool you! The most delicate metallurgical and manufacturing skills are required in their production. In one type of transistor there are three thin adjacent regions of germanium, each region containing chemical elements in exact quantities, the whole unit being no larger than the head of a match! Suitable leads, or wires, must be positioned in proper relation to these layers with utmost accuracy, using microscopes and oscilloscopes.

Transistors can do many things: transform radio energy for driving a telephone receiver or loudspeaker—amplify weak signals—generate a-c current—convert a-c to d-c—respond to light—increase, decrease or halt the flow of current. Small and rugged, they're going to work today in the Bell System and in varied types of military equipment.

Quantity producing these mighty mites—with laboratory precision—is typical of many forward-looking engineering projects at Western Electric.

Western Electric

A UNIT OF THE BELL SYSTEM SINCE 1882

On The Campus

by

Kneeland Godfrey, c'55

The several engineering societies on campus represented by student groups are once again beginning to function. The societies wish to welcome all new engineering students and to invite them to join an organization. All will print notes on their groups' activities from time to time during the semester in this column.

The eight groups representing Civil, Mechanical, Electrical and Radio, Mining and Metallurgy, Chemical, Agricultural, Military, and Automotive Engineers offer men entering courses in these fields, or who are interested in them, a good opportunity to meet fellows with like interests.

Too, they may talk with experts who from time to time speak at the society meetings. This sort of activity is ideal for engineers, for it gives them a good selling point when they become seniors and start to hunt for jobs. The chance to get experience as an officer of a student group offers itself to members—in such a position they may develop leadership, a quality which is a great asset to everyone.

Other groups of engineers are the various honorary societies: Chi Epsilon (C.E.), Kappa Eta Kappa and Eta Kappa Nu (E.E.), Pi Tau Sigma, and Tau Beta Pi. Theta Tau is a professional engineering fraternity and Triangle is a social fraternity for engineers. The Polygon Board, a coordinating group representing all the engineering societies, is another of the groups which will publish news of its doings in this column. Polygon puts on the St. Pat's Dance and represents the engineering students on campus.

MINING AND METALLURGY CLUB

The Mining and Metallurgy Club is beginning the new school year with a series of planned events which will highlight the group's activities for the season. Some of the club members plan to travel to Chicago to attend the Student Night of the American Institute of Metallurgical Engineers (AIME). A dinner meeting with the Milwaukee Foundrymen is planned for sometime in November. The purpose of the event is to acquaint the local club members with those presently connected with foundry work so that both parties can get to know what they may expect in the future. Other than these meetings, a series of regular meetings is planned which usually include an informal smoker and a speaker from industry.

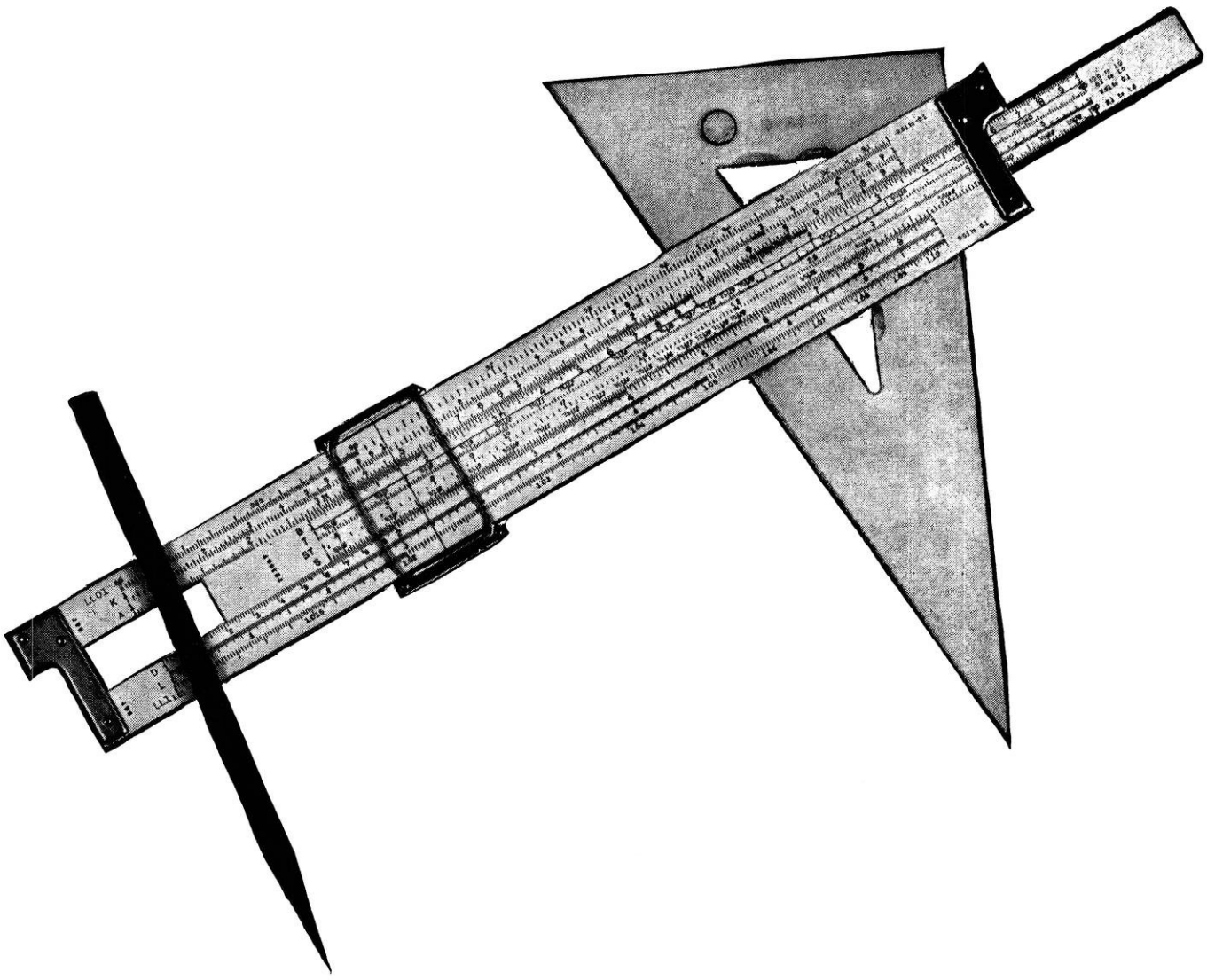
This year the club intends to make a special call to freshman Mining and Metallurgy students to enroll them in the organization. The officers plan to contact instructors of freshman M. & Me. courses to get their permission to speak to the students on the several benefits of the club. The contacts made and experience gained by members of the club cannot be overemphasized, the officers of the organization point out.

The officers of the club for the fall term are: Everett Belter, President; Wayne Jacobs, Vice President; Norm Feige, Secretary; Jack Miller, Treasurer; and John Frenck, Polygon Board representative. The other Polygon member, Jerome Murkve, has graduated and will be replaced at one of the first meetings.

SAE

The final meeting of 1951-52 was on "Air Force Jets and Rockets". The scheduled speaker, Major Barfield, was unable to come up from Dayton, Ohio, because of ill health, and was replaced by Lt. Col. Nelson. The Colonel gave a very fine speech, and showed that he knew how to bring his highly technical information down to the level where most of the members were able to understand the facts and theories. The other item of business was the announcement of the results of the election of this year's officers. It turned out that there were few nominations to the offices made at the previous meeting, and

(*please turn to page* 46)



You'll find classmates—and a future—at Boeing!

Men from more than 120 top engineering schools are building rewarding careers at Boeing. So chances are, you'd be working with some of your classmates here. And in addition you'd be a member of an Engineering Division renowned for its trail-blazing contributions to both military and civil aviation.

If that's the kind of engineering prestige you'd like to enjoy, look into Boeing opportunities. This company has been growing steadily for 35 years. It provides the finest research facilities in the industry. It offers you work on such exciting projects as guided missiles and the fastest known bomber in the world: the B-47 six-jet medium bomber, as well as the still-classified B-52 eight-jet heavy bomber.

You can work in Seattle, in the Pacific Northwest, or in Wichita, Kansas. Boeing provides a generous moving and travel allowance, gives you special training, and pays a good salary that grows with you.

Plan *now* to build your career as a member of Boeing's distinguished Engineering personnel after graduation. Boeing has present and future openings for experienced and junior engineers in aircraft

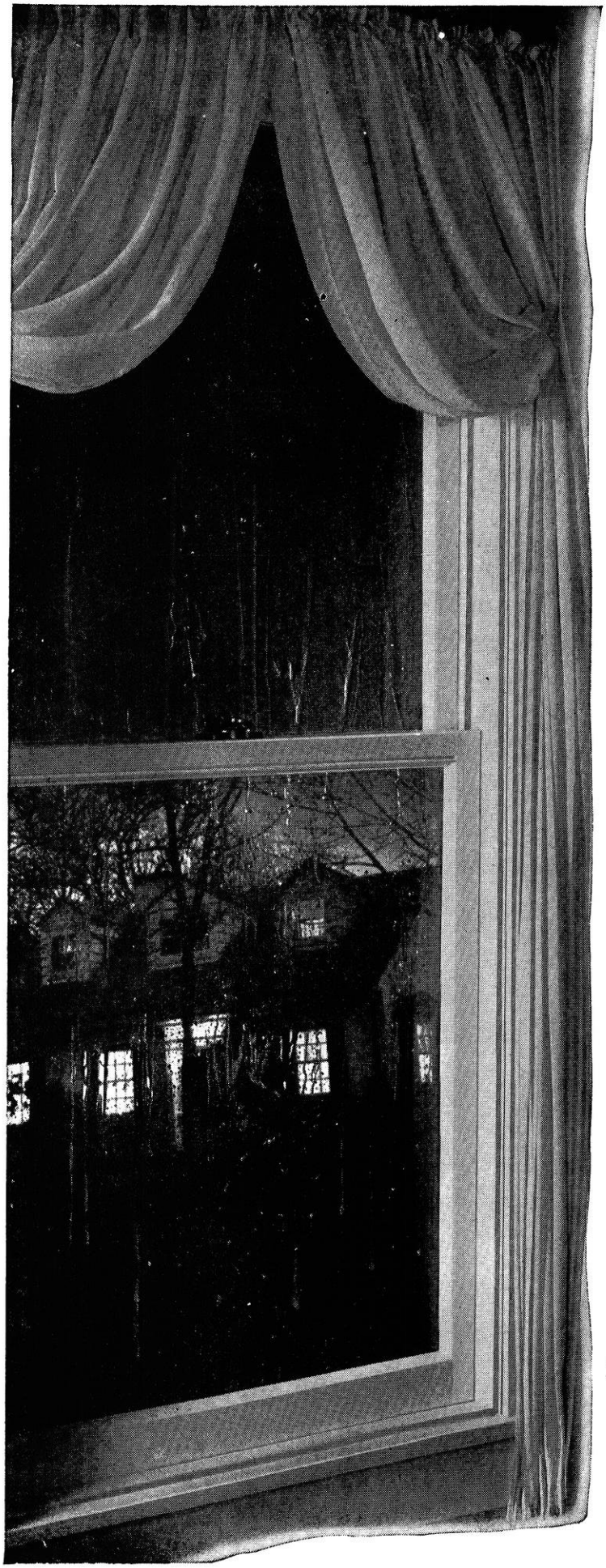
- **DESIGN**
- **RESEARCH**
- **DEVELOPMENT**
- **PRODUCTION**
- **TOOLING**

also for servo-mechanism and electronics designers and analysts, and for physicists and mathematicians with advanced degrees.

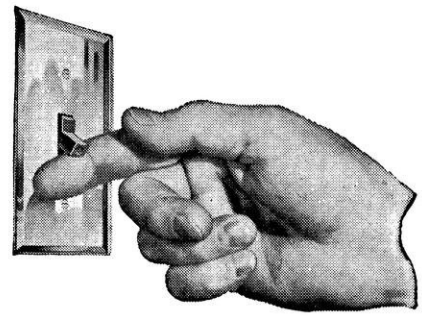
For further information, consult your Placement Office, or write:

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

BOEING



Gloom chaser . . . that works

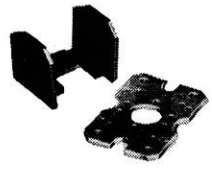


Fair weather or foul, when you flip a light switch you *expect* light. You take it for granted. Actually, like a touchdown in football, the result is the triumph of teamwork in electrical apparatus.

The power company is the captain. The players include the manufacturers of generators, transformers, switch gear, and electrical fixtures. But an *unseen essential* called *Synthane* is present, too.

Synthane is a laminated plastic. It is an excellent electrical insulator. It is also a mechanical material that combines light weight and strength, a chemical-resistant material that machines easily.

Send for the complete Synthane Catalog. Then, if you find Synthane a material you can use, we will be glad to help you with design, sheets, rods, tubes or fabricated parts. Synthane Corporation, 10 River Road, Oaks, Pennsylvania.



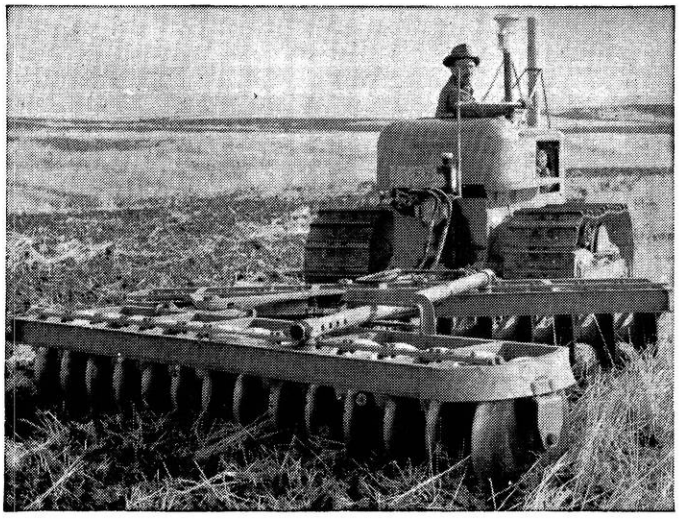
Insulator (left) made from Grade X Black Synthane for Square D Company and switch mounting plate made for Cutler-Hammer Inc. of Grade GLCC-M Synthane. Both parts require good electrical characteristics.

Synthane-one of industry's unseen essentials

SYNTHANE

LAMINATED PLASTICS

Another page for **YOUR BEARING NOTEBOOK**

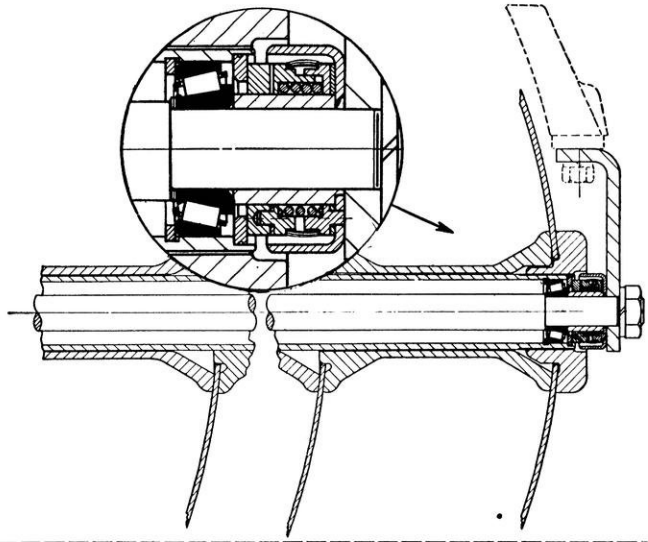


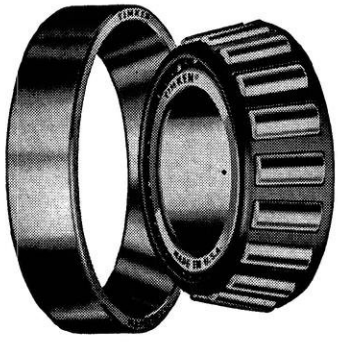
How agricultural engineers solve 3 design problems at once

Designing farm machinery applications like the through shafts of disk harrows presents three big problems to agricultural engineers: 1) combination loads, 2) dirt, 3) ease of operation. Engineers solve all three problems at once by designing the shafts on Timken® tapered roller bearings. Because they are tapered, Timken bearings carry both radial and thrust loads in any combination. They keep housings and shafts concentric, making closures more effective. Dirt stays out—lubricant in. And they keep shafts turning easily because of their true rolling motion and incredibly smooth surface finish.

How to mount disk harrow shafts on TIMKEN® bearings

Two single-row Type TS Timken bearings are indirectly mounted on a stationary shaft in a rotating disk assembly. The bearing cups are press-fitted against snap rings. The bearings are adjusted by means of shims between the bearing cone and shaft shoulder. A special spring-backed rubbing seal assures maximum protection to the bearings. The rubbing seal itself is protected by a shield fitted about the closure assembly.





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

How to learn more about bearings

Some of the engineering problems you'll face after graduation will involve bearing applications. If you'd like to learn more about this phase of engineering, we'll be glad to help. For a copy of the 270-page General Information Manual on Timken bearings, write today to The Timken Roller Bearing Company, Canton 6, Ohio. And don't forget to clip this page for future reference.

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

WSPE--

(*continued from page 23*)

did likewise for the ethics and practices committee. Mr. Carl Mohs, Carl E. Mohs Association of Madison, discussed membership; Mr. Phillip Davy of the Davy Engineering Co., La Crosse, reported for the publications committee and Mr. Page Johnson, of the Portland Cement Association, Madison, on the public relations committee, Mr. Robert Smeaton, Allis Chalmers Co., Milwaukee, registration promotion and Ralph Purucker, Public Service Commission, university cooperating committee. Mr. Zenno Gorder, La Crosse city engineer, expressed his thanks to the members who assisted him on the program committee.

Highlight of the vacation angle of the conference was the boat trip on Saturday up the Mississippi through Lock No. 7 and return. This was especially appreciated by the visitors.

The noon luncheon session was presided over by Mr. Pierce Ellis, assistant to the president of Wisconsin Public Service Corporation, Milwaukee, and first vice president of the state society. The address of welcome was given by Mayor Henry Ahrens of La Crosse. Mr. Arthur Behling, consulting engineer of Milwaukee, and national director of the society, next introduced Mr. Paul Robbins, national executive director, Washington, D.C., who gave more detail on the activities of the national headquarters. He stressed the need for analyzing the motives of the use of engineers and using them where the value of their services will be greatest. He also pointed out the frequent use of the definition of registration of professional engineers, together with employment on professional work in recent federal government legislation and directives. Mr. Rexford S. Mitchell, president of La Crosse State College added a light touch to the luncheon meeting with his appropriate and entertaining remarks on current topics.

Mr. Arthur L. Christensen, La Crosse manager of Northern States Power Co., presided at the engineers banquet. An indication that the engineers are not oblivious to the beautiful scenery in the state, is evident by the appearance of Miss Jeanne Huston of La Crosse—our own "Miss Wisconsin" at the speakers table. She gave an interesting account of her recent trip to Atlantic City. Entertainment was provided

by a barber shop quartet—"The Nameless Four." The main speaker of the evening was Mr. Ted Neubauer, chief development engineer of the Trane Co., La Crosse, who spoke on Atomic Energy and the Engineer. His background includes graduation from the University of Michigan and Massachusetts Institute of Technology and various air-conditioning development positions. However, for this presentation he drew on his employment with the Manhattan project set up in 1943, to develop and manufacture the atomic bomb. His discussion was illustrated with numerous slides explaining the "basic building blocks" of the atomic bomb and others showing the living and working areas of Oak Ridge, Tenn., where much of the work was done. The meeting concluded with dancing to the music of Don Kay.

The ladies program was ably chairmaned by Mrs. Arthur Christensen, assisted by Mmes L. F. Kehoe, E. C. Kesting, F. Davy, Zenno Gorder, James Johnson, of La Crosse and Mrs. Clifford Nelson of Black River Falls.

For a well-engineered and enjoyable program, the society is deeply indebted to Zenno Gorder, state program chairman, and his assistants, Carl Wahlstrom, Kenneth Zurn, Arthur Christensen, Edwin Kesting, Frank Davy, Merlin Eklund, Lawrence Kehoe, and Donald Grunditz.

Frank L. Carlson
Western Chapter WSPE
Public Relations Chairman

We are pleased to welcome the following members and affiliate members into the Society.

MEMBERS

Herman P. Siebken, Plant Supt. and Vice Pres. Commonwealth Telephone Co., Madison.

Richard Ahrens, Engineering Department, Improved Paper Machinery co., Appleton.

Walter G. Wefel, Chief Mechanical Engineer, Consolidated Power and Paper Co., Wisconsin Rapids.

Robert E. Nelson, Partner, Wisconsin Tool and Machinery Co., Milwaukee.

John J. Meadows, Plant Manager, Shafer Bearing Co., Wauwatosa.

Frederick D. Mackie, Supt. of Distribution, Madison Gas and Electric Co., Madison.

Frank E. Nordeen, Manager and Sales Engr., General Electric Co., Madison.

Lester W. Stockner, Electrical Engineer, Wisconsin Power and Light Co., Madison.

John P. Kelly, Assistant to Technical Advisor, X-Ray Dept., General Electric Co., Milwaukee.

Cheever J. Dixon, Production Manager, Mercury Engineering Co., Milwaukee.

Curt E. Hoerig, Vice President, Manufacturing, Geuder, Paeschke and Frey Co., Milwaukee.

John H. Moran, Jr., Assistant Engr., Transformer Dept., Allis-Chalmers Mfg. Co., West Allis.

(*please turn to page 40*)

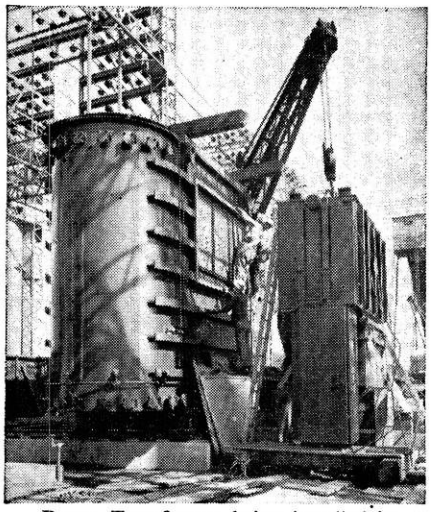
Make the First Job Count!

by PAUL CLARK
Application Engineer, Electric Control Section
WEST ALLIS WORKS
(Graduate Training Course 1950)
Iowa State—EE—1949

IT SUDDENLY occurred to me while I was a senior, looking for a job, that my first job would be all important. In a way, it was going to be almost as much a part of my schooling as my last year at "State."

Since then, I've been glad I thought of it that way, because that's what the first year and a half was . . . schooling. Among other things, I learned what I wanted to do, and learned a lot about products and industry problems. But I give much of the credit for the great amount I learned to the Allis-Chalmers Graduate Training Course and consider myself very lucky to have chosen Allis-Chalmers. Perhaps a quick review of my own experience will show why I feel that way.

PAUL CLARK



Power Transformer being installed in Midwest utility.

After graduating from Iowa State in 1949

I started the Allis-Chalmers Graduate Training Course on the Steam Turbine erection floor. From there I went to the switchgear and pump departments to familiarize myself with other utility equipment; and from there, to the Motor and Generator section, which at the time was my goal.

Brain of a giant 107,000-kw steam turbo-generator is this complex *Regulex* voltage control. Clark finds such control a fascinating problem.

Arrange Your Own Course

From this, you begin to see the freedom a GTC student has at Allis-Chalmers. You not only have complete freedom in arranging your course, but you can change your course as you go along and your interests develop. Best of all, you have a wide choice, because Allis-Chalmers builds such a wide line of products.

Even after getting to the Motor and Generator section, which had been my original goal, I had a chance to change my mind. While I found a certain glamour to the big motors and generators, I became *really* intrigued by the electrical brains of these giants, and decided to go to the control section to learn more about them. I have been working there ever since.

Today, I am in charge of pricing, applying and promoting the sale of three lines of control devices: *Rocking Contact* voltage regulators; *Regulex* voltage regulators; and liquid rheostats. Part of my time is spent traveling . . . visiting customers and helping district office salesmen.

The time spent in other departments has paid off too. It not only helped me find the work I liked best, but I met people in departments all over the plant that I now work with in coordinating jobs for utilities. Even time on the Steam Turbine erection floor proved valuable, because it helps me in talking shop to utility men.

Wide Choice at A-C

One reason you have such a wide choice is the fact that Allis-Chalmers makes equipment for every basic industry, including electric power, cement, mining, rock products, flour milling, and steel. Just to give you an idea, here are some of the products you might some day redesign, build or sell: transformers, steam condensers, pumps, motors, blowers, unit substations, steam and hydraulic turbines and generators, crushers, kilns, grinders, coolers, rolling mills, sifters, and many others.

That diversity can mean a lot to you in helping you find the job you want. It certainly helped me make my first job count.

Science - -

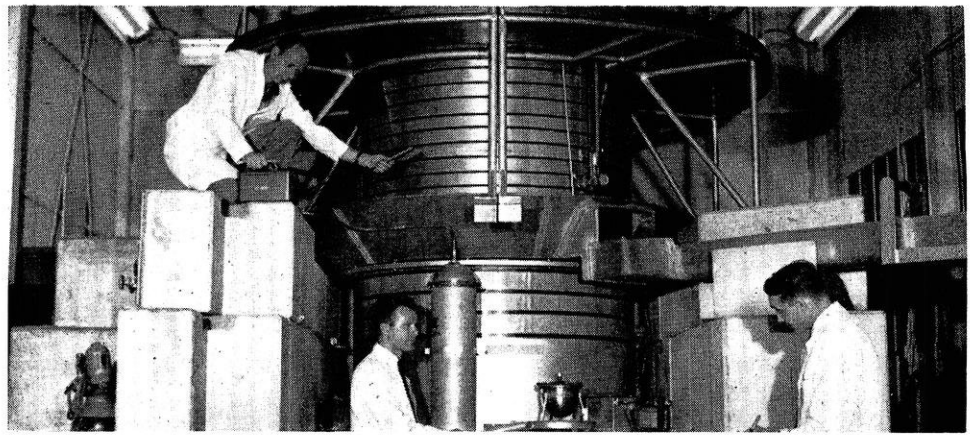
(*continued from page* 19)

NORTH AMERICAN SHOWS "BABY" REACTOR

The first atomic energy reactor to operate in California was revealed today when North American Aviation's water boiler neutron source was demonstrated at the company's Downey plant. The "baby" reactor is being used to further the development of reactors and associated projects.

While the water boiler reactor is quite small in comparison with reactors for producing fissionable materials or useful power, from it may be obtained information of value in designing improved reactors for various purposes. The water boiler is a part of a facility for making reactor physics measurements to enlarge the basic information upon which reactor development is based. The water boiler neutron source will supply the neutrons, minute particles of matter, needed for these measurements.

The exterior of the reactor is shielded by a housing of two-foot thick concrete blocks each weighing 1,000 pounds, forming a structure about the size of a single car garage. The concrete surrounds a cylindrical graphite reflector five feet in diameter and six feet high, formed by stacking graphite bars horizontally inside a steel tank. The reflector surrounds the reactor core, a stainless steel sphere one foot in diameter. The production of atomic energy takes place inside this sphere which contains a Uranium 235 enriched uranyl nitrate solution. It is from the nuclear fission of this material in a water solution that the reactor derives its power—and its name "water boiler."



Atomic energy engineers of North American Aviation's Atomic Energy Research Department measure the background radiation level around the water boiler type atomic energy reactor. Concrete blocks, used to shield the reactor, have been removed, showing the tank-like housing where the graphite reflector and core are located.

The rate of fission, the production of atomic power, is controlled by a system of control rods which can be moved horizontally through the concrete and graphite to the core. These rods, made of cadmium, boron, and aluminum, have a retarding effect upon the nuclear fission inside the core. Depending upon their nearness to the core, the rods can control the fission from a "stop" to "wide open" rate of reaction. The graphite reflector "bounces back" neutrons which come from the core. Any stray neutrons which escape the reflector are trapped by the concrete and engineers working outside the reactor are shielded from any harmful effects of atomic radiation.

The water boiler type reactor is unique in its safety features. Although the reactor is constructed to be completely controllable by mechanical means, it has inherent features which contribute to its safety. If the mechanical controls were to fail and a "run away" fission process resulted, heat produced by the process would raise the temperature of the water solution sufficiently to stop power production. At this point emergency control rods could be employed to restore the reactor to a neutral condition.

New RCA Victor record changer —easiest to play at all three speeds!

World's simplest 3-speed changer, this versatile Victrola combines new playing ease with the finest reproduction of sound. And it changes "45" rpm records *correctly*, on the same turntable used for other speeds.

Key to this advance is RCA Victor's *slip-on* "45" spindle, which fits over the permanent spindle and locks in place. No plugs or extra gadgets. Simply stack your "45" records on this fine instrument, and play up to fourteen of them—at the twist of a knob. Then, whenever you wish, remove the "45" spindle, flick the needle and speed controls, and the same Victrola changer will play records automatically at 33⅓ or 78 rpm.

More than a year of research and engineering went into this changer—further evidence of the leadership which assures you finer performance in any product or service of RCA and RCA Victor.

* * *

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

Write today to College Relations Division, RCA Victor, Camden, New Jersey. **Also many opportunities for Mechanical and Chemical Engineers and Physicists.**

WSPE--

(*continued from page* 36)

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Albert C. Greiner, Application Engineer, Square D Co., Milwaukee.

Thomas Midgley, Jr., Application Engineer, Processing Machinery Div., Allis-Chalmers Mfg. Co., West Allis, Wis.

Jim L. Mitchell, Asst. Engr., Mechanical Power Dept., Allis-Chalmers Mfg. Co., West Allis, Wis.

Carl E. Matheis, Sales Engr., The Louis Allis Co., Milwaukee.

A. Leo Huehnel, Engineer in Charge, Square D Company, Milwaukee.

Elmer F. Oltmanns, Design Engineer, Staff Engineering Dept., Kimberly Clark Corp., Neenah.

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John Gordon Thompson, Acting City Engineer, Madison.

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Robert G. Hart, Construction Superintendent, Siesel Const. Co. Milwaukee.

Frederick R. Gruner, Assistant to Manager, Processing Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee.

Robert J. Mendenhall, Supervisor of Technical Sales, A. O. Smith Corp., Milwaukee.

Leroy C. Zignego, Engineer, Wisconsin State Highway Comm., La Crosse.

Walter C. Yaeger, Building Plans Engr., Wisconsin Telephone Co., Milwaukee.

AFFILIATE MEMBERS

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Thomas V. Poole, Junior Sales Engr., Socony Vacuum Oil Co., Milwaukee.

Orville R. Sallander, Engineer, State Highway Comm. of Wis., La Crosse.

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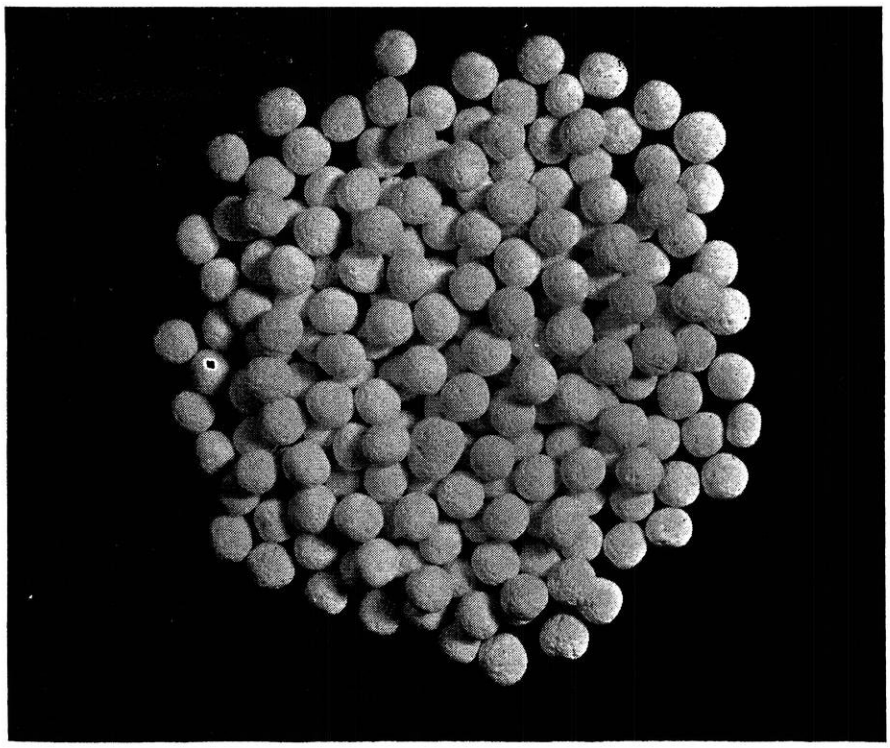
What Are These Spheres?

- ☐ *Catalyst Supports*
- ☐ *Moth Balls*
- ☐ *Abrasive Grains*



They are catalyst supports — Norton refractory products made of chemically inert, heat-resistant, wear-resistant materials for use as catalytic carriers in chemical processes. Pictured in spherical shape here, they are also available as pellets and rings.

Composition and Properties

These supports are commercially available in ALUNDUM* (fused alpha alumina) mixtures varying from 77% to 89% alumina with silica as the principal impurity. In addition to their refractoriness, they are chemically inert, mechanically strong and wear-resistant.

Water absorption values of these supports vary from 12% to 22% by weight. Surface areas by the nitrogen absorption method range up to about one square meter per gram. Crushing strengths vary from 20 to 600 pounds, depending on size and shape, and bulk densities range from 60 to 80 pounds per cubic foot.

Many Refractory Products

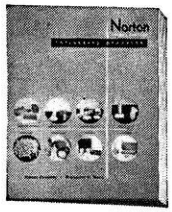
Catalyst supports are but one of many refractory products made by Norton. These include small furnace refractories such as tubes, cores and muffles; large furnace refractories such as bricks, plates, muffles and other shapes; refractory cements; refractory laboratory ware; kiln furniture for ceramic plants.

In its search for refractory products that can be used at higher and higher temperatures, Norton has developed a line of pure oxide refractories. These refractory shapes, as their name implies, are molded without bond and then fired at sufficiently high temperatures to produce a truly sintered product.

The principal raw materials used in the manufacture of Norton pure oxide refractories are ALUNDUM (fused alumina), MAGNORITE* (fused magnesia), fused stabilized ZIRCONIA and, to a limited degree, fused thoria.

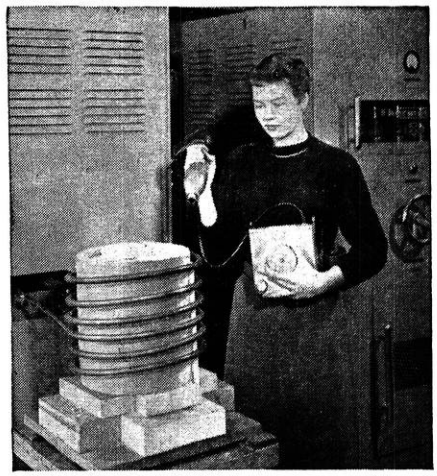
Planning Your Future?

Norton Research is continually developing better products to make other products better. Young technicians who are interested in contributing to the technical advances of the future will find Norton Research well worth investigating.



Free Booklet on

longer lasting Norton refractory products contains detailed descriptions of Norton contributions in this field. Write for your copy.



Norma L. Gullberg, A.B., Chemistry, Clark University '46, takes a reading with an optical pyrometer on a high temperature furnace used for catalyst support tests.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

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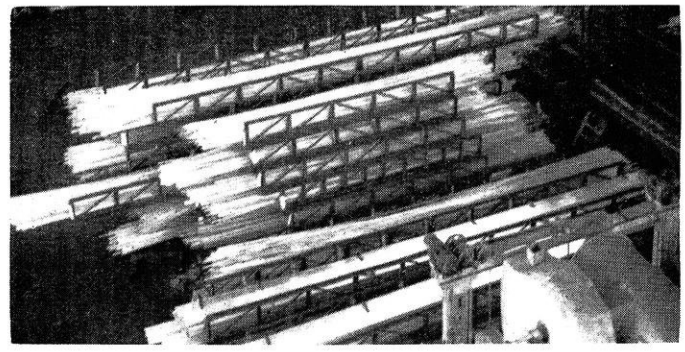
Reynolds Aluminum - -

(*continued from page* 17)

Pure aluminum is periodically drawn off and poured into pigs weighing 50 or 60 pounds. These are later remelted with alloying metals to obtain desired compositions, and then cast into ingots.

4. Characteristics of Aluminum. Aluminum has a natural "white" surface that can be mechanically finished, etched, electroplated, or anodized to produce a color absorbing surface. This surface reflects up to 95% of light and radiant heat. It is non-sparking, non-magnetic, non-toxic, resistant to most chemicals and has high thermal and electrical conductivity. It is rustproof, forming a protective oxide that adheres to and protects the underlying metal.

Probably the most well-known characteristic of aluminum is its high strength-to-weigh ratio. Certain aluminum alloys have a higher tensile strength than steel, while only weighing one-fourth as much. This is why, pound for pound, aluminum gives three times as much metal as steel, brass or nickel. The cost is lower, because there is less weight to handle, fabrication is cheaper and finishing is often eliminated. Aluminum is the most versatile metal in production today. It can be blanked, precision machined, sawed, sheared, stamped, cut, drawn, bent, cold or hot forged and rolled, extruded, upset, spun, cast, pierced, hammered, welded, riveted, soldered, or brazed.



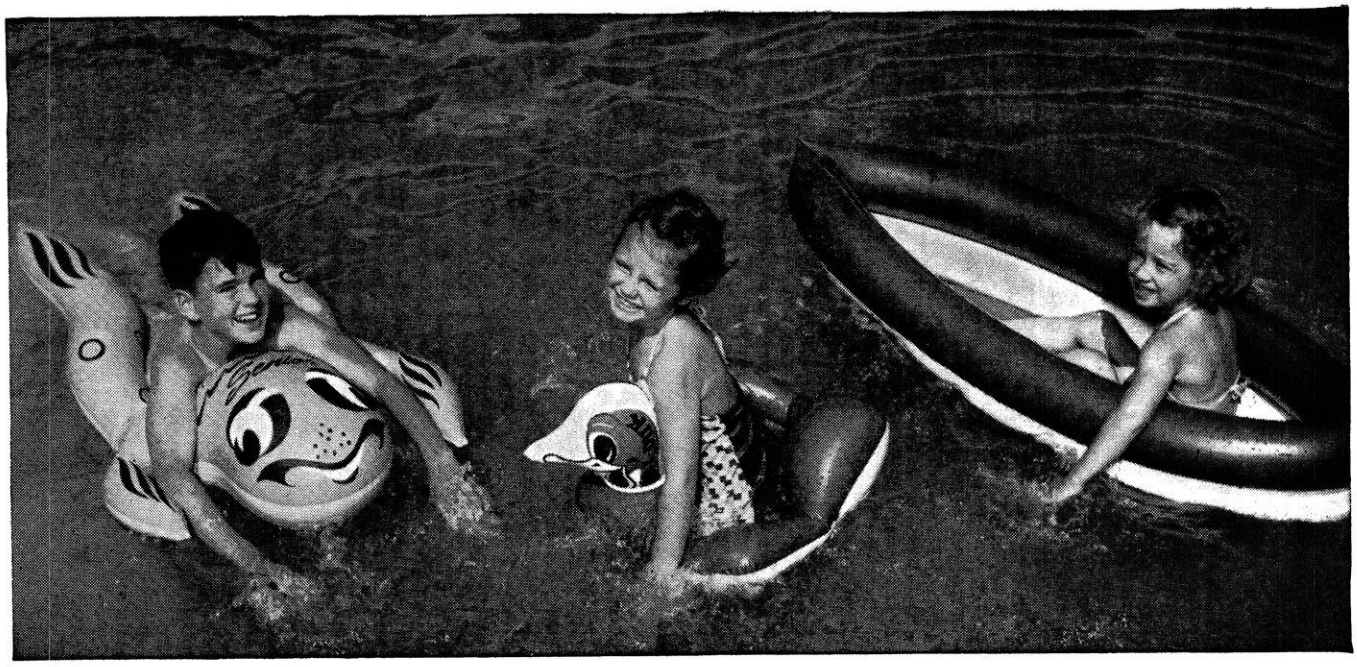
Stockpile of aluminum extrusions.

5. Forms of Aluminum Stock. Aluminum stock takes the form of sheets, plates, wire, rods, bars and cable.

Sheet and plate stock is formed from rectangular ingots weighing up to 4000 pounds, by hot rolling. Hot rolling stops at one-eighth of an inch thickness and cold rolling continues if thinner sheets are desired. Three-fourths of Reynolds aluminum is fabricated into sheet and plate stock.

Rod stock has a round cross-section while bar is square, rectangular, octagonal, or hexagonal. Bar and rod are formed by hot rolling between grooved rollers which reduce the cross-section and elongate the stock simultaneously.

(*please turn to page* 44)



How chemical research in petroleum yielded benefits far a-field

ONE OF THE processes on which Standard Oil has done important development work is the Oxo process, which converts olefins to aldehydes and alcohols by high-pressure reaction with a mixture of hydrogen and carbon monoxide.

Today Standard Oil is constructing an Oxo plant for the large-scale production of iso-octyl alcohol. Its capacity will be ten million pounds a year. Other alcohols could be produced here with only minor changes.

Iso-octyl alcohol is used to make phthalic and adipic esters. These are plasticizers for vinyl plastics, found in a wide variety of products ranging from toys to life rafts. Iso-octyl alcohol is also useful as a base for making lube additives, anti-foam agents, and other important products.

Research on the Oxo process continues in our Whiting laboratories with a view toward improving plant operation and finding other applications for the process.

The Oxo process is just one of a wide variety of subjects under study at Whiting by young men with training in engineering and chemistry.

Standard Oil Company

910 South Michigan Avenue, Chicago 80, Illinois

STANDARD

Reynolds Aluminum--

(continued from page 42)

Wire is made by cold drawing rod through a series of dies that successively decrease the diameter of the rod.

Cable is made by stranding aluminum wire around a steel core which makes it about 50% stronger and 20% lighter than copper cable of equal power capacity.

6. Grand Rapids Extrusion Plant. Originally costing more than $6,000,000, this plant has a rated capacity of 18,000,000 pounds of shapes and tubing yearly and employs some 600-700 workers.

Basically, alloys from virgin aluminum are forced through dies having an opening whose size and shape is that of the pieces desired. These extruded pieces are then heat treated, straightened, cut to desired lengths, packed and shipped.

Specifically, the process is this: Billets, from the casting department, are fed into the reheat ovens on one of the six extrusion presses in the plant. (The presses range in size from 1650-ton to 3850-ton capacities.) After being heated to about 1000°F, the billet is placed in the press cylinder and a steel dummy block set in behind it. The dummy block protects the pushing ram and prevents any metal oozing back out of the cylinder. Hydraulic pressure in the line, up to 4000 psi, extrudes the shapes at the rate of 3 to 100 feet per minute, depending upon the shape being extruded. The steel die may have more than one opening and is held in place by the die holder in front of the cylinder. An eight-five foot, carbon-block-lined run-out table carries the cut-off extruded pieces to a circular saw where they are rough cut to length.

Finishing processes include straightening, annealing, contouring, solution heat treating, artificial aging, and cutting to length.

Forty-foot extrusions are solution heat treated in a 77-ft. vertical electric furnace. They're held at constant temperature by a thermocouple until treatment is complete and then quickly lowered into a water quench.

Eight hydraulic and pneumatic stretch straighteners, ranges from 75-ton to 250-ton, straighten to remove kinks, buckles and twists in the treated extrusions. To obtain a consistent increase in mechanical properties, the practice is to stretch each shape 0.7% of its length.

Angular deviation between legs of shapes such as zees, tees, angles and channels is corrected in one of two contouring or roll-truing machines, or in a 24-spindle roll straightener.

Final cutting is done by various-diameter swing-type circular saws.

The quality of material released is the responsibility of the inspection department. A co-function of the department is helping sales offices determine exact customer needs and corresponding inspection standards.

Each extrusion is hand-packed in bundles of 150 pounds or boxes weighing up to 500 pounds. Boxes weighing up to 3000 pounds are packed only if the customer can handle them. Shipping is by truck and rail from the Grand Rapids Extrusion Plant.

7. Fabrication Service. This service includes blanking, embossing, stamping, drawing, spinning, forming, roll-shaping, tube bending, welding and finishing. Several fabrication plants, each with more than 1,000,000 square feet of floor space, are strategically located throughout the country to provide these services to manufacturers who have neither the equipment nor experience themselves. The plants contain mechanical and hydraulic presses, brake presses, shears, spinning lathes, roll formers, tube benders, and facilities for all types of welding and finishing. A new process—the color-anodizing of aluminum—is gaining in popularity. By it, a chip-proof brilliant color is actually made a part of the metal surface.

This fabricating service also saves large manufacturers the cost of shipping and handling scrap and rejects.

8. Principal Products and Uses.—Architectural and building uses of aluminum number in the thousands.

Interior and exterior decorations of aluminum are near-perfect, because they require no maintenance, are rust-proof, have a natural "whiteness," initial low cost, light weight and can be made in all sizes and shapes.

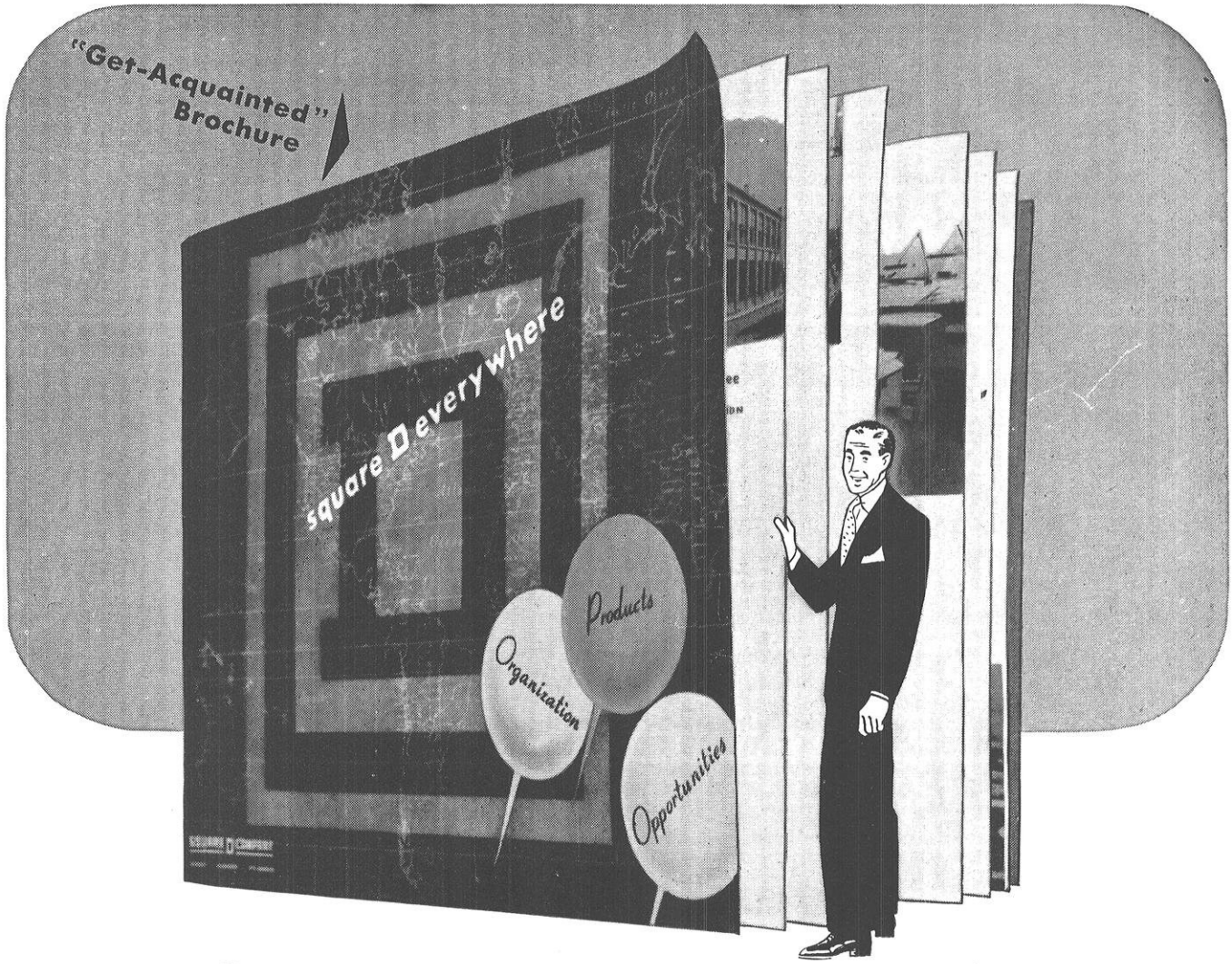
Aluminum is used in the building industry for gutters and downspouts, insulation, windows, heating and air-conditioning ducts and even nails. Farm uses include grain bins, irrigation equipment, portable structures of all types, on down to paint for old wood and metal.

Rolling and printing of aluminum foil is one of Reynolds' largest production operations. Tissue-thin foil can be color printed and laminated to wood, paper or roofing felt. It can wrap any shape, and be molded into any type of container. It varies in hardness, luster, color and surface design, and thus has been used for almost every type of store-size package sold today.

Aluminum powder, made by pulverizing pure aluminum in hammer or ball mills, has two characteristics which give it added uses. First, the powder will explode, making it useful for pyrotechnics, signal flares and explosives. Second, if suspended in a paint solution, the flakes float to the top and "leaf" together like roof shingles when the paint drys. This gives an unequaled protective coating for wood or other metals.

9. Summary. This report has shown how the Reynolds Metals Company takes bauxite ore from the mines of Jamaica, Arkansas and Haiti, ships it to the U.S. where it is reduced to pure aluminum by electrolysis. From ingots it is changed to various forms of aluminum stock which is further shaped by extrusion, hot or cold rolling and other metal-working processes. The finished forms include building products, mill products, foil products, pigments, consumer goods and chemicals.

The uses for aluminum are endless, with new ones being discovered daily. Its light weight, high alloy strength, corrosion resistance, high electrical and heat conductivity, workability, modern appearance and low cost make it the near-ideal metal of today and tomorrow.



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Campus--

(*continued from page* 32)

therefore the nominating committee had to appoint candidates for the offices. The election was held by postcard ballot to make it easier for the voters.

This year's first meeting will be held about October 16th, and will feature Nordberg's Radial Diesel Engine. Two topics of the business meeting are definitely planned. Members will nominate and elect one more Polygon Representative (two are required for each society), and also select a replacement for Bob Traver, the Treasurer. Members miss Bob, and wish him and his family the best of luck, and hope that he can return soon. Bob's parents moved recently to Rochester, N.Y., and his father subsequently became seriously ill. Bob, as a result, has elected to remain home and help his family.

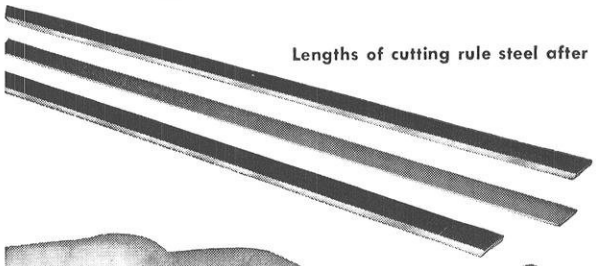
Officers elected or appointed last spring:

Chairman—Carl F. Thelin; Vice-chairman—Donald P. Haas; Treasurer—Robert Traver; Recording Secretary—Zygmunt "Ziggy" J. Przedpelski; Corresponding Secretary—Paul Padrutt; Polygon Representative—William C. Dries.

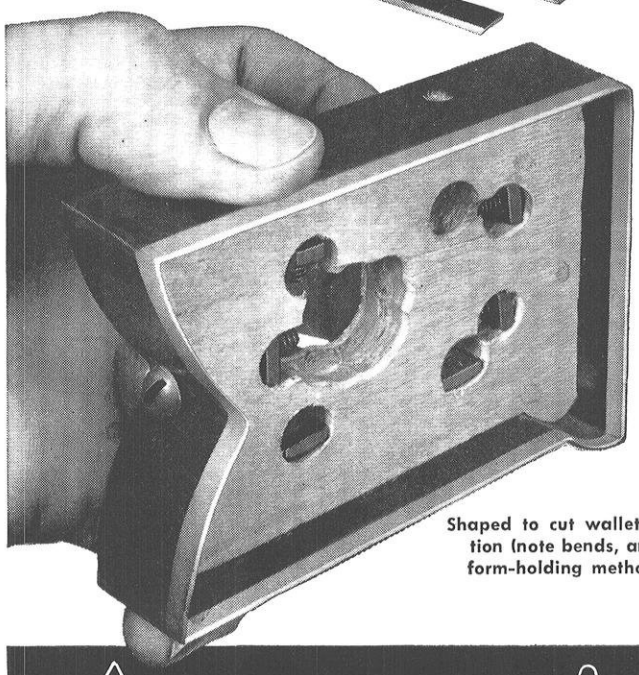
(*please turn to page* 52)

What's Happening at CRUCIBLE

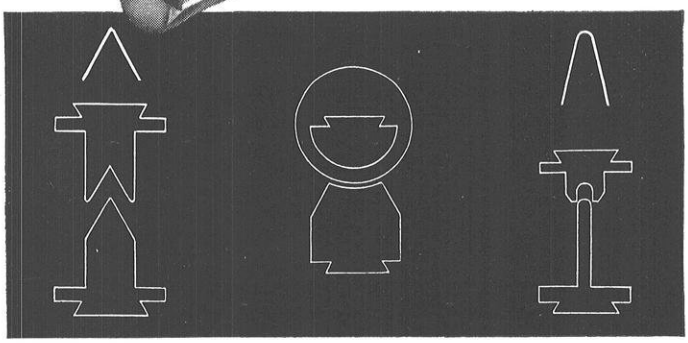
about scoring and cutting rule steel



Lengths of cutting rule steel after edging



Shaped to cut wallet section (note bends, and form-holding method)



Some examples of the many shapes of bends needed

Scoring and cutting rule steel is a cold-rolled specialty steel for use in preparing dies for cutting paper, leather, rubber and other materials.

It is a pre-tempered product manufactured by skilled workmen, using precision rolling and hardening equipment, to close limits for chemistry, grain size and hardness. This product must also be capable of meeting intricate bend requirements in the hardened and tempered condition.

This specialty is furnished with round edges and in coil form to the rule manufacturer who grinds the edges — the one edge square and the other to a knife edge as well as cutting the material into desired lengths. This is sold to a die-maker who bends the rule to the required shape. This is then the nucleus of a pre-hardened die, which when properly brazed and supported is used to cut out material for display cards — aircraft parts — pocketbooks — wallets — gloves — gaskets — washers.

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Since there is a great diversity of cold-rolled products, our staff of field metallurgists can help you apply what you require. Take full advantage of Crucible's more than 50 years experience as the first name in special purpose steels. Crucible Steel Company of America, General Sales and Operating Offices, Oliver Building, Pittsburgh, Pa.

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National Drawn Works, East Liverpool, Ohio • Sanderson-Halcomb Works, Syracuse, N. Y. • Trent Tube Company, East Troy, Wisconsin

Fluorine--

(*continued from page* 21)

terial is broken up by the electric current into hydrogen and fluorine, which are discharged at the cathode and the anode respectively. Because fluorine and hydrogen react explosively, the anode and the cathode compartments are separated by a diaphragm to prevent contact of the gases. Additional hydrogen fluoride, which is obtained by treating fluorspar with sulfuric acid, is continuously added to replenish the cell. The anodes are of carbon, but the rest of the cell, fortunately, can be constructed of ordinary carbon steel and Monel. These metals as well as copper and nickel, form a protective surface coating of fluoride upon exposure to the gas, rendering them resistant to further attack.

By the spring of 1942, the work had gone so well that big industrial organizations were asked to take on the laboratory-scale operations and put them on a factory-scale basis. Most industrial scientists, like their university colleagues, were not happy. They were less happy when they saw for themselves what fluorine could do.

They put on asbestos clothes, and the fluorine set the asbestos on fire. They tried rubber gloves to protect their hands, and the rubber burst into flame. They set up barricades of wood, steel, concrete and brick, and fluorine ate through them. They tried to pump fluorine through steel pipes, and the pumps exploded and the steel caught fire. Steel could be used only if it were absolutely clean—no water, no pipe dope, and no grease. If any of these contaminants were present, the fluorine would start reacting and produce a hot spot in the steel, a spot about the size of a fingernail, which would suddenly become white hot and flare into action. The metal melts and bursts, flame appears, and the molten metal and fluorine is ejected a considerable distance.

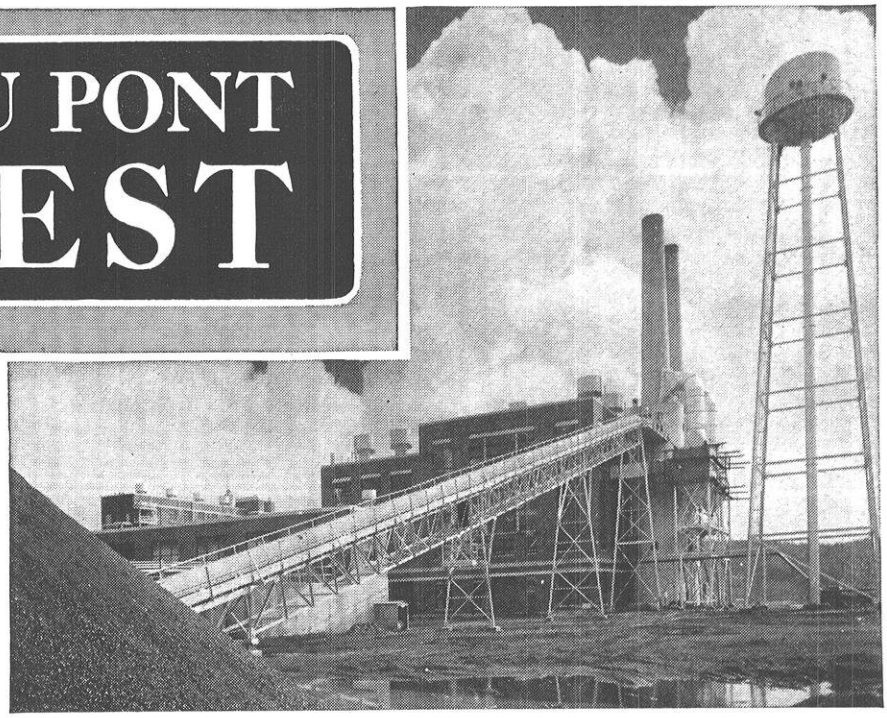
Working out the production of fluorine was difficult, but the problem of handling and storing were even knottier. In several instances fluorine chemistry lifted itself by its own bootstraps: The only satisfactory packing material for valves, pumps, gaskets, and the like was a mixture of a metal fluoride and tetrafluoroethylene polymern; and the only lubricant for pumps that wasn't attacked by the corrosive gas was a hydrocarbon oil in which all the hydrogen atoms were replaced by fluorine.

Even the pumps had to be of special design in order to stand up under the action of the corrosive gas. A regular commercial oil-operated diaphragm pump was arranged to transmit pulsation hydraulically to a second diaphragm pumping head in contact with the fluorine. The two pumping heads were connected by a pipe passing through a fire wall and containing a highly fluorinated hydrocarbon inert to fluorine. The expensive mechanical pump was thus protected in case of failure of the diaphragm or valves in actual contact with the highly corrosive gas.

Now that the gas could be manufactured, it was ready to be put on the market. Interstate Commerce Commission representatives were consulted informally on the possibility of shipping tanks or cylinders of compressed fluorine gas in freight cars. The I.C.C. men investigated, learned what fluorine could do to steel, wood, and flesh, and said flatly, "No!" But these scientists wouldn't take "no" for an answer. They learned how to store fluorine in nickel and Monel metal. They found that by storing fluorine in small quantities, about one-half pound in a cylinder, they could handle it safely. Finally they convinced the I.C.C. that fluorine could be shipped safely on freight cars.

Thus fluorine has become a useful and serviceable chemical. After years of hard work, costly experiments, and exasperating failures, fluorine is a chemical reagent of unprecedented possibilities. Still holding fluorine at arms length, scientists must learn how to have fluorine at their fingertips. Fluorine has not been conquered; it has just been tamed.

THE DU PONT DIGEST



This powerhouse *for a nylon plant at Martinsville, Va., was designed by Du Pont engineers. It houses two 135,000 lb./hr. boilers and two 7,500 KW extraction turbine generators.*

Power Work for M.E.'s

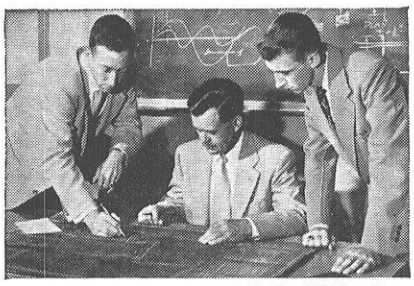
Varied needs of 71 Du Pont plants pose a host of original power problems

Heart of Du Pont's manufacturing program is the power plant. To make some 1200 products and product lines the Company operates 71 plants.

Most require steam and electric generation, water supply and treatment, heat exchangers, piping systems and related services. The designing of these power plants, their erection and operation are all in the hands of engineers, the great majority being mechanical engineers.

But this is not the most interesting thing about power work here. What challenges the highest skills of the engineer at Du Pont is the wealth of original problems constantly arising. Power requirements vary enormously, not only from plant to plant but from time to time.

Process operating pressures may range from over 15,000 psi. to 2 mm of mercury, electrical requirements from as low as 7,000 to higher than 1 million KWH/day, and temperatures from −360° to over 3,500°F.



George S. Mahaffey, *B.S. in M.E., Penn State '52 (right), B. S. Norling, B.S. in E.E., Washington State '24, and A. S. Noell, Jr., B.S. in E.E., Duke '51, discuss the power requirements of a new processing area.*

Here are examples of recent "off-the-beaten-path" power problems.

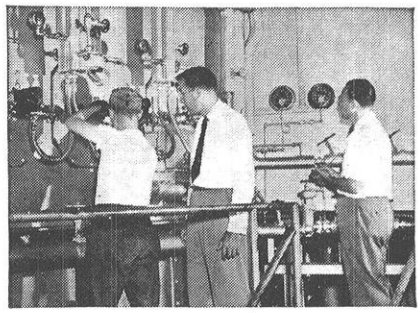
1. A plant using natural gas as its basic fuel produces a waste oil of variable hydrocarbon composition and a waste gas with only 110 Btu/cu. ft. Du Pont M.E.'s designed burners, fans, boilers and combustion controls to permit use of all three fuels for generating steam.

2. At another plant 20,000 gpm of cooling water were to be drawn from a nearby river. Since the water level fluctuated 40 feet between normal and flood stages, it was necessary to evaluate several plans for pump-house constructions against cooling towers. The engineers installed a unique pump house whose submerged vertical pumps operate even when the structure is entirely under water.

Aside from design and construction, Du Pont mechanical engineers concern themselves with such related subjects as economic evaluations, equipment selection, heat balances, load calculations, waste heat boilers.

For example, where various process temperatures from 300° to 600°F. were required, Dowtherm was selected as the supply medium at the rate of 35 million Btu/hr. The engineers installed a central system for primary supply because it calculated to be more economical than separately located vaporizers.

On the operational side, M.E.'s supervise the supply of power and services. They establish performance standards and analyze equipment for results, cost and maintenance.



Edward W. Garrison *(right) M.S. in M.E., California Tech '47, and Byron R. Brown (center), B.S. in M.E., New Hampshire '49, supervise adjustment of furnace conditions in a study of power-plant efficiency.*

Whether viewed from the design and construction side or the operational side, the diversity of Du Pont's manufacture offers a wealth of opportunities in power work for the mechanical engineer.

OPPORTUNITIES for men and women with many types of technical training are discussed fully in "The Du Pont Company and the College Graduate." For a copy, write 2521 Nemours, Wilmington, Del.

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150th Anniversary

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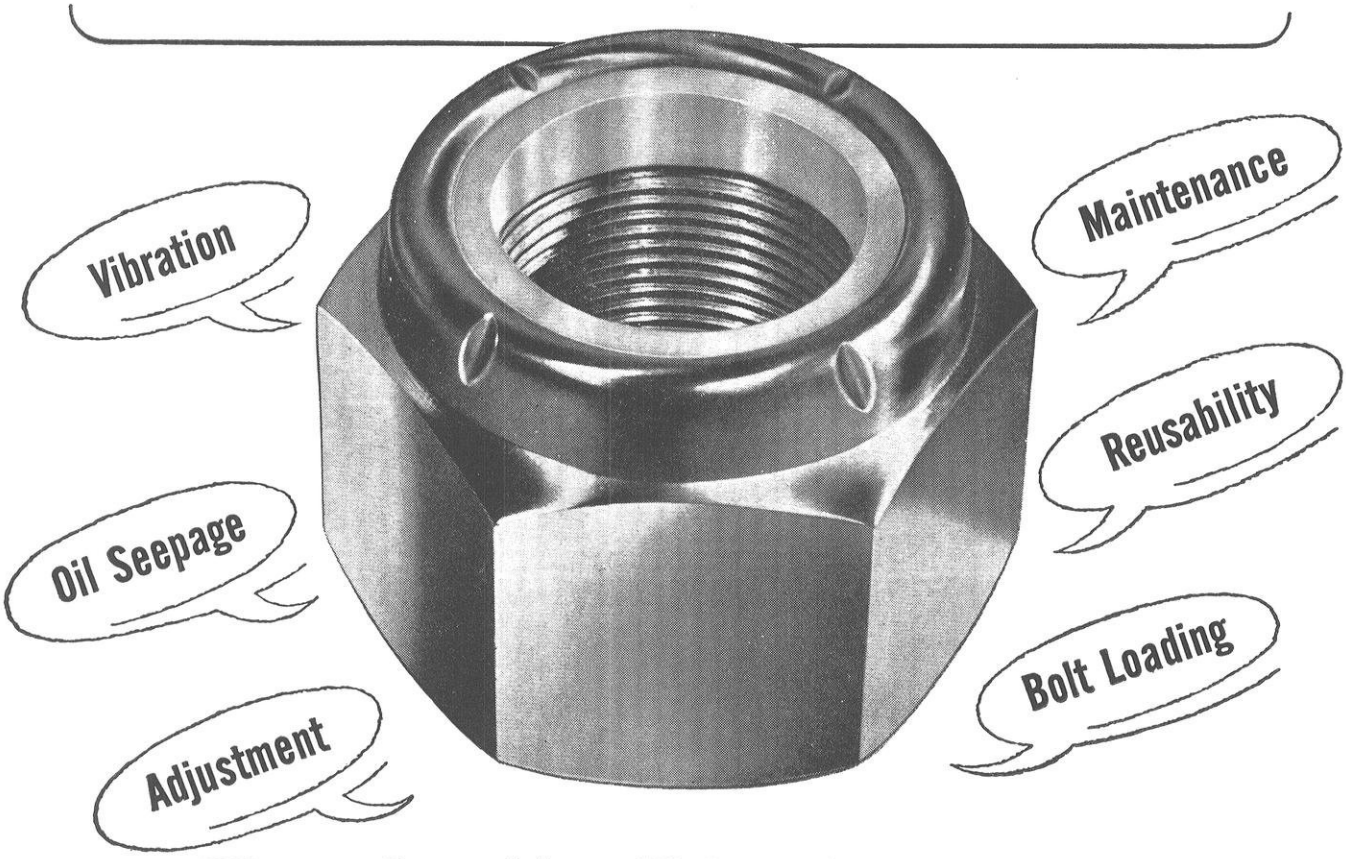

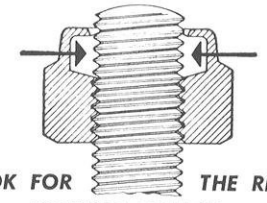

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Whenever fastening presents a problem—ESNA is ready with a quick answer. More than 3000 types and sizes of self-locking vibration-proof fasteners—plus the "know-how" of ESNA engineers—are available here at ESNA.

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Be familiar with the design help ESNA offers. Write us for details on Elastic Stop Nuts. Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, N. J.

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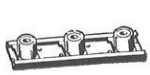
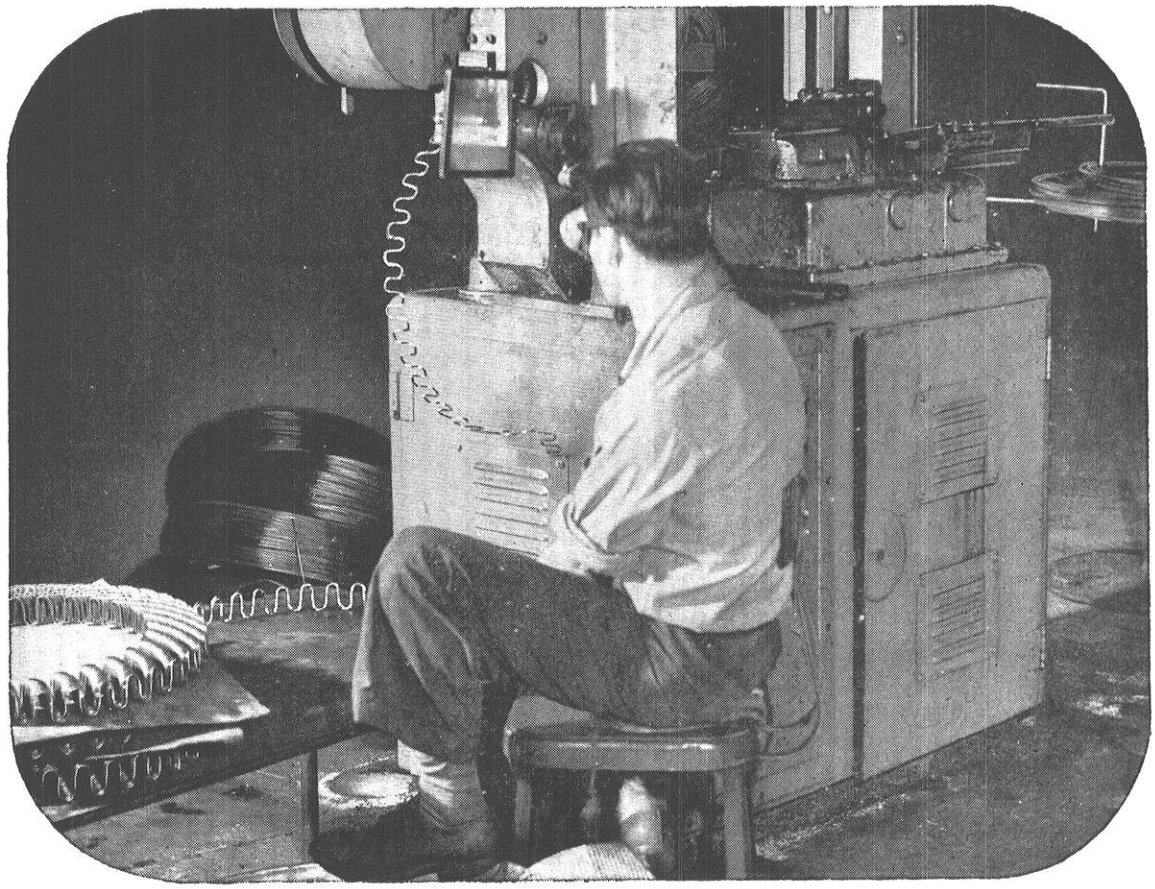

GANG CHANNEL


NYLON CAP

DESIGN HEADQUARTERS FOR SELF-LOCKING FASTENERS

SPRING WIRE



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Campus - -

(*continued from page 46*)

Student Branch—AIEE and IRE

The University of Wisconsin student branches of the American Institute of Electrical Engineers (AIEE) and the Institute of Radio Engineers (IRE) concluded the semester last spring by combining. The two groups merged to eliminate duplication of meetings, to combine their treasuries to make it a workable sum, and to provide an opportunity for members of each of the two organizations to attend the functions of the other.

The group's plans for the fall semester include a talk on Spectrum Analyzers and Uses on October 10th and a meeting on November 12th with the Madison section of the AIEE. Refreshments will be served at all functions. Activities during the second semester will be highlighted by inspection trips and a nationally sponsored Paper Contest. An inspection trip through the Madison Gas and Electric Company and another in the Wisconsin Bell System will be major meetings of the spring term. A great opportunity for those who enjoy writing is the AIEE Paper Contest which will be held in the spring. It is open to all members of the AIEE and will be run so that the branch winners will be placed in the national contest. The ultimate district winners will receive a cash prize (along with the runners up) and will be given an all-expense-paid trip to the district convention.

The newly elected officers of the club are Frank Balash, President; Tony Glavin, Vice President and Program Chairman; Don Colvin, Secretary and Treasurer; Charles Wittkop, AIEE local branch Secretary and Treasurer; and Al Schmidley, IRE local branch Secretary and Treasurer.

AIChE

Officers for 1952-53: President, Jack S. Buchanan, Ch E 4; Vice President and Treasurer, George Rasmussen, Ch E 3; Secretary, Clayton Bossart, Ch E 4; Polygon Board, Allen Rabe, Ch E 4; Russ Awe, Ch E 4.

Regular meetings once a month consisting of: (1) speaker or movie; (2) refreshments after meeting.
meeting.

Attend annual AIChE convention in spring of year, where each chapter is invited to present paper on a Chem. Engr. subject.

Last year this convention was held at the University of Illinois and the winning paper was read by a Wisconsin man, Don Casser. As a result we now have the traveling trophy which will be given to this year's winner. Convention this spring will be in Detroit.

Awards are presented every year to the oustanding senior student and sophomore student.

Social events have been held about once a semester, but this year we hope to extend this program to include two parties each semester.

Nature was working for you...a billion years ago

Age-old natural gas—changed beyond recognition by the hand of science—is in nearly everything that's new today

Geologists tell us that centuries ago mountains rose and crumbled . . . oceans formed and disappeared . . . and great masses of plant and animal life were buried under layers of earth, rock, and water. Gradually, chemical reactions changed that buried matter into oil and natural gas.

IT IS IMPORTANT TO ALL OF US—Natural gas came into its own within the lifetime of many of us. Its great importance began when scientists learned to separate and use its parts. Out of this work in the field of petro-chemistry came "Prestone" anti-freeze, the all-winter type that took the worry out of cold weather driving. Then there are today's plastics. Some are so soft and pliable that they make beautiful, long-lasting curtains and drapes for your home. Others are so tough and enduring that they are used to protect the bottoms of ocean liners. Natural gas products are important ingredients in nearly all of them.

FROM ANTI-FREEZE TO FUEL—Wherever you turn, there's something that's been made better by the magic touch of chemistry. It brings you many of today's life-saving wonder drugs . . . man-made fibers for exciting new textiles . . . hundreds of useful chemicals . . . and also "Pyrofax" gas, the modern bottled gas for home, farm, and industry.

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STUDENTS and STUDENT ADVISERS: *Learn more about the many fields in which Union Carbide offers career opportunities. Write for the free illustrated booklet "Products and Processes" which describes the various activities of UCC in the fields of* ALLOYS, CARBONS, CHEMICALS, GASES, *and* PLASTICS. *Ask for booklet I-2.*

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STATIC

BY I. R. DROPS

The poor duck hunter in his blind
Is chilled in front and wet behind.
It's seven hours since he fed
And twenty since he's been in bed.
It cost him near a hundred bucks
To hide himself from silly ducks
Which presently, ere day dawns dim,
Will rise and hide themselves from him.

* * *

An Arab furtively stepped on a scale
Near the end of a lingering day
A counterfeit coin he dropped in the slot
And silently stole a weigh.

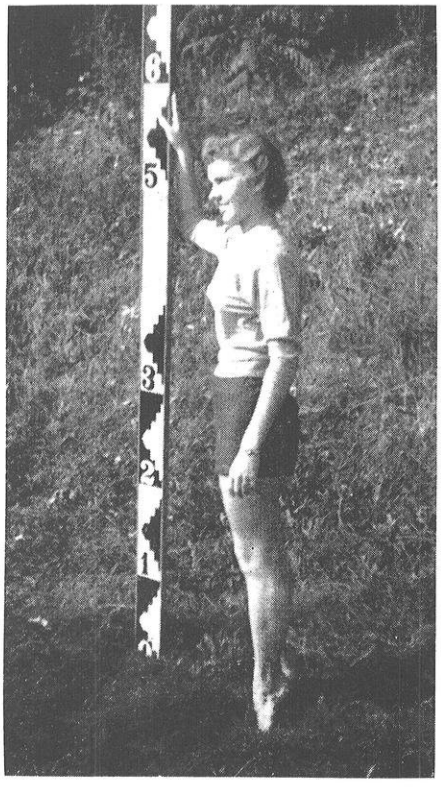


Photo by D. Dauterman

The Civil Engineers report that Marianne Schuchardt was not at C.E. Summer Camp.

Her lips quivered as they approached mine. My whole frame trembled as I looked into her eyes. Her body shook with intensity as our lips met, and my chin vibrated and my body shuddered as I held her, pulsating, close to me.

The moral. "Never kiss them in a car with the engine running."

* * *

Pants are made for men and not for women. Women are made for men and not for pants. When a man pants for a woman and a woman pants for a man, they are a pair of pants. Such pants do not always last and then they are called breeches of promise. This often turns into a suit. When two couples are mixed up in a suit, all panting, it is a suit with two pair of pants.

* * *

"I'm going to have a little one,"
Said the girl friend, gay and frisky;
But the boy friend up and fainted
Not knowing she meant whiskey!

* * *

The telephone rang late one night.

"What is it?" asked the tired C. E.

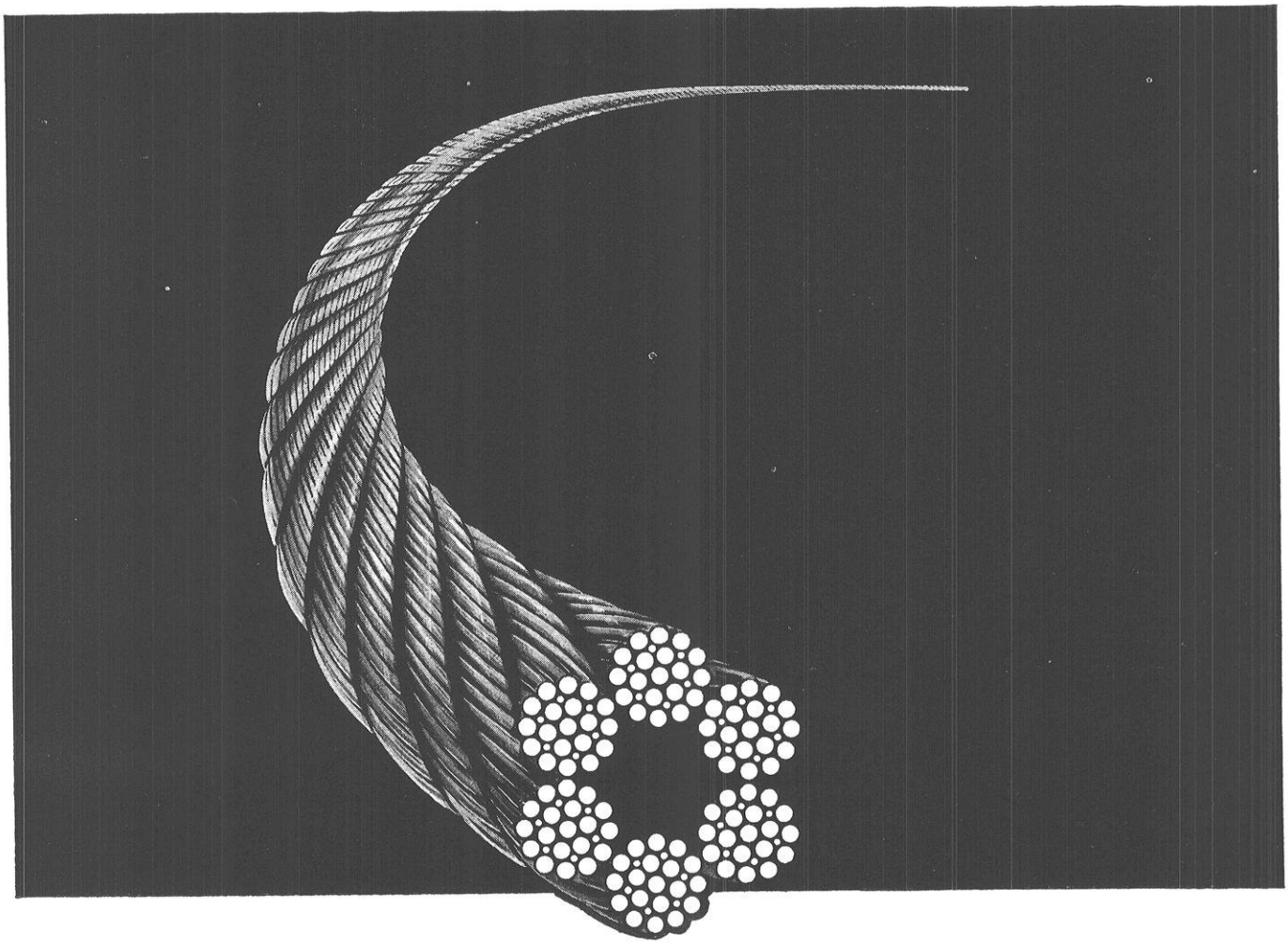
"It's a long distance from New York," replied the operator.

"I know it is," said the C. E., and back he went to bed.

* * *

Scotch Highlanders have the habit of interjecting the personal pronoun "he" after the noun, as in "The King he has come." A Scotch minister recently began his discourse thus:

"My friends, I take my text from Peter, fifth chapter, and eighth verse. 'The devil he goeth about like a roaring lion, seeking whom he may devour.' We will divide our subject as follows: "Firstly we'll try to ascertain who the devil he was. Secondly, where the devil he was going? Lastly, we shall grapple with the heart of the question, what the devil he was roaring about."



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A one-foot length of this six-strand, steel-sinewed piece of wire rope has 150 or more feet of wire. And each wire in this precision product must be accurate within a thousandth of an inch.

It wasn't always so. But deeper mines and oil wells, higher buildings, greater logging, shipbuilding and construction projects called for stronger, safer rope . . . without increase in diameter. So rope engineering became a science.

SINEW OF INDUSTRY...

Special steels with the right combination of fatigue and abrasion resistance . . . skillful wire drawing . . . lubricant-saturated fiber centers . . . and scores of sizes, grades and "constructions" are necessary to meet today's wire rope requirements.

Wire rope manufacture represents the contributions of countless craftsmen whose challenge was industry's need . . . whose accomplishments, industry's gain.

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Keeping alert to the needs of business and industry . . . and meeting them under competitive conditions . . . has characterized America's growth.

And keeping people abreast of these developments is the job of America's all-seeing, all-hearing and reporting Inter-Communications System.

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

COMMUNICATION IS OUR BUSINESS...

The McGraw-Hill publications are a part of this American Inter-Communications system.

As publishers, we know the consuming insistence of editors on analyzing, interpreting and reporting worthwhile ideas. We know that business men, in order to keep abreast of their jobs, subscribe to—pay for—McGraw-Hill magazines edited for their specific business interests . . . for the editorial pages tell "how" and the advertising pages tell "with what."

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To a few engineering graduates, "McGraw-Hill" will mean "writing" as well as "reading."

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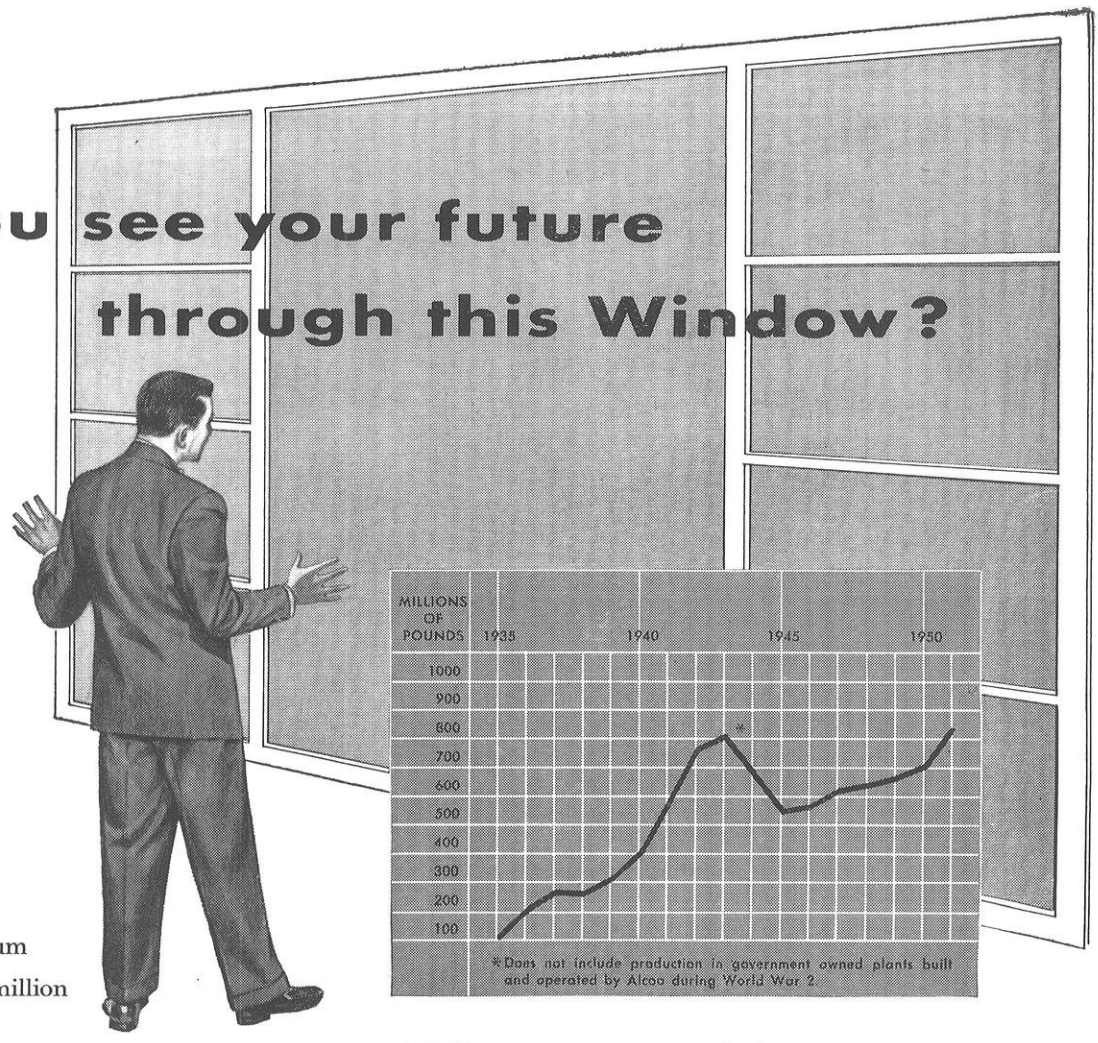
Can you see your future through this Window?



This is an aluminum window, one of four million that will go into buildings in 1953. Twenty years ago, it was just an idea in the mind of an Alcoa development engineer. Ten years ago, only a few thousand were made annually. Now, production *is increasing* at the rate of over half a million a year. This is just one of a torrent of new uses for aluminum which means that Alcoa must continue to expand. Consider the opportunities for you if you choose to grow with us.

What can this mean as a career for you?

This is a production chart . . . shows the millions of pounds of aluminum produced by Alcoa each year between 1935 and 1951. Good men did good work to create this record. You can work with these same men, learn from them and qualify yourself for continually developing opportunities. And that production curve—is still rising, we're still expanding, and opportunities for young men joining us now are almost limitless.

Ever-expanding Alcoa needs engineers, metallurgists, and technically minded "laymen" for production, research and sales positions. If you graduate soon, if you want to be with a dynamic company that's "going places", get in touch with us. Benefits are many, stability is a matter of proud record, *opportunities are unlimited.*

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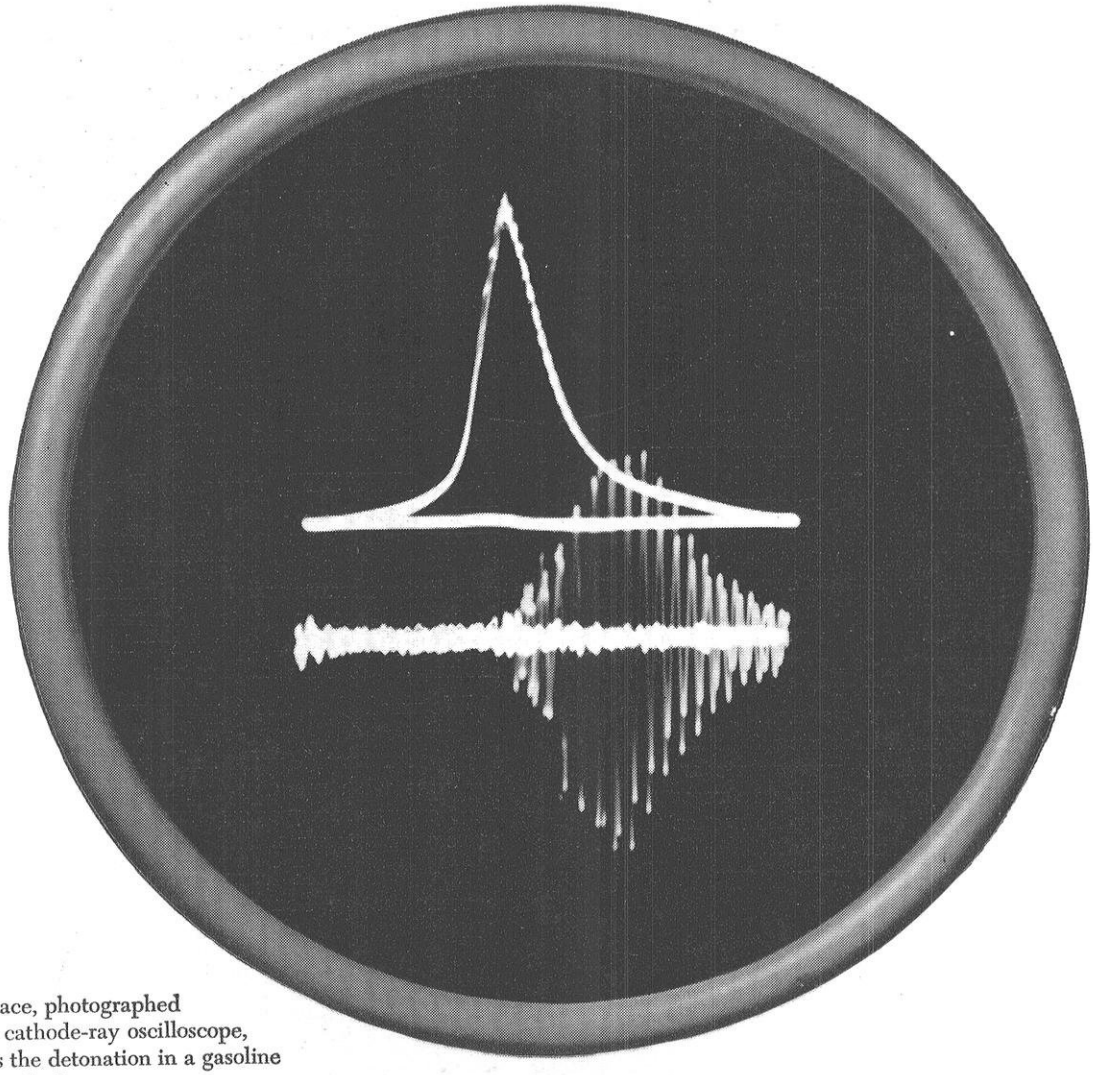

This trace, photographed from a cathode-ray oscilloscope, depicts the detonation in a gasoline engine cylinder.

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"Can I be sure I'll be an individual at G.E.?"

. . . asks John Dillingham, Union College 1952

What's it like to work for a large company? In this and subsequent ads, the questions of college students on this subject will be answered by G-E men of varying degrees of experience. What's your question? Send it to College Editor, Dept. 221-6, General Electric Co., Schenectady 5, N. Y.

JOHN G. HUTTON, *General Engineering Laboratory* . . . It is largely the enterprise of the individual which makes him outstanding. In his own thinking he becomes a cog in a machine, not realizing that every such cog is a chosen piece, performing functions for what it is best characterized as a vital member of a team operation. So it is with the individual in General Electric. Just as in the community an individual is free to "be himself," but for his own and the community's sake he must be part of that community. General Electric's success lies in its unique ability to instill in its employees great team spirit yet at the same time to recognize the employee's inalienable right to be himself.

H. A. WINNE, *vice-president, Engineering Services* . . . An important point which many young people overlook is that, by and large, individuals work in groups of reasonable size in either large or small companies. In the large company these groups may be called units or sections, and a number of these may constitute a department: a number of departments may make up a division: and the company may comprise several divisions. In each component the "manager" has a comparatively small number of people reporting to him, and consequently any outstanding performer quickly comes to his attention.

Furthermore, in General Electric we have a number of courses which train for advancement and we are constantly combing the organization to recruit people for these courses, so by this separate means management keeps in touch with individuals.

On the basis of forty-two years' experience in the Company I can assure you it is difficult for the college graduate to lose himself in the organization. There are too many people watching him, although he may not realize it for some time after entering the Company.

J. L. MICHAELSON, *manager, Employee Relations, General Engineering Laboratory*. . . The Company system for periodic employee evaluation furnishes a valuable guide to the individual with respect to his progress and ability. It also imposes on supervisory personnel the requirement that they study carefully the characteristics of all their employees. The system is so arranged that ability and good performance cannot remain unnoticed. Far from remaining obscure, each individual's characteristics are evaluated in order to provide him with the greatest opportunity to make use of his talents and abilities.

J. A. SPENCER, *manager, Employee Relations, Apparatus Sales* . . . The day I began work with G.E. twenty-odd years ago, and entered the plant with thousands of other Company employees, I felt small and insignificant and much inclined to climb on the first train returning to Montana. In a short time, however, I realized that I would be considered as an individual at General Electric.

I learned that the Company was operated in units of manageable size and that each person received individual consideration. My supervisors discussed my progress with me at regular intervals. I also learned that every employee's salary is reviewed individually at regular intervals.

Through this I learned that the individual cannot become lost in General Electric—neither can he hide!

You can put your confidence in—

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