

TECHNOLOGY

REVIEW

April 1954



greater sensitivity . . .

longer wear in partial rotation

SIGMA RELAY 6X

ACTUAL SIZE MPB No. 2A

HERE'S **HOW** SIGMA INSTRUMENTS, INC.
builds better relays
with MPB bearings!

OPERATING CONDITIONS — consistently accurate response to equal amounts of current . . . partial shaft rotation . . . strength to withstand severe shock, vibration, plus extreme temperature changes. CRITICAL — wear, low starting torque, trouble-free operation of bearings supporting armature shaft, RESOLVED—by use of 2 MPB No. 2A's, miniature angular contact bearings.

MPB bearings, installed in the redesigned Sigma 6X electrical relay increased sensitivity and consistency of performance. Test sample models completed many million cycles of partial rotation with no variations in performance . . . no bearing wear . . . no adjustment necessary.

“Designing in” MPB bearings can help you get greater accuracy, longer life in your precision mechanisms. For the most complete design information ever offered on miniature ball bearings request, on your letterhead, MPB catalog TR54c

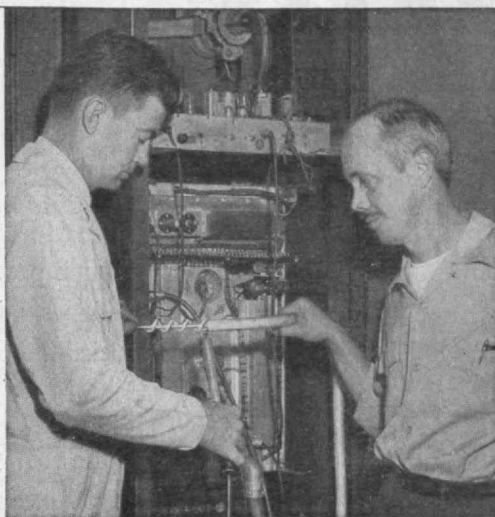
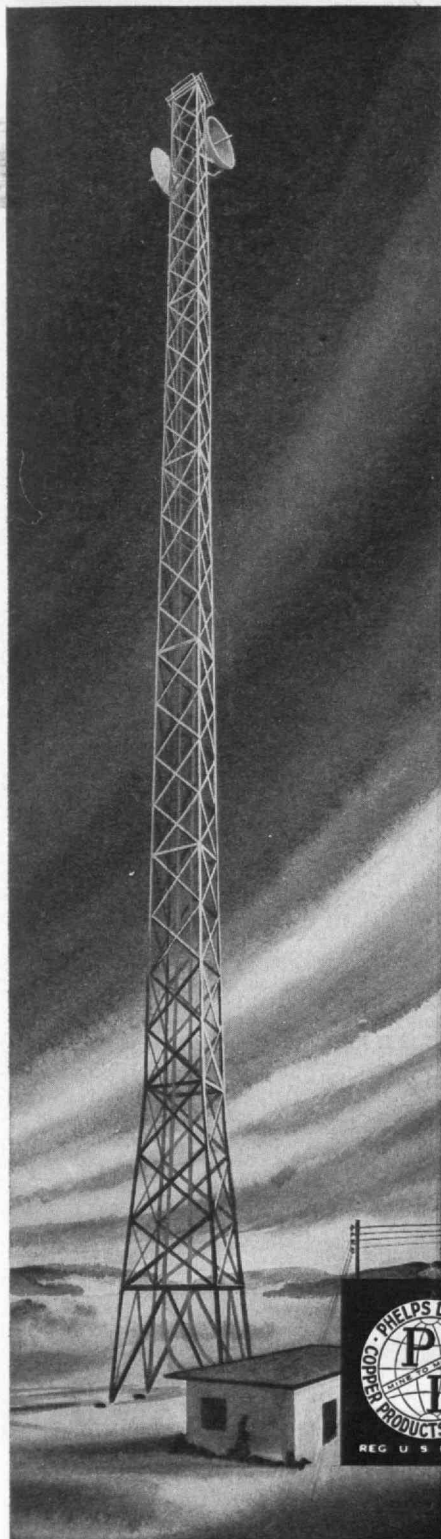
Miniature Precision Bearings, Inc.



Keene, New Hampshire

Styroflex Coaxial Cable

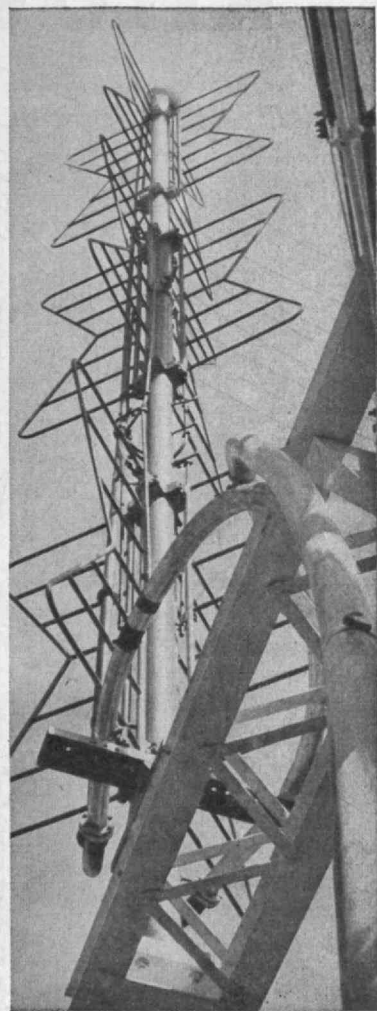
has many applications in the communications field!



Mobile Pickup



Community Antenna



Television Broadcast

Microwave

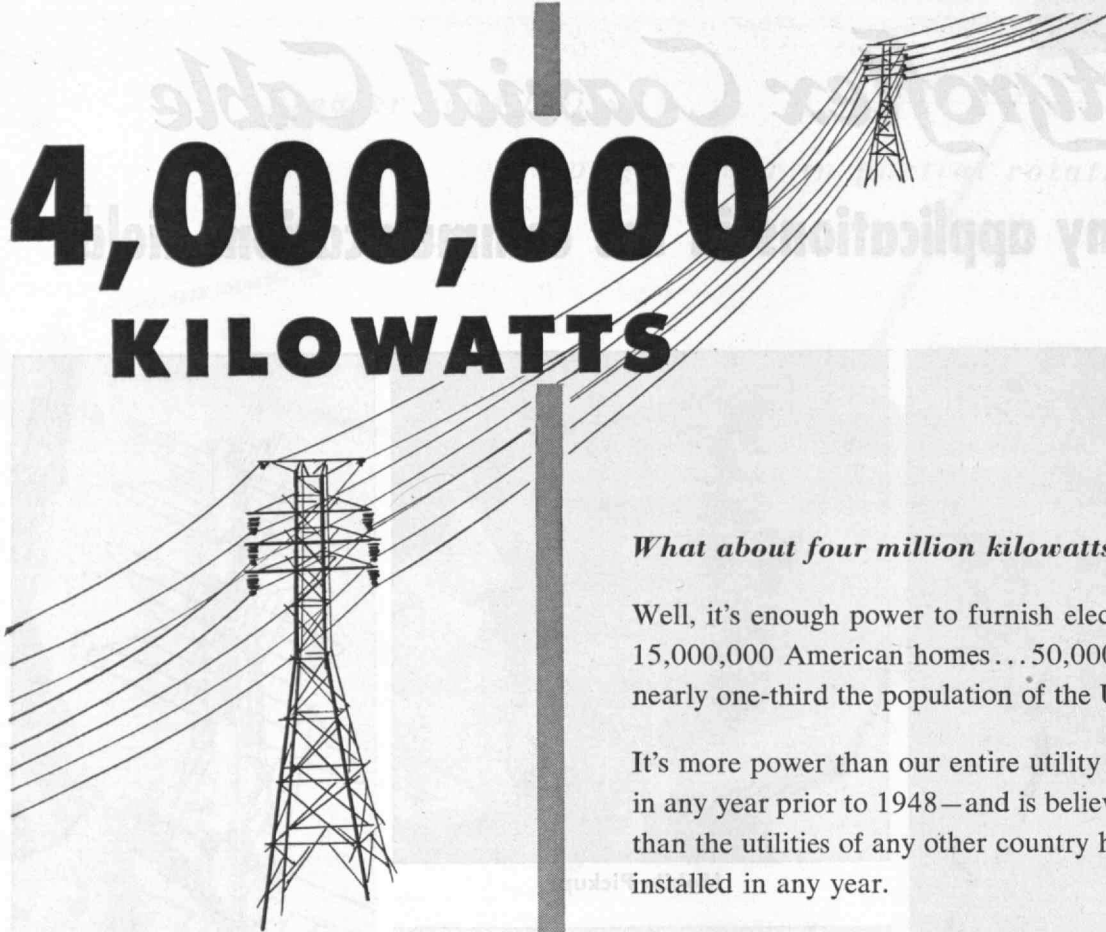
Styroflex, with its unique design, provides efficient, dependable service . . . has won the enthusiastic support of engineers as a result of successful installations throughout the communication field.

PHELPS DODGE COPPER PRODUCTS
CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.



4,000,000 KILOWATTS



What about four million kilowatts?

Well, it's enough power to furnish electricity for 15,000,000 American homes... 50,000,000 people... nearly one-third the population of the United States.

It's more power than our entire utility industry installed in any year prior to 1948—and is believed to be more than the utilities of any other country have ever installed in any year.

This 4,000,000 kilowatts—to be more exact, 4,129,000—is the amount of new utility capacity powered by C-E Boilers *placed in service* in 1953.

The big point about it from *your* standpoint is this: this vast acceptance of C-E Boilers by utilities—the most exacting buyers of steam generating equipment—is another important reason why you can be assured of the most advanced design when you buy boilers and related equipment from Combustion. And, since the C-E line provides a type and size for all requirements from 4000 lb of steam per hr up, there is a Combustion boiler that's just right for your steam needs.



COMBUSTION ENGINEERING, INC.

COMBUSTION ENGINEERING BUILDING • 200 Madison Avenue, New York 16, N. Y.

B-714

BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS & FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

ALWAYS BUILDING, NEVER BUILT

The Chemical Process Industries are constantly growing to meet expanding consumer demand. The 1953 sales of chemicals and allied products in the United States reached a record \$20,000,000,000 — a 15-fold increase over sales at the turn of the century.

During this half century, Lummus has played a major role in assisting the Chemical Process Industries in their phenomenal growth. Lummus engineers have translated many processes from the pilot plant to industrially successful operations. They have assisted in the development of processes for the manufacture of alcohols, styrene, toluene, butadiene, ethylene, propylene, acety-

lene, and other chemicals. They have created innovations in reactors, absorbers and distillation equipment. They have designed and constructed chemical plants on every continent.

Lummus shares with the Chemical Process Industries an eagerness to meet the challenges of the future. Let our engineers help plan your next project for future growth.

THE LUMMUS COMPANY, 385 Madison Avenue, New York 17, N. Y. *Engineering & Sales Offices:* New York, Houston, Montreal, London, Paris. *Sales Offices:* Chicago, Caracas. *Heat Exchanger Plant:* Honesdale, Pa. *Fabricated Piping Plant:* East Chicago, Indiana.



LUMMUS

DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES



ENGINEERS

needed to
work on new

"Grumman
Cat"

Grumman, nearing its 25th Anniversary, needs engineers to work on its new experimental light-weight Naval fighter, plus other jet fighters, anti-sub planes, and amphibians. Grumman has openings for experienced aircraft engineers, and recent engineering graduates.

LAYOUT DESIGNERS AND DRAFTSMEN

Airframe Structures
Equipment Installation
Detail Drafting

FLIGHT TESTING

Planners
Analysts
Computers

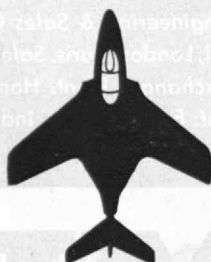
HYDRAULICS

Systems Design
Testing

STRUCTURES

Stress Analysis
Static Testing
Applied Loads

Send resumé to Engineering Personnel Dept.
Interviews at Employment office.



**GRUMMAN AIRCRAFT
ENGINEERING CORPORATION**

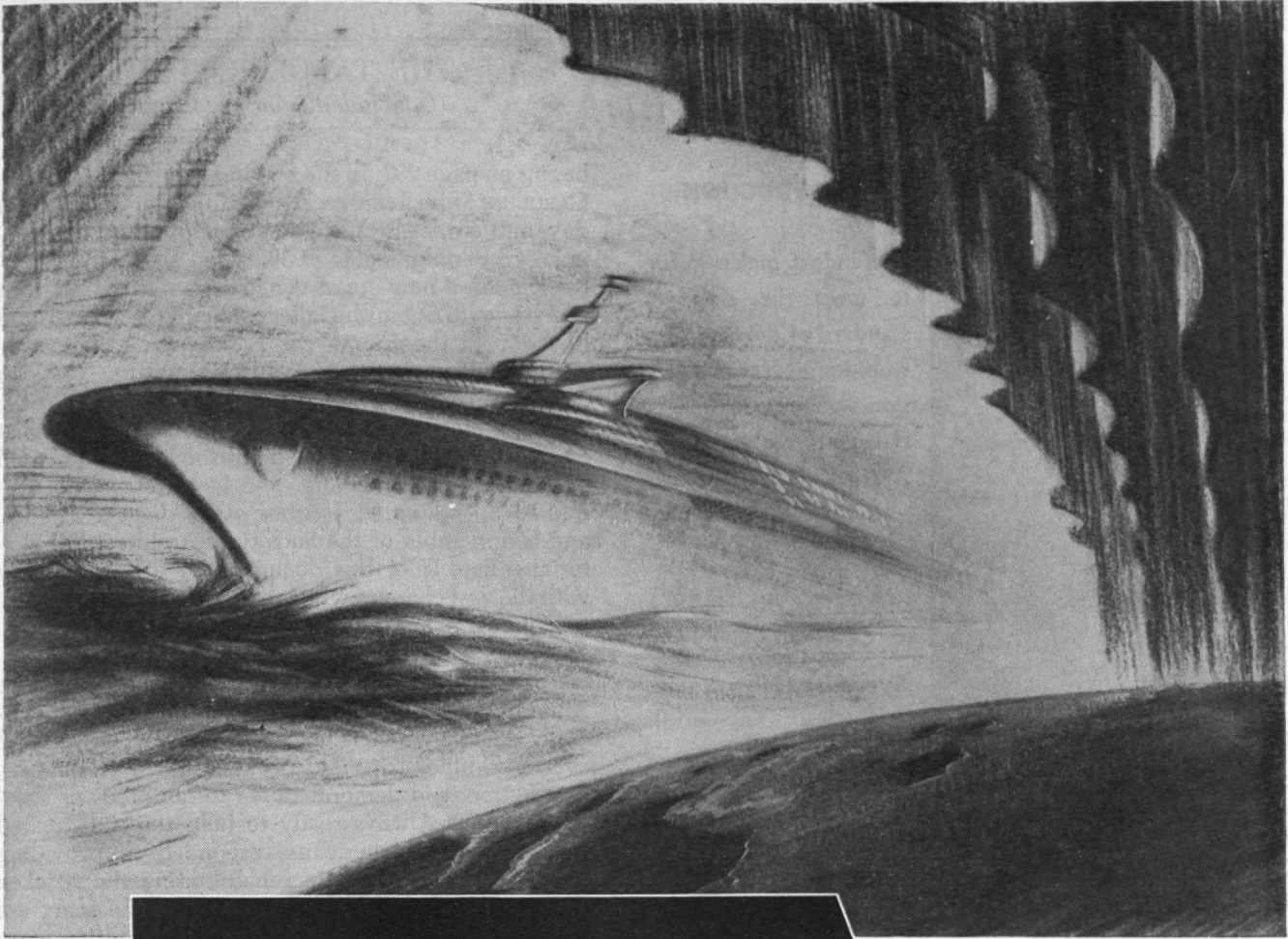
BETHPAGE • LONG ISLAND • NEW YORK

THE TABULAR VIEW

Radio Pioneer. — Probably no man has made more significant contributions to progress in radio communication than Major Edwin H. Armstrong whose discovery of regeneration (1914), the superheterodyne receiver (1918), super-regeneration (1922), and noise-free, frequency-modulation transmission (1936) has truly revolutionized "wireless." Certainly no man was a more determined example of rugged individualism than this radio pioneer whose brilliant and controversial career came to an abrupt end on January 31. EDWARD L. BOWLES, '22, for many years Professor of Electrical Communications and now Consulting Professor of Industrial Management at M.I.T., was personally well acquainted with "the Major" for several decades, and records his tribute to a former friend (page 292). As published in this issue of *The Review*, Dr. Bowles's address was originally broadcast over Station WGBH, the frequency modulation station of the Lowell Institute Co-operative Broadcasting Council. Professor Bowles's broadcast was not only transmitted via the system of frequency-modulation which the Major had devised, but was sent on its way by means of a transmitter which Armstrong had built and donated to educational activities in this area.

Atmospheric Pollution. — By pouring soot, smoke, fumes, and other gases into the fresh air which we breathe, man has made a major contribution to atmospheric pollution. Although the extent of such pollution tends to increase as society becomes more completely industrialized, it is possible to take steps to keep foreign substances under control. Such measures are discussed (page 294) by HAROLD BAVLEY, engineer for the Division of Occupational Hygiene, Massachusetts Department of Labor and Industries. Since 1935, when he received the B.S. degree in chemical engineering from Northeastern University, Mr. Bavley has worked in the field of industrial hygiene and safety. Since 1946 he has been in charge of engineering activities of the Massachusetts Division of Occupational Hygiene. He is a registered professional engineer, and has contributed numerous articles to the literature, including one on Ionizing Radiation which appeared in the June, 1953, *Review*.

Technology's Architecture. — Throughout its eight and one-half decades of education in architecture, science, and engineering, the Institute has had three different homes. The original one in the Mercantile Library Building on Summer Street in Boston saw the birth of M.I.T. and served it but a few years. The home on Boylston Street witnessed the growth of the Institute through its adolescent era, and the Institute has grown to vigorous manhood since moving to its site in Cambridge. In each of its three locations, M.I.T. buildings were marked by different, and characteristic, architecture. The story of Technology's architecture is traced from the beginning in 1865 to the present time in a two-part article, of which Part I (Concluded on page 286)



BEYOND THE HORIZON....

Most of the current alloys developed for engineering use at elevated temperatures contain Molybdenum.

As stresses and temperatures—such as those used for marine propulsion power plants—increase, it is certain that the alloys which make this possible will rely more and more upon their Molybdenum content.

Climax furnishes authoritative engineering data on Molybdenum applications.

Climax Molybdenum Company
500 Fifth Avenue · New York City 36 · N.Y.



ENGINEERED FOR PRODUCTION

Diefendorf makes gears to meet the exacting standard of the engineer who designs for production—quality in material and workmanship. All materials. All styles.

**DIEFENDORF GEAR
CORPORATION**

Syracuse, New York

DIEFENDORF GEARS

THE ORIGINAL SWING BOOM MOBILE CRANE WITH
FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

KRANE KAR

**MOVES LOADS
EASIER - FASTER -
SLASHES COST OF
MATERIALS HANDLING**



KRANE KAR handles loads at
Sides as well as at Front.

Gas or Diesel. Pneumatic or solid rubber tires; 9 to 37 ft. booms or adjustable telescopic booms; electric magnet, clamshell bucket, and other accessories available.

At your service 24 hours every day because it is gasoline-powered (no layups for battery charging). Works inside and outside your plant. KRANE KAR serves also as an auxiliary to existing crane facilities . . . and as an emergency tool for plant maintenance. Let us show you. Ask for Bulletin No. 79 or for a Sales-Engineer.

1½, 2½, 5 and 10 ton capacities.

SILENT HOIST & CRANE CO.

891 63rd ST., BROOKLYN 20, N. Y.

THE TABULAR VIEW

(Concluded from page 284)

begins on page 297. In the first installment, the author, CAROLINE SHILLABER, recalls the splendor of an earlier day, and emphasizes architectural progress in Technology buildings up to 1938, when the Institute entered upon a new era of construction. Miss Shillaber is a graduate of Smith College. She has been assistant librarian in the Library of Landscape Architecture and City Planning at Harvard University. Not long ago, however, Miss Shillaber became librarian of the Arthur Rotch Memorial Library of Architecture at M.I.T. from which vantage point she has documented Technology's architecture. She has contributed articles to *Speculum*, *A Journal of Mediaeval Studies*, and is a member of the Society of Architectural Historians. Part II of this documentary article, dealing with the vast changes which have occurred since 1938, will appear in the May issue of The Review.

Tornado Tragedy.—Less than a week before Alumni Day, 1953, central Massachusetts was suddenly struck by a vicious tornado that wrought havoc over a 40-mile strip, and brought death, desolation, destruction, and demoralization to hundreds of innocent victims. Always ready to help those distressed by emergency, Americans responded in providing temporary shelter and in rehabilitating the stricken region. Today, less than a year later, the scars are healed and a story of magnificent co-operation is revealed (page 303) by WALTER C. VOSS, '32. Joining the M.I.T. Faculty in 1928, he became head of the Department of Building Engineering and Construction in 1940, and served in that position until his retirement in 1953. This post fitted him admirably for the responsibility of serving as consultant to the Worcester Housing Authority which assumed major responsibility for the program of rehabilitation. To a long and distinguished career in the field of building construction, Professor Voss adds new laurels by serving the Institute this year as special lecturer.



Air Reduction Co., Inc.
8 Contracts

Satisfactory Construction

For the past five years, 66% of our total billing to 34 different companies has been repeat business, largely non-competitive—proof of satisfactory construction and completion.

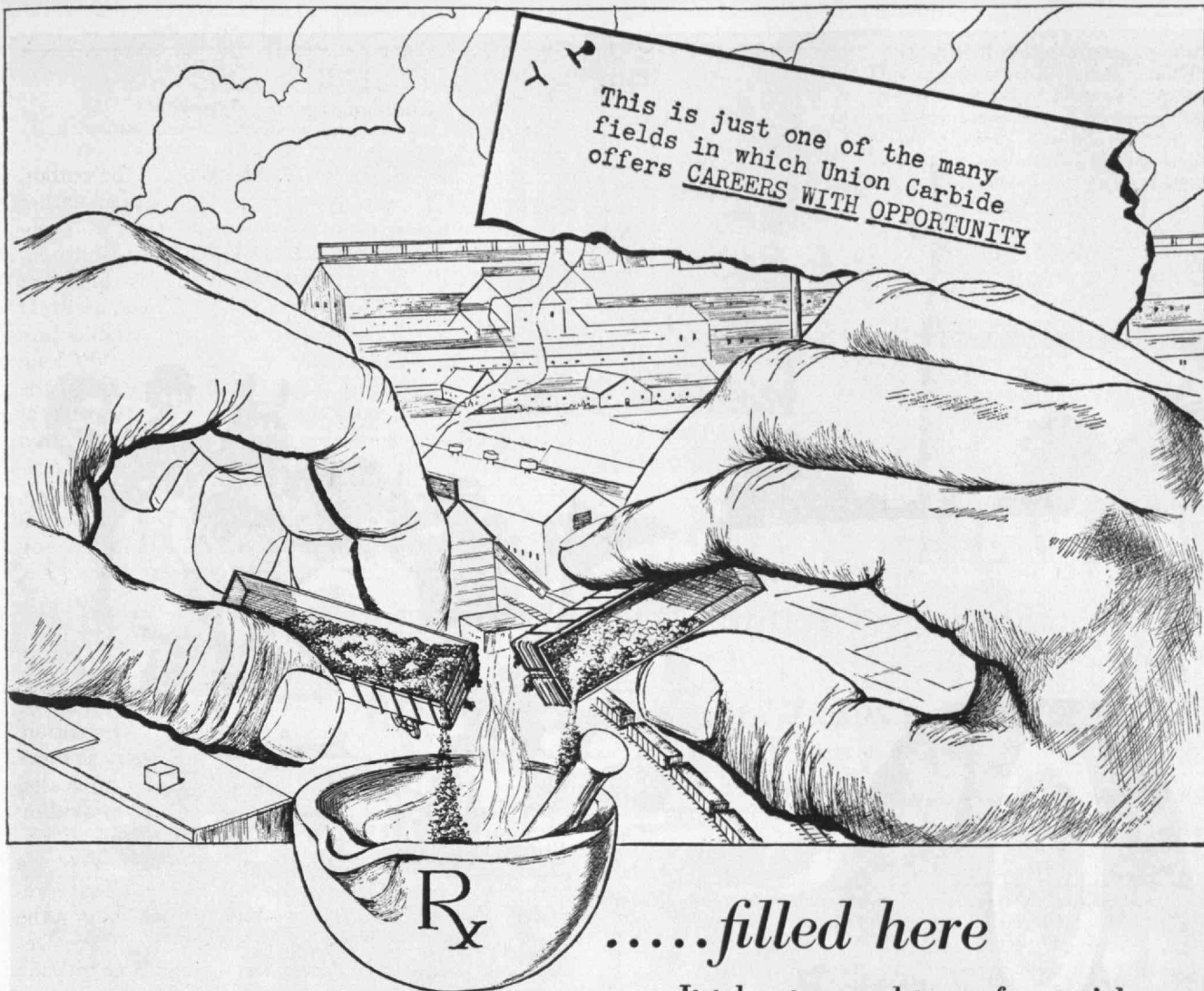
W. J. BARNEY CORPORATION

Founded 1917

101 Park Avenue, New York

INDUSTRIAL CONSTRUCTION

Alfred T. Glassett, '20, President



.....filled here

It takes tons and tons of materials
to fill the prescriptions that give strength and stamina to the steel you use

THE STEEL that's everywhere—in your automobile, in trains, machines, and buildings—is stronger and more enduring because it has been treated with special “vitamins and tonics.”

STEEL GETS ITS VITAMINS from the industry's “drugstores”—the plants where alloying metals are made. Here, prescriptions usually call for ingredients by the ton. Their huge “mixing bowls” are white-hot electric arc furnaces, in which temperatures reach over 3,500 degrees Fahrenheit.

These alloying metals are refined and concentrated forms of both rare and common metals. Among them are chromium, boron, silicon, tungsten, columbium, and vanadium. Individually, or together, they give steel durability, toughness, hardness, rust and corrosion resistance, and other special qualities. Chromium, for example, is the secret of making steel stainless.

VARYING COMBINATIONS of these and other alloys are added to every ton of molten steel produced today. Without them we wouldn't have the hundreds of different kinds of steel that do so much for all of us in so many ways.

MORE THAN 50 ALLOYS—The people of Union Carbide pioneered in the development and production of alloying metals. They produce more than 50 different alloys for steel and other metals that go into products that serve you.

STUDENTS AND STUDENT ADVISERS: Learn more about career opportunities with Union Carbide in **ALLOYS, CARBONS, CHEMICALS, GASES, and PLASTICS.** Write for booklet K-2.

UNION CARBIDE
AND CARBON CORPORATION

30 EAST 42ND STREET  NEW YORK 17, N. Y.

In Canada: UNION CARBIDE CANADA LIMITED

UCC's Trade-marked Products include

ELECTROMET Alloys and Metals
HAYNES STELLITE Alloys
ACHESON Electrodes

BAKELITE, VINYLITE, and KRENE Plastics

DYNEL Textile Fibers

PRESTONE Anti-Freeze

NATIONAL Carbons

PYROFAX Gas PREST-O-LITE Acetylene UNION Carbide

LINDE Oxygen

EVEREADY Flashlights and Batteries

SYNTHETIC ORGANIC CHEMICALS



The miracle strength and safety of Goodyear's Triple-Tempered 3-T All-Nylon Cord!
The extra mileage of a thicker tread! The safer footing of Resist-a-Skid traction!

And now... Goodyear presents the

New All-Nylon Cord Double Eagle

with the new quiet

"Velvet Ride"!

The All-Nylon Cord Double Eagle is known, deservedly, as the world's finest passenger car tire.

Now Goodyear announces still greater improvements. Ingenious, new "Safety Silencers" in the tread pattern practically eliminate "squeal" on turns to give you a new, smooth, quiet "velvet ride." And this new tread gives you even *greater* traction than before.

The All-Nylon Cord Double Eagle is actually up to $1\frac{1}{2}$ to 2 times stronger than standard cord tires. It delivers more mileage, by far, than any other passenger car tire.

See the new, improved All-Nylon Cord Double Eagle at your Goodyear dealer's now. Goodyear, Akron 16, Ohio.

GOODYEAR

The world's finest tire... by miles!

Double Eagle, T. M.—The Goodyear Tire & Rubber Company, Akron, Ohio