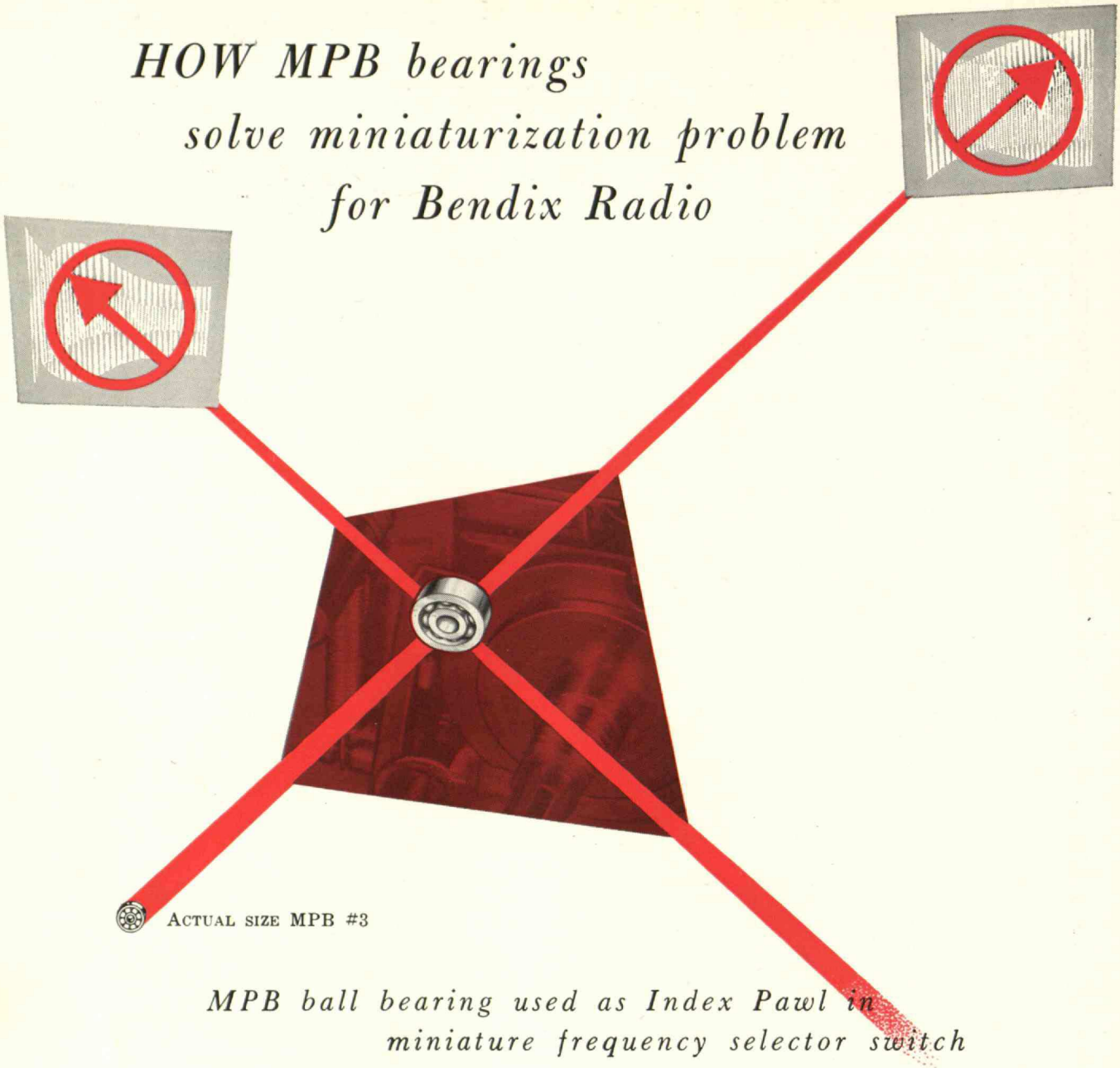
TECHNOLOGY REVIEW

April 1955

HOW MPB bearings solve miniaturization problem for Bendix Radio



ACTUAL SIZE MPB #3

MPB ball bearing used as Index Pawl in miniature frequency selector switch

OPERATING CONDITIONS — miniature ball bearing serves as index pawl in 4-position indexing device . . . bearing travels at 936 r.p.m. CRITICAL — low starting torque, low friction rotation . . . high impact loads . . . long, trouble-free bearing life. RESOLVED — by use of MPB No. 3, .1875" o.d. full-race bearing.

To quote Mr. John F. Wroten, Jr., mechanical engineer with Bendix Radio Division, these are some of the reasons why MPB bearings were selected in the miniaturization of their frequency selector switch: "The low friction rotation of the bearing practically eliminates drag in the indexing action, and reduces to a minimum the amount of power required for disengagement. Also, the bearing displays unusually high resistance to the frequent impact loads a detent stop of this kind must withstand . . . . Because rolling contact occurs between the pawl and the plate, the plate can be made of soft stainless steel."

For problems involving miniaturization, consult MPB, pioneer manufacturer of miniature ball bearings.

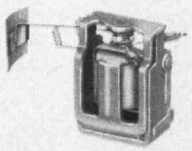
Miniature *Precision* Bearings, Inc., 103 Carpenter St., Keene, N. H.

Instrument Mechanisms

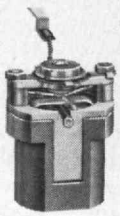
from the World's foremost builder

Whether the instrument system requires mechanisms combining miniature size with high torque, or great deflection with high sensitivity, or 'most any other combination of specific instrument characteristics... more than likely there's a WESTON mechanism already available which meets the requirements *exactly*. But for new or unusual needs, Weston engineers are available to assist at the drawing board stage. In either case, Weston's long leadership in instrument design... *since 1888*... offers best assurance of getting mechanisms *specifically designed for*, rather than merely adapted to, the system. WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

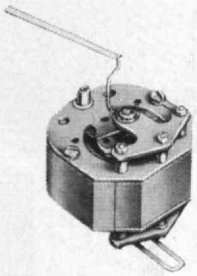
Model 9934—Miniature, self-shielded core magnet mechanism designed for operation of warning flags where space requirements are critical. Capable of 90° total deflection.



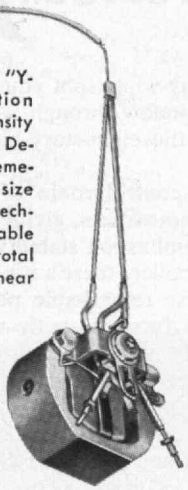
Model 9889—Small self-shielded core magnet mechanism featuring spring-backed jewels for ruggedness and the requirements of vibration and shock; suppressed characteristics if desired; optional location of mounting. Capable of 90° total deflection and can be used for both warning flags and indicator.



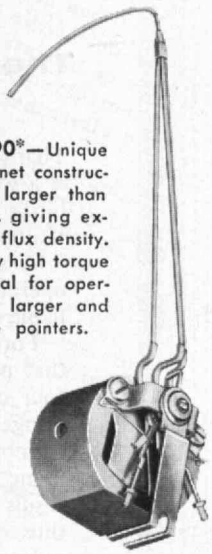
Model 9897—Long scale, 250° self-shielded movement, linear motion for operation of pointers where great deflection is a requirement. Capable of sensitivities in the order of 1½ microamperes per degree deflection.



Model 9891*—Unique "Y-Cor" magnet construction giving very high flux density with very high torque. Designed for operating extremely long pointers. Small size makes it ideal for multi-mechanism instrument use. Capable of 45° (22.5-0-22.5°) total deflection, essentially linear up to 40° (20-0-20°).



Model 9890*—Unique "Y-Cor" magnet construction, slightly larger than Model 9891, giving extremely high flux density. The extremely high torque makes it ideal for operation of the larger and heavier type pointers.



Model 9929—Self-shielded core magnet mechanism of high flux density. Designed for operating pointers with high moments of inertia. Total deflection up to 120 degrees available. Also available in miniature size (Model 9892).

**These Models useful as sensitive, self-shielded galvanometers.*

WESTON Instruments

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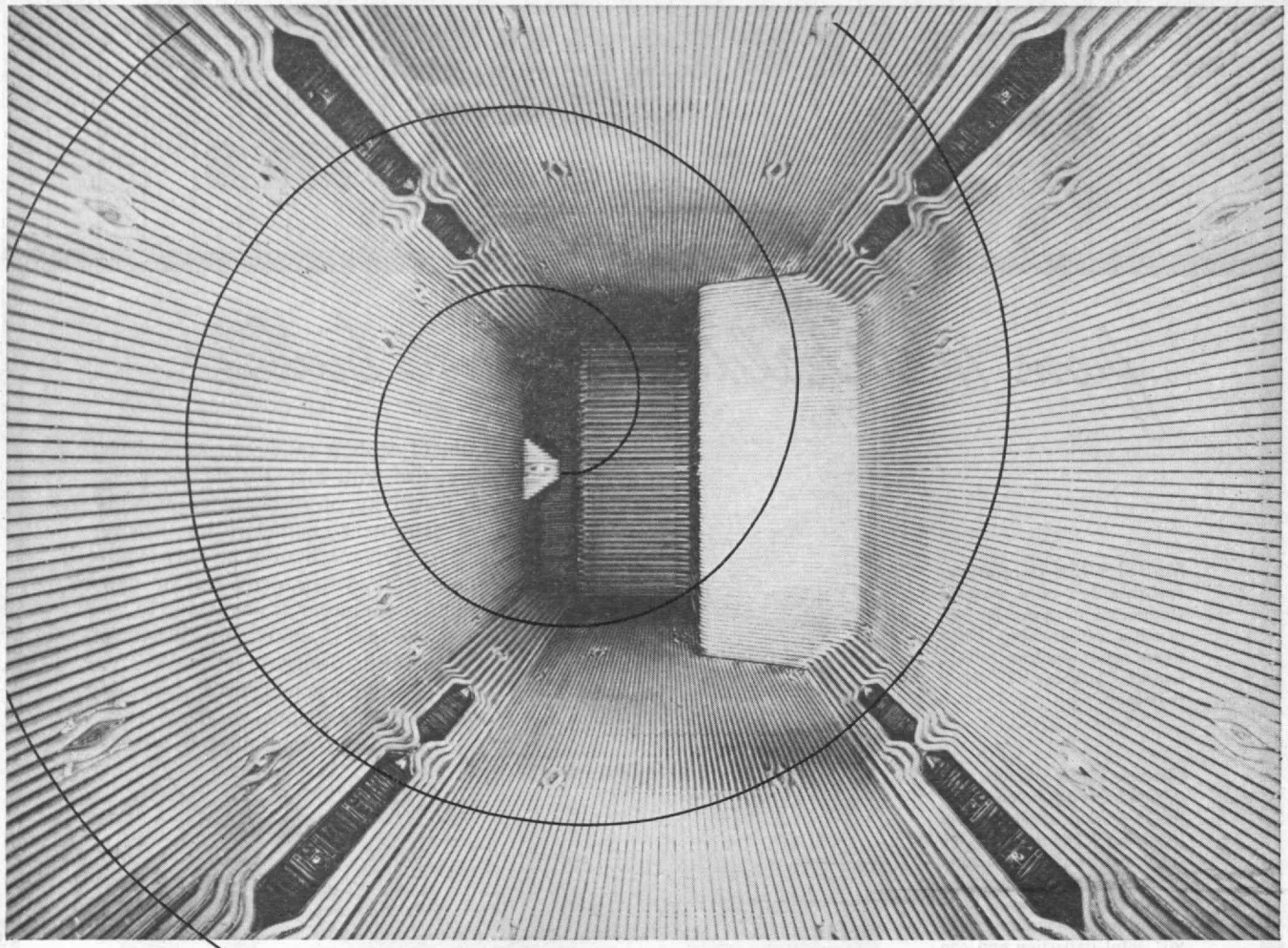

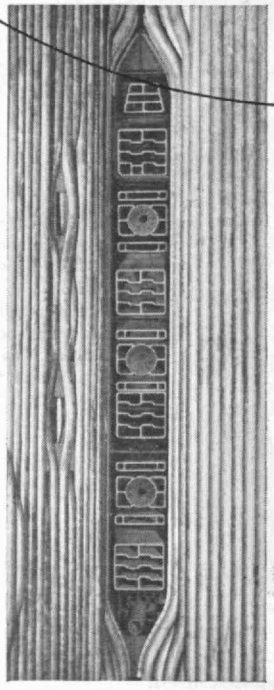

Corner of furnace showing one of four C-E Tilting Burners (Type TV) for firing pulverized coal, oil or gas, separately or in combination.

The camera sees an *Inferno*

That's right! The tiny white spot you see in the center of the picture is a water-cooled window through which a television camera has a bird's eye view of the eight-story-high inferno raging in this C-E Utility Boiler.

A screen in the control room of the power station shows the operator what the camera sees, giving him invaluable information on flame conditions, combustion stability, etc.

For drama in a boiler, there's no better show "on camera" than that put on by those remarkable performers—one in each of the four corners of the furnace—aptly named TV Burners. For these **T**angential **V**ertically adjustable burners—exclusive development of Combustion Engineering—create a literal *cyclone of flame*. The four flame streams—blasting into each other with tremendous impact—result in thorough mixing of fuel and air in the shortest possible time; thus effecting rapid and complete combustion, whether the fuel is pulverized coal, oil or gas.

Furthermore, this inferno moves up and down automatically to maintain the uniform steam temperature so important to peak turbine performance.

While the C-E "TV" Burner is "on stage" only in large power stations, it typifies the many major advances in fuel burning and steam generation pioneered by Combustion. These advances mean top performance in *any* boiler, large or small, that bears the Combustion nameplate. B-811

C-E

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THE LUMMUS COMPANY, 385 MADISON AVENUE, NEW YORK 17, N. Y.

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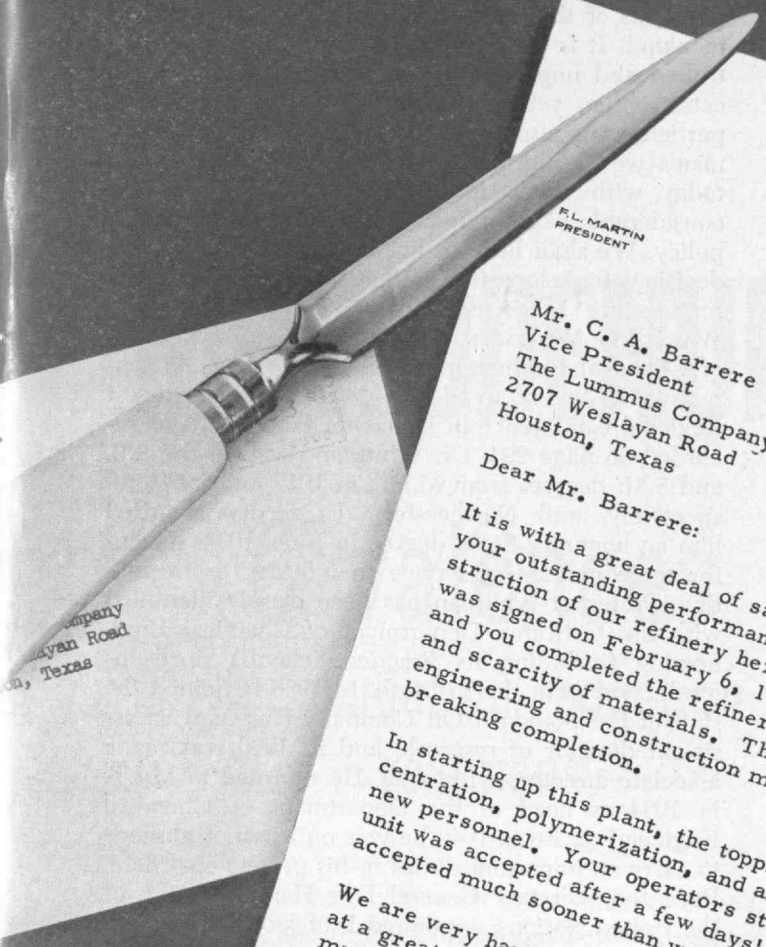

SUNTIDE REFINING COMPANY

REFINING PETROLEUM SUNTIDE MARKETING PRODUCTS

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CORPUS CHRISTI, TEXAS

F. L. MARTIN
PRESIDENT

November 3, 1954

Mr. C. A. Barrere
Vice President
The Lummus Company
2707 Weslayan Road
Houston, Texas

Dear Mr. Barrere:

It is with a great deal of satisfaction we advise you and The Lummus Company of your outstanding performance and the remarkable record you achieved in the construction of our refinery here at Corpus Christi. The contract with your company was signed on February 6, 1952; groundbreaking ceremonies were held March 12, 1952, and you completed the refinery in eighteen months under the most adverse conditions and scarcity of materials. The expediting of the materials and the know-how of engineering and construction methods are the two prime factors in this record breaking completion.

In starting up this plant, the topping and vacuum, fluid catalytic cracking, gas concentration, polymerization, and alkylation units each were staffed with completely new personnel. Your operators started up each of these units, and each and every unit was accepted after a few days' performance test. In fact, the whole plant was accepted much sooner than would ordinarily be the case under these circumstances.

We are very happy with all phases of the plant. As a matter of fact, it has operated at a greater capacity than originally planned. I am pleased to advise that in all of my refining experience, I have never witnessed a more satisfactory installation, and all of us here at Suntide are very proud of our refinery's performance as well as its appearance.

We would appreciate your extending our sincere compliments for a job well done to all members of your organization who had part in the building of Suntide.

Yours very truly,

F. L. Martin

FLM/b

THE TABULAR VIEW

Peaceful Atoms. — Man's knowledge of the atom, and the use to which that knowledge is put, provide problems of the most serious kind for the future of mankind. It is generally recognized that the uncontrolled and improper use of atomic energy can be catastrophic; yet the beneficent use of radioactive particles can also provide important advantages to man's well-being. Many decisions are being made today, with respect to atomic energy, which have a considerable bearing upon, and in turn affect, public policy. We shall have to live by the results of these decisions for a long time. What some of these policy matters are is discussed (page 283) by PROFESSOR WALTER G. WHITMAN, '17, Head of the Department of Chemical Engineering. The Review's article represents the text of an address given at the Southwest Regional Conference in Dallas on January 29, as recorded on page 294. Dr. Whitman received the S.B. and S.M. degrees from M.I.T. in 1917 and 1920, respectively, and Northeastern University awarded him an honorary Sc.D. degree in June, 1954. Except for three periods of service to industry or the nation, Professor Whitman has been closely identified with the Institute's Department of Chemical Engineering (including its Practice Schools) since his graduation from the Institute. In 1926 he joined the staff of the Standard Oil Company (Indiana) as assistant director of research, and in 1930 was made associate director of research. He returned to M.I.T. in 1934 as head of the Department of Chemical Engineering. From 1942 he was on leave of absence to carry on important duties in his professional field. Recently, Secretary General Dag Hammarskjöld, of the United Nations, appointed Professor Whitman to assume responsibility for setting up the first world scientific conference on atomic energy. This conference will be held next August in Geneva. Professor Whitman is also on the General Advisory Committee to the Atomic Energy Commission.

Managerial Thinking. — At the Southwest Regional Conference held in Dallas on January 29, DOUGLAS M. MCGREGOR, Professor of Industrial Management in the Institute's School of Industrial Management, spoke on "The Changing Role of Management." Except for the rather considerable amount of discus-

(*Concluded on page 274*)

MOLYBDENUM

6 valences

for oxidation-reduction reactions

Molybdenum chemicals have valences of 0,2, 3,4,5, and 6. Easy transitions between valence states make them useful in controlled oxidation-reduction reactions.

0

Mo

$Mo(CO)_6$

+2

Mo_6Cl_{12}

Mo_6Br_{12}

+3

$MoCl_3$

K_3MoCl_6

$MoBr_3$

$MoBr_3.3C_5H_5N$

$Mo_4O_3(C_2O_4)_3$

+4

MoO_2

MoS_2

$MoSe_2$

$K_4Mo(CN)_8$

+5

Mo_2O_5

Mo_2S_5

$MoCl_5$

$MoOCl_3$

+6

MoO_3

MoS_3

MoF_6

MoO_2Cl_2

$MoO(OH)_2Cl_2$

$R^*_x(MoO_4)_y$

$(NH_4)_6Mo_7O_{24}$

$(NH_4)_2MoS_4$

K_2MoS_4

$H_3PMo_{12}O_{40}$

$Na_3PMo_{12}O_{40}$

$H_4SiMo_{12}O_{40}$

$Na_4SiMo_{12}O_{40}$

*R= Ag, Ba, Ca, Ce, Co, K, Li, Na, Ni, Pb, Sr, Zn

Over forty molybdenum chemicals in all valence states are available in experimental quantities. Write for our bulletin *Manufacturers of Molybdenum Chemicals*. Climax Molybdenum Company, Dept. U, 500 Fifth Avenue, New York 36, N. Y.

MU 5-17

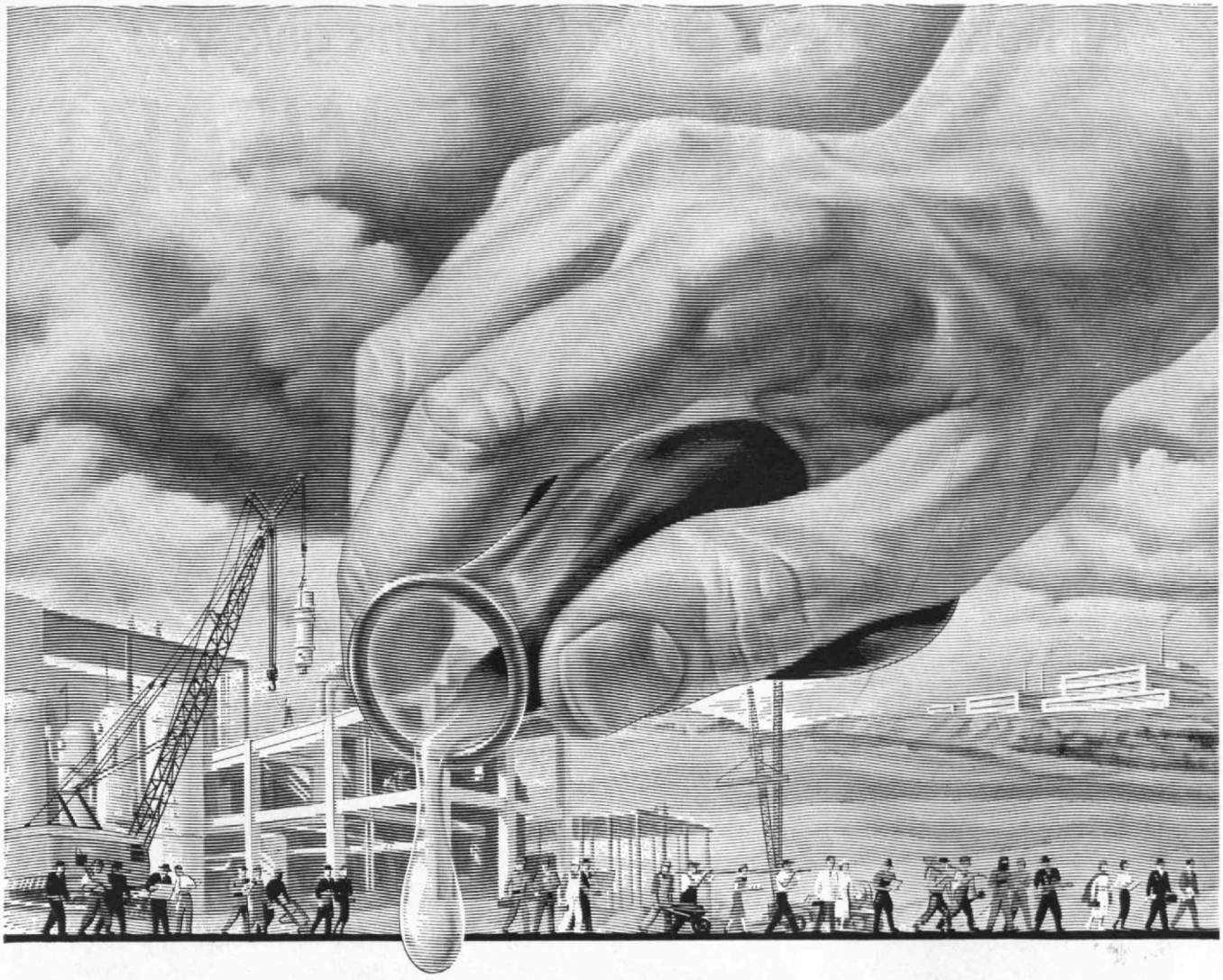
CLIMAX MOLYBDENUM

THE TABULAR VIEW

(*Concluded from page 272*)

sion which this talk initiated, Dr. McGregor's address appears in this issue of The Review (page 287). Management's reborn confidence in itself is based on the belief that people are willing to co-operate toward the achievement of a stated objective; it is also based on confidence in the latent abilities of the individual. Such, at any rate, is Dr. McGregor's view, based on two decades of experience in dealing with topics in psychology and labor relations. In 1932 Dr. McGregor received the B.A. degree from Wayne University; from Harvard University he received the M.A. and Ph.D. degrees in 1933 and 1935, respectively. After serving for two years on the teaching staff of Harvard University, Dr. McGregor joined the M.I.T. staff in 1937 as instructor in the Department of Economics and Social Science. He became assistant professor in psychology in 1938, associate professor in 1942, and professor in 1948. From 1948 to 1954 he was president of Antioch College. He returned to M.I.T. last year.

Great Famines. — Since the dawn of human existence, hunger has persistently pursued the predominant masses of mankind. The more serious of the world's great famines are recorded (page 291) by JAMES A. TOBEY, '15, a frequent contributor to The Review. Whether man will ultimately win out, in the race for food, remains to be seen, but Dr. Tobey holds that man now has it within his power to regulate population and food production sufficiently well that starvation in most parts of the world could be a thing of the past. Dr. Tobey received the S.B. and Dr.P.H. degrees from M.I.T. in 1916 and 1927 respectively, the LL.B. degree from Washington Law School in 1922, and the M.S. degree from the American University in 1923. As his latest article goes to press, he is returning to his home in Newtown, Conn., after a pleasant sojourn in West Palm Beach, Fla.



More jobs—through science

From the earth, air, and water come new things for all of us—and new jobs

THE ELEMENTS OF NATURE are a limitless frontier, a continuing challenge to science. Out of them, scientists are developing new materials that benefit us all in many ways.

A CHEMICAL A MONTH—The scientists of Union Carbide, for example, have introduced an average of *one new chemical per month for over twenty-five years.*

Some of these have led to the growth of important industries, such as plastics and man-made textiles. This, in turn, has meant more opportunities, more jobs—in construction, manufacturing, engineering and sales, as well as in research.

IN OTHER FIELDS, TOO, the people of Union Carbide have helped open new areas of benefit and opportunity. Their alloy metals make possible stainless and other fine steels; the oxygen they produce helps the sick and is essential to the metalworker; their carbon products serve the steelmakers and power your flashlight.

PROGRESS THROUGH RESEARCH—Union Carbide has 23 research and development laboratories constantly working in major fields of science to continue this record of product development—and more jobs through science.

FREE: *Learn how* ALLOYS, CARBONS, GASES, CHEMICALS, *and* PLASTICS *improve many things that you use. Ask for the 1955 edition of "Products and Processes" booklet E-2.*

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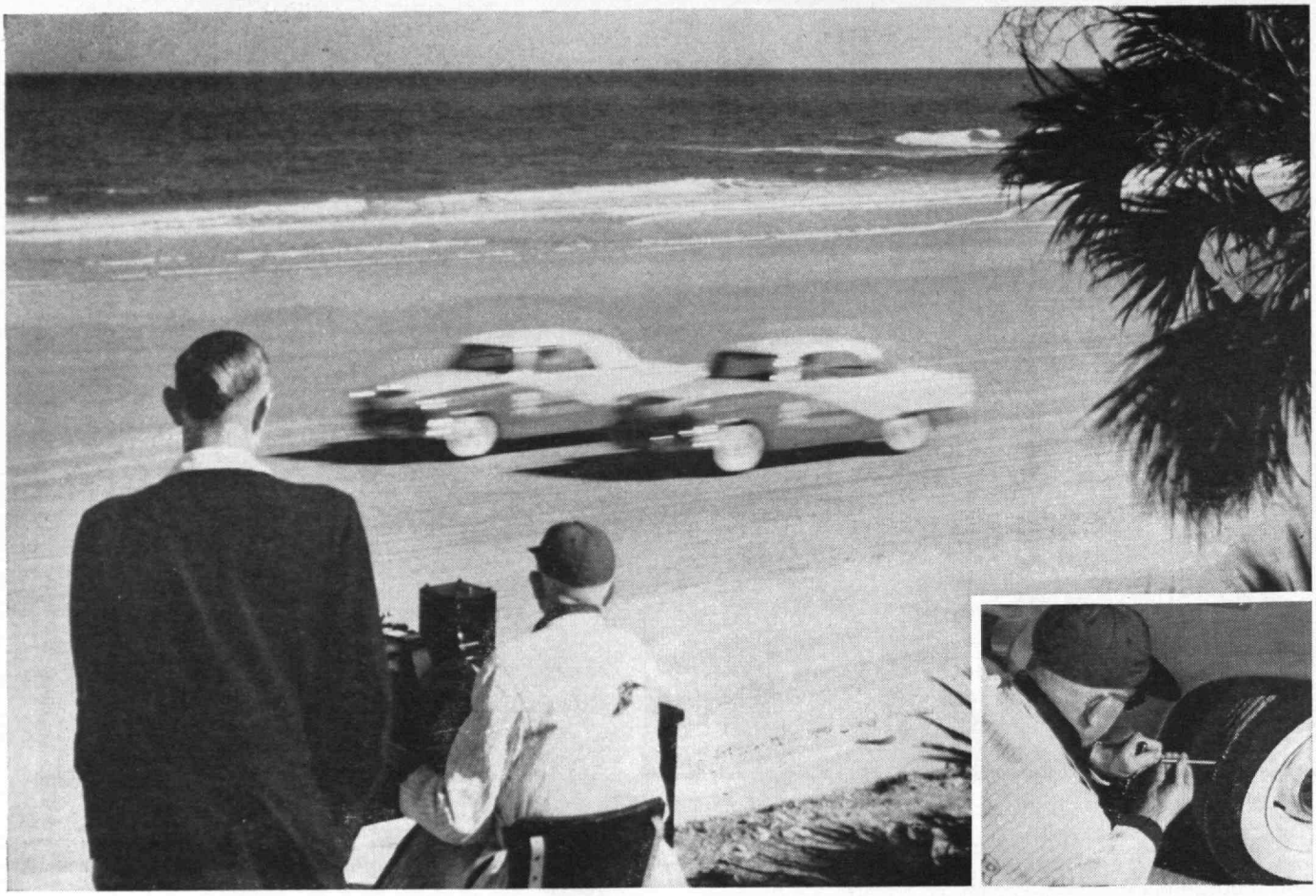
MORE MILES OF WEAR!



We put conventional tires and tubes and new Goodyear Tubeless DeLuxe Super-Cushions through murderous 100 m.p.h. speed runs on Daytona Beach. When each of the cars stopped, we tested the tire temperature: 228 degrees for the tires and tubes — only 199 degrees for the Goodyear Tubeless DeLuxe Super-Cushions—proof that Tubeless Super-Cushions run cooler, even at high speeds, and build up less mileage-robbing heat.

Goodyear's exclusive 3-T Cord and Grip-Seal construction make possible this ultra-modern tubeless tire!

You're miles ahead with the new Tubeless Super-Cushion. This great new tire is lighter, runs cooler, wears longer. And it fits your present wheels.

Underneath this advanced tread is the stoutest heart on the highway—3-T Cord. In its exclusive 3-T process, Goodyear triple tempers tough cord sinews and integrates them with improved rubber compounds under Tension, Temperature and Time to produce the most durable tubeless tire body made!

It gives greater protection against blow-outs, too! Any tire may blow out if it is severely cut or damaged. But naturally the tire with the strongest cord offers the greatest protection against cuts and bruises. 3-T Cord is so tough that breaks grow slowly—you get a gradual, harmless loss of air. Goodyear, Akron 16, Ohio.

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