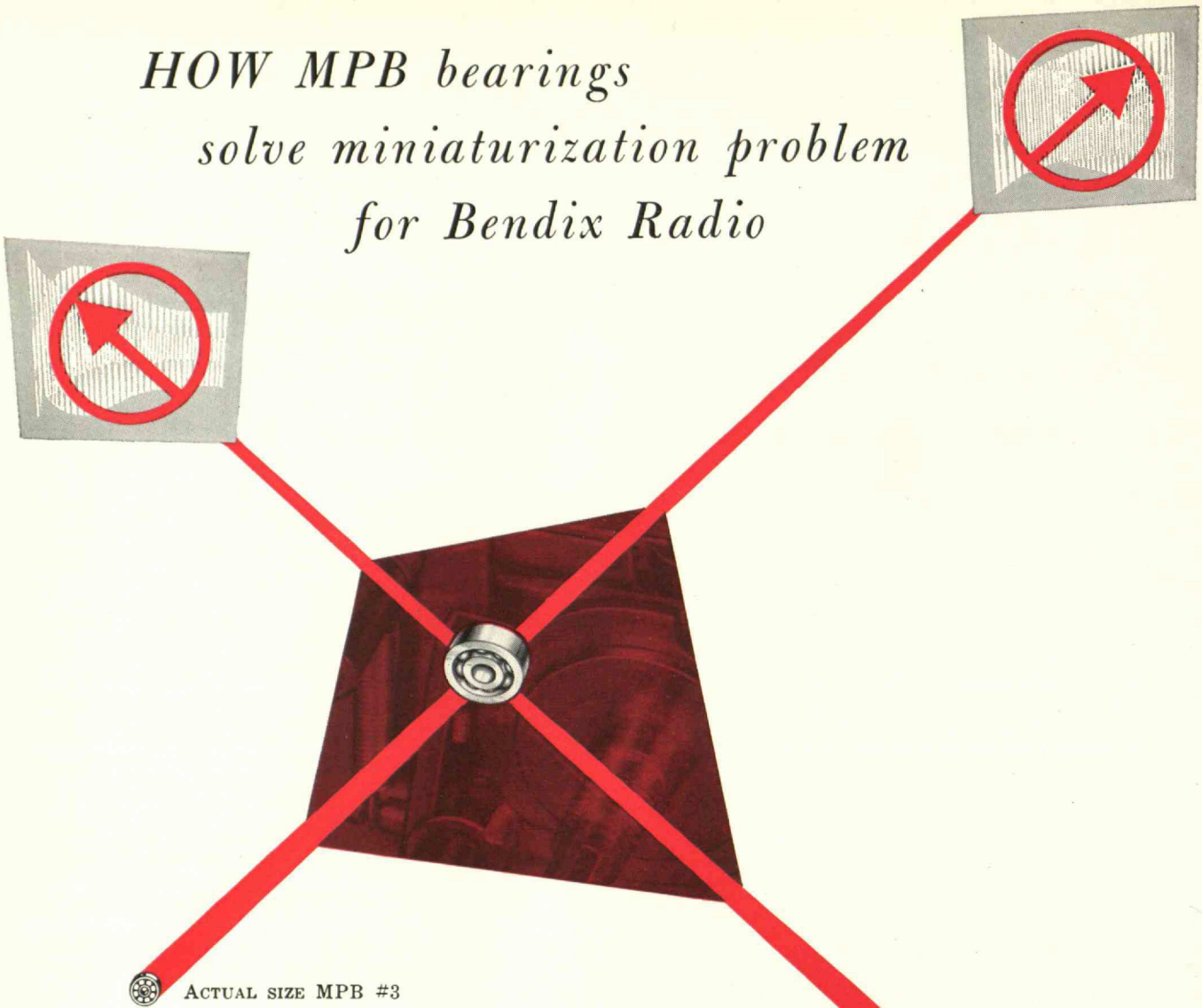
# TECHNOLOGY REVIEW

March 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.

# LION OIL COMPANY

LION

EL DORADO, ARKANSAS

J. B. ROGERSON,
MANAGER OF MANUFACTURING

MANUFACTURING DIVISION

October 29, 1954

LUMMUS

DATE REC'D: NOV. 1, 1954
ROUTE TO: C.A.B.
REMARKS:

Mr. C. A. Barrere
Vice President
The Lummus Company
2707 Weslayan
Houston 6, Texas

Dear Mr. Barrere:

The construction of our chemical plant in St. Charles Parish, Louisiana, to produce 300 tons per day of ammonia, 450 tons per day of nitric acid, and 550 tons per day of ammonium nitrate pellets was completed by your company June 1, 1954, and was well within labor cost and time allocated to this project.

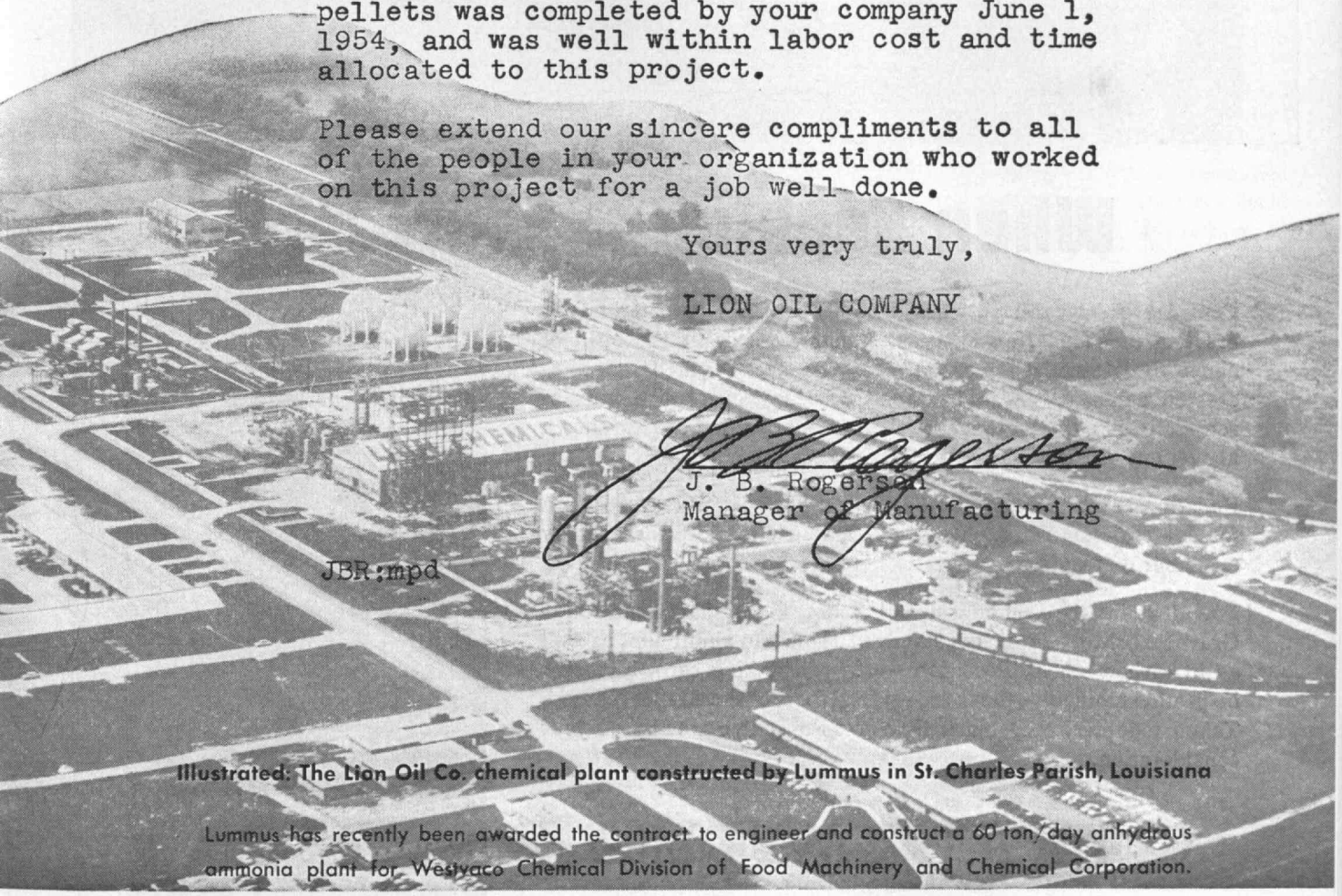
Please extend our sincere compliments to all of the people in your organization who worked on this project for a job well done.

Yours very truly,

LION OIL COMPANY

J. B. Rogerson
Manager of Manufacturing

JBR:mpd



**Illustrated: The Lion Oil Co. chemical plant constructed by Lummus in St. Charles Parish, Louisiana**

Lummus has recently been awarded the contract to engineer and construct a 60 ton/day anhydrous ammonia plant for Westvaco Chemical Division of Food Machinery and Chemical Corporation.

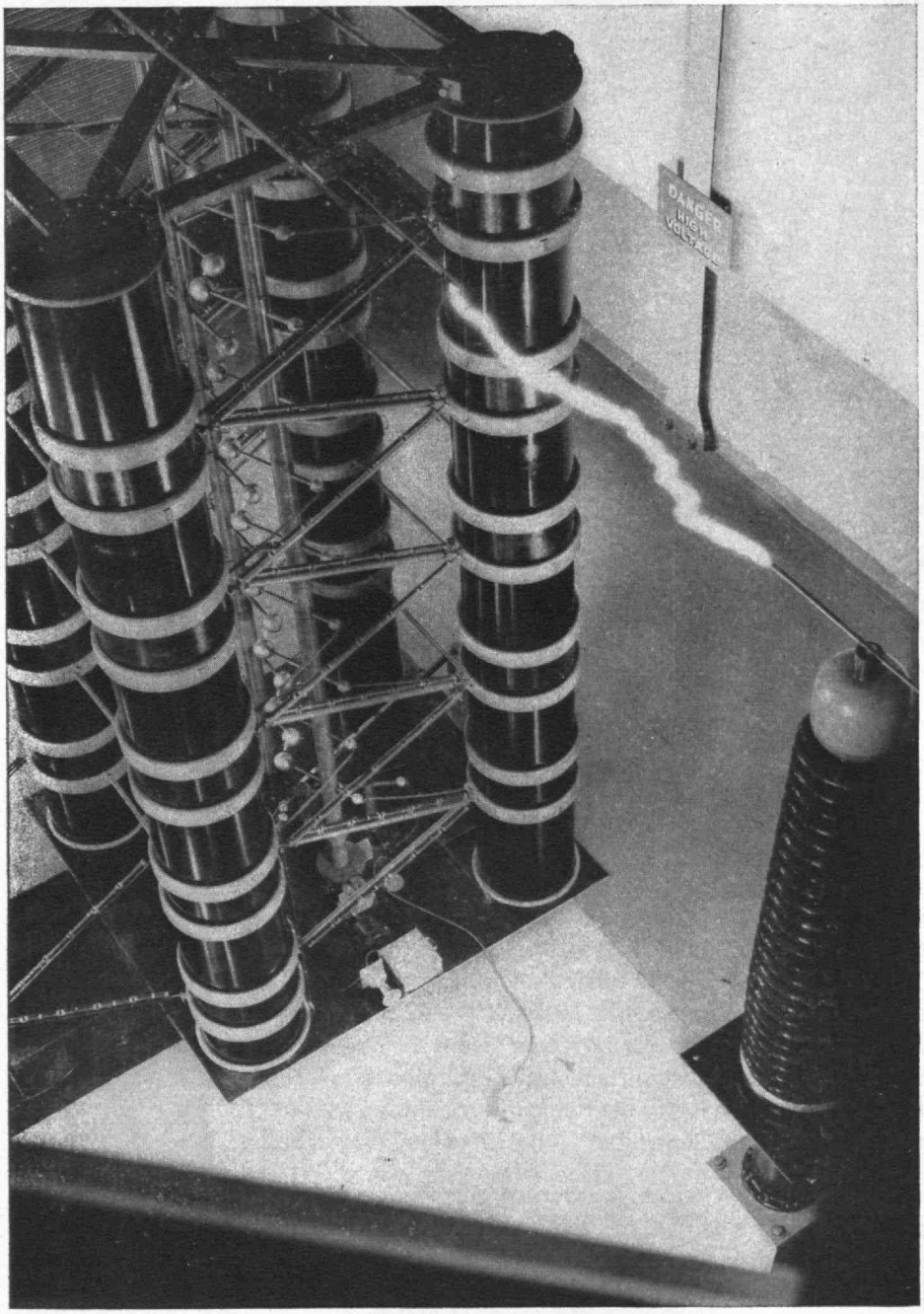
**THE LUMMUS COMPANY, 385 MADISON AVENUE, NEW YORK 17, N. Y.**

**DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES**

THE TECHNOLOGY REVIEW, March, 1955, Vol. LVII, No. 5. Published monthly from November to July inclusive at Emmett Street, Bristol, Conn. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription $4.00; Canadian and Foreign subscription, $4.50. Entered as second-class matter December 23, 1949, at the Post Office at Bristol, Conn., under the Act of March 3, 1879.

# New Phelps Dodge Research Laboratory

## PROVIDES FINEST HIGH VOLTAGE TEST FACILITIES




Modern utility systems are requiring progressively higher voltage underground cables to carry the constantly increasing power loads.

Phelps Dodge is fully equipped to meet these utility demands with its new high voltage laboratory in Yonkers, N. Y. This laboratory is provided with the finest power cable research and testing facilities and is staffed by skilled engineering personnel.

Typical example of this new equipment is the Lightning Generator, shown at left. This generator produces powerful electric discharges equivalent in magnitude and severity to natural lightning. It is capable of attaining surge currents of 30,000 amperes and test voltages up to 2,000,000 volts in less than a millionth of a second.

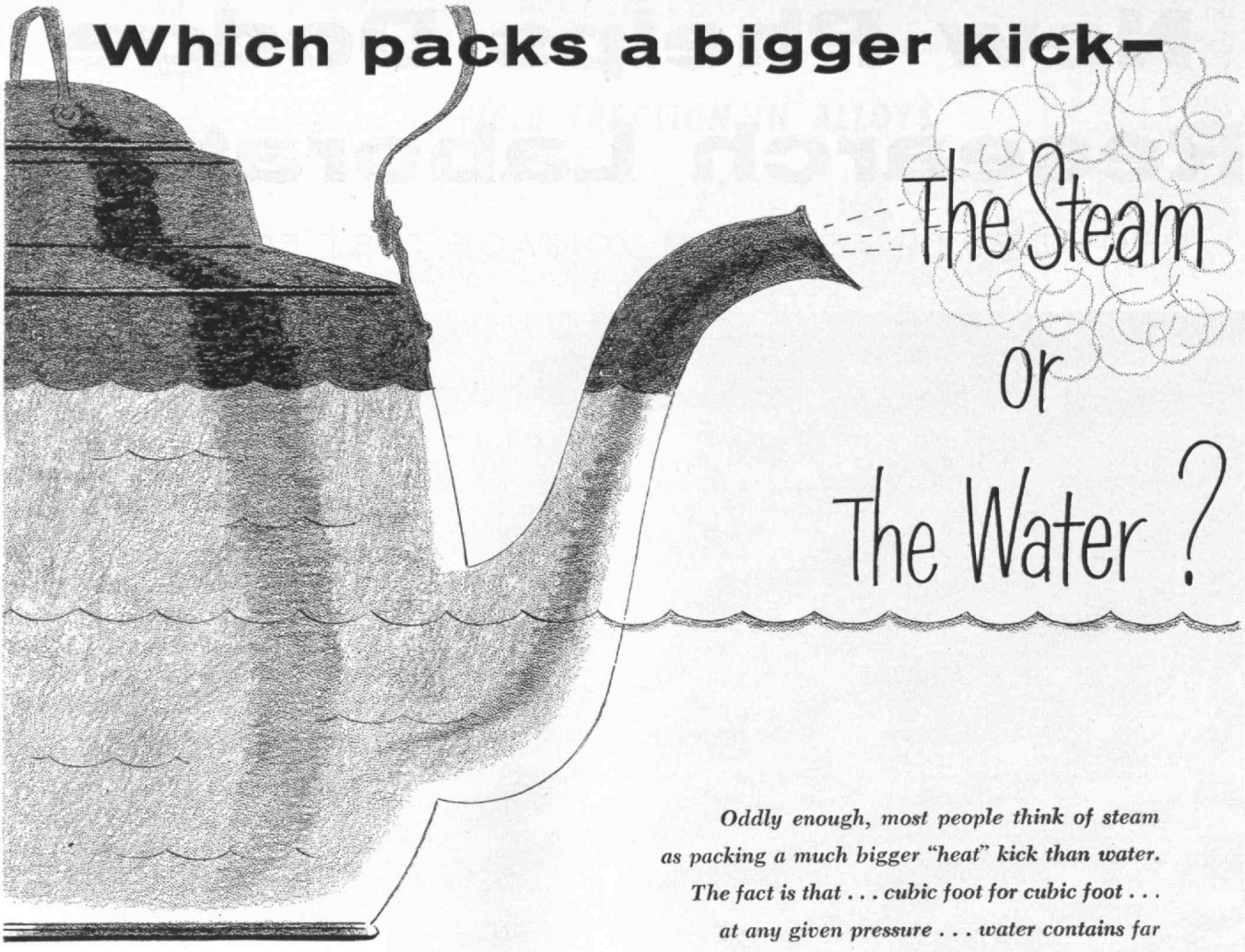
Ability of the various cable designs to operate continuously at the required extra high voltages is determined by 60-cycle alternating current tests up to 750,000 volts.

PHELPS DODGE COPPER PRODUCTS CORPORATION
REG U S PAT OFF

**PHELPS DODGE COPPER PRODUCTS CORPORATION**

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

# Which packs a bigger kick—




*Oddly enough, most people think of steam as packing a much bigger "heat" kick than water. The fact is that . . . cubic foot for cubic foot . . . at any given pressure . . . water contains far more heat than steam — more than 50 times as much, for example, at such a typical industrial process pressure as 110 lbs. per sq. in.*

## That's why we're in hot water—and like it

. . . in the business of making *hot water* boilers, that is. But not for producing the kind of hot water you're familiar with . . . we're talking about high-pressure, high-temperature water—up to 300 lbs. per sq. in. and 425° F. At such pressures and temperatures water offers important advantages over steam for large heating installations and for many process heating requirements. And Combustion has a boiler design that is ideally suited to the job of heating and distributing high-temperature water — the C-E La Mont Controlled Circulation Hot Water Boiler.

If you have a heating or process job that's suitable for high-temperature water, it will pay you to look into a C-E La Mont installation. As compared to steam, it will give you a far simpler and less expensive distribution system, substantially lower fuel and maintenance costs and many operating advantages, such as more uniform temperatures and better temperature control. Write our Hot Water Heating Department for further information.

B-804

**COMBUSTION ENGINEERING**

Combustion Engineering Building
200 Madison Ave., New York 16, N. Y.

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

# Doelcam joins MINNEAPOLIS Honeywell

H HONEYWELL

WE ARE PROUD to become the newest division of the world's largest producer of automatic controls. Our experienced staff of design engineers, our modern manufacturing facilities and our precision instruments all match the high standards set by Minneapolis-Honeywell. We shall continue to maintain our leadership as a quality manufacturer of servo components for bombing and navigational computers, fire control systems and missile stabilization and guidance systems. Whether your applications are of a military, laboratory or industrial nature, you may rely upon our instruments for measurement and control to continue to remain unsurpassed in a precision industry.

Doelcam
A DIVISION OF MINNEAPOLIS-HONEYWELL
H HONEYWELL
SOLDIERS FIELD ROAD
BOSTON 35, MASS.

*Instruments for Measurement and Control*
Synchros • Gyros • Amplifiers • Microsyns • Servo Motors


**SERVO MOTORS**—All Navy Bureau of Ordnance Types —115 volts, 400 cps—fulfill rigid requirements of MIL-S-17087.

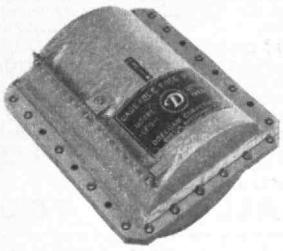
*Write for Bulletin SM1*


**SYNCHROS** — Sizes 11 through 31 — 115 volts, 400 or 60 cps — meet exacting requirements of MIL-S-16892 or FXS-1066.

*Write for Bulletin S1*


**AMPLIFIERS**—D-C Indicating Amplifier (shown here), Selected Range D-C Amplifier and Magnetic Null Indicator all use Doelcam Second-Harmonic Magnetic Converter in input stage for low drift and high sensitivity.

*Write for Bulletin A1*



**GYROSCOPES** — Cageable Free Gyro (shown here), Junior Rate Gyro, K Rate Gyro, Gyro Stable Platforms — used in guided missiles, aircraft flight evaluation systems and bombing and navigational computers.

*Write for Bulletins K, JR, and CFG1*

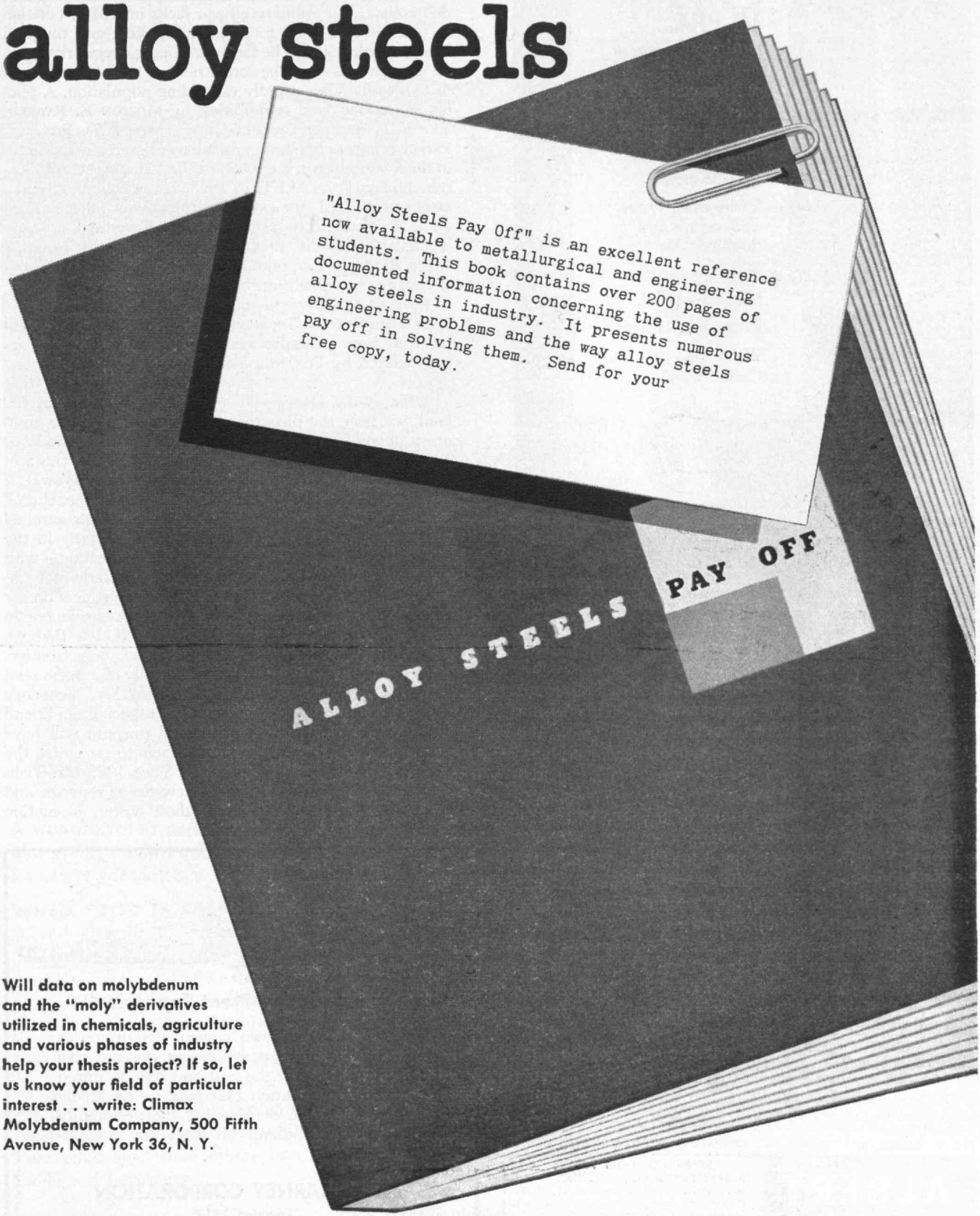
# THE TABULAR VIEW

**Limitations of Logic.** – The increased complexity of technology and the need to properly assess the effects of science and engineering on man's life stimulate the need to examine the present status of engineering education. The requisite becomes all the more apparent when it is recognized (as reported on page 80 of the December, 1954, issue of The Review) that the nation's colleges and universities will face a bumper crop of students in the next decade or two. One study of engineering education is presented in this issue (page 233) by JOHN B. WILBUR, '26, Head of the Institute's Department of Civil and Sanitary Engineering. Despite the official position of the author, the views expressed by Dr. Wilbur are entirely his personal ones. Professor Wilbur makes an appeal for a "vertical type" of engineering training, in which logic and the informal faculties are developed simultaneously, in contradistinction to the horizontal type of training with "prerequisites." Professor Wilbur received S.B., S.M., and Sc.D. degrees from the Institute in 1926, 1928, and 1933, respectively. After two years in engineering practice, Dr. Wilbur returned to M.I.T. in 1930 as an instructor in Civil Engineering. He was made assistant professor in 1934, associate professor in 1937, and professor in 1943. He became acting head of his Department in 1944, and permanent head in 1946. Professor Wilbur is a member of the American Society of Civil Engineers and of the Boston Society of Civil Engineers. He is a fellow of the American Academy of Arts and Sciences, and an honorary member of Chi Epsilon, the honorary civil engineering fraternity. He is the author of many technical papers and bulletins and, with Professor Walter M. Fife, '21, of a textbook, *Theory of Statically Indeterminate Structures.*

**Hold for Future Use.** – A few rugged die-hards refuse to see the logic of that tail-chasing, economic shell game which requires our citizens to pay taxes in order that the government can keep agricultural prices up so that taxpayers' foodstuffs cost more than they would without government intervention. The farmers plant, reap, store –

(*Concluded on page 224*)

# 60 case histories of alloy steels




**Will data on molybdenum and the "moly" derivatives utilized in chemicals, agriculture and various phases of industry help your thesis project? If so, let us know your field of particular interest . . . write: Climax Molybdenum Company, 500 Fifth Avenue, New York 36, N. Y.**

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**CLIMAX MOLYBDENUM**

## THE TABULAR VIEW

(*Concluded from page 222*)

and collect; the ordinary citizen faces increased taxation so that the cost of his food can be boosted; and the land becomes exhausted! The land now being overworked – to fill storage bins – will be sorely needed in another decade or two to feed our rapidly expanding population. A plan for conserving land is proposed by MILTON E. PARKER, '23, in "A Bumper Crop of Grass" (page 237). Professor Parker brings to his study a vast background of experience in the food industry. He received the S.B. degree in Industrial Biology from M.I.T. in 1923. He served as research associate at M.I.T. for a year under Samuel C. Prescott, '94 (now Professor of Industrial Biology, Emeritus), as dairy technologist of the Research Laboratories of National Dairy Products Corporation, manager of Beatrice Foods Company, as consulting food engineer, and, since 1948, as head of the Department of Food Engineering at the Illinois Institute of Technology. The stimulation and aid received from a similar article in *Lion Oil News* is acknowledged by Professor Parker.

**Attila at the Door.** – On every hand, throughout the land, we hear the plea that there should be more engineers, of youthful years, preparing for the next World War. The training of scientists and engineers in the U.S.S.R. has had a meteoric rise since the end of World War II, if numbers of enrolled students is a guide. In the United States, however, the number of college students enrolled in science and engineering has dropped steadily in the past few years. This drop in technical education – with Attila at our front door – is of concern to GEORGE TICHENOR who advocates (page 241) technical education for all it is worth. Mr. Tichenor believes that enrollment in science and engineering can be increased, but that we need to recognize that "science offers not only frontiers to be explored, but also the virginal beauty of a poem read for the first time." It will be surprising if Mr. Tichenor's thesis does not raise a few eyebrows – especially in liberal arts educational circles – but a good purpose will have been served if his views provoke others to recognize the nation's current educational needs. Since 1923 Mr. Tichenor has had a varied career as newspaper reporter and writer, editor, novelist, teacher, ghost writer, promotion director, and public relations adviser.