

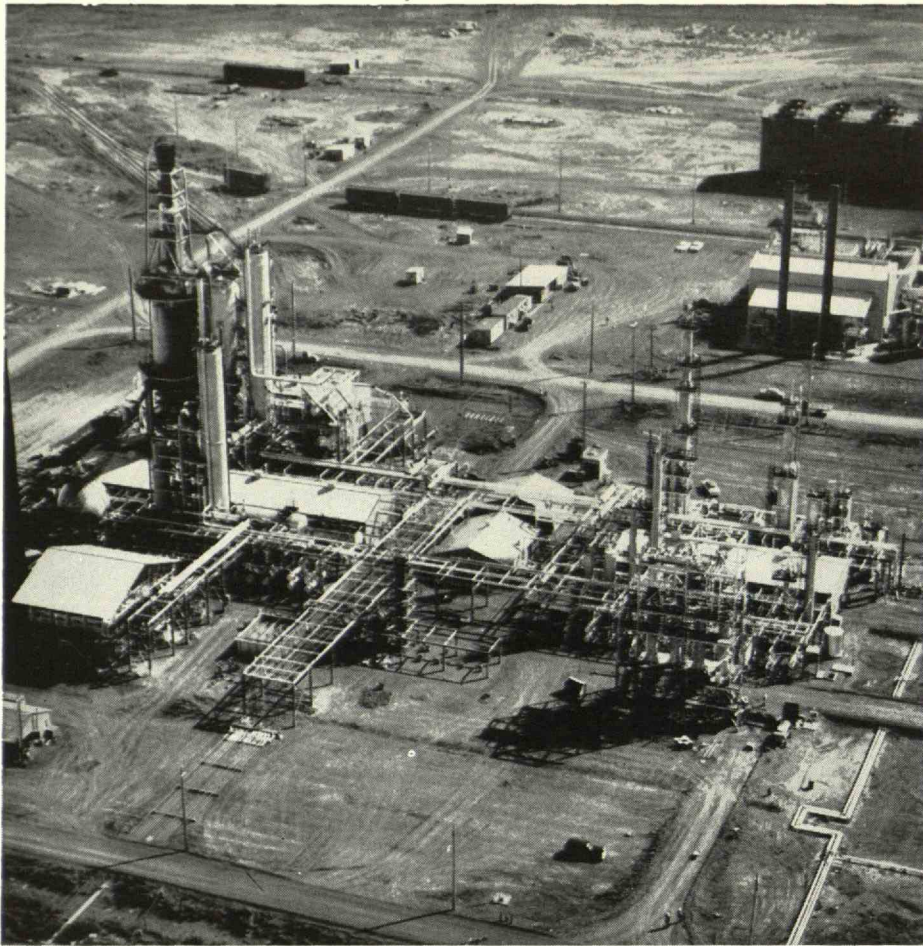
# TECHNOLOGY

REVIEW

*July* 1955







**Tuesday night, September 28th:**  
the Lummus initial operating team first fed oil into the crude unit of the 30,000 B/D refinery which Lummus designed, engineered and constructed for a major oil company at Mandan, North Dakota.

**Wednesday night, September 29th:**  
oil was fed into the fluid catalytic cracking unit.

**Friday night, October 1st:**  
the entire refinery was in operation at two-thirds capacity, with products going to storage.

## Mandan refinery starts up in three days

The Mandan refinery was completed ahead of schedule, started up in record time, and has been operating ever since. It is an integrated plant including crude distillation section, fluid catalytic cracking unit, vapor recovery section, polymerization unit, treating and blending sections and desalter.

The owner has expressed pleasure and enthusiasm over the excellent time and performance records on the installation, made possible through painstaking engineering and construction efforts.

This adds one more to the over 700 efficiently engineered and constructed projects which Lummus has brought to completion over the past 50 years. May we work with you on your next project.


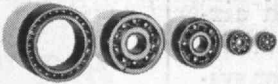

The Lummus Company, 385 Madison Avenue, New York 17, N. Y. **Engineering & Sales Offices:** New York, Houston, Montreal, London, Paris, The Hague. **Sales Offices:** Chicago, Caracas. **Heat Exchanger Plant:** Honesdale, Pa. **Fabricated Piping Plant:** East Chicago, Indiana.

# LUMMUS

DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

Ready for the Rope?

R. Osborn

Don't give up! Here's all you need  in order to get the whole story of how these  MPB's 

BALL BEARINGS ACTUAL SIZE

are solving problems in the design of precision instruments



CUT THE CALAMITY AND CUT OUT THE COUPON

Miniature Precision Bearings, Inc., 12 Precision Park, Keene, N. H.

YES! Please send me the reprint of the article, MINIATURE BALL BEARINGS FOR PRECISION INSTRUMENTS

name

title


company

street

city

zone

state

 MINIATURE PRECISION BEARINGS, INC., KEENE, N. H.

THE TECHNOLOGY REVIEW, July, 1955, Vol. LVII, No. 9. 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.



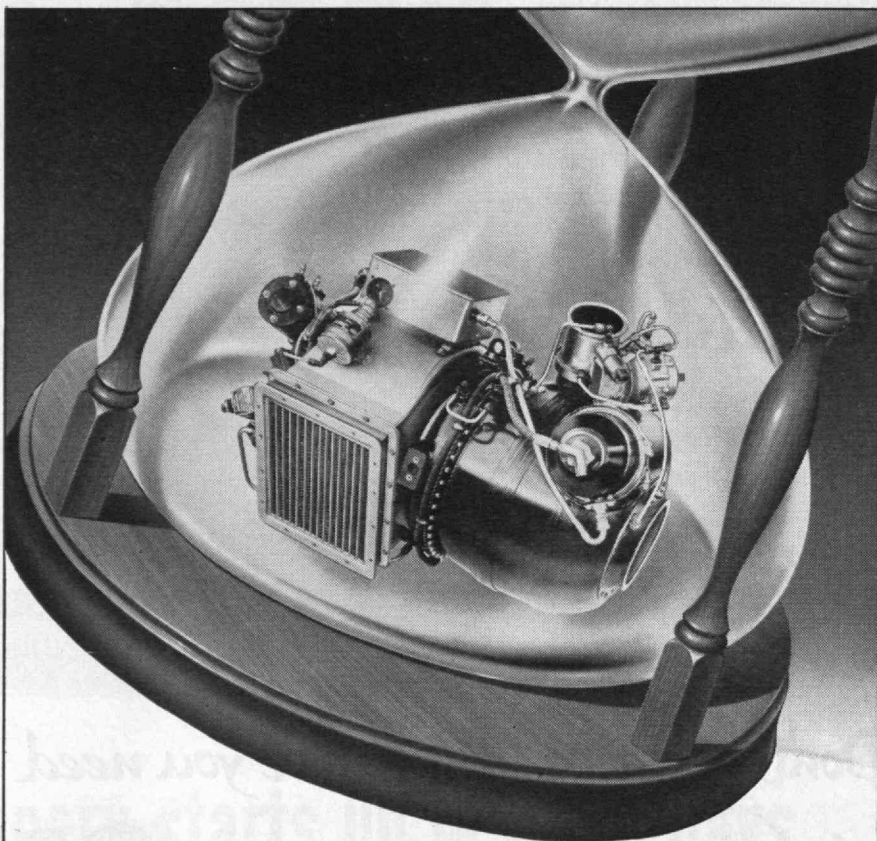
# To the engineer with a bent for research...

AiResearch is looking for your kind of engineer.

At AiResearch, we operate on the very frontier of present scientific knowledge. Through the years, we have made a practice of anticipating the trend of modern engineering and being ready with the answers.

A typical example of progress is our activity in the rapidly expanding field of small turbomachinery. AiResearch pioneered small turbines and now has more experience in their design, development and manufacture than all other companies combined. We have also led the way in the development of aircraft pressurization and air-conditioning and of pneumatic, electronic, and heat transfer systems. All of America's modern aircraft contain AiResearch equipment. We lead and intend to increase that leadership.

That's why we need creative engineers... and appreciate them. You who qualify for an AiResearch position will receive stimulating assignments, utilize some of the finest research facilities in the country and be well rewarded financially.



**TEST OF TIME** passed by small gas turbines at AiResearch, with proved performance in the field. AiResearch has developed and produced more small gas turbines than any other company in the world.

Premium positions are now open for mechanical engineers...electrical engineers...physicists...specialists in engineering mechanics...specialists in aerodynamics...electronics engineers...aeronautical engineers.

Write to Mr. Wayne Clifford, AiResearch Manufacturing Company, 9851 S. Sepulveda Blvd., Los Angeles 45, California. Indicate your preference as to location between Los Angeles and Phoenix.



**THE GARRETT CORPORATION**

**AiResearch Manufacturing Divisions**

Los Angeles 45, California • Phoenix, Arizona

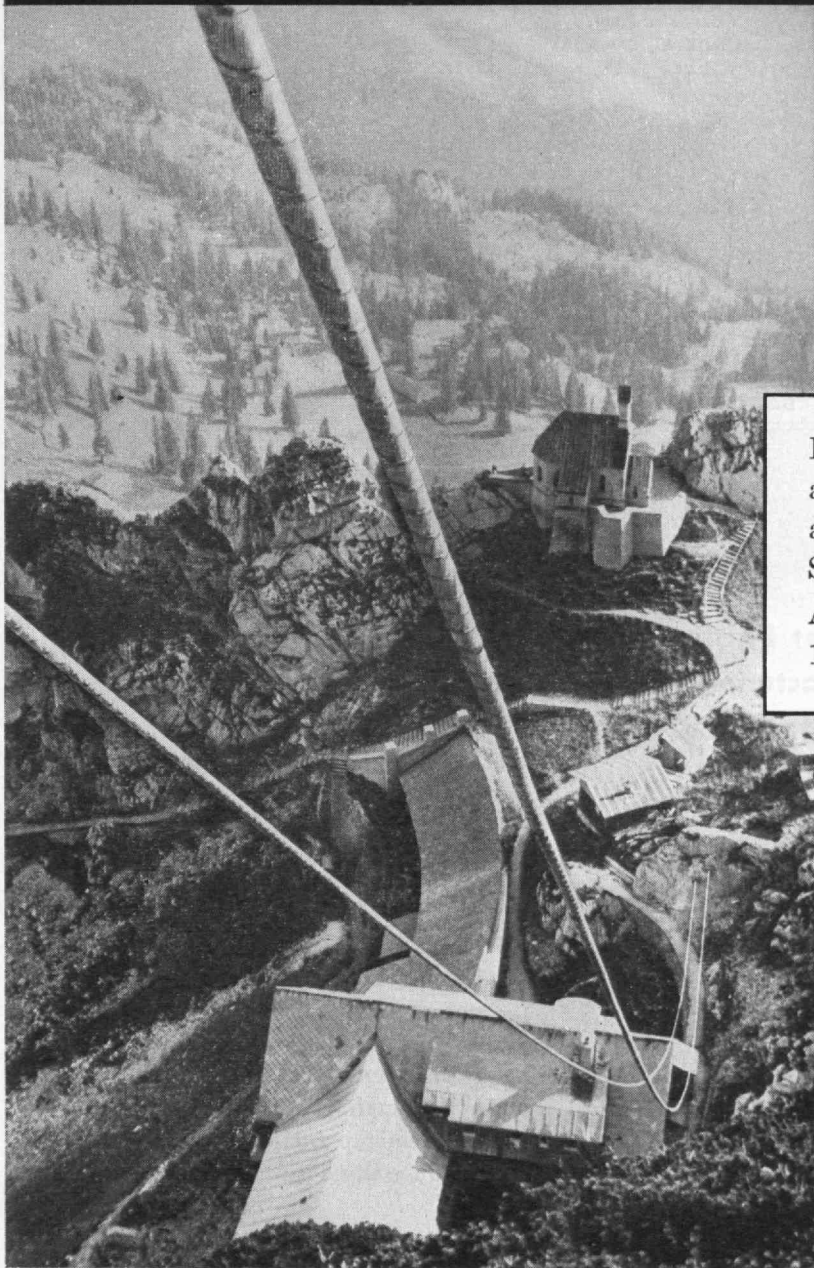
*Designers and manufacturers of aircraft components:* REFRIGERATION SYSTEMS • PNEUMATIC VALVES AND CONTROLS • TEMPERATURE CONTROLS

CABIN AIR COMPRESSORS • TURBINE MOTORS • GAS TURBINE ENGINES • CABIN PRESSURE CONTROLS • HEAT TRANSFER EQUIPMENT • ELECTRO-MECHANICAL EQUIPMENT • ELECTRONIC COMPUTERS AND CONTROLS

# Styroflex Coaxial Cable

**FIRST CHOICE FOR**

**DIFFICULT MOUNTAINOUS CONDITIONS!**



Courtesy Felton & Guillaume, Cologne

*After 5 Years of  
Rigorous Service in the  
Swiss Alps, the Electrical  
Characteristics of Styroflex  
are Unchanged!*

FM Installation of Styroflex Cable  
armored for 25-ton ice load  
at the Wendelstein Alp near the  
Swiss border.

Aluminum sheath approximately  
 $1\frac{1}{8}$  inches OD.

*Ideal for Remoting  
Video Circuits for both  
Television and Radar!*

Inquiries regarding your  
particular problems will be welcomed  
by our engineering staff.



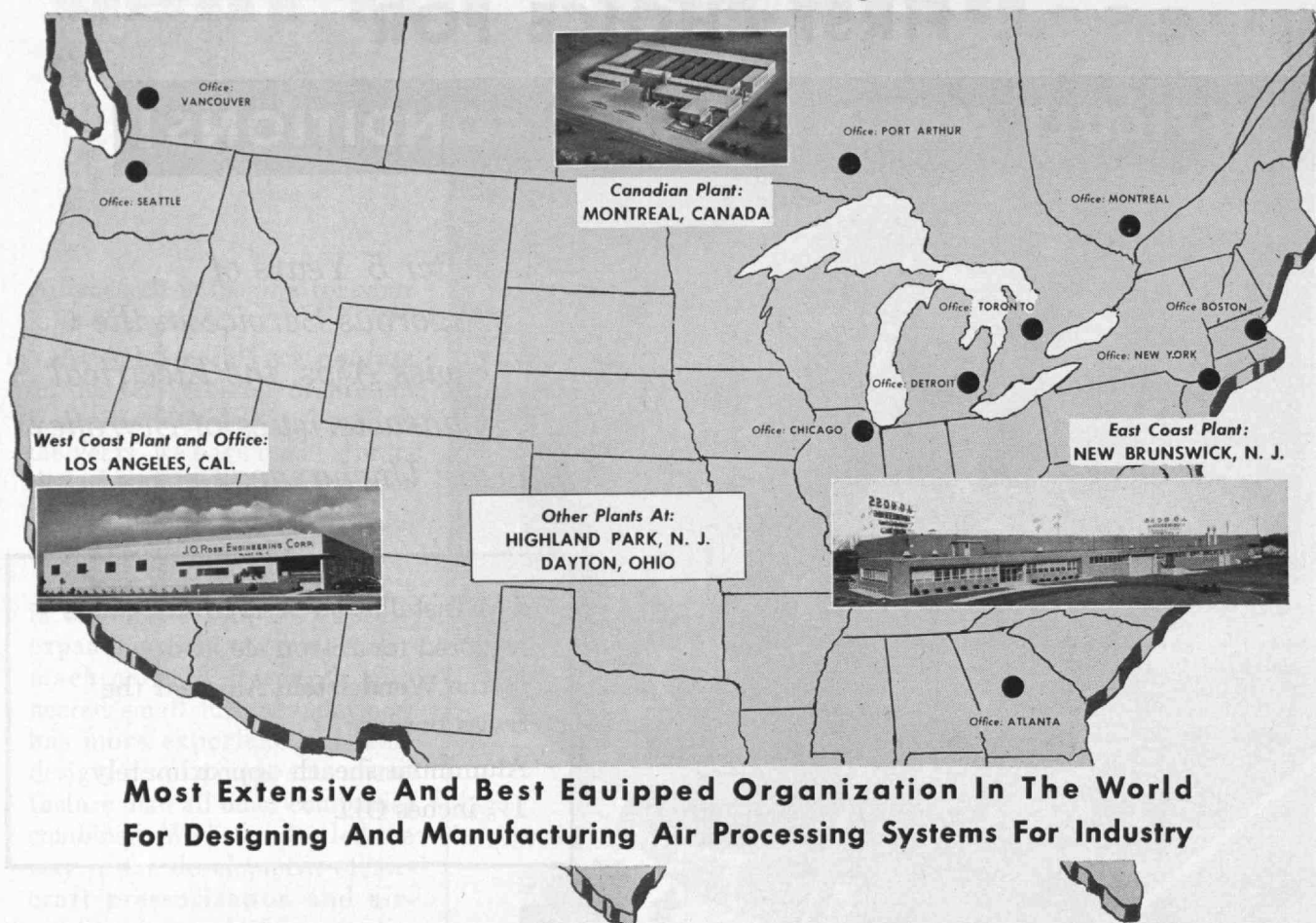
***PHELPS DODGE COPPER PRODUCTS***

**CORPORATION**

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

# 5 ROSS Plants

# 12 ROSS Offices... throughout U.S. and Canada



**Most Extensive And Best Equipped Organization In The World  
For Designing And Manufacturing Air Processing Systems For Industry**

An industrial air system bearing the name ROSS has considerably more behind it than just a salesman and a shop. Each piece of ROSS equipment represents the result of more than 30 years of experience, the combined engineering skill of the largest staff of specialists in this field, the most exhaustive research and testing

**Systems For  
DRYING  
BAKING  
CURING  
HEATING  
COOLING  
CONDITIONING  
HIGH PRESSURE  
HOT WATER HEATING  
and similar systems**

and the finest plant manufacturing facilities and equipment.

ROSS offers a complete engineering team consisting of sales engineers, control engineers, electrical engineers, material handling specialists, experts on fans, etc. with a thorough knowledge of the engineering principles involved to produce the desired results.

## J. O. ROSS ENGINEERING CORPORATION

Saxton W. Fletcher '18 — President

**Main Office: 444 MADISON AVENUE, NEW YORK 22, N. Y.**

ATLANTA • BOSTON • CHICAGO • DETROIT • SEATTLE • LOS ANGELES

ROSS ENGINEERING OF CANADA, LIMITED, MONTREAL, CANADA

CARRIER-ROSS ENGINEERING COMPANY LIMITED, LONDON, ENGLAND



# the **Van de Graaff**<sup>®</sup>

... ideal radiation source

for  
**FUNDAMENTAL**  
and  
**APPLIED RESEARCH**  
meets these  
stringent  
requirements

It produces a beam of any fundamental particle or radiation—electrons, x-rays, protons, deuterons, tritons, neutrons.

Its beam is intense, homogeneous, of known energy, and of predictable direction and dimensions.

Its beam characteristics are stable and controllable over a wide range of energies.

## ... now used in these applications

- Nuclear cross-section measurements •
- Cancer therapy •
- Radiobiological research •
- Radiation chemistry •
- Chemical analysis of surface films •
- Neutron activation analysis •
- Radioactive isotope production •
- Industrial radiography •
- Sterilization of foods and drugs •
- Instrument calibration •
- Radiation standards •
- Injectors for giant accelerators •
- Metallurgical research •
- Radiation damage •
- Geophysical research •
- Fundamental problems in physics and chemistry •

Ask us for specific recommendations on the application of Van de Graaff particle accelerators in your radiation engineering program.

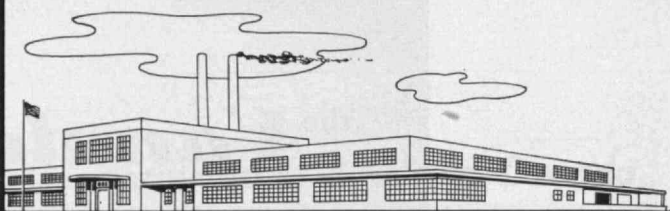
## HIGH VOLTAGE ENGINEERING CORPORATION

7 UNIVERSITY ROAD

CAMBRIDGE 38, MASSACHUSETTS



In all forms of Industry, from small repair shops to large production plants . . .

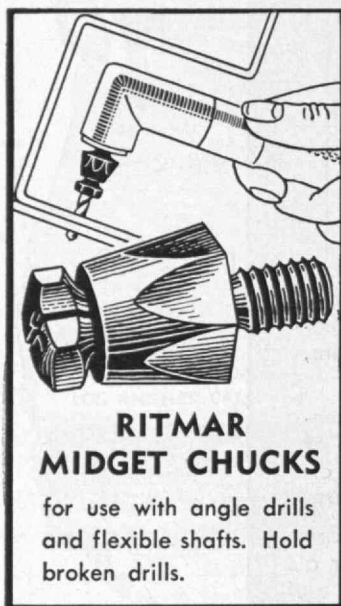


# "Awkward-Spot"

DRILLING and TAPPING problems are easily solved with these popular . . .

## RITMAR TOOLS

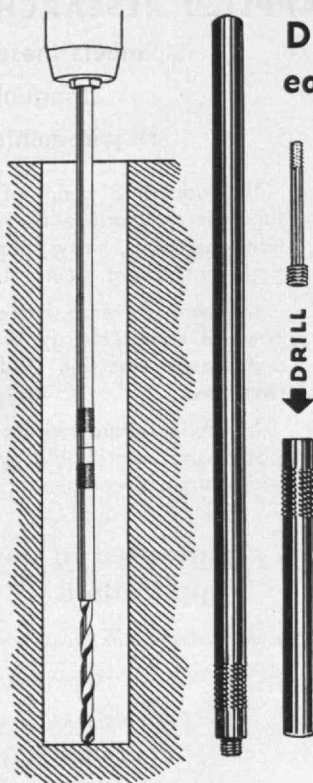
Users of RITMAR Tools include most of the civil and military aircraft builders — and virtually all the major airlines — in the U. S. and Canada, as well as the best-known manufacturers of motors, appliances, instruments, machinery, etc.



### RITMAR MIDGET CHUCKS

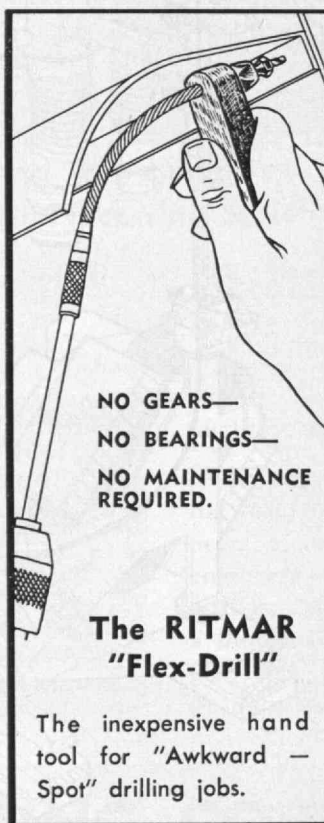
for use with angle drills and flexible shafts. Hold broken drills.

Perhaps this group of devices contains the solution to one or more of **YOUR** manufacturing, reworking, or repairing problems.



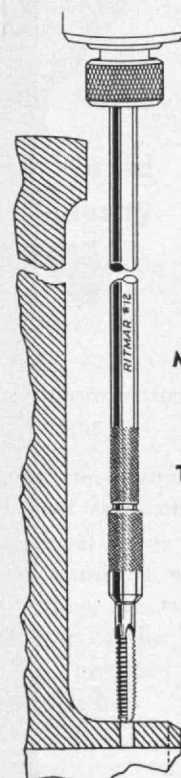
### The "LITTLE BEAVER" DRILL EXTENSION

for "Remote-Spot" drilling operations. Inter-changeable chucks hold drills in sizes from #52 to #10.



### The RITMAR "Flex-Drill"

The inexpensive hand tool for "Awkward — Spot" drilling jobs.



Both MACHINE and HAND TAPPING

### The RITMAR TAP EXTENSION

for "Remote-Spot" tapping.

Holds regular taps. Has positive drive. Taps can be replaced without the use of tools.

**RITMAR** Corporation

183 NEW YORK AVENUE  
HUNTINGTON, L. I., NEW YORK

W. A. CRESSWELL, JR. President

II-36



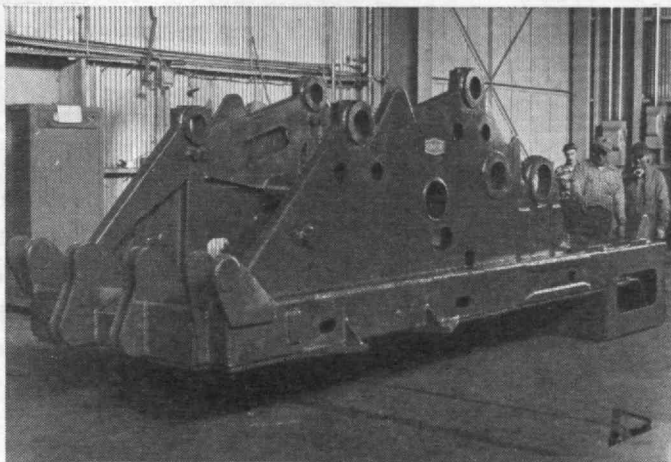


## **GRAVER** Fabricates All-Welded Revolving Frames for **P&H** Power Shovels

The versatile P&H Dragline pictured above, feeding rock onto a conveyor (Model 1055 LC) uses an all-welded revolving frame for extra strength. Graver recently fabricated five such assemblies for the Harnischfeger Corporation, one of which is shown in the inset.

This is an integrally welded rigid unit of box section design to withstand the great variety of stresses it will encounter. Traditional Graver quality is seen in the uniform welds which were inspected during manufacture by the most modern and comprehensive techniques. These include the initial accurate dimensional inspection on specially designed layout tables, periodic visual inspections, and magnetic particle and X-ray inspections.

Graver has achieved a reputation for developing new equipment and advanced techniques and is expert in welding carbon and stainless steels, and aluminum. For the more complex, difficult welding problems consult your Graver engineering representative. Meanwhile write for new illustrated brochure, "WELDMENTS."



### **GRAVER TANK & MFG. CO., INC.**

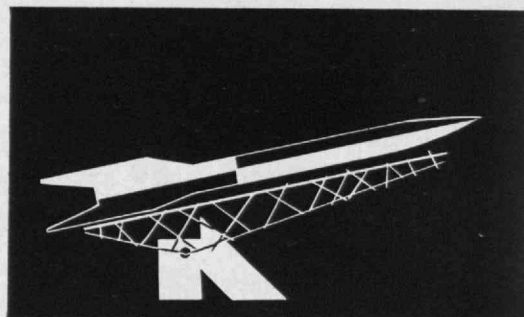
East Chicago, Indiana

CHICAGO • NEW YORK • PHILADELPHIA • EDGE MOOR, DEL. • CATASAUQUA, PA. • PITTSBURGH • CLEVELAND • DETROIT • TULSA • SAND SPRINGS, OKLA. • HOUSTON • ODESSA, TEXAS • CASPER, WYO. • LOS ANGELES • FONTANA, CAL. • SAN FRANCISCO

**GRAVER** ...source for  
quality weldments

# ENGINEERING OPPORTUNITY

*Investigate the*  
**NORTH AMERICAN AVIATION'S** *many diverse*  
**AIR FORCE SM-64 NAVAHO**



## GUIDED MISSILES

Aerodynamics • Thermodynamics • Missile  
Airframe Structures • Armament Systems and  
Components • Weapons Systems Engineering •  
Flight Test Operations and Instrumentation •  
Power Plant Systems

At North American you can join an engineering team . . . staffed by key engineering personnel . . . and help push back the frontiers of airframe, automatic guidance and control systems for missiles, fire and flight control systems for jet aircraft, and rocket engine research and development. You'll find that North American is aware of your worth. Your time, talent and training will be amply rewarded and given full opportunity to grow with North American's progress.

If your background equips you for a career in aerodynamics, thermodynamics, electro-mechanical engineering and manufacturing, North American offers you unlimited opportunity. The engineering, pioneering and know-how that established the company that has built more airplanes than any other is contributing to leadership in these new and expanding fields.