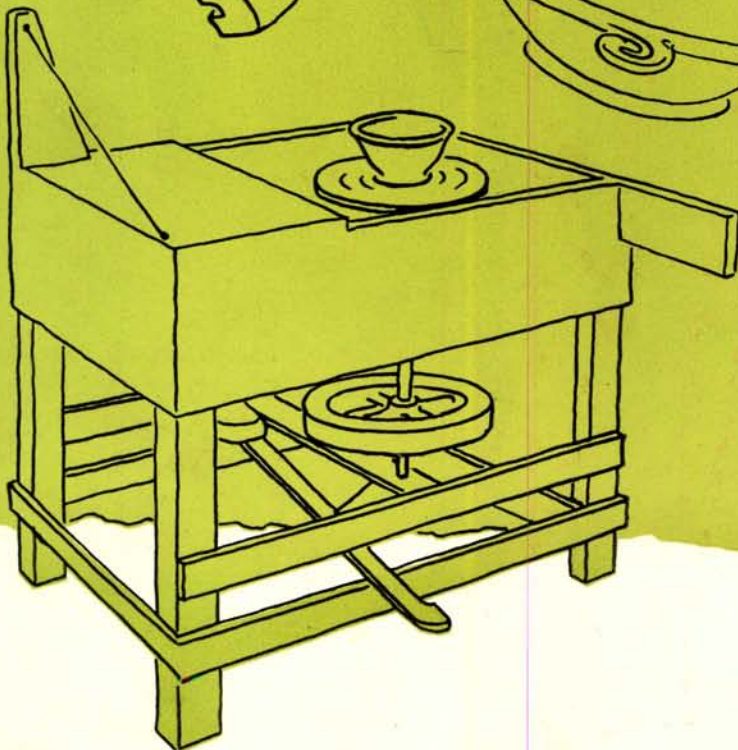


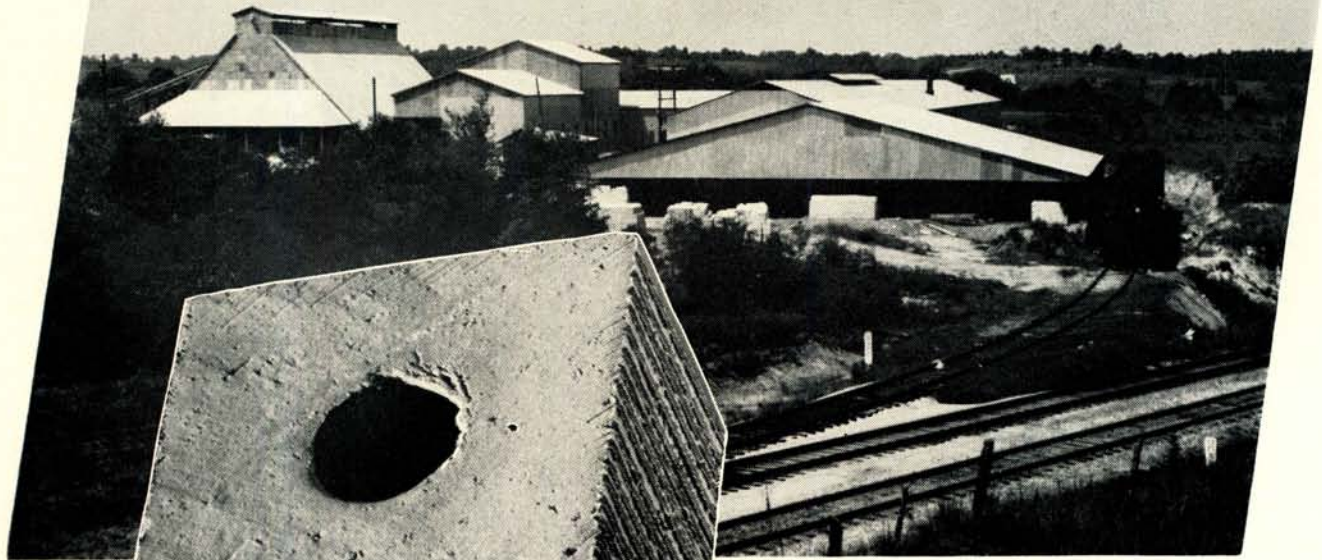
AMERICAN  
**Ceramic**  
SOCIETY  
**Bulletin**



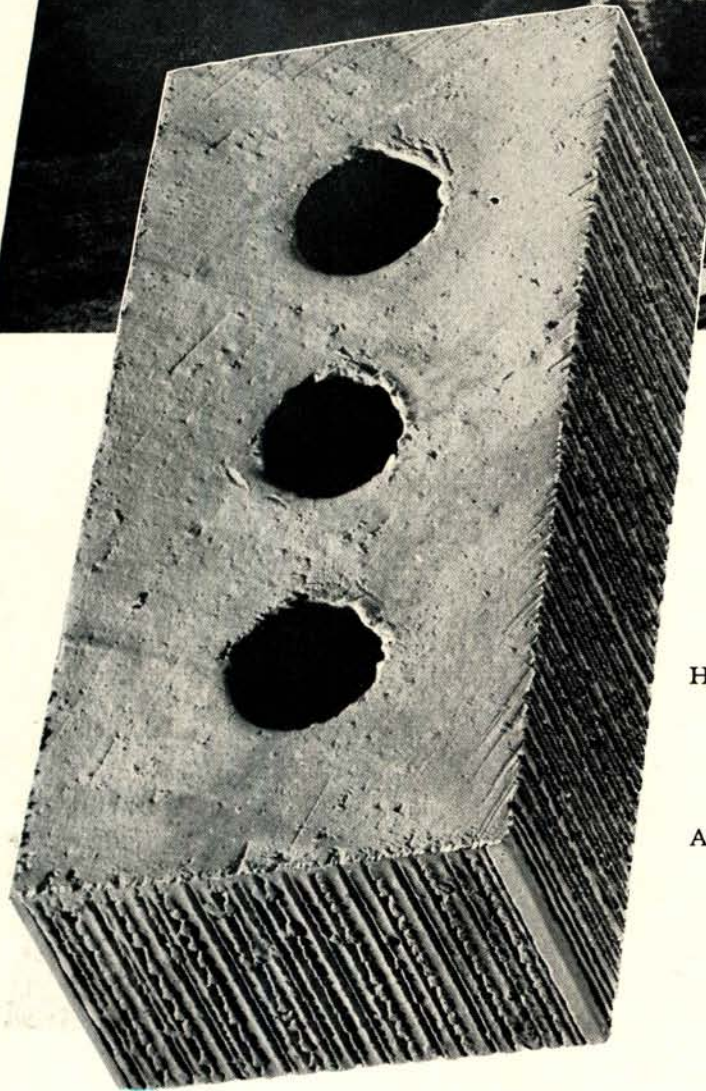
MAY • 1951

# Once upon a wilderness...

## HARROP PLANNED A PLANT



New plant of the Holly Springs Brick and Tile Co., Inc., Holly Springs, Miss.



... and built it, too!

There was nothing but trees here in 1949, when HARROP engineers paced off the site of this Holly Springs plant.

Today this modern clay plant, complete with HARROP dryer-kiln, turns out a profitable stream of handsome white face-brick. Buyers as far away as Minnesota and the Atlantic coast specify it for beauty, hardness and general high quality.

All the way through, Holly Springs is a HARROP job. HARROP engineers helped select the site . . . planned the plant layout and supervised its construction . . . specified the equipment and built the dryer-kiln . . . turned an *idea* into a going concern.

You, too, may have an unfulfilled idea—a complete plant, or an efficient modern dryer-kiln.

HARROP engineers are ready to help you . . . a non-obligating consultation can be conveniently arranged . . . just write, wire, or phone.



Practical Ceramic Engineering,  
Put Profitably to Work.

### Harrop Ceramic Service Co.

35 E. Gay Street

Columbus 15, Ohio

STRAIGHT AND CIRCULAR TUNNEL KILNS • DRYERS • PLANT CONSTRUCTION AND EQUIPMENT • CERAMIC RESEARCH

why

**PAUL O. ABBÉ**

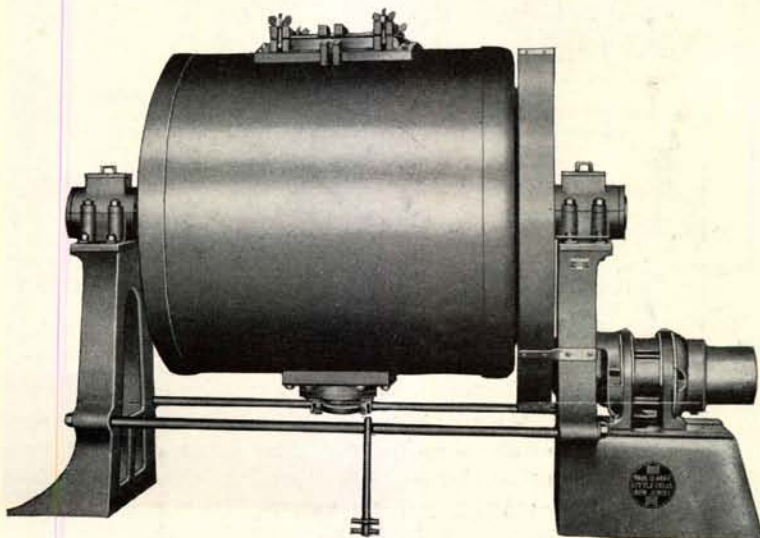
mills are better,  
more economical  
producers

It will pay you to own Paul O. Abbé Mills  
because of their definite points of superi-  
ority over any other Mill you can get today.

Superior engineering features of these Mills  
include:

1. The all-steel construction of the cylinders
2. Superior trunnion design
3. Completely assembled cylinder machined between centers in lathe
4. Superior design of bearings
5. Machine cut gears
6. Bottom pinion mounting
7. Accurate machining and mounting

*For full details of this story refer to your Paul O. Abbé Catalog U, Section B, pp 6-8. Or if you haven't a copy write for one today.*



**PAUL O. ABBÉ**

400 CENTER AVE.

LITTLE FALLS, NEW JERSEY

How to get longer mold life from POTTERY PLASTER

# USE *Water* THAT IS FIT TO DRINK

POTTERY PLASTER LIKES IT CLEAN  
AND UNIFORM IN TEMPERATURE



USG\* Pottery Plaster is made to exacting specifications to assure uniformity. This high quality works to your best advantage under closely controlled shop conditions and practice.

In mixing, for example, water that is fit to drink should be used. *It's clean*—free of sediment and dissolved chemicals that affect the setting time of plaster.

*Uniform* water temperature is also important. It should not vary more than 10° F. from your established normal.



**Drinking water  
purity means  
better molds**



**Right temperature helps  
control setting time, expansion,  
mold characteristics**

## Remember these 8 important rules

1. Store plaster in a warm, dry place and always use oldest plaster first.
2. Make uniformity doubly sure by weighing both water and plaster accurately.
3. Use an alarm-type interval timer to measure length of soaking and mixing time.
4. USE "WATER FIT TO DRINK," ALWAYS AT THE SAME TEMPERATURE.
5. Mix in a properly designed bucket with a high speed mechanical mixer—keep buckets and mixing equipment clean at all times.
6. Be sure to dry molds thoroughly before using them.
7. Prevent carelessness and unnecessary abuse in mold handling and use.
8. Follow mold performance in the clayshop carefully, and at regular intervals.

### **Longer Wear . . . Better Ware . . . SAVE THESE RULES**

Your U.S.G. representative will be glad to show you how to adapt them to your shop procedure . . . and give you other valuable information. Call him at any time, or

write Industrial Sales Division, Dept. 139, United States Gypsum, 300 W. Adams St., Chicago 6, Illinois.

\*T. M. Reg. U. S. Pat. Off.

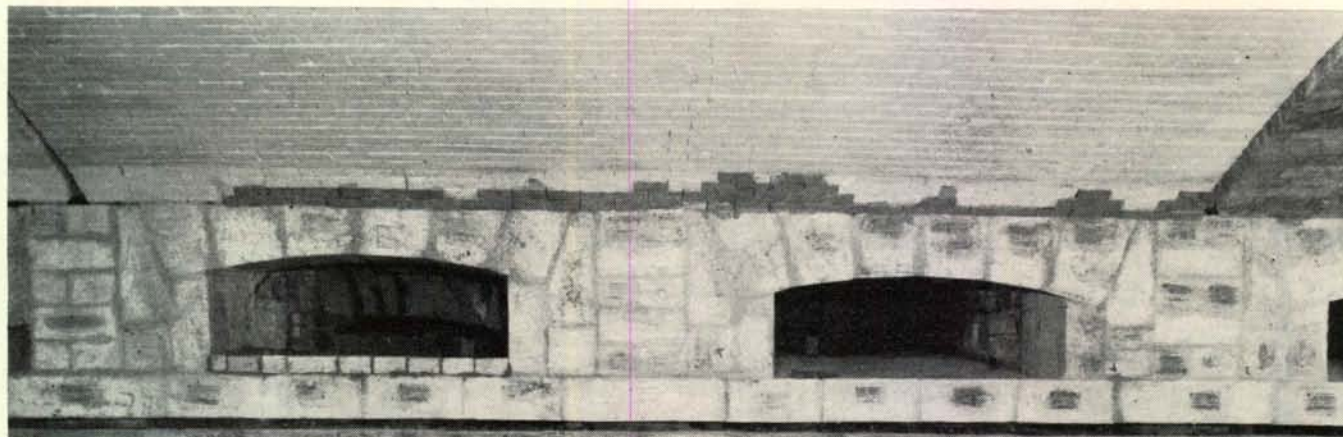


## United States Gypsum

**For Building • For Industry**

Gypsum • Roof Decks • Insulation • Hardboards • Expanded Metals • Sound Conditioning

# Here's the best refractory for superstructures



## MONOFRAX H refractory is made specifically for superstructure duty

With tank blocks lasting considerably longer, operators are finding it wise to install MONOFRAX H fused cast material. This refractory insures maximum superstructure life—a minimum of refractory-caused defects in the glass. Here are the reasons:

- **Chemically inert**

Because of the unusual chemical inertness and refractoriness of beta alumina, MONOFRAX H refractories prevent eutectic formations with other refractories, volatilized alkalis, and batch dust. No appreciable formations develop when it is placed either next to, or below, other commercially available refractories.

- **Blocks set easily, fit snugly**

Careful and skilled workmanship is a plus value of all MONOFRAX H blocks. You'll find that they lay up quickly and easily—make smooth, tight-fitting joints.

- **Minimizes dripping**

The nearly pure alumina content of MONOFRAX H refractory gives this material a refractoriness that practically eliminates all dripping. Moreover, since this material contains less than 0.5% glassy matrix there is negligible "honey-combing" of the refractory face. In other refractories with a higher percentage of interstitial glass, this glassy matrix is often leached out by the furnace atmosphere leaving a "honey-combed" refractory face that is prone to spall.

- **High resistance to heat shock**

MONOFRAX H material is not only resistant to extreme

heat—being safe up to 3450° F—but it can also withstand the repeated shock of fluctuating temperatures. It has a fairly open crystalline structure that permits the particles to expand and contract slightly without introducing undue stresses. As a result, MONOFRAX H material has superior stamina and durability.

- **Fewer stones**

Containing over 99% beta alumina, MONOFRAX H refractory has a single-phase crystalline body which makes it exceptionally resistant to spalling. (Other refractories with several crystalline phases and a glassy matrix—each with a varying modulus of rupture—are prone to shatter and slough off into the bath.) The excellent spalling resistance of MONOFRAX H material means far fewer refractory-caused defects in the glass—plus a much longer lasting superstructure.

- **Weighs less, therefore costs less**

Since fused cast refractories are purchased to fill a certain volume—yet are priced by weight—their density has a direct bearing on how much they cost. MONOFRAX H refractories, having a fairly open structure, are comparatively lighter and therefore offer more cubic feet of refractory per dollar.

★ ★ ★

*To help you apply your refractories to best advantage, we maintain a staff of engineers for consultation. It makes sense to avail yourself of their wide experience, and there's no obligation, of course. Just drop us an inquiry at the address below.*



## THE CARBORUNDUM COMPANY

Dept. J-51, Refractories Div.

Perth Amboy, New Jersey

*"Carborundum" and "Monofrax" are registered trademarks which indicate manufacture by The Carborundum Company*

## DO YOU USE RUTILE IN ANY QUANTITY?

### For Use In . . .

- GLAZES      • STAINS
- COLOR OXIDES
- ACID-RESISTING ENAMELS
- ELECTRODE COATINGS
- TITANIUM ALLOYS

### OTHER PRODUCTS

- Milled Magnetite
- "Fractured" and Ball-Milled Zircon
- "Orelectric" Cements
- "Orwash" Sagger Wash and Refractory Coatings

### Orefraction Exclusive Processes Assure You Highest Purity Granular & Milled Rutiles

When you use Orefraction Rutiles you get clean Rutile that is free from contamination and is purity processed to the particle sizes you require—from granular to 400 mesh. Orefraction Rutile makes possible more easily controlled, more stable colors in bodies, glazes and enamels. In glazes and enamels it also promotes acid resistance.

### CALL OREFRACTION ENGINEERS

They welcome the opportunity of working with you in your applications which use Rutile and Zircon. Write us your problems.

Then Check

## Orefraction Rutiles

(High in TiO<sub>2</sub> Content)

For Their Superior Working Properties



*Orefraction Inc.*

7430 Thomas Street, Pittsburgh 8, Pa.

## ENGLISH CHINA and BALL CLAYS

### OUR BRANDS

YOU PROBABLY KNOW THEM. IF NOT WE WILL GLADLY SUBMIT SAMPLES AND PERTINENT DATA FOR YOUR PRODUCT.

### BALL

M & M      GREAT BEAM  
IVORY      No. 11

### CHINA

M.G.R.      No. 17  
M.W.M.      No. 44

## MOORE & MUNGER

33 Rector Street  
NEW YORK 6, N. Y.

# CLAY MACHINERY YOU CAN

# *forget* ABOUT!



Worrying time is cut to the bone when AMERICAN clay machinery goes to work for you. From claybank to kiln, there's an AMERICAN machine to give top performance on each production operation.

Structural clay products plants for nearly a century have looked to AMERICAN for leadership. This rich clay-working background CAN'T BE PURCHASED. But a RIDDELL specialist will gladly apply it to your problems absolutely free. He will show you how to boost plant output without adding manpower and without cutting quality. He can develop a plan that will free up your worrying time.

Ask us about this service — Naturally, you'll not be obligated — write The W. A. Riddell Corp., Bucyrus, Ohio.

## AMERICAN Nos. 233 and 290 DE-AIRING EXTRUDING MACHINES

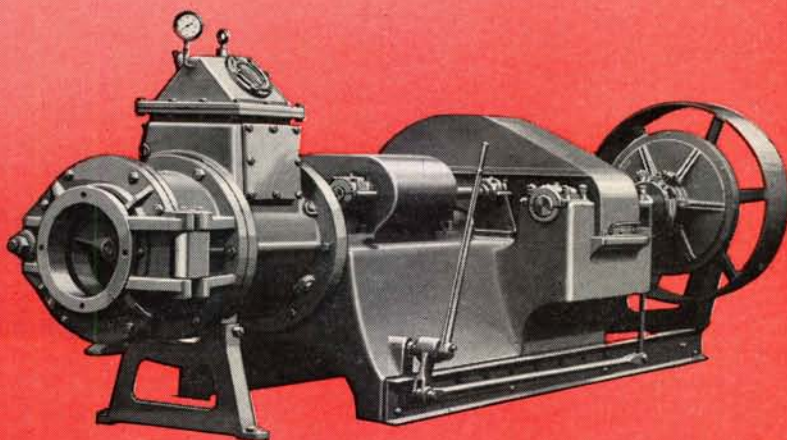
Rated capacities per hour:

### No. 290

Building Brick	10,000 to 15,000
Street Paving Blocks	7,500 to 10,000
Hollow Blocks	10 to 15 tons

### No. 233

Building Brick	4,000 to 7,500
Street Paving Blocks	3,500 to 5,000
Hollow Blocks	7 to 10 tons



*American*  
SINCE 1857  
FROM CLAY BANK TO KILN

W. A. RIDDELL CORPORATION • Bucyrus, Ohio



## "F-R-H Performance Is Tops!"

"Our production rate is exceedingly high," reports the Glandorf Tile Company, Glandorf, Ohio, manufacturers of drain tile. "Our F-R-H Hummer turns out 19,800 four-inch units in a 9-hour day; during four years of operating on a 54-hour-a-week schedule, out-  
age time has been small and maintenance low.

"Despite a constantly high rate of production, product quality has always been excellent.

F-R-H features, especially

its exclusive double pug shafts, and its efficient de-airing, have permitted us to extrude denser, more uniform ware—and have practically eliminated losses. In our book, F-R-H performance is tops!"

F-R-H De-Airing Machines are making friends day after day in countless plants throughout the Ceramic Industry. Decide now to improve YOUR operation with F-R-H cost-cutting, product-improving performance.

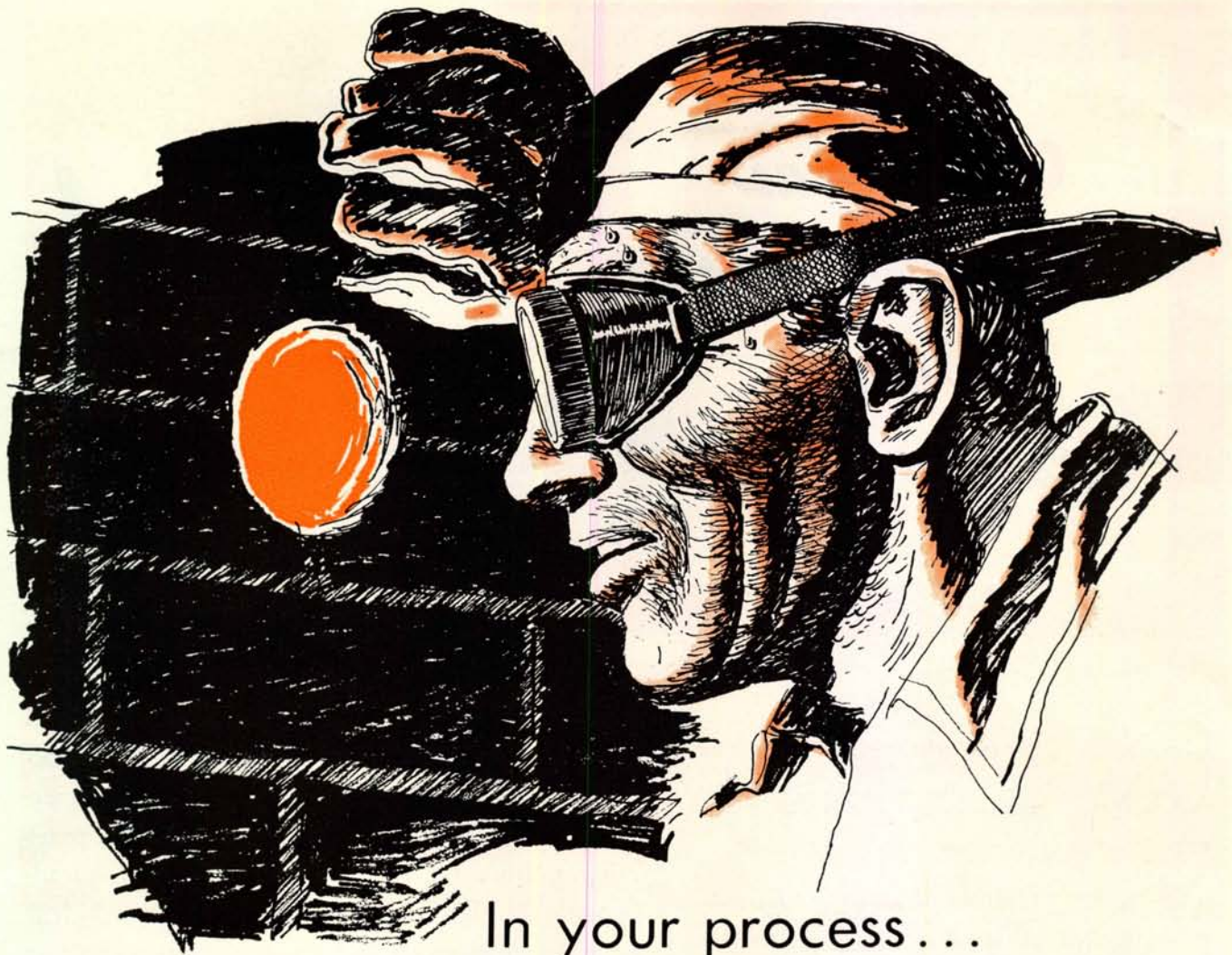
Outline your requirements and send them to: The Fate-Root-Heath Company,  
Dept. B-2, Plymouth, Ohio

**FRH**

# CERAMIC MACHINERY

*Plymouth Locomotives • Industrial Tractors*

THE FATE-ROOT-HEATH COMPANY • PLYMOUTH, OHIO



In your process . . .

## HOW HOT IS HOT?

To meet the requirements of today's high-temperature processes, ALCOA Aluminas are helping refractory manufacturers revise our concept of "how hot is hot." Operating temperatures that were once inconceivable are common today. Yet new processes and speeded production are pushing even those temperatures higher and higher.

Modern operators are using refractories fortified with ALCOA Alumina to increase the output of their metallurgical furnaces, chemical processing kilns, glass tanks and other high-temperature equipment. They know that these refractories *considerably reduce down time!* And down time costs more than good refractories.

Even at moderate temperatures, a *little* ALCOA Alumina in refractories makes a marked difference, but the higher the alumina content, *the better the performance.* Strength and stability are improved . . . resistance to spalling, abrasion and fluxing is increased . . . thermal and mechanical shock resistance is improved. Such refractories are being successfully used up to 3650° F.

Perhaps refractories fortified with ALCOA Alumina are the answer to *your* extra high-temperature requirements. Let us discuss them with you. We'll gladly refer you to reliable sources of supply. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 612E Gulf Building, Pittsburgh 19, Pennsylvania.

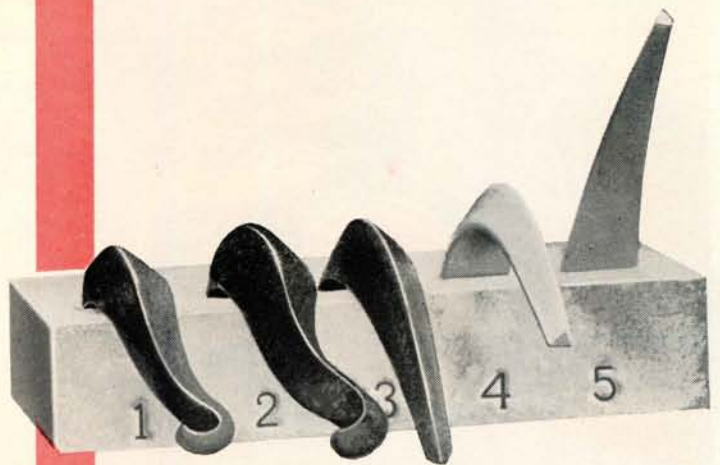
# Alcoa Chemicals



### ALUMINAS and FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS  
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM

**ORTON** has  
the right cones  
for every  
ceramic firing



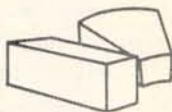
The soft series are used principally for firing overglaze colors, gold, and lusters on china and glass. The cones to order are from number 022 through 011.



The low temperature series are designed for firing red clay products, soft glazes and some art pottery. The low temperature cones are numbers 010 through 01.



The intermediate temperature series are best suited for buff and white clay products, refractories, abrasives and hard glazes. Cones to order in this series are numbers 1 through 19.



The high temperature series are used for testing refractories and firing special refractories, etc. The cone numbers are 20 through 42.

Make sure the cones you are ordering are the RIGHT CONES (number and size of cones) for your job.

What series of ORTON PYROMETRIC CONES to use with a specific ceramic firing is a vitally important consideration. To meet every type of firing operation, ORTON manufactures sixty-one different cones ranging from the lowest (cone 022), a soda-lead-borosilicate glass to the highest (cone 42) which is pure aluminum oxide. In between these two extremes fall the cone series that will give you a maximum double-check by helping you determine kiln heat advance as well as the end firing point and heat distribution. ORTON PYROMETRIC CONES fall, generally, into four classifications.



Write Today for "The Properties and Uses of Pyrometric Cones"—It's Free! So that you can quickly and simply find all pertinent information regarding the selection and various uses of pyrometric cones, ORTON has printed a comprehensive, 56-page manual. This "pocket size" booklet is designed for quick, easy reading—giving you not only information on the cones but other information on various phases of the firing processes.

REPRESENTATIVES: *South America*—Ferro Enamel, S. A., Avellaneda F. C. S., Argentina; Ferro Enamel, S. A., Sao Paulo, Brazil. *Mexico and Central America*—Ferro Enamel Corporation, Edificio C. I. B. A., Guerrero No. 2—Desp. 309-310, Mexico, D. F. *International*—International Division, Ferro Enamel Corp., 4150 E. 56th St., Cleveland 5, Ohio. *Europe*—Allied Engineering Div., Ferro Enamel Ltd., Wombourn, Wolverhampton, England. *Canada*—Ferro Enamels (Canada) Ltd., Oakville, Ontario, Canada.

The Edward **ORTON, Jr.**  
Ceramic **FOUNDATION**

1445 Summit Street

Columbus 1, Ohio

**ORTON PYROMETRIC CONES**



### Have You a Ceramic Problem?

Let Pemco's ceramic engineers and laboratory technicians take your industrial problem and come up with the solution. This is a Pemco service to the ceramic industry and entails no obligation on your part.

IF YOU are a user of glaze frits, Pemco offers something more . . . the plus advantages of controlled uniformity. Only Pemco produces glaze frits and all-fritted glazes by the *continuous smelting process* which effectively eliminates the hazard of changes in time, temperature and composition. If you are making your own frit, you owe it to yourself to investigate the economy of commercial frit and particularly the production and cost advantages that Pemco offers you with its all-fritted glazes. You are assured the *uniform quality* and the *consistent performance* so important to a successful ceramic operation.

## "After All, It's the Finish that Counts"



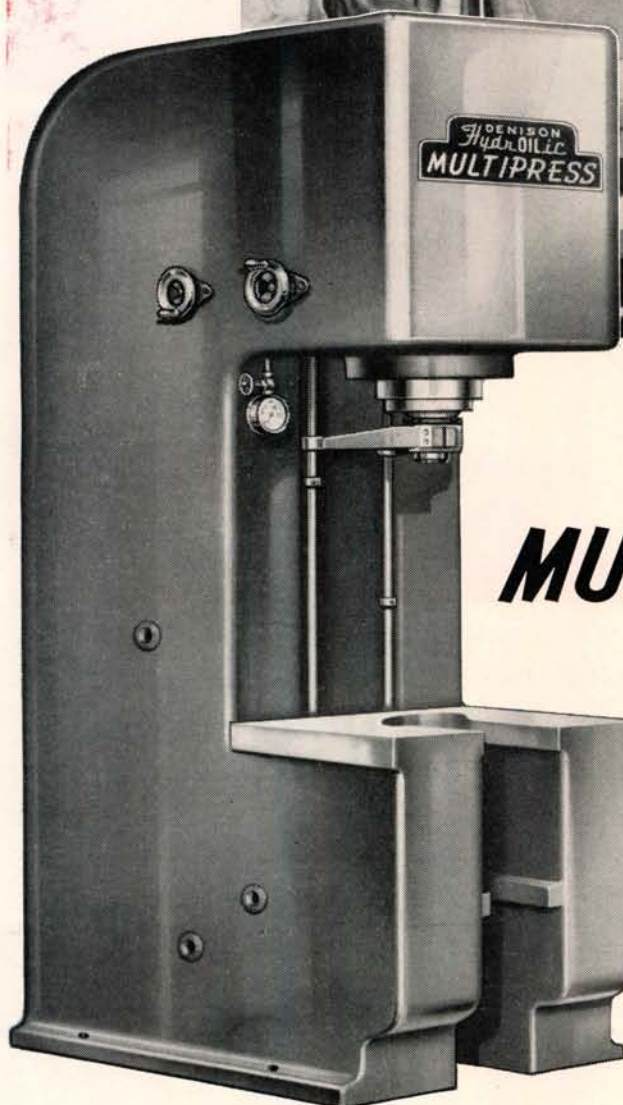
The 1951 A.S.I.E. Merit Award presented to Pemco exclusively in its field "For Leadership in Formulation, Facilities and Processes in the Porcelain Enamel and Ceramic Industry."

# PEMCO CORPORATION

5601 EASTERN AVE.  BALTIMORE 24, MD.

"THE WORLD'S FINEST" PORCELAIN ENAMEL FRITS • GLAZE FRITS • PORCELAIN ENAMEL COLORS • GLAZE STAINS • GLASS COLORS AND RELATED CERAMIC MATERIALS

# f for faster, better production at lower cost



"Ware is uniformly better—"  
 "Production up to 50% faster—"  
 "Scrap losses have been cut to the bone—"  
 "Worker fatigue dropped remarkably—"  
 "Top quality is automatic, even with new help—"

**MULTIPRESS**<sup>®</sup>—with its fast, oil-smooth power control, is winning comments like these from ceramic plants of every type. And it's easy to see why!

You can preset the Multipress controls to accurate pressure limits that apply exactly the same "squeeze" to every piece of ware in each run.

You can also have dual controls that give the operator full control of the ram action at all times. Pressure can be applied rapidly or in easy stages, or reversed instantly at any time.

"Vibratory" Ram Action, available *only* on Multipress, completes each down stroke in a rapid series of short, full-pressure repeat strokes. This brings better air escapement, and more uniform compaction of material.

Multipress is built in many sizes and models, with capacities from one ton to 50 tons. Many optional controls and accessories offer highest production efficiency on a wide range of compaction operations. Write for details.

The DENISON ENGINEERING CO., 1161 Dublin Road, Columbus 16, Ohio

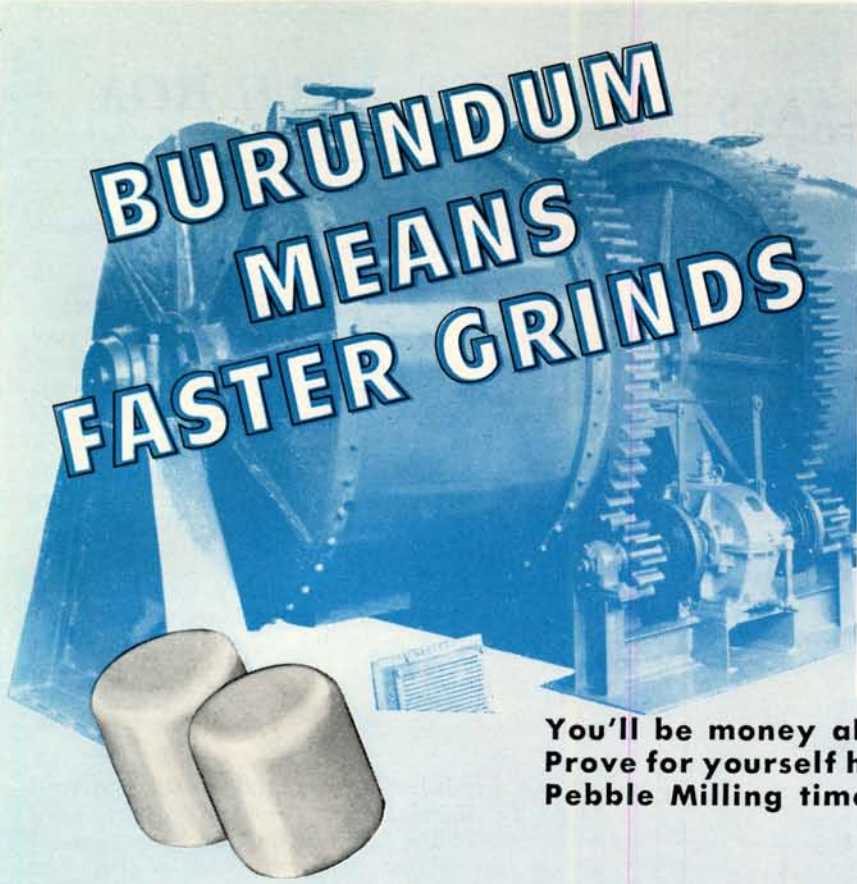


DENISON also makes other types of ceramic presses.

The HydroILic glass-forming press at left is controlled with the same direct-action pressure "feel" as the ordinary glass press, but cuts manual effort to a fraction of the previous need. The two-strain rod HydroILic press at right is ideal for forming jobs requiring very large dies, or front-to-back feeding motion. Send for full details.



# BURUNDUM MEANS FASTER GRINDS



Burundum — the tubular-shaped grinding media is setting impressive records in both wet and dry grinding.

Report after report shows ball and pebble milling time cut 30% to 50% from the time required with porcelain balls or flint pebbles.

Burundum grinds faster because it is much heavier, much harder than porcelain or flint. Burundum grinds faster because its unique tubular shape gives greater contact area, more shear action.

But faster grinding is only one of the advantages Burundum offers. Burundum is tough, wears slowly, keeps contamination down.

Burundum is dense, non-porous — resists staining, discoloration; washes easily.

**You'll be money ahead to test Burundum. Prove for yourself how you can cut Ball and Pebble Milling time 30% - 50%.**

**U. S. STONWARE CO.**  
Akron 9, Ohio

*Borax, Boric Acid*  
**AND A VARIETY OF  
OTHER BORATES**

**Anhydrous Boric Acid • Anhydrous Borax  
Anhydrous Rasorite • Rasorite Special Concentrates**

**Calcium Borates—  
Gerstley Borate and Colemanite**

*Information and Bulletins on Request*

**PACIFIC COAST BORAX CO.**

Division of Borax Consolidated, Limited

LOS ANGELES NEW YORK CHICAGO CLEVELAND



MANUFACTURERS OF THE FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS

## *The Best West of the Rockies*

● **POTTERY CLAYS**

English and American

● **CERAMIC COLORS**

Blythe Colour Works, Ltd.

● **SLABS...SETTERS...SAGGERS**

● **STANDARD PYROMETRIC CONES**

Edward Orton, Jr., Ceramic Foundation

● **FRANTZ FERROFILTERS**

● **LAKEFIELD NEPHELINE SYENITE**

Great Lakes Foundry Sand Co.

**ELWYN L. MAXSON**

Offices, Store and Warehouse  
1208 Isabel St., Burbank, Calif.

## ENGLISH CHINA CLAYS

for

# Superior Pottery Clays



- Unlimited Quantities
- Uniform Drying
- Good Fired Color
- Increased Fired Strength
- Improved Casting



Used by Manufacturers  
Who Demand the Best

## ENGLISH CHINA CLAYS

SALES CORPORATION

551 Fifth Ave., New York 17, N. Y.

## THE MAILBOX

The following excerpts are taken from letters received concerning the passing of Dr. Heinrich Ries.

Those of us who knew Dr. Ries and worked with him have lost a friend whom we valued and respected very highly. He and the late Joseph Keele, who cooperated with him in an extensive study of the clays of Canada 35 or more years ago, gave an impetus to the ceramic industry of the country that has done much to place it upon the high plane in which it now stands.

HOWELLS      FRECHETTE  
Ottawa, Canada

Terrribly sorry to hear of the passing of Heimich Ries. He was a grand man.

J. C. HOSTETTER  
Winter Park, Fla.

I was sorry indeed to learn of the death of my good friend, Dr. Heinrich Ries. We were long associated in the work of The American Ceramic Society, and I always admired the basic knowledge of Dr. Ries and his desire to help others along the pathway of scientific ceramics. He was always patient, friendly and sympathetic toward the views of others.

Our Society will miss him and long remember the valuable work he did for us in connection with the geology of ceramics.

LAWRENCE      BARRINGER  
Schenectady, New York

. . . . Dr. Heimich Ries' sudden death at Ithaca, New York, came as a great shock. It is true that Dr. Ries was getting along in years, but the last I saw him he was in good health for a man of his years. Heinrich had served well and long in the field in which he was interested. I think our great sympathy should be extended to those who were closest to Dr. Ries.

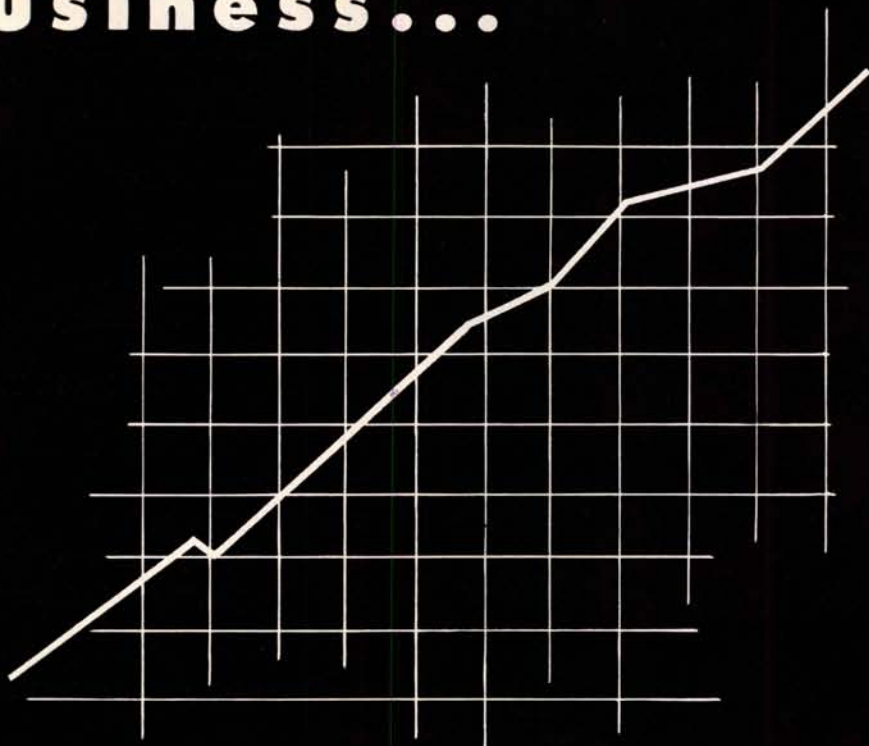
C. FORREST TEFFT, *President*  
The Claycraft Company  
Columbus, Ohio

It was a real shock to hear of the death of Dr. Heinrich Ries. He was one of the best friends I ever had and it was he who invited me to join The American Ceramic Society when I was doing field work with him for the Kentucky Geological Survey. I owe a lot to him. To me he was one of the greatest men in geology and ceramics.

Cecil E. Bales, *President*  
The Ironton Fire Brick Co.  
Iron ton, Ohio

A necrology of Dr. Ries appears on page 195 of this issue

**good  
business...**



The performance benefits derived from the use of Foote lithium compounds, plus the relatively modest cost of these materials, has proved to be good business—and big business for many industries.

Foote Mineral Company's expansion program which begins with the development of rich domestic ore reserves, is ample proof that the future points to the continued economical availability of Foote lithium compounds.



**FOOTE MINERAL COMPANY**

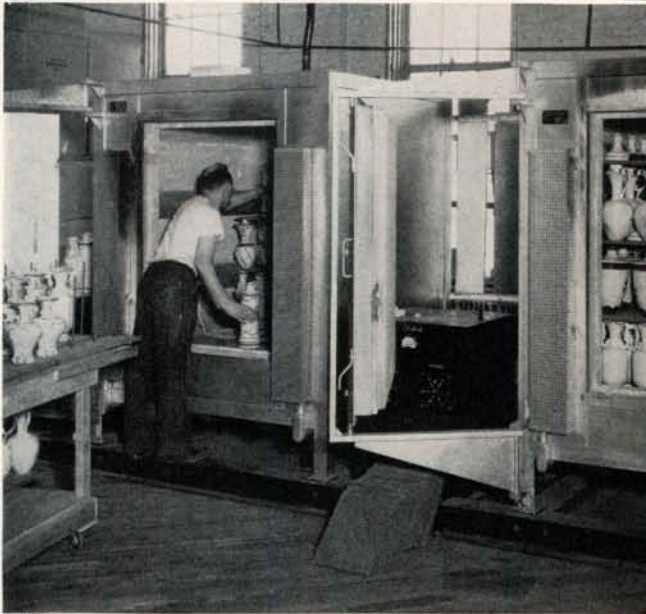
HOME OFFICE AND RESEARCH LABORATORIES

414 Eighteen W. Chelton Building, Philadelphia 44, Pa.

PLANT: Exton, Pa.



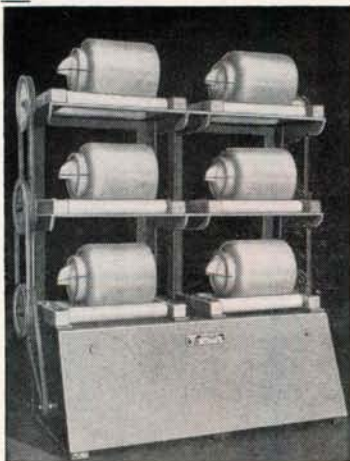
# PERECO ELECTRIC KILNS



**Models for every ceramic need in  
production, pilot plant, and research**

**Temperatures range from 450° to 5000° F.**

"Our best mode of decorating china to date," is the user's comment about the Pereco Electric Kilns shown above. And, it's typical of the value that users in the entire ceramic field place on many different types of Pereco equipment. These have proven efficient and economical on dozens of production and laboratory assignments requiring closely controlled temperatures up to 5000° F. Tell us about the specific application you have in mind. If a standard unit in the Pereco line does not serve your purpose, our engineers will be glad to design and build special equipment. Write today.



## PERECO PATENTED BALL MILL

These easy-to-handle mills speedily grind and blend ceramic materials. Jars can be put on or lifted off without stopping mills. No lid tightening or strapping is required. Made in 1, 2, or 3 jar sizes and multiples as shown. Motors, jars (either stoneware or porcelain) pebbles, lids, gaskets included.

WRITE FOR DETAILS



**PERERY EQUIPMENT CO.**

Dept. N. 893 Chambers Rd., Columbus 12, Ohio

# MEETING CALENDAR

## The American Ceramic Society

**54th Annual Meeting**, William Penn Hotel, Pittsburgh, Pa., April 27-May 1, 1952

**Pacific Coast Regional Meeting**, Hotel Wilton, Long Beach, Calif., October 24-26.

## Fall Divisional Meetings

**Refractories Division**, Bedford Springs, Pa., September 14-15.

**Whitewares-Materials and Equipment Divisions**, combined meeting, Bedford Springs, Pa., September 28-29

**Glass Division**, Corning, N. Y., October 12-13

## Local Sections

Central Ohio, Logan	May 25
Northern California	June 4
Philadelphia, Engineers' Club, Philadelphia	June 7
Southern Ohio, Terrace Park Country Club, Cincinnati	June 8
Upstate New York Section, Rochester	June 8
Tennessee Valley, Spruce Pine, N. C.	July 20-21

## Other Ceramic Organizations

Structural Clay Products Conference, University of Illinois, May 31-June 1

British Ceramic Society Refractory Materials Section, Sheffield, England, June 6-7

International Commission on Glass, Paris, France, June 6-9

Pennsylvania Ceramics Association, Nittany Lion Inn, State College, Pa., June 14-16

Ceramic Association of New Jersey, Carteret Club, Trenton, June 15

Ohio Ceramic Industries Association, Annual Spring Meeting, Zanesville Country Club, Zanesville, Ohio, June 22

Porcelain Enamel Institute Forum, Columbus, Ohio, October 10-12

Structural Clay Products Institute, Greenbrier Hotel, White Sulphur Springs, W. Va., October 28-31

Canadian Ceramic Society, 50th Annual Meeting, Niagara Falls, Ontario, February 11-13, 1952

## Other Organizations

Society for Applied Spectroscopy, New York, Annual Meeting, May 25-26

Second Annual Conference on Industrial Research, Columbia University, New York, June 11-15

ASME 1951 Semi-Annual Meeting, Toronto, Canada, June 11-15

ASTM Annual Meeting, Atlantic City, N. J., June 18-22

National China, Glass and Pottery Show, Hotel New Yorker, New York, July 15-20



**HARSHAW**

symbol of progress

The Harshaw trademark symbolizes progress . . . a continuous search for new processes . . . a striving for perfection. In addition, it is a reminder that we vigilantly guard the quality of our chemicals.

Wherever you see the Harshaw trademark, whether on tank car, package or laboratory bottle, remember it identifies chemicals that will help do a better job.

**THE HARSHAW CHEMICAL CO.**

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Tons Glass Pulled.....	136,798
Sq. Ft./ton of glass/operating day (Average)...	7.22
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# CORHART ELECTROCAST REFRATORIES

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## A Solat Furnace for High Temperature Research

by WILLI M. CONN

Rockhurst College, Kansas City, Mo.

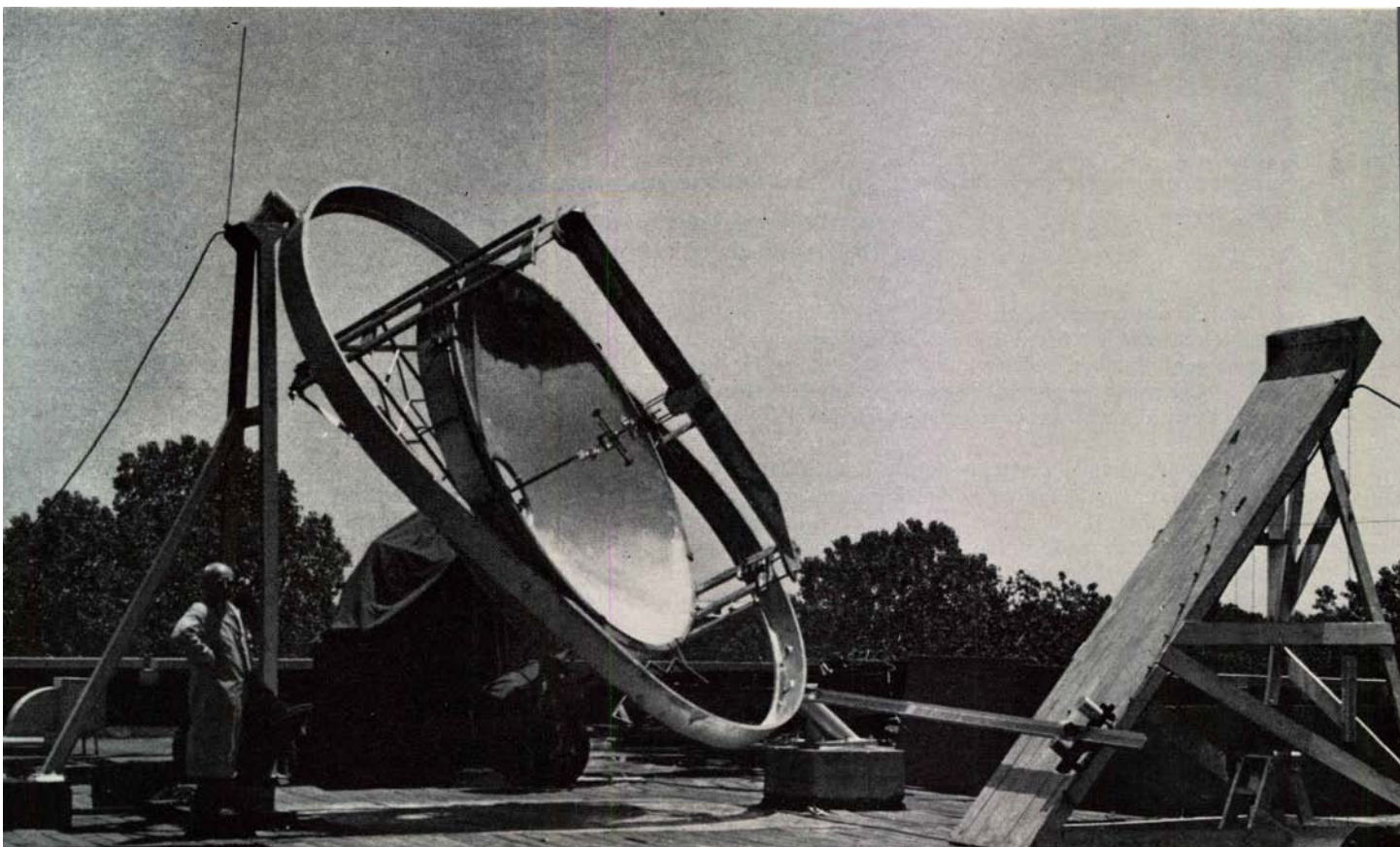
A new and important instrument for high-temperature research is the recently developed solar furnace which, by using the radiant energy of the sun, is able to produce extremely high temperatures in a small area. The furnace, originally designed for A C Spark Plug Division, General Motors Corp., Flint, Mich., with the cooperation of the Aluminum Company of America, Pittsburgh, Pa., is at present mounted at Rockhurst College, Kansas City, Mo. Its large aperture of 120 in. and short focal length, 34 in., concentrates parallel rays from the sun into a small area near the focal point of a parabolic mirror, producing an image of the sun  $\frac{3}{8}$  in. in diameter. Attainable temperatures are somewhat less than the apparent temperature of the sun, 6000°C., due to energy losses from passage through the atmosphere, reflection and absorption losses, and so on. The solar furnace has many uses, but is particularly effective for studies of refractory substances—for determining their melting points, for discovering high-temperature modifications, and for producing and studying possible glass forms of refractory oxides. It is also being employed in an attempt to extend the internationally accepted temperature scale and in the development of new high-temperature materials.

### Description of Furnace

Radiant energy from the sun falls on a parabolic mirror which concentrates it in a sample placed near the focal area of the mirror; the size of the image and the area of heating increase as the focal length is extended. The 120-in. aluminum mirror, the largest now in use, is supplemented by a 60-in. searchlight metallic mirror which serves for preliminary work. The mirror is mounted on a polar axis which is parallel to the axis about which the earth rotates. The mounting consists of a heavy steel oval ring supported on trunnions at either end of its major axis around which it can be rotated. A circular ring 123 in. in diameter which actually supports the mirror is mounted inside the oval ring. To adjust the mirror in declination, ring and mirror can be rotated about the minor axis of the oval ring by means of the trunnions fastened to it.

The polar axis is rotated by means of a rigid lever clamped to its lower end. The other end of the trolley-equipped lever is connected by a cable, guided in a circular track, with an astronomical driving clock which acts as the controller. This clock controls the downward rate of travel of the trolley and lever, the rotation of the polar axis turning the mirror so it

The solar furnace located at Rockhurst College, showing the 120-in. aluminum mirror. Dr. Conn is pictured at the left.



tracks the sun along its path in the sky. The length of the track permits continuous experiments of more than two hours without need for resetting the lever.

An adjustable bridge, shown in the photograph, is mounted above the reflector, and allows the sample under test to be moved in and out of the focal area by remote control. Another adjustable bridge under the reflector is provided for mounting an auxiliary mirror or for supporting the crucible.

The method developed to produce an accurate, well-defined paraboloidal surface of aluminum with an aperture of 120 in. and a focal length of 34 in. is applicable to construction of even larger metallic mirrors, and no limitations in size seem apparent at this time.

#### Procedure

A suitable sample,  $V_4 \times \frac{1}{2} \times 4$  in. or  $\frac{3}{8}$  in. diameter by 4 in. in length cut from a brick or a mineral, or produced by casting, molding or extrusion in the plastic form, is placed in a holder near the focal area of the furnace, and the mirror is adjusted in declination with the lever arm of the polar axis in its highest position. The controller is started and final adjustment of the mirror relative to the sun is made by means of a sighting device and a telescope before the sample is brought into the focal area. The rate of heating is controlled by adjusting an Al cylinder which controls the area of mirror receiving radiation from the sun. Temperatures measured with an optical pyrometer which is calibrated to read temperatures up to 6000 °C., can be controlled within  $\pm 1^\circ\text{C}$ . up to about 2000 °C. If the sample melts, the liquid drops into a crucible with a refractory lining, preferably of the same material as the sample. The device which holds the sample permits it to be moved in all directions so that new parts of a melting substance can be constantly brought into the focal area. Powdered material can be poured continuously into the region of extreme temperature.

#### Advantages

The furnace offers the researcher many advantages. Substances are heated under very pure conditions and in an oxidizing atmosphere. The addition of a quartz-glass attach-

ment will permit work in a reducing or neutral atmosphere, or in a vacuum. Electric or magnetic fields, gases or fumes which might disturb reactions or spectra studied are absent. A temperature of 2500 °C. can be reached in a matter of 10 seconds, yet cooling is also rapid.

#### Disadvantages

The small area of heating provided is one limitation. Another is the fact that unfavorable weather conditions hinder or prevent use of the furnace. Temperatures up to 2000 °C. may be obtained even if the day is slightly hazy, but higher temperatures require a clear atmosphere. Cumulus clouds or a considerable overcast preclude the use of the furnace.

#### Conclusions

The solar furnace has been used to melt all solid materials which can be heated in air, including the so-called superrefractories, porcelain, and oxides including zirconia. Many glasses and well-developed crystals of exceptional hardness have been produced. Work is being done on the development of the quartz-glass attachment which will permit the heating of samples in a neutral or reducing atmosphere, or in a vacuum.

The final limitations of the solar furnace are undetermined as sufficient knowledge of the sun is not available. However, it has proved a valuable tool to high-temperature research, and further investigation will no doubt solve some of the unanswered questions in this interesting field.

**Dr. Conn presented a paper on the application of the solar furnace to glass melting, at the 53rd Annual Meeting of the American Ceramic Society (Glass Division, No. 14). This paper will be published in one of the forthcoming issues of *The Journal*.**

## Ceramic Engineers May Be Deferred as Being in a "Critical Occupation"

Ceramic engineering is one of the "Professional and Related Occupations" listed as critical occupations by the Department of Labor, which may be cited as reason for deferment. Ceramists are given the same recognition as chemical, civil, electrical, and other engineers in principal fields of technology.

Critical occupations are taken into consideration by local draft boards or by the individual services in the case of reservists liable to call. There is no blanket deferment, and decisions are to be made on the merits of the individual cases, or according to the policy of the branch of the service to which a reservist belongs.

Lists of critical professional and skilled occupations have been set up as a guide in channeling men into service jobs where their skills and training can be used to best advantage, and to make possible the retention in civilian work of those who are most needed.

Requests for delay in calling to duty of reservists may be made by either the employee or employer, and will not be considered unless the reservist has actually received orders to report to active duty. Requests received in advance of receipt of such orders will be held but not acted upon until such time as orders to active duty are issued.

Reservists should ascertain the procedure of their particular organization if they wish to request a delay, as policies on this point vary among the different services.

Ceramic engineering at present is receiving more recognition as a profession than in the past. Efforts to gain this recognition by the Institute of Ceramic Engineers and The American Ceramic Society are described in part in the Institute report on page 100 of the March, 1949 *Bulletin*, "Technical Personnel and the Security Program."

# CRYSTAL CHEMISTRY IN CERAMICS

by W. E. HAUTH, JR.

Iowa State College, Ames, Iowa

## VII. Polymorphism

**N**O discussion of crystal chemistry concepts would be complete without a consideration of the phenomenon of polymorphism and of the factors which affect the accompanying transformations. Crystal polymorphism is a well-known property of many minerals of interest to the ceramic engineer. The inversions which occur in silica upon heating are the best-known example. A knowledge of the principles underlying these inversions can be of great value to the ceramist in the attack on such problems as the thermal spalling of silica refractories and the great susceptibility of zirconium oxide to thermal shock.

Buerger<sup>1</sup> in defining polymorphism states that "Polymorphism includes every possible difference in the crystalline structure of a substance, excepting homogeneous deformations." In other words, the crystalline substance is capable of existing in a number of different crystalline forms depending upon the temperature, pressure, and the presence of impurities.

### Theory of Polymorphic Transformations

For any given crystalline substance only one structure is thermodynamically stable over a certain range of temperature and pressure. In this range all modifications of this structure will eventually transform to this structure. Any modification, although previously stable in another range, will transform to this structure at the boundaries. The rate at which this transformation occurs depends upon the type of structural change necessary. Such transformations may be grouped into two types. The first is the rapid or high-low type which occurs almost instantaneously and is reversible, and involves only a slight structural change. The second type is the sluggish transformation which proceeds very slowly and involves a large structural change.

Before considering in detail the characteristics of these types of inversions let us discuss why such inversions occur. By the use of Pauling's rules (as given in Part III) it is possible to predict the structure of ionic crystals on the basis of coordination. However these rules do not give a unique solution of the structure for any given compound, since there are a number of alternate solutions which completely satisfy the structural requirements. Each of these alternate structures is a possible polymorphous modification and possesses a given lattice energy. Therefore, disregarding temperature, at normal pressures only that modification having the lowest lattice energy will be stable. However when temperature is considered, the most stable form will be that which has the least free energy at that temperature; that is, the form which has the least lattice energy combined with the ability to ac-

commodate the thermal agitations. As the temperature increases, the ability to resist breaking of the bonds by thermal agitation, i.e., the lowest vapor pressure, becomes increasingly important.

Now it is possible to explain why a polymorphic transformation occurs and why there exists a definite transformation temperature. Consider a crystal existing at absolute zero; the most stable form will be that structure which possesses the least lattice energy. As temperature increases, the atoms and groups of atoms vibrate and by this vibration produce a strain in the crystal bonds. As the temperature is further increased, greater strain occurs in the bonds, giving rise to a higher vapor pressure. In some cases this leads to a disruption of the bonds throughout the crystal, and it melts. However, if at some temperature there is an alternate structure which is capable of resisting the thermal agitation and therefore has a lower vapor pressure, the original structure will transform into it. The new structure will now be stable and will continue so until another such transformation occurs, or until it melts. Therefore the transformation temperature may be considered as the temperature at which the vapor pressure curves of the polymorphic modifications cross, the high-temperature form having the lower vapor pressure above, and the higher vapor pressure below that point.

### Types of Inversions

As has been mentioned previously all polymorphic transformations may be divided into two classes, depending upon the type of structural change involved. The first type, the high-low transformation, involves only a distortion of the bonds in such a manner that the symmetry is changed and the structure has a lower bond-disrupting tendency. Therefore the vapor pressure of the new form just above the transformation point will be lower than that of the original.

The essential characteristics of this high-low type of transformation may be summarized as follows.

- (1) The transformation occurs promptly when the transformation temperature is reached.
- (2) The transformation is complete in a few seconds.
- (3) The transformation is reversible.
- (4) The difference in energy content between the high and low modifications is relatively small.
- (5) A temperature hysteresis or lag inversion is often present, i.e., the transformation starts at a slightly higher temperature on heating than on cooling.
- (6) The transformation does not proceed from nuclei, but occurs throughout the whole crystal at once, provided it is entirely at the proper temperature.

An example of this type of transformation is the quartz inversion from low quartz to high quartz at 573 °C. This is but one of the several high-low inversions that occur in the Si<sub>2</sub> system. This system will be discussed in detail later.

<sup>1</sup> M. J. Buerger and M. C. Bloom, "Crystal Polymorphism," *Z. Krist.*, 96, 182-200 (1937).

The second type of inversion is the sluggish transformation. This is characterized by a very slow rate of change, since it involves a breakup of the original structure and the formation of a new structure, as compared to the mere distortion of bonds in the case of the high-low type. To bring about this rearrangement of the atoms it is necessary to maintain the temperature near the transformation temperature for a considerable length of time. Although occasionally the vapor pressure of the original form may be high enough to permit the transport of ions through the vapor phase to form the new structure, a flux may be necessary for the transformation to take place. In all cases the presence of a flux greatly accelerates the change. As would be expected, the rate of change in structure also increases as the temperature advances into the field of stability of the new form.

An example of this type of transformation is found in the tridymite-to-cristobalite inversion at 1470 °C. As has been found to be the case in this inversion, the sluggish type of transformation usually proceeds inward from a free surface on the crystal.

### Influence of Composition

In the discussion presented above, polymorphism has been considered from the point of view of pure compounds. From these considerations it would seem that the structure found at any given temperature would be that form which is stable in that range. However, exceptions to this in nature are very numerous. This could be rationalized by reasoning that the high-temperature modifications were formed at temperatures within the stability field and then rapidly cooled, subsequent transformations not having sufficient time to occur. However, this does not explain the fact that it is possible to form high-temperature forms well below their range of stability; for example, the formation of cristobalite by heating silica gel with a melt of sodium phosphate at temperatures less than 750 °C. An indication of a possible explanation for this phenomenon is that analyses of apparently stable high-temperature modifications of various crystals show that these forms are decidedly less pure than the lower forms.

Buerger<sup>2</sup> has presented a theory which very adequately explains the apparent stabilization of high-temperature forms on the basis of the inclusion of impurity atoms or ions in the crystal. This inclusion occurs in the form of solid solution (as presented in Part VI) and may be of any one or more of the three possible types, (1) addition, (2) proxy or substitution, and (3) omission.

That the high-temperature modification of a crystal has in general a more open structure than the low-temperature form can be seen from the silica minerals, the specific gravity of quartz being 2.65, tridymite 2.26 and cristobalite 2.32. Addition solid solution can take place only when an opening exists in the crystal lattice of a size comparable to that of the atom or ion available for solid solution. The more compact forms, generally the low-temperature forms, would have a considerably smaller capacity for the inclusion of impurities by addition solid solution than would the more open high-temperature forms. Similarly, if a considerable number of impurity atoms are added to a high-temperature modification, it may be impossible for the transformation to the more compact structure to occur. This would extend the range of stability of the high-temperature modification indefinitely. For lesser amounts of inclusions, the transformation temperature may be lowered significantly.

The effect of the inclusion of impurities by substitution solid solution on the stability ranges of the various polymorphic forms is considerably more subtle and of less magnitude than in the case of addition solid solution. The stabilization

<sup>2</sup> M. J. Buerger, "The General Role of Composition in Polymorphism," *Proc. Nat. Acad. Sci.*, 22, 685 (1936).

Table I. Modifications of Silica

Form	Properties
Low quartz	Stable at atmospheric temperature and up to 573°C.
High quartz	Stable from 573° to 870°C.; capable of existence above 870° but is then not the stable form.
Low tridymite	Capable of existence at atmospheric temperature and up to 117°C., but is not the stable form in this range.
Lower-high tridymite	Capable of existence between 117° and 163°C. but is not the stable form in this range.
Upper-high tridymite	Capable of existence above 163°C., and is the stable form from 870° to 1470°C.; above 1470° is again unstable; melts at 1670°C.
Low cristobalite	Capable of existence above 163°C., and up to 200° to 275°C. but is not the stable form in this range.
High cristobalite	Capable of existence above 200° to 275°C., and is stable from 1470° to 1710°C., its melting point.
Vitreous silica	Capable of existence at atmospheric temperatures and up to 1000°C. as above where it begins to crystallize with measurable rapidity; but is an unstable, undercooled liquid at all temperatures below 1710°C.

effect would be related to the difference in size of the original and the substituting ion or atom. An atom of larger size than the original would tend to lower the transformation temperature, the presence of the larger atom inhibiting the collapse of the lattice. An atom of smaller size than the original would tend to raise the inversion temperature slightly because of its weakening effect on the structure.

Omission solid solution would tend to weaken the structure to a considerably greater extent than the proxy type and thus could cause compacting of the high-temperature form above the usual transformation temperature. That is to say, omission solid solution in the high-temperature form would tend to increase the range of stability of the compact or low-temperature form.

The discussion given above may be applied to the determination of the type of structure that a crystal will assume on precipitation from a melt. If a melt is not pure, the impurities may influence the mechanism of precipitation of any given structure in several ways. They may cause changes in ionization, cause the formation of new atomic groups, act as inert barriers lowering the number of collisions, or cause a local disorder on the surface of the growing crystal and thereby prohibit growth and change the orientation and increase the energy of the form. All of these effects would lower the probability of the formation of crystals. However, if there exists a possible structure which is capable of including the impurities in its lattice, by the means mentioned above, this form would be preferentially precipitated. Since the high-temperature forms of a crystal tend to be the more open, these structures would be most capable of including the impurities present in the melt. Therefore it is quite probable that the high-temperature modification will be precipitated from an impure melt even though the temperature is far below its range of stability. This phenomenon was demonstrated in experiments with  $Sb_2O_3$  by Bloom and Buerger.<sup>3</sup>

In view of the discussion presented above, it may be said that if a given structural form is known to exist and this form is metastable for the pure compound, it may not be considered to be metastable unless the compound is known to be pure. The presence of impurities may shift the transformation point so that the form which would be metastable for the pure compound would be stable for the impure compound.

<sup>3</sup> M. C. Bloom and M. J. Buerger, "On the Presence of Polymorphous Forms,  $Sb_2O_3$ ," *Z. Krist.*, 96, 365 (1937).

## Polymorphism of Silica

The silica system offers a fine example for the concepts of polymorphism, silica being capable of existing in a large number of modifications. Table I presents the modifications and their ranges of stability. However, it must be remembered that these temperature ranges apply only to pure silica. The presence of even a small amount of impurity may greatly effect these ranges.

Since each transformation from one form to another involves a change in structure and thus a change in properties, a thorough knowledge of these changes is of great value to the ceramic engineer. Only a short discussion can be given here; however, Sosman<sup>4</sup> has presented a detailed treatise on the subject of silica.

The silica system contains both the high-low and sluggish types of transformation. Those from high quartz to upper-high tridymite and from upper-high tridymite to cristobalite are the sluggish type. The others are high-low transformations and all exhibit the characteristics set forth for these types of transformations. In general, the quartz forms are relatively closely packed structures whereas the tridymite and cristobalite have relatively open structures. This is reflected in their specific gravity values as given above. The great change in density between quartz and tridymite is responsible for the expansion known to occur upon the formation of tridymite. This expansion is not a factor in thermal shock resistance of silica brick because the quartz-tridymite transformation is the sluggish type occurring very slowly. A high-low inversion such as low to high quartz is much more destructive, since the transformation occurs in a period of a few seconds. Therefore the critical temperature for thermal rupture of silica brick is 573 °C.

The presence of the two sluggish transformations in the silica system leads to the great number of forms shown in Table I. The low-temperature modifications of tridymite and cristobalite are possible since, with a decrease in temperature, two paths are available for the high-temperature form. In the presence of a solvent, these forms may be dissolved and re precipitated as quartz through a sluggish inversion. However in the absence of a solvent these forms collapse to form the low modifications through a high-low transformation.

The sluggishness of the transformations between the three major forms of silica also complicates the behavior of the various forms on heating and cooling. When quartz is heated its behavior is somewhat different than might be expected. In the range from 870° to 1470 °C. the type of transformation which occurs depends upon the presence or absence of a flux. In the pure dry state the formation of tridymite directly usually does not occur. Instead the

quartz transforms to cristobalite and this inverts to tridymite. The reason for the formation of the unstable intermediate phase is not clear although it may be linked with the slightly higher density of cristobalite as compared to tridymite. In the presence of a flux quartz may transform directly to tridymite. Above 1470 °C. quartz transforms directly to cristobalite ; however, on cooling cristobalite will not invert directly to quartz below 870°C. but, if a flux is present, will transform into tridymite. The inversions relating cristobalite and tridymite upon heating and cooling are as would be expected and take place slowly either in the dry state or in the presence of a solvent. The rate at which they occur is increased markedly by the presence of the flux.

## Titania and Zirconia

Two other oxides of importance in ceramics which exhibit polymorphism are titania and zirconia. These oxides are similar to silica in that each is capable of occurring in three major forms. However this analogy is not perfect, since the baddeleyite to  $\beta$ - $ZrO_2$  transformation is reversible, i.e., the high-low type. The  $a_2$ - $ZrO_2$  form has a low-temperature modification,  $\alpha_2$  changing to  $ai$ - $ZrO_2$  at 625 °C. through a high-low inversion.

Zirconia is also capable of existing in a cubic form in the presence of impurities. This cubic form is stable over the entire range from room temperature to its melting point. It is possible to produce this form by heating zirconia in the presence of lime or magnesia. Its formation is undoubtedly caused by the inclusion of these materials in the lattice by solid solution. This reaction is the basis for the present method of producing stabilized zirconia refractories.

Titania occurs in three major polymorphic forms, anatase, brookite and rutile. The stability fields of these modifications have not been completely delineated. However, it is known that, like silica, the transformations from one form to another are of the sluggish type. Also it has been found that anatase is capable of existing in two high-low forms.

Since zirconia, titania, and particularly silica are important ceramic raw materials, a knowledge of the fundamental concepts of polymorphism should greatly aid the engineer in use of these materials. Perhaps the most important phase of the entire discussion presented above is the role which composition plays in the stabilization of high-temperature forms. This knowledge has been applied successfully to certain ceramic problems and undoubtedly will serve as a tool for the attack of others in the future.

**This is the seventh of eight articles on crystal chemistry by Prof. Hauth to appear in *Ceramic Bulletin*. The eighth and concluding article will appear in this June issue.**

<sup>4</sup> R. B. Sosman, Properties of Silica, Chemical Catalog Co., Inc., New York, 1927.

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# Design *in* Industry

by THEODORE S. JONES

The Institute of Contemporary Art, Boston, Mass.

The Institute of Contemporary Art, founded in Boston in 1936 as a nonprofit, educational organization, has for years been increasingly active in the encouragement, exhibition, and publication of the best of contemporary art. In 1947 the Institute became convinced that the specialized educational institution may properly occupy a position midway between art and industry, as intermediary, counselor, and critic. The Institute believed that the artist should have a significant place in industry; industry should make better use of the artist; the consumer should find good design increasingly available; and the Institute should actively help to achieve each of these worth-while goals.

The Institute, being a specialized organization devoted to the encouragement of creative activity in the arts, has had ample occasion to study the relationship in twentieth-century America of the arts to industry. With a few exceptions the record of collaboration has been one of failure, of mutual distrust, misunderstanding and frustration. Art has looked to industry for patronage, and industry to art for inspiration; but industry's patronage has generally been sporadic and superficial, and the artist's inspiration has been, for the most part, impracticable or suspect.

In such an atmosphere both education and arbitration play a vital role; it is possible to interpret each party to the other, much as labor and management so often have responded successfully to mediation.

In undertaking to help the artist and manufacturer work together effectively, the Institute realized that "Art in Industry" is not a recent concept. Such organizations as the Werkbund, the Bauhaus, Britain's Council of Industrial Design, and many others come to mind. As recently as February, 1947, the American Academy of Arts and Sciences, also on Newbury Street in Boston, sponsored a symposium to discuss the Artist in Industry. The excellent work of such organizations as the Museum of Modern Art, the Akron Art Institute, the Walker Art Center, the Albright Art Gallery in Buffalo, the Detroit Institute of Arts, and the Merchandise Mart in Chicago in exhibiting well-designed products of American industry is well known.

The Institute of Contemporary Art, in creating its Design in Industry Department in January, 1948, chose a more direct method of attack than heretofore employed. Rather than merely putting its stamp of approval on objects already manufactured, it elected to try to influence design at the drafting board stage, a direct effort to educate manufacturers to strengthen design within their companies at the point of origin, in the designers themselves, each educated in his company's particular manufacturing problems and processes. In brief, the Institute's creed was this: if trained artists of proved creative capacity could be located, given a thorough understanding of materials and the problems of a particular manufacturer, sympathetic guidance and enlightened handling, they could produce design of uniform excellence and integration. Ideally such a program of Art in

Industry would enrich the living of our nation by offering well-designed goods as satisfying as they are useful.

Corning Glass Works and its subsidiary, Steuben Glass, decided to test the validity of the Institute's thesis by means of an experimental program, calculated to affect the design of glass products both at the mass-produced (Corning) and luxury (Steuben) levels. For Corning, the program entailed the establishment of a new Department of Design, for this important element of manufacture had not heretofore had a formal position in the administrative structure of the company. For Steuben, the program would be utilized for the refinement and amplification of a well-formulated and highly developed design policy. Steuben for some years has had as its byword the "trilogy" of design, workmanship, and material, wherein none of the three elements could be deficient without nullifying the whole. The concept, if not new, posed an arresting question: how, with all the complications of present-day manufacture, might the "trilogy" remain strong and intact?

For years Corning has spent annually hundreds of thousands of dollars on technical research. No doubt the Company's advertising slogan "Corning Means Research in Glass" is familiar to all. Now Corning was to initiate, with the Institute's help, a program of design research of a type indeed rare in American manufacturing.

During the first six months of 1948 the Institute, working in close collaboration with the Corning-Steuben organization, drafted the curriculum for the pilot program and made searching inquiries at a large number of universities and art, architectural, design, and trade schools for recommended graduates who might qualify, by virtue of their ability and training, as candidates for the Corning pilot program. Meanwhile, preparations were made for the physical installation at Corning of a combined training center and experimental laboratory.

In July, 1948, the pilot training program was inaugurated. Twelve "trainees" were invited to Corning to undergo intensive instruction in glass manufacturing for a period of eight weeks. The trainees were, without exception, individuals whose creative capacity had impressed their selectors and whose design background was thorough. All twelve had had formal training as painters, sculptors, architects, or industrial designers. Three of the twelve were artists who had already attained substantial recognition; one as sculptor and ceramist, one as a fabric designer, and one as a painter. The twelve candidates were all graduates of leading universities.

All instruction was given by specialists in various departments of the Corning-Steuben organization, and the program was administered jointly by the Directors of Design for Corning and for Steuben. As the trainees had been selected for their advanced status in design, design instruction *per se* was deliberately excluded from the curriculum.

The educational methods adopted for the program were based upon an integrated framework of demonstrations, lectures, conferences and seminars, design projects, and observations of and participation in manufacturing operations. Trainees' designs were criticized during the greater part of the program only in material and its manufacture. Design criticism as such was completely avoided until the closing

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weeks of the course, when the trainees' technical comprehension was considered to have reached an advanced stage.

Instruction was confined in the first five weeks to the subject of glass, the properties and limitations of the material, its characteristics in handling, and its manufacture by the off-hand method. Subsequently, the problems of designing products for manufacture by semi-automatic and automatic methods were taught. Glass decoration by cutting, engraving, and other finishing processes was also investigated in the latter phases of the training course.

Lectures were given on the history and development of glass, on the raw materials and the tools, and on the intricacies of glass technology and research, manufacture, marketing, sales promotion and related matters of concern to the designer. The trainees were given a thorough insight into the complex workings of a major American industry, its administrative organization and its ultimate relationship to the consumer. Study groups visited many of the Corning facilities for purposes of familiarization with all branches and observation of the various methods of manufacture as illustrated in the separate plants.

Since the completion of the Corning-Steuben training program in September, 1948 seven outstanding manufacturing concerns have joined Corning and Steuben as participants in our Design in Industry program. Of ceramic interest are The Shenango Pottery Company of New Castle, Pa., vitrified hotel and restaurant ware; Haviland and Company, fine dinnerware, New York City; and The Fostoria Glass Company, Moundsville, W. Va.

The Institute's service includes an analysis of the company's design policy, procedure, personnel and competitive position, the procurement of outstanding young designers, the planning and implementation of training programs for educating the designers in the company's manufacturing and designing processes, critical evaluation of new designs, and continuing stimulation and encouragement. Much time is spent with company top management analyzing the nature and evolution of design, the right and wrong way to educate and guide designers, the organizational procedure for selecting designs to be placed in production, the education of the sales, production, and other departments to understand the aims of the design program. The Institute hopes to continue the development of an informal association of manufacturers committed to the consolidation of good design in every product which finds its way into the American home.

After an explanation of the way in which the Design in Industry program functions with Corning-Steuben, a brief description of its relationship with the Shenango Pottery Company, the largest manufacturer of vitrified china in the world, is in order. At the inception of the relationship early in 1949, Shenango asked the Institute to make a search for outstanding young artists interested in full-time employment in the Art Department of their factory in New Castle. About sixty young men and women, highly recommended by schools of art, ceramics, and design, were interviewed. Of

these, six participated in a six weeks' training program at Shenango during September and October, 1949; four men and two women. Their educational background included such schools as the Cleveland Art Institute, Cranbrook Academy of Art, New York State School of Ceramics, and Ohio State University. Of these six, three are now employed full-time by the Company, under Mr. McBurney, the Art Director, and Mr. Trimble, the Head Designer, together with three designers previously employed by the Company and who also participated in the training program. The Art Department has doubled in size both in personnel and floor space. Potters' wheels and other equipment have been installed as well as a modest library of books, magazines, and photographs.

Procedures for developing and selecting new shapes and decorations for the finished line have been clarified and strengthened. The quality of the Art Department's personnel and the leadership of Mr. McBurney have developed a new attitude toward and appreciation of design in Shenango which runs through the entire Shenango family, including top management, foremen, and general workers.

Thus far the Institute's Design in Industry Department has placed in industry about forty artists and designers ranging in age from 22 to 40. In the search for outstanding young people, many schools of art, architecture, and design have been visited and regular correspondence is carried on with a great many more such institutions. While the Institute does not serve as an employment agency, a central reference source or clearing house of information about designers in this country and abroad, The Designers' Register, has been set up.

Recognizing a need for the professional counsel of eminent authorities in design, education, and industry in the expansion of its services, the Department of Design in Industry formed the Advisory Committee. The members of the committee include Marcel Breuer, architect, designer; Serge Chermayeff, President, Institute of Design, Chicago; Brig. Gen. Georges F. Doriot, President, American Research and Development Corp. and Professor of Manufacturing, Harvard Business School; Alfred M. Frankfurter, Editor, *Art News*, Hareld D. Hodgkinson, Managing Director, Filene's of Boston; Edgar Kaufmann, Jr., Consultant on Industrial Design, Museum of Modern Art, New York; Professors Robert Woods Kennedy and Gyorgy Kepes, School of Architecture and Planning, M. I. T.; Alexander J. Kostellow, Head, Department of Industrial Design, Pratt Institute; Edward Marcus, Vice-President, Neiman-Marcus, Dallas, Texas; Eliot Noyes, architect, designer, teacher; John M. Phillips, Director, Yale Gallery of Fine Arts; Walter Sanders, architect, designer, teacher; and Dorothy Shaver, President, Lord and Taylor, New York. Members meet occasionally with the associated manufacturers and are available individually for consultation.

The Institute's Design in Industry program offers to manufacturers these levels of design evaluation and criticism other than that by company design personnel: (1) by Institute of Contemporary Art personnel, (2) by the Design Directors of the associated manufacturers meeting bi-monthly, and (3) by the Advisory Committee.

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THE AMERICAN CERAMIC SOCIETY

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# A Carbon Resistance Furnace

## for P.C.E. Tests

by H. E. CoVAN and J. L. CARRUTHERS

The Edward Orton, Jr., Ceramic Foundation, Columbus, Ohio

### Introduction

Testing for the pyrometric cone equivalent of raw materials or products is very important to the ceramic industry, and in obtaining these equivalents there are several variable factors which can greatly affect the results. Some of the most important of these variables are: the furnace, the fuel, the operator, the type of plaque material, the setting of the test cones, and the fineness of the sample under consideration.

The last two factors mentioned are standardized, and the plaque material is suggested in A.S.T.M. Standard Method of Test for Pyrometric Cone Equivalent of Refractory Materials, C<sup>24-46</sup>. A standard furnace and fuel have not yet been agreed upon.

There are a variety of furnaces in use today, but results on test samples do not always check. One of the first furnaces to be used for this purpose was the Deville charcoal furnace. It is not known if any of these are in use at the present. The gas-fired furnace has been popular and can be used almost universally with natural, city, or bottled gas. However, a premix or blower system is required to reach the higher temperatures. The oxy-acetylene furnace is satisfactory for very high P.C.E. value, but is considered dangerous by some people. However, as almost all testing laboratories have electric power, an electric furnace, which is safe and easily controlled, would seem an ideal furnace for this purpose.

Any type of furnace which is used to determine the P.C.E. value should be capable of meeting the heating rate specifications as set forth in A.S.T.M. C<sup>24-46</sup>. If this heating rate cannot be met by the furnace in use, it is quite possible that the results obtained would not be comparable to those results from another furnace or from a different type of furnace. This could result in considerable and costly confusion and misunderstanding.

The purpose of this paper is to describe in detail a furnace which will meet the above-mentioned specifications for heating rate, and which, for eighteen years, has proved very satisfactory in the standardization of pyrometric cones above cone 20 and in obtaining P.C.E. of raw materials and refractories. Since 1931, when it was first built, many improvements and revisions have been made so that today it can be used with very satisfactory results by inexperienced operators after a minimum of instruction and by following the A.S.T.M. specifications.

It should be possible, therefore, to choose from among the above-mentioned types of furnaces, one furnace and one source of heat energy for standard P.C.E. determinations. It was with this thought in mind that this paper was written, and the furnace described herein is suggested for consideration as the standard furnace for P.C.E. testing.

### Review

This type of electrical resistance furnace was originally named the "Gran-Annular Electric Furnace" by its inventors,

C. H. Fulton and W. A. Coursen. Fulton<sup>1</sup> described his furnace in a report on an investigation of slags in 1912. Zay Jeffries<sup>2</sup> in 1914 again describes the furnace, giving considerable detail and comparing it with platinum wire furnaces. Jeffries also covers much of the theory of the operation and explains the controls which he and Fulton developed. He states that any one of three granular types of resistors can be used, namely: Kryptol,\* granular carbon, or granular graphite. He preferred Kryptol, using a potential of 110 volts, and his paper is based on this type of resistor. The granular furnace can be operated with either direct or alternating current.

Granular carbon and granular graphite do not require high voltages, preferably being operated at low voltage with higher current input. In the control of his furnace, Jeffries used a special rheostat which he and the furnace inventor designed. This consisted of nineteen coils of resistance wire, each of which is connected to a separate single throw switch.

### Description of Furnace

An assembly drawing of this furnace is shown in Fig. 1. This drawing also shows a vertical cross section through the middle from top to bottom, and a horizontal one through the center from side to side. Details of various parts of the furnace are shown in Fig. 2.

The essential features of the furnace, as given by the inventors and quoted by Jeffries, are as follows: (1) Two concentric cylindrical tubes, the inner one forming the heating chamber, and the cylindrical space between the tubes which, when filled with a granular resistor, becomes the resistor cylinder. (2) A resistor of uniform cross section throughout its length. (3) Positive and firm insertion of the tubes in the electrode plates maintains the resistor chamber in perfect shape. (4) Any part can be readily and cheaply replaced. (5) Simplicity and compactness of construction prevent racking and distortion during heating.

In 1931, when the furnace was built at the Orton Foundation, most of the parts were made from items at hand. For example, the transformer, an old oil-type affair, was rebuilt and, with a number of resistance coils added as a rheostat, became a tap transformer capable of delivering 9000 watts. This is a much greater capacity than is needed for the furnace as it has never been necessary to use over 6000 watts. The wiring diagram for this unit as it is connected to the furnace is shown in Fig. 3. Complete unit tap transformers can be purchased, however, at reasonable cost. The driving mechanism for rotating the pedestal which includes the gear bracket, gears, and motor, is rotated at about 6 r.p.m. to evenly distribute the heat to all cones on the plaque should a hot spot develop in the tube.

<sup>1</sup> C. H. Fulton, "The Constitution and Melting-Points of a Series of Copper Slags," *Trans. Am. Inst. Mining and Met. Engrs.*, Vol. XLIV, 751-80 (1913).

<sup>2</sup> Zay Jeffries, "Notes on the Gran-Annular Electric Furnace," *Met. Chem. Eng.*, 7 [3] 154-57 (1914).

\* A mixture of graphite, silicon carbide, and clay.

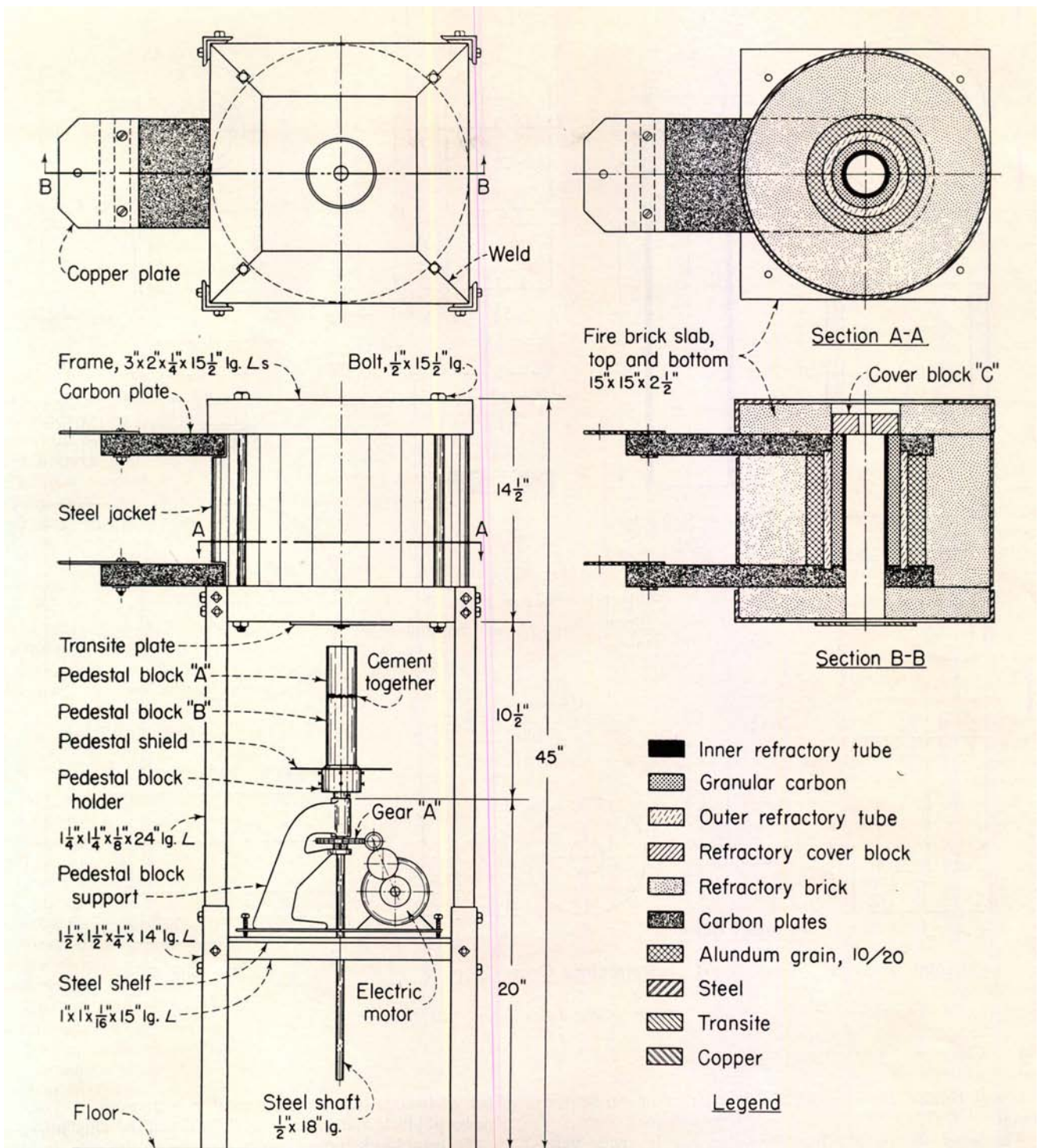


Fig. 1. Assembly drawing of the carbon resistance P.C.E. furnace showing a vertical cross section through the middle from top to bottom, and a horizontal section through the center from side to side.

### Materials

The materials required for building this furnace cost approximately \$40, the motor about \$20, and the transformer about \$500, making a total of \$560. Construction costs are estimated at approximately \$100.

### Cost Reduction and Maintenance

The cost given above, as stated previously, is based on all new materials, and could be reduced considerably by using salvaged or second-hand materials and equipment.

The top and bottom slabs of this furnace were made by first welding together the framework of angle iron and pouring into it a mixture of 50% Portland cement and 50% firebrick grog crushed to  $y_4$  mesh. This would reduce the number of the insulating firebrick necessary by about 16 brick. Slabs thus made have been in service since the furnace was built and have never had to be repaired.

The steel jacket for the body of the furnace consists of a steel shell 15 in. in diameter and 8 in. long, of 26 gauge metal, properly notched so as not to touch the carbon plates. The furnace brick can be laid up with a thin mortar of fire-clay

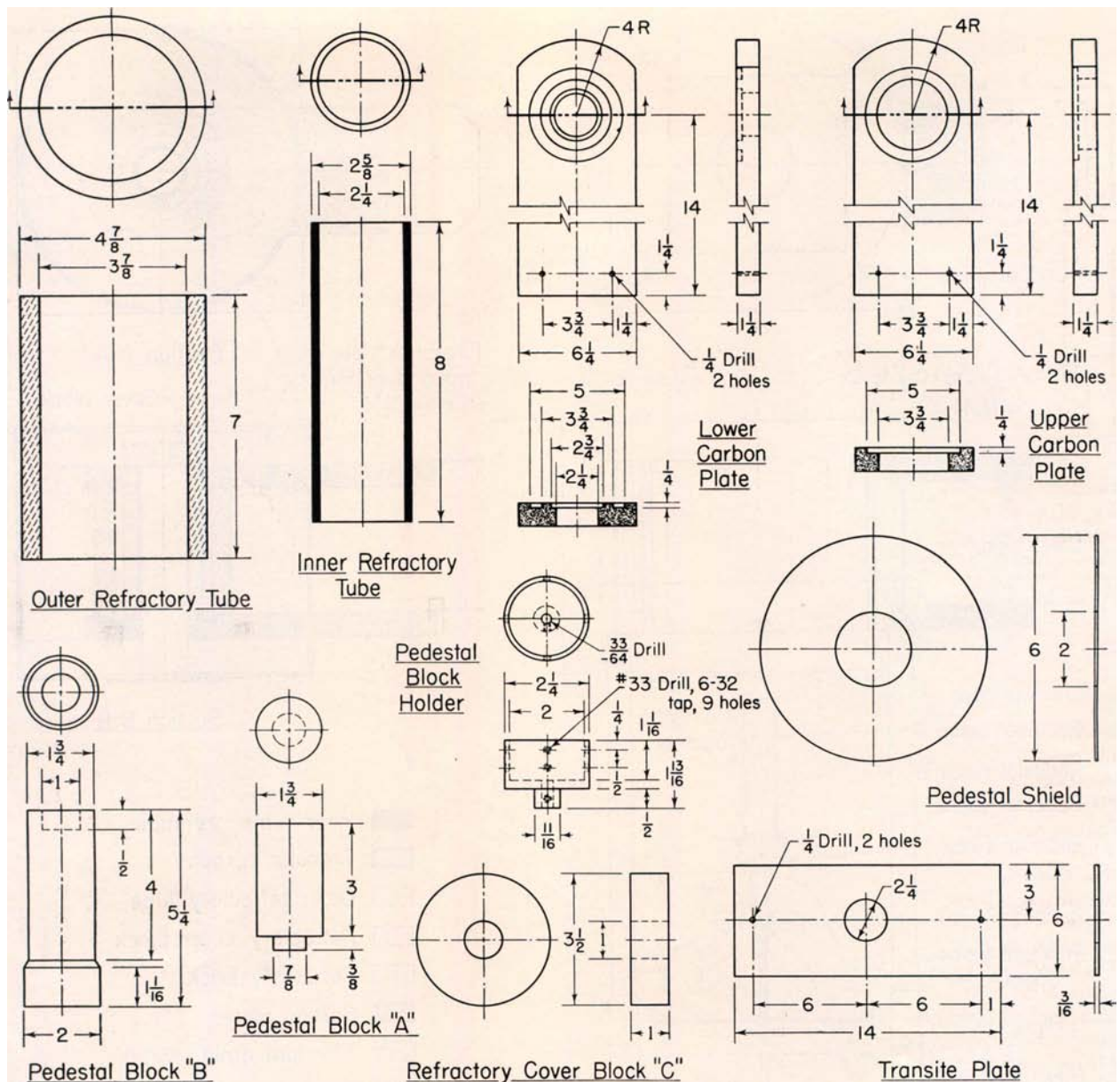


Fig. 2. Detail drawing of the P.C.E. furnace.

slip and banded together with a few strips of galvanized metal.

The inner and outer refractory tubes can be made very easily. However, satisfactory tubes can also be purchased, a beryllia tube being recommended for duty above cone 33. A mix found to be very satisfactory for an all-purpose tube for all cone numbers which can easily be pressed in a split plaster mold is Alundum X fines 36 F white 6 lb., Alundum X grain 10/20 white 2 lb., Florida kaolin plastic 1 lb., Corundite or Deville furnace mix 1 lb., and binder (Cere Amic flour #1) 9V2 oz. The amount of mixture given is sufficient to make one each of the following parts: 1 inner tube; 1 outer tube; 1 top pedestal block A; and 1 refractory cover block C; see Fig. 2.

The parts made from the above mix should be fired to cone 10 to 12 before using, although tubes have been put into the granular furnace after thorough drying without pre-firing. However, pre-firing of the tubes will insure longer life. It is not unusual to obtain 10 fusion tests all above cone 35 with prefired tubes made of this mixture. Many types of manufactured tubes and many different mixtures have been tried over the years, but the above has given the greatest num-

ber of fusions before replacement was necessary. The top pedestal block A and the cover block C will last indefinitely.

Pedestal block B can be fashioned from a firebrick, but it is preferable to use an insulating firebrick so that the heat will not be conducted to the driving mechanism. Pedestal block A is cemented to B with high-temperature refractory cement.

A number of granular fusion furnaces have been built so that the pedestal is fixed, and it is necessary to raise and lower the furnace with a block and fall. It will be noted in Fig. 1 that this furnace is stationary and that the pedestal is movable in a vertical direction. By loosening a set screw in Gear A, the shaft on which the pedestal rests can be raised until the pedestal and cone plaque are in the furnace, and the pedestal shield touches the transite plate on the bottom of the furnace. The set screw is then tightened against the shaft and Gear A will rotate the cone plaque in the furnace.

The pedestal block support, or gear bracket, shown in Fig. 1 is a casting, but a serviceable bracket can be made with 3/16 x 1-in. cold-rolled steel or brass, thus again reducing the cost.

The entire driving mechanism, including gear bracket or

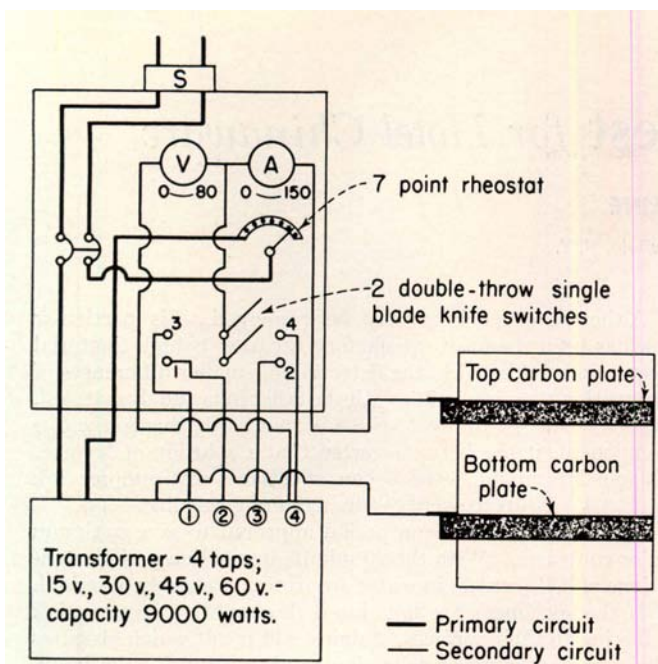


Fig. 3. Wiring diagram.

pedestal holder, and motor drive, are mounted on a movable metal base with a screw through each corner so that the pedestal can be centered and leveled. This is shown in Fig. 1 and is illustrated in Fig. 4.

The maintenance cost of the furnace has been found to be very low. The granules of carbon will gradually burn away in the hot zone leaving voids, and it will be necessary, in order to restore maximum contact, to settle the mass and add some new granules. The granular carbon should never be packed in, but put in loosely after breaking up the old mass and voids. The refractory tubes will burn through eventually, but it is very simple to replace them. In fact, the whole interior of the furnace, including the alundum grain, the tubes, and granular carbon can be removed and the furnace rebuilt in less than one-half hour.

There is an optical pyrometer mounted above the furnace and focused onto the cone plaque. It is thus possible to follow the temperature rise to the cones and to record the end points. In place of the optical pyrometer, a thermopile could be mounted and a continuous recording of the temperature made with a recording potentiometer.

Figure 5 shows the tools used to set up the cone plaques for this furnace.

### Summary

Tests have been made in the Orton Foundation granular carbon furnace at various heating rates throughout the years. It is very simple to control the heating rate to meet the A.S.T.M. specification. Recently, two individual P.C.E. tests were made in this furnace, several days apart, one test a check on the other. The P.C.E. value of the sample in the first test was between cone 34 and 35, and in the second test, the value was cone 34. The A.S.T.M. heating rate for cone 34 is 2 hours and 17 minutes, and both of the above tests were completed practically on schedule.

#### Acknowledgment

The authors wish to acknowledge the help of H. G. Wolfram, E. D. Chase, and E. G. Constans in gathering the material for this paper.

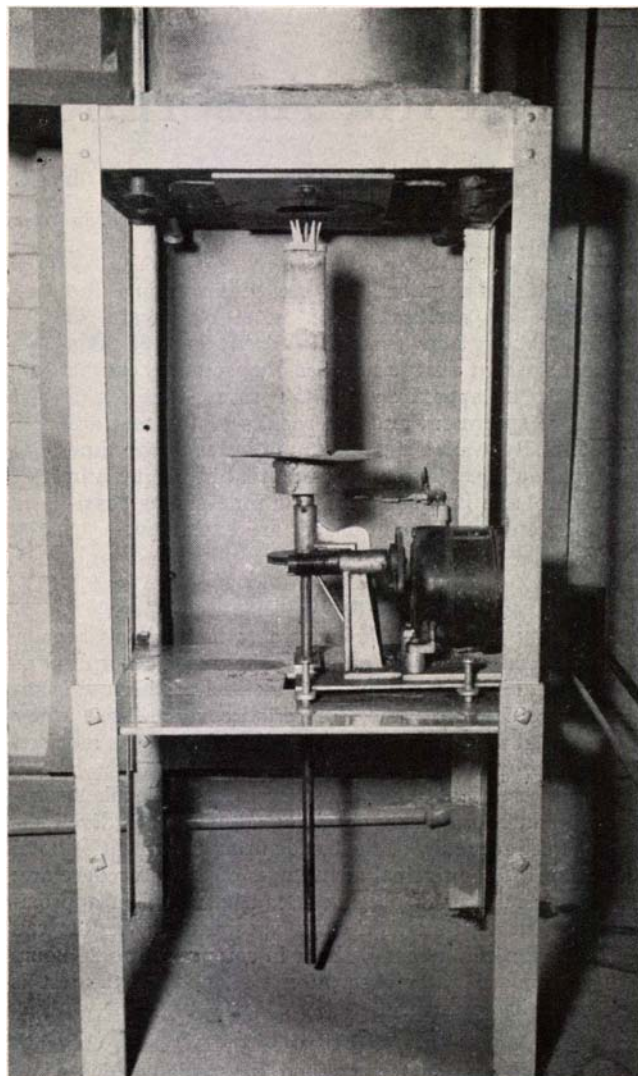


Fig. 4. The entire driving mechanism, including gear bracket, pedestal holder, and motor drive, is mounted on a movable base with a set screw through each corner so that the pedestal can be centered and leveled.

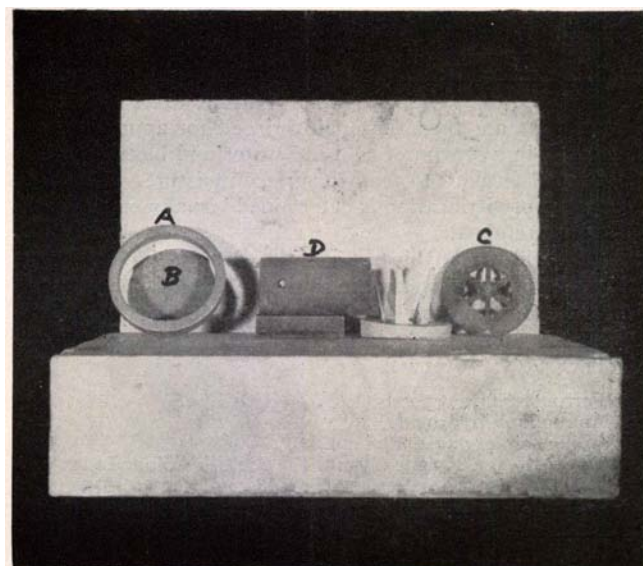


Fig. 5. Tools used to set up cone plaques for the furnace. (A) ring mold for forming plaque; (B) metal disk used to push plaque from mold; (C) guide for setting cones in plaque; (D) gauge for setting cones at proper angle of  $82^\circ$  with horizontal.

# An Ink Absorption Test for Hotel Chinaware

by R. W. CLINE

Buffalo Pottery, Inc., Buffalo, N. Y.

**An ink absorption test for determining the degree of vitrification of hotel chinaware is described. The principal advantages of this test are that a large number of specimens can be tested in approximately the same time as a single specimen, and the results of the test are generally available within 30 minutes of the time of sampling. The use of this test in bisque kiln control and its application as a time-saving possibility on Government orders are explained.**

## Introduction

FOR many years the boiling-water method has been a standard test for determining the water absorption of hotel chinaware. While this method has been satisfactory in most instances, the test period covers a least a day and the results are somewhat more quantitative than is required in normal process control work.

The purpose of this paper is to describe a simple ink absorption procedure for quickly obtaining a semiquantitative indication of the adequacy of the bisque firing treatment of hotel chinaware. The principal advantages of this procedure are:

(1) a large number of specimens can be tested in approximately the same time as a single specimen, (2) results can be obtained within about 1/2 hour in comparison to 26 hours for the standard water absorption test, and (3) the test is simple and inexpensive.

## The Test

The ink-absorption test method is especially adapted to white ware bodies with water absorptions<sup>1</sup> of 1% or less. This is satisfactory since the majority of hotel chinaware items fall within this 1% range, as is indicated by the requirements of Federal Specification M-C-301a, which permits absorptions to (a) 0.3% for regular and light weight ware, (b) 0.5% for heavy weight ware, and (c) 1.5% for items whose maximum dimension exceeds 10 inches.

To perform the test, fragments of ware, identified with lead pencil, are immersed for 20 minutes in ink in an open vessel, such as a beaker. The ink is then returned to its bottle and the specimens are then thoroughly rinsed for approximately 60 seconds in a stream of cold tap water and blotted with a paper towel or cloth to remove surface moisture. The relative degree of vitrification is determined visually on the basis of the color retained.

The ink chosen for this test is of the diammonium hydroxyferrigallate type and was made available through the cooperation of the Government Printing Office, under the designation of 21-E-8.4. This ink has a pH of 8.4 and the composition is as follows:

Ferrous sulfate crystals,  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ , 15 gm.  
Ammonium hydroxide (28%  $\text{NH}_3$ ), 15 ml.  
Gallic acid crystals, 10.5 gm.  
Dye—4.5 gm. Xylene-Cyanol FF (British Colour Index No. 715) for the green shade of blue  
Water, 1000 ml.

The author was formerly Research Associate at the National Bureau of Standards for the Vitrified China Association, Inc. He is now Ceramist, Buffalo Pottery, Inc.

<sup>1</sup> Determined, as specified in Federal Specification M-C-301a, by weight per cent of water absorbed during a 5-hour boil, followed by a 20-hour soak.

Although other inks may be employed, this particular ink has been the most satisfactory because its high tinctorial power and shade aid in the detection of smaller differences of absorption than is possible with the other inks and dyes tested. Since the success of ink 21-E-8.4 is apparently due to the dye component, it has been suggested that a solution of Xylene-Cyanol FF might serve as an effective substitute for ink 21-E-8.4. No tests were conducted along this line.

A 20-minute immersion period appeared to give optimum color contrasts. With the 20-minute immersion period, variations of 0.1% or less in water absorption are easily observed.

If the specimens are not rinsed thoroughly to remove ink adhering to their surfaces, staining will result which obscures the true darkening of color due to absorption by the body. Cold rinse water is preferable to hot. Rinsing is incomplete if ink is transferred from the specimens to the material employed to dry them.

The color of the tested specimens will become somewhat lighter during the first few minutes after blotting, but this should not impair the usefulness of the test. Other sources of color variations are (1) temperature of the specimens, and (2) length of time they are exposed to the humidity of the atmosphere before testing. Where variation in absorbed moisture among members of a test group is suspected, all specimens should be dried and cooled prior to testing. If all specimens have been subjected to about the same conditions, this precaution is unnecessary.

## Use in Bisque Kiln Control

An example of the use of this test in bisque kiln control is the procedure adopted in a plant producing hotel chinaware. Each morning a representative sample, obtained from the cars drawn from the kiln the previous day, is tested in the laboratory. Under normal conditions, a specimen is selected from each top, middle, and bottom deck of every third or fourth car. Each specimen is from the center portion of a bung of ware located near the middle section of the deck. Specimens which may still be warm are broken first so that the fragments about 1 in. square broken from them will cool to room temperature by the time the remainder of the test fragments are ready. Ink absorption results are generally available within 30 minutes from the time of sampling. Car locations marked on the specimens provide a means of correcting faulty kiln firing conditions, and cars of underfired ware can be spotted before they are unloaded. The extent of underfiring is detected readily by sampling each car suspected, including hollow ware and flat ware from bungs which are near the edges of the decks. A similar procedure is employed to check uniformity of heat treatment across any specified section of a car.

In all cases, ink-absorption specimens are calibrated against a weekly determination of water absorptions of representative specimens.

## Time-Saving Possibility

Another time-saving possibility could be employed to advantage in testing samples of glaze ware prior to shipment. On Government orders, where specifications require absorption determinations on 3 pieces from every 100 dozen, a water-absorption specimen of the specified size, and a smaller-size, ink-absorption specimen would be broken from each piece in the sample. From the appearance of the specimens after

the ink-absorption test, the specified water absorption test could be performed on the darkest 10 to 25% of the specimens, or, if some underfired ware is indicated, on a portion of the group selected with the aid of the Government Inspector as representative of the entire sample.

### Summary

The ink-absorption test, as described, has proved its value in more than two years of operation in a typical plant producing hotel chinaware. The procedure is simple, and results obtained in less than an hour are a satisfactory basis for taking action when necessary to correct faulty firing conditions.

Relative values obtained by this method should be periodically checked by means of the more time-consuming water-absorption test. The application of the ink-test as described in this paper is recommended.

### Acknowledgments

The author wishes to thank the Vitrified China Association, under whose auspices the preliminary tests were conducted; Messrs. R. F. Geller, W. H. Smith, and W. D. Appel of the National Bureau of Standards, for their suggestions; and the Government Printing Office for furnishing the ink. For the encouragement and suggestions from Mr. R. E. Gould, Chairman, Vitrified China Association Research Committee, the author is especially grateful.

## Report of the Ceramic Film Committee, Missouri School of Mines Chapter of Keramos

Keramos chapter of the Missouri School of Mines, which annually prepares an up-to-date list of industrial and educational films pertaining to ceramics and related fields, has completed its annual report for this year. Several additions and revisions have been made to the list which appeared in the May, 1950 *Bulletin*, pp. 190-92, including a few films which have become available for distribution only recently.

A system of numbers has been used to designate one or more distributors of a certain film. The number or numbers following each film corresponds to the distributor listed at the end of the report. All films are black-and-white unless color is indicated. Most of the films are free except for transportation charges. Rentals are indicated even when it applies to only one of the distributors. The distributor should be consulted for details of procurement and nearest shipping point.

Stanley W. Niemczura has been chairman of the Ceramic Film Committee, assisted by George MacZura and Roger Scrivner.

### Abrasives

*Abrasives, Manufactured*, 16 mm., 24 min., sound, rental; experiment which led to discovery of carborundum; manufacturing processes, and uses of this product. (6, 18)

*Romance of Industry*, 16 mm., 40 min., sound; shows the operations and procedures in the manufacture of abrasives and abrasive products, plus many varied uses and applications in industry. (7)

*The First Principles of Grinding*, 16 mm., 45 min., sound; manufacturing processes, mainly the technical and practical phases of grinding wheels and their applications. (7)

### Art & Archeology

*Arts and Crafts of Mexico*, 16 mm., sound, rental; Mexican handicrafts such as basket making, glass blowing, cloth making, and pottery making. (11)

*Clay in Action*, 16 mm., sound, rental; sculpturing a portrait in clay. (11, 16)

### Chemistry and Physics

*Air in Action*, 16 mm., 1 reel, sound, rental. (16)

*Battle Against Rust*, 16 mm., 12 min., sound; depicts the steps in the formulation, manufacture, and end use of Rust-Oleum Rust Preventives. (22)

*Catalysis*, 16 mm., 11 min., sound, rental; explains the phenomena associated with catalysis. (16, 18)

*Characteristics of Gases*, 16 mm., 1 reel, sound, rental. (16)

*Characteristics of Liquids*, 16 mm., 1 reel, sound, rental; properties of liquids and forms they assume, reasons for manifestations of surface film, tension and viscosity in drops, jets, and bubbles. (16)

*Characteristics of Solids*, 16 mm., 1 reel, sound, rental. (16)

*Colloids*, 16 mm., sound, rental; concept of the colloidal state and types of colloids. (11, 16)

*Electrons*, 16 mm., 11 min., sound, rental; shows conduction of electricity in liquids, gases, and vacuums, laws suggested and conclusions drawn. (18)

*Energy and Its Transformations*, 16 mm., sound, rental; defines potential, kinetic, and radiant energy as manifested in its various forms. (11)

*Friction*, 16 mm., 1 reel, sound, rental. (16)

*Heat and Pressure*, 16 mm., 1 reel, sound, rental. (16)

*Light Waves and Their Uses*, 16 mm., sound, rental; illustrates principles of reflection and refraction of light. (11)

*Mechanics of Liquids*, 16 mm., 1 reel, sound, rental. (16)

*Nature of Color*, 16 mm., 1 reel, sound, rental. (16)

*Oxidation and Reduction*, 16 mm., 1 reel, sound, rental. (16)

*Radio-Frequency Heating*, 16 mm., 40 min., sound, color; theory of radio-frequency heating. (24)

*R-F Induction Heating*, 16 mm., 10 min., sound; the economy of radio-frequency induction heating. (24)

*Surface Chemistry*, 16 mm., 3 reels, sound, rental; observations in properties of the molecule, production of nonreflecting glass and comparison to ordinary glass; discovery of the means of measuring size and shape of molecules. (16)

*The What, Why and Where of Speed Heating*, 16 mm., 10 min., sound; explanation of what speed heating is and its use. (24)

*Velocity of Chemical Reactions*, 16 mm., 1 reel, sound, rental; effect of nature and concentration of reacting substances and of temperature on reactions. (11, 16)

*Automatic Jiggering*, 16 mm., 30 min., silent; single-line and eight line Miller Automatic machines in operation. (20)

*Semi-Automatic Jiggering*, 16 mm., 20 min., silent; hydraulically operated Miller Semi-Automatic ware forming machines in operation. (20)

*Lubrication*, 16 mm., 30 min., sound; the theory of friction and practical application of lubricants to various mechanical elements. (6)

### Enamels

*Modern Porcelain Enameling*, 35 mm., 20 min., sound (slides); shop practice in porcelain enameling. (12)

### Fuels

*Chemistry of Fire*, 16 mm., 3 reels, sound, rental. (16)

*Chemistry and Combustion*, 16 mm., 1 reel, silent, rental. (16)

*Our Common Fuels*, 16 mm., 1 reel, sound, black-and-white or color, rental. (16)

*Fire*, 16 mm., 1 reel, sound, rental; domestic uses of fire and principles of combustion. (16)

*Fuels and Heat*, 16 mm., 11 min., sound, rental; explains the role of carbon in fuels, the manufacture and storage of carbohydrates by plants, how coal and oil were produced by nature. (16, 18)

*Heat and Its Control*, 16 mm., 40 min., sound; the history of heat control including development of modern laboratory tested insulation materials. (6)

*Steam for Power*, 16 mm., 30 min., sound, color; a story of man's efforts to obtain ever more plentiful, more economical power by using steam to harness the energy released from the combustion of fuels. (3)

### Geology

*Earth's Rocky Crust*, 16 mm., sound, rental; the building up and breaking down of rocks and land forms. (11)

*Geological Work of Ice*, 16 mm., sound, rental; effect of ice on surface rocks. (11)

*Work of the Atmosphere*, 16 mm., sound, rental; effects of the atmosphere on the surface of the earth. (11)

### Glass

*Duplate Safety Glass, Manufacture*, 16 mm., 10 min., sound (reel 4); the manufacture of Duplate Safety Glass and Multiplate Bullet-Resisting Glass. (21)

*To Greater Vision*, 16 mm., 28 min., sound; tells the story of light and glass and the importance of optical science in our everyday life. (5)

*Glass, Looking Through*, 16 mm., 18 min., sound, rental; how intricate machines blow and mold liquid glass in modern British mass-production methods. (18)

*Making Glass for Houses*, 16 mm., sound, rental; step-by-step process for making glass. (11, 16)

*Manufacture of Polished Plate Glass*, 16 mm., 20 min., sound (reels 1 & 2); shows the manufacture of polished plate glass, mirrors, the bending of plate glass and tempered polished plate glass. (21)

*Mortar and Glass*, 16 mm., 20 min., sound, color; illustrates the methods for laying glass block panels. (2)

*New Romance of Glass*, 16 mm., 20 min., sound, rental; depicts the processes in the manufacture of glass products. (23)

*PC Glass Blocks*, 16 mm., 10 min., sound (reel 5); manufacture of PC Glass Blocks. (21)

*Pennvernon Window Glass, Manufacture*, 16 mm., 10 min., sound (reel 3); the manufacture of Pennvernon Window Glass. (21)

*Romance of Glass*, 1=6 mm., 45 min., 5 reels, sound; the manufacture of polished plaije glass, mirrors, the bending of plate glass, and tempered polished plate glass, the manufacture of Pennvernon Window Glass, Duplate Safety Glass, Multiplate Bullet-Resisting Glass^and PC Glass Blocks. (21)

*Glass, Safety*, 16 mm, /2 reels, silent; the manufacture of safety glass from the mining of the raw materials to the installation of the finished product. (6, 18)

*Sand and Flame*, 16 mm., 21 min., sound, rental; the production of all kinds of glass. (6, 13, 18, 23)

*Walls of Daylight*, 16 mm., 25 min., sound, color; depicts the manufacture of Insulux Glass Blocks, its physical characteristics, and the advantages of this light-transmitting material. (2)

*The Story of Rock-Wool Home Insulation*, 16 mm., 25 min., sound; explains the theory of heat transfer and the application of rockwool insulation. (6)

### Pottery

*Craftmanship in Clay; Glaze Application*, 10 min., sound, color, rental; introduces glazing as an activity of interest to pottery makers and demonstrates methods of applying glaze. (17, 18)

*Craftmanship in Clay; Simple Slab Methods*, 10 min., sound, color, rental; techniques by which attractive pottery may be made from clay, demonstrating tools and their proper use. (17)

*Clay Pottery*, 16 mm., 1 reel, sound, rental; progressive stages from digging of clay to finished products. (16)

*Pottery Making*, 16 mm., 11 min., sound, rental; shows a professional potter at work mixing clay preparatory to working; the use of plaster cast, making angular shaped pottery, and the technique of applying glazes is demonstrated. (11, 23)

### Raw Materials

*Lima Moves the Earth*, 16 mm., 25 min., silent, color; features shovels and draglines in construction, mining and crawler and rubber-mounted material handling cranes. (4)

*This is Magnesium-Treasurefrom the Sea*, 16 mm., 25 min., sound; shows the extraction of magnesium from ocean water and the possibilities of this metal as an engineering material. (10)

*Story of an Ore Sample*, 16 mm., 22 min., sound, color; a sample is followed from the time it is unearthed by the prospector until the Cyanamid Mineral Dressing Laboratory reports on how it may best be beneficiated. (1)

*A World of Aggregates*, 16 mm., 40 min., sound, color; shows the use of rock, sand, and gravel and the portable machines used to produce the aggregates. (19)

*Missouri Natural Resources*, 16 mm. 33 min., sound, color; some scenes show materials related to ceramics and ceramic industries. (6)

*Oklahoma and Its Natural Resources*, 16 mm., 26 min., sound; brief shots only of certain ceramic plants in the state-wide descriptive film. (6)

*Ohio and Its Mineral Resources*, 16 mm., 29 min., sound, color; travelogue version including many phases of ceramic raw materials and industries. (6)

*Texas and Its Natural Resources*, 16 mm., 47 min., sound; brief shots of ceramic industry in state-wide descriptive film. (6)

### Refractories

*A. P. Green Fire Brick Co.*, 16 mm., 40 min., silent; a tour showing the steps in the manufacture of firebrick. (15)

### Structural Clay

*Making Bricks for Houses*, 16 mm., sound, rental; step by step manufacture of structural brick. (11, 16)

### Whiteware

*China Clay*, 16 mm., 11 min., sound, rental; how china clay is obtained and sent to U. S. from England. (18)

*Colour in Clay*, 16 mm., 10 min., sound, color, rental; story of modern pottery. (11, 16, 18)

*The Making of Fine China*, 16 mm., 20 min., sound, color, rental; shows the processes involved in the making of fine china. (8)

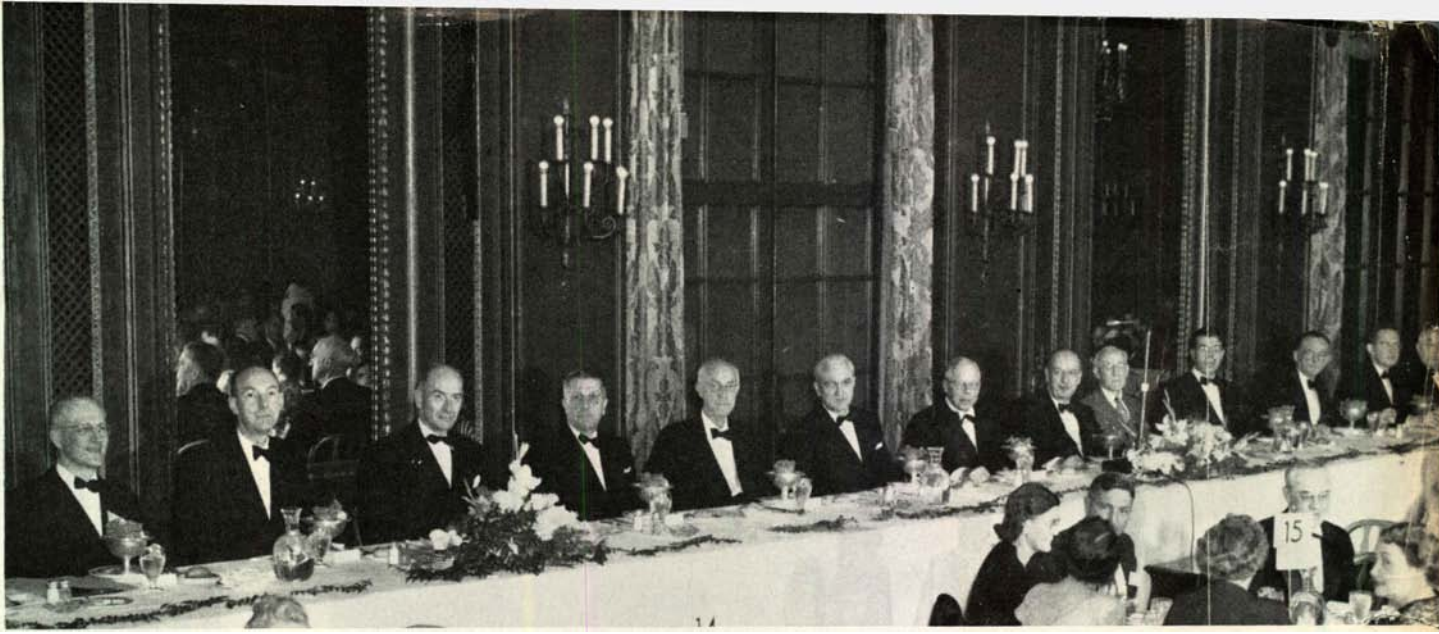
*The Oldest Art*, 16 mm., 30 min., sound, color; a history of the plates and cups on our tables. (14)

*The Story of the Cup*, 16 mm., 13 min., sound; story of how the cup is formed and manufactured. (14)

*Story of a Spark Plug*, 16 mm., 33 min., sound; forming, firing, glazing and uses of spark plugs. (6, 9)

### Addresses of Distributors

- (1) American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.
- (2) American Structural Products Co., Insulux Glass Block Div., Box 1035, Toledo 1, Ohio
- (3) Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.
- (4) Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Lima, Ohio
- (5) Bausch & Lomb Optical Co., Rochester 2, N. Y.
- (6) U. S. Bureau of Mines, 2800 Forbes St., Pittsburgh, Pa.
- (7) Carborundum Co., Niagara Falls, N. Y.
- (8) Castle Films, 542 Dearborn St., Chicago 5, 111.
- (9) Champion Spark Plug Co., Toledo, Ohio
- (10) Dow Chemical Co., Midland, Mich.
- (11) Encyclopedia Britannica Films, Wilmette, 111.
- (12) Ferro Enamel Corp., 4150 E. 56th St., Cleveland, Ohio
- (13) General Motors Corp., Film Section, 3044 W. Grand Blvd., Detroit 2, Mich.
- (14) Gladding, McBean & Co., 2901 Los Feliz Blvd., Los Angeles 26, Calif.
- (15) A. P. Green Fire Brick Co., Mexico, Mo.
- (16) Ideal Pictures, 28 E. 8th St., Chicago 5, 111.
- (17) Instructional Materials Center, University of Washington, Seattle 5, Wash.
- (18) Iowa Manufacturing Co., Cedar Rapids, Iowa
- (19) Miller Pottery Engineering Co., 2300 Palmer St., Pittsburgh, Pa.
- (20) Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh, Pa.
- (21) Rust-Oleum Corp., 2425 Oakton St., Evanston, 111.
- (22) University of Illinois, Visual Aid Service, Div. of Univ. Extension, Champaign, 111.
- (23) University of Indiana, Bloomington, Ind.
- (24) Westinghouse Electric Corp., 511 Wood St., Box 868. Pittsburgh 30, Pa.



The 53rd Annual Meeting Banquet Tuesday evening. Seated at the speakers' table are (left to right): Charles S. Pearce, Society General Secretary; R. W. Douglas, Secretary, British Society of Glass Technology; Aaron K. Lyle, Society Vice-President; W. E. Cramer, Society Treasurer; S. R. Scholes, Orton Lecture Chairman; Robert Twells, Purdy Award Committee Chairman; Ralph K. Hursh, Purdy Award Winner; J. W. Hepplewhite, President; Arthur S. Watts, Society Honorary Member; Howard R. Lillie, President-Elect; John F. McMahon, Binns Award Committee Chairman; Robert F. Rea, General Committee Chairman, and Richard D. Rudd, Chicago Local Section Chairman. Not present when the photo was taken were T. A. Klinefelter and Hewitt Wilson, Society Vice-Presidents, and William C. Taylor, the Orton Lecturer.

## *New Annual Meeting Record Set 2074 Ceramists Convene in Chicago*

A NOTHER attendance record was set this year when 2074 members and guests registered for the 53rd Annual Meeting April 22-26 in the Palmer House, Chicago. The previous all-time high was the 2041 recorded at the 52nd Annual Meeting in New York. An unusually heavy registration was conducted Sunday, with more than 1000 persons signing in by evening. Guests seemed to receive accommodations rapidly at the hotel, and as a result, were able to enter into the spirit of the Meeting in short order.

One of the outstanding features of the Meeting was the Mid-Century Market which opened Sunday noon. This was the first large affair to get underway, and throughout the four-day sessions was well-attended. The activity drew very favorable comment from many who viewed the exhibit.

Highlighting the opening day's program was the General Reception in the Red Lacquer Room. A capacity crowd was on hand to hear the musicale which preceded the reception. Entertainment was provided by Miss Nancy Carr, soprano, and the Chicago Association of Commerce Glee Club. Awards for the Camera Club exhibit, which was opened Sunday afternoon, were made at the Club's dinner Sunday evening. Sessions were held Sunday afternoon by the Ceramic Education Council and Institute of Ceramic Engineers. Preliminaries of the Student Speaking Contest were also conducted Sunday afternoon, with the finals taking place in the evening. The Board of Trustees met on Saturday evening.

J. W. Hepplewhite presided over the General Session Monday morning, during which resolutions for the late A. S. W. Odelberg of Sweden and Heinrich Ries, both Honorary Members of The Society, were passed. Dr. Ries was the last surviving Charter Member of The Society.

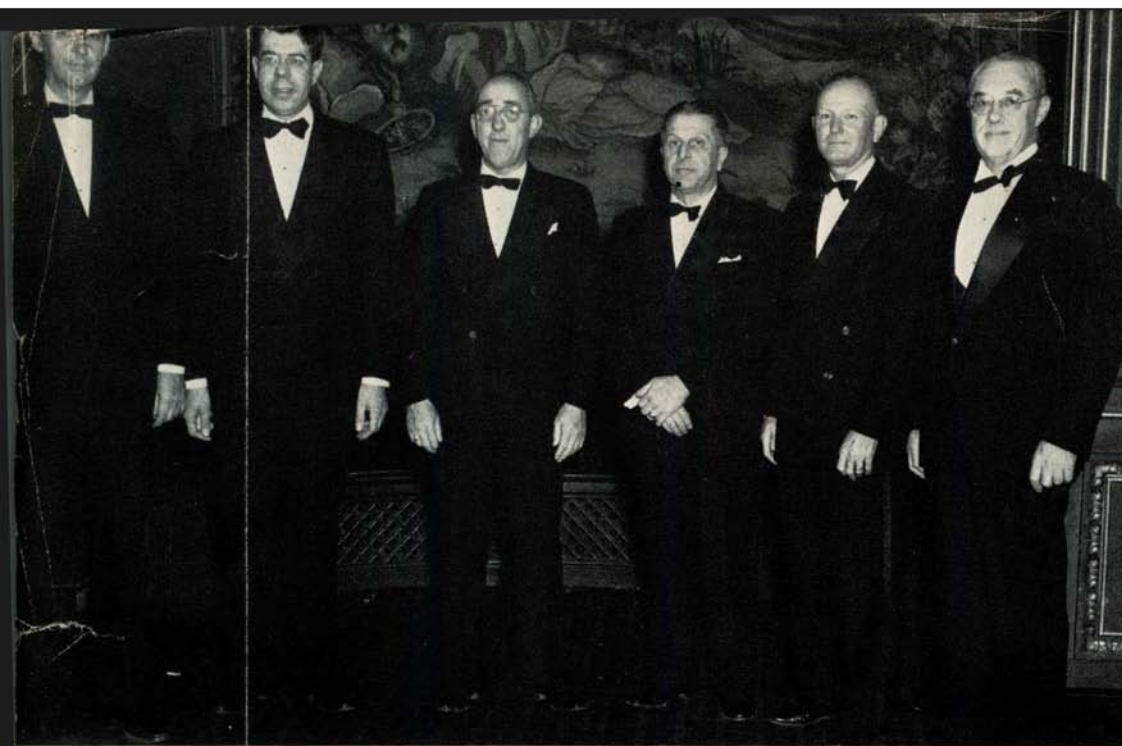
William C. Taylor, vice-president and director of manufacturing and engineering at Corning Glass Works, delivered the annual Edward Orton Jr. Fellow Lecture at the General Session. "The Effect on Glass of Half a Century of Technical Development" was his subject. Preceding the Orton

Lecture, Hewitt Wilson, director of the Southeastern Region, United States Bureau of Mines, addressed the gathering on the topic "New Minerals for Ceramics." The morning session also included a film on atomic energy.

The technical sessions of The Society's eight Divisions began on Monday afternoon and continued through Wednesday afternoon. An outstanding selection of papers, reporting new fields of research, was presented, many of which will be published in the *Bulletin* and *Journal* the coming months. At many sessions latecomers found only standing room available. The newly formed Basic Science Division got off to an auspicious start with well-attended sessions and spirited discussions following the presentation of papers.

J. W. Hepplewhite (left), the outgoing President, presenting the gavel of office to Howard R. Lillie, newly elected President of The Society. W. Edward Cramer (right), President-Elect for 1952-1953 looks on.





New officers of The American Ceramic Society for 1951-1952 are (left to right): R. Lillie, President; Edwin M. Rupp, Treasurer; W. Edward Cramer, President-Elect; Ray W. Pafford, Vice-President; Arthur A. Wells, Vice-President. Probert W. Dager, Vice-President; Howard



The Board of Trustees dinner. Seated | Carolina Ceramics, Inc.; Ray W. Pafford | Glass Works; J. W. Hepplewhite, Ferrl | Aaron K. Lyle, Hartford-Empire Co.; F.]

A capacity crowd turned out for the floor show Monday night in the Grand Ball Room, where even all standing space was occupied. An exceptionally entertaining program was arranged for the occasion, including dancing girls from the Empire Room of the Palmer House, a puppeteer from the Boulevard Room of the Stevens Hotel, an acrobatic exhibition, music by a male quintet, and selections by a harmonica imitator. After the floor show, dancing was enjoyed by the crowd.

Covers were laid for more than 400 at the General Banquet Tuesday evening in the Red Lacquer Room. High lights of this affair were the installation of the 1951-1952 slate of

Robert Twells (left) presenting the Ross Coffin Purdy Award to Ralph K. Hursh.



officers, presentation of annual awards, and introduction of new Fellows. Dancing followed the banquet program.

### ***Ralph Hursh Receives Purdy Award***

The Ross Coffin Purdy Award, presented annually for "the most valuable contribution to ceramic technical literature," was received at the banquet by Dr. Ralph K. Hursh, Emeritus Member of The American Ceramic Society and a University of Illinois faculty member since 1911.

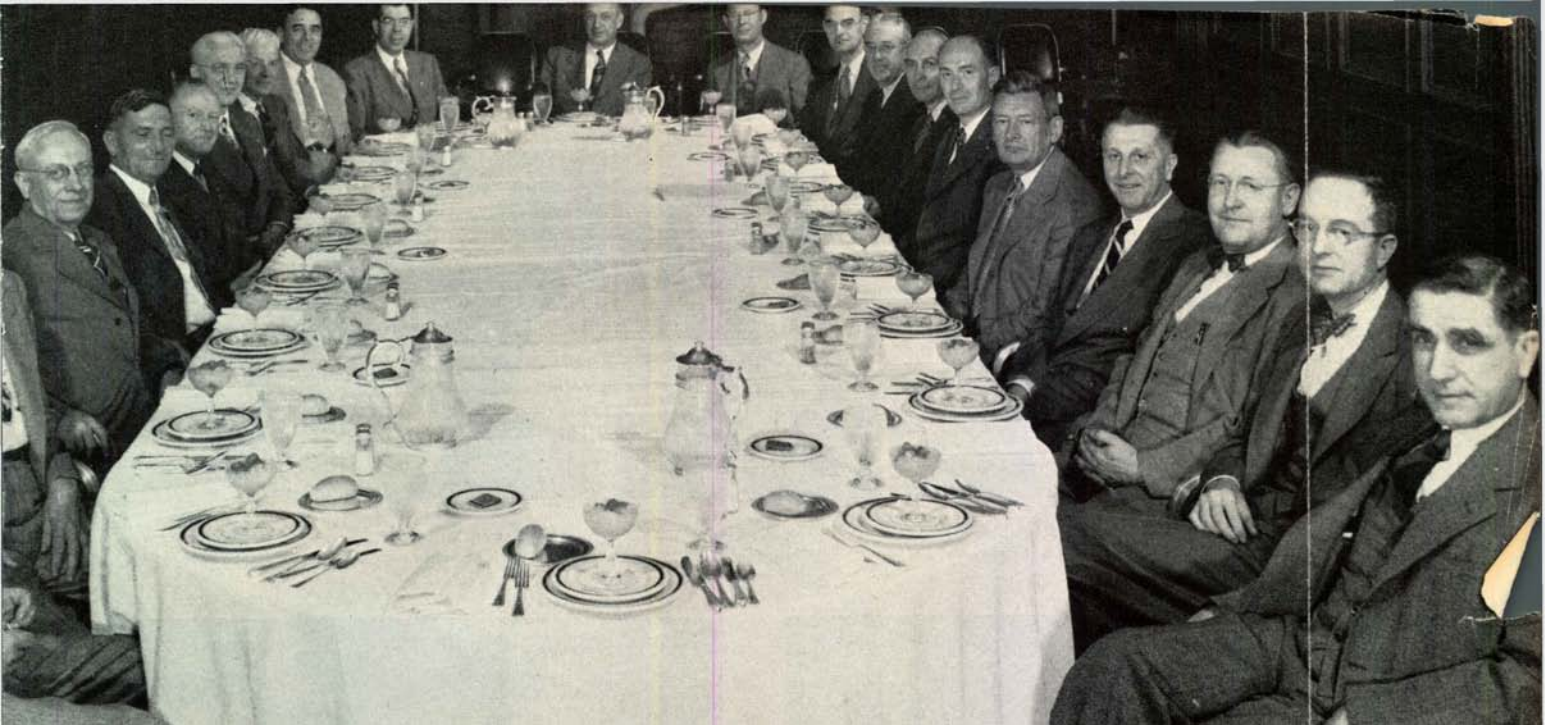
Dr. Hursh is the third winner of the Award, which is the highest The Society can bestow. It is given in memory of the late Ross Coffin Purdy, who for 25 years was General Secretary of The American Ceramic Society. The coveted Award is a plaque of photosensitive glass bearing a photograph of Dr. Purdy and an inscription.

The paper which won Dr. Hursh the Award is "Developments of a Porcelain Vacuum Tube" which was published in the March, 1949 issue of the *Journal*, pp. 75-80. A biography of Dr. Hursh appeared on p. 27 of last January's *Bulletin*. Dr. Ivan Peyches, director of research for the St. Gobain Co., Paris, France, was winner of the Award last year, and in 1949 the first Purdy Award went to F. P. Hall and Herbert Insley for their work in compiling Phase Diagrams for Ceramists, published in 1947 by The American Ceramic Society.

### ***Five Students Given Ferro Awards***

Raymond J. Brown of Berwyn, 111., who will receive a B.Sc. degree in Ceramic Engineering this June from the University of Illinois, was winner of the \$500 first prize in the Ferro Enamel Corp. Second Annual Student Contest for the best papers on porcelain enameling technology. His paper was entitled "The Littleton Softening Point Test as a Method of Measuring Frit Fusibility."

Presentation of the Ferro Awards, totaling \$1000, were made at the Monday afternoon session of the Enamel Division. Second prize of \$300 went to Harold P. Cahoon of Salt Lake City, Utah, whose paper was entitled "The Use of Phosphors in Vitreous Enamels." Mr. Cahoon received



From left to right: Probert W. Doger, H. C. Spinks Clay Co.; William E. Dougherty, O. Hommel Co.; T. A. Klinefelter, U. S. Bureau of Mines, Raleigh, N. C. ; L. R. Whitaker, Corning Glass Co.; Robert Twells, Electric Auto Lite Co.; John W. Whittemore, Virginia Polytechnic Institute; R. B. Carothers, H. C. Spinks Clay Co.; Howard R. Lillie, Corning Glass Co.; H. M. Kroner, Bethlehem Steel Co.; Stuart M. Phelps, Mellon Institute; Arthur A. Weils, Homer Laughlin China Co.; Hewitt Wilson, U. S. Bureau of Mines, Tenn.; John D. Norton, Massachusetts Institute of Technology; W. E. Cramer, Industrial Ceramic Products, Inc.; G. H. Spencer-Strong, Pemco Corp.; Karl Schwartzwolder, A C Spark Plug Co.; and John D. Sullivan, Battelle Memorial Institute.

a master's degree in ceramic engineering at the University of Washington and is now pursuing his doctor's degree at the University of Utah, where he completed his undergraduate work.

William F. Carroll of Pasadena, Calif., a student at the University of Washington, won the \$100 third prize for his paper on "Vitreous Enamel for Aluminum." Awards of \$50 each were presented the fourth and fifth place winners, who were, respectively, Paul C. Gaertner, Jr., now on duty as a U. S. Naval Reserve officer, and Charles K. Russell, a senior at the University of Illinois. Mr. Gaertner, who completed his paper while a student at Georgia Institute of Technology, wrote on "An Investigation of the Use of a Semi-Conducting Porcelain Enamel as a Means of Producing Copper-Copper Oxide Rectifiers." Mr. Russell, who won third place in last year's contest, wrote about "The Effect of Thermal Expansion on the Torsional Adherence of Porcelain Enamels."

The Awards were presented by Dr. G. H. McIntyre, vice-president and director of Research of Ferro Enamel Corp. Judges were Dr. McIntyre, Charles S. Pearce, General Secretary of The American Ceramic Society, and Edward Mackasek, managing director of the Porcelain Enamel Institute, Inc.

### ***New Fellows Inducted***

Members elected to the Society Fellowship the past year were presented with Fellowship certificates at the General Banquet. They were Frederic L. Bishop, Jr., of American Window Glass Co.; Ralph K. Day, Libbey-Owens-Ford Glass Co.; Howard Failmezger, Victor Insulators, Inc.; Norbert J. Kreidl, Bausch and Lomb Optical Co.; Gordon R. Pole, Minnesota Mining and Manufacturing Co.; Merle D. Rigterink, Bell Telephone Laboratories; Games Slayter, Owens-Corning Fiberglas Corp.; A. Paul Thompson, Eagle-Picher Co., and Lorenzo R. Whitaker, Carolina Ceramics, Inc.

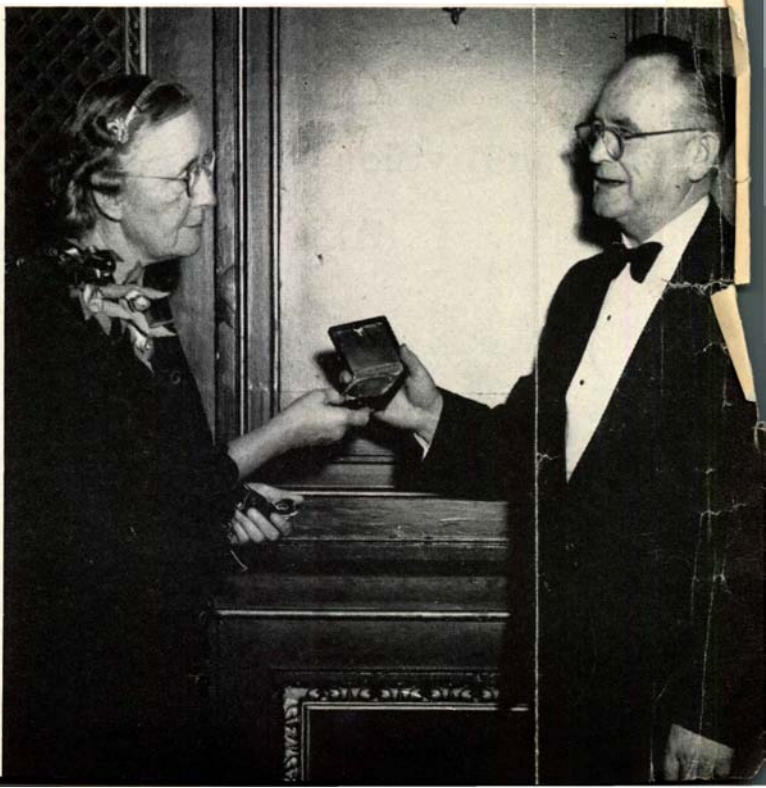
Newly elected Fellows who were not present at the Banquet included John H. Chesters of United Steel Co., Ltd.,

England; George J. Easter, Electro Refractories and Aluminates Corp.; A. T. Green of the British Ceramic Research Association, England; Russell P. Heuer, General Refractories Co.; Arnold E. Pavlish, Kelley Island Lime and Transport Co., and Armando de Arruda Pereira, Ceramic Sao Caetano, Brazil.

### ***Miss Cable Awarded Binns Medal***

Miss Margaret K. Cable, who for many years served on the faculty of the ceramic department at the University of North Dakota, was presented the Charles Fergus Binns Medal

Margaret Cable (left) receiving the Charles Fergus Binns Medal from John F. McMahon.



## Basic Science Division Officers, 1951-1952



V. J. Duplin, Jr.  
Trustee

E. F. Osborn  
Chairman

N. W. Taylor  
Chairman-Elect

Herbert Insley  
Vice-Chairman

Helen B. Barlett  
Secretary



Sunday evening reception in Red Lacquer Room.



Raymond J. Brown (left), University of Illinois, winner of the Ferro Award, is congratulated by G. H. McIntyre. His paper, "The Littleton Softening Point Test as a Method of Measuring Frit Fusibility," took the \$500 first prize in the contest.

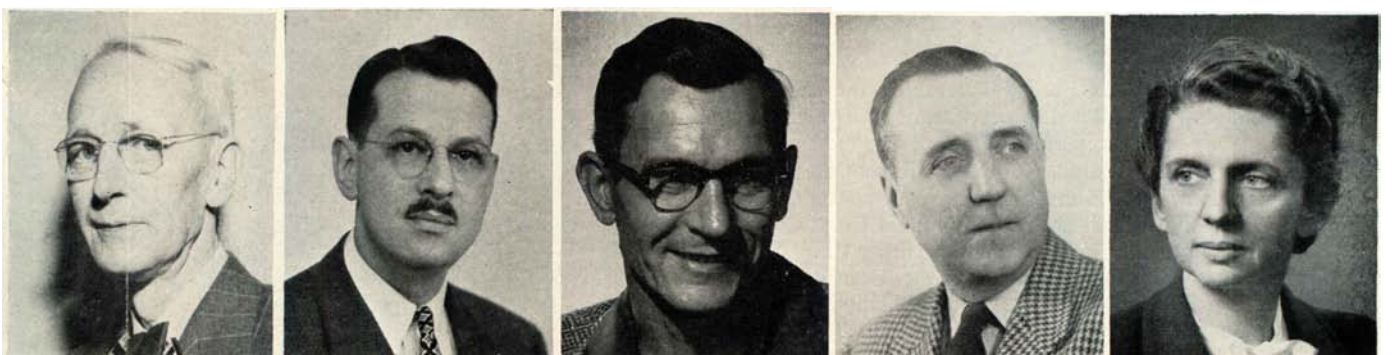
for outstanding contribution to ceramic design. This medal is given by former students of Charles Fergus Binns, first director of the New York State College of Ceramics and a Past President of The American Ceramic Society, to the ceramist who has produced the most outstanding piece of ceramic artware or ceramic design.

Miss Cable, who had studied with Prof. Binns at Alfred University, now operates a small art pottery in southern California.

### ***Fourteen in Speaking Contest***

Fourteen students from as many ceramic schools partici-

## Design Division Officers, 1951-1952



R. Guy Cowan  
Trustee

Marvin G. Yutzy  
Chairman

Paul Bogatay  
Vice-Chairman

F. J. Vontury  
Vice-Chairman

Claudia G. Boynton  
Secretary

# Lname Division Officers, 1951-1952



G. H. Spencer-Strong  
Trustee



E. E. Howe  
Chairman



E. E. Marbaker  
Vice-Chairman



Wayne A. Deringer  
Secretary

ated in the Student Speaking Contest this year. Walter F. >ynsavage of Pennsylvania State College won first place or his presentation on "Foam Glass." He received an award if \$15 and a one-year American Ceramic Society membership. Second place winner was George Ev. Spring of Georgia nstitute of Technology who spoke on "Glass Mold Cleaning

by Liquid Honing," while placing third was Carl J. Kohler of the University of Texas for his talk on "Electronic Drying of Ceramic Bodies." Mr. Spring was awarded \$10 and Mr. Kohler \$5. Both received a one-year Society membership. Winner of the fourth prize was Oscar Manz of the University of Saskatchewan, who won a one-year Society membership.

resident Hepplewhite introducing Dr. William C. Taylor, the Orton Lecturer, at the Monday General Session.

Hewitt Wilson addresses the General Session on New Minerals for Ceramics.



# ilass Division Officers, 1951-1952



K. C. Lyon  
Trustee



C. E. Leberknight  
Chairman



F. V. Tooley  
Vice-Chairman



F. L. Bishop  
Secretary

## Materials and Equipment Division Officers, 1951-1952



W. E. Dougherty  
Trustee

C. M. Lambe, Jr.  
Chairman

Andrew Pereny  
Vice-Chairman

Frank Jansma  
Secretary

His topic was "Use of Saskatchewan Ball Clay in White-ware." The winning papers will appear in coming issues of the *Bulletin*.

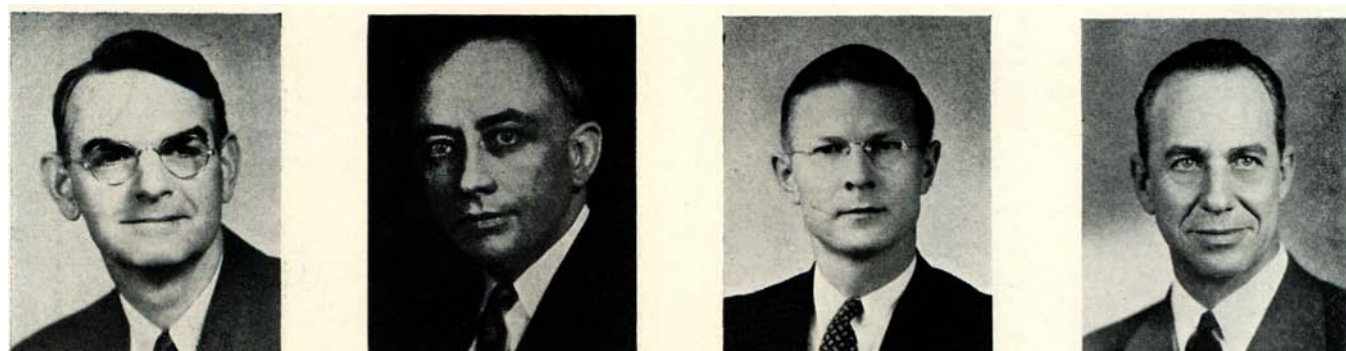
Other speakers and the titles of their papers were: Samuel H. Filreis, North Carolina State College, "Porcelain Enamel for Aluminum"; Fennimore Bradley, University of Washing-

ton, "Advertising and the Future of Ceramics"; John R. Neely, Missouri School of Mines, "Radiant Energy for Drying Ceramic Ware"; Stanley D. Mark, Jr., Ohio State University, "Developing Special Refractories for Use in Rocket Combustion"; James W. Parker, Jr., Clemson College, "Production of a Satisfactory Grog from Domestic

New Fellows inducted at the Meeting. Front row (left to right): K. Day, A. Paul Thompson, Frederic L. Bishop, Jr., Howard Failmezger, Norbert J. Kreidl. Back row (left to right): Ralph Gordon R. Pole, Games Slayter, Lorenzo R. Whitaker, and Merle D. Rigterink.

New Trustees: William E. Dougherty (left), Materials and Equipment Division; and A. Curtis Jackson, Structural Clay Products Division, took office at the Meeting.

## Refractories Division Officers, 1951-1952



Stuart M. Phelps  
Trustee

A. Paul Thompson  
Chairman

Ralph R. Rhodes  
Vice-Chairman

F. W. Schroeder  
Secretary

## Structural Clay Products Division Officers, 1951-1952



A# Curtis Jackson  
Trustee

J.J.C. Steele, Jr.  
Chairman

Paul V. Johnson  
Chairman-Elect

T. E. Carothers  
Vice-Chairman

Eugene C. Clemens  
Secretary



Student Speaking Contest winners (left to right): Oscar Manz, University of Saskatchewan, fourth prize winner; George Ev. Spring, Georgia Institute of Technology, second; Walter F. Lynsavage, Pennsylvania State College, first; and Carl J. Kohler, University of Texas, third.



Shown at right above are all the Student Speaking Contest entrants at the 53rd Annual Meeting. Front row (left to right): Carl J. Kohler, University of Texas; Samuel H. Filreis, North Carolina State College;

Fennimore Bradley, University of Washington; John R. Neely, Missouri School of Mines; Stanley D. Mark, Jr., Ohio State University; and James W. Parker, Jr., Clemson College. Back row (left to right): Walter F. Lynsavage, Pennsylvania State College; Robert M. Pinkham, Virginia Polytechnic Institute; Francis V. Pixley, New York State College of Ceramics; George Ev. Spring, Georgia Institute of Technology; Charles K. Russell, University of Illinois; James D. Welterlen, Iowa State College; Duncan C. Morrison, Rutgers University; and Oscar Manz, University of Saskatchewan.

Kyanite"; Robert M. Pinkham, Virginia Polytechnic Institute, "Correlation of Heat Treatment, Water Absorption and Strength of Structural Building Units"; Francis V.

Pixley, New York State College of Ceramics, "Temperature Variations in a Tunnel Kiln"; Charles K. Russell, University of Illinois, "The Torsion Test as Applied to Porcelain Enam-

## White Wares Division Officers, 1951-1952



Karl Schwartzwalder  
Trustee

Hal H. Rice  
Chairman

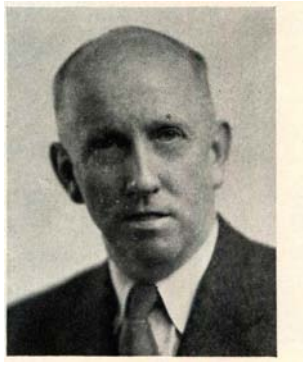
George T. Morse  
Vice-Chairman

Ralph E. Gibson  
Secretary

## Institute of Ceramic Engineers Officers, 1951-1952



Robert Twells  
Trustee



George J. Easter  
President



A. H. Couch  
Vice-President



A. I. Andrews  
Secretary-Treasurer



Part of the audience which filled the Grand Ball Room of the Palmer House to see the Floor Show Monday evening.



Francis J. Calverley (left), winner of the \$64 Question, receiving his 64 silver dollars from Wharton Jackson, President of Georgia Kaolin Company.

els"; James D. Welterlen, Iowa State College, "The Laboratory Application of Plastic Pressing"; Duncan C. Morrison, Rutgers University, "A Petrographic Study of a Refractory Block-Glass Interface."

### Women Enjoy Activities

Approximately 250 women took part in the activities arranged for their entertainment during the Meeting. A luncheon and style show was held on Monday in the Wedgewood Room of the Marshall Field store, and a tea on Tuesday afternoon in the Grand Ball Room of the Palmer House. Lillian Brodahl Smith, widely known midwestern monologist,

entertained at the tea. Wednesday's activities featured a book review by Florence Bourke Ellis and a plant trip to Haeger Potteries, Dundee, 111. Some of the women also enjoyed the performance of "South Pacific" and a tour of the Merchandise Mart.

### View MacArthur Day Parade

Officers of The American Ceramic Society, exhibitors, and other members who remained in Chicago Thursday afternoon had the opportunity of watching from the exhibition hall the parade honoring General Douglas MacArthur.

## Ceramic Education Council Officers, 1951-1952



F. H. Norton  
Trustee



J. F. McMahon  
President



W. W. Kriegel  
Vice-President



R. L. Cook  
Secretary



Howard R. Lillie was installed as President of The American Ceramic Society at the General Banquet held during the 53rd Annual Meeting in Chicago.

Mr. Lillie, who is research physicist for Corning Glass Works, Corning, N. Y., succeeds J. W. Hepplewhite as head of the Society.

## *Howard R. Lillie Takes Office as President*

Howard R. Lillie, research physicist for Corning Glass Works, Corning, N. Y., became the 53rd President of The American Ceramic Society when he took office at the 53rd Annual Meeting. Other officers installed at the Meeting included William E. Cramer, President-Elect; Probert W. Dager, Ray W. Pafford and Arthur A. Wells, Vice-Presidents, and Edwin M. Rupp, Treasurer. Charles S. Pearce, General Secretary of The Society, is starting his seventh year in that office.

President Lillie was born on May 13, 1902, in Northeast, Pa., and attended high school in Ripley, N. Y. He majored in mathematics and physics at Allegheny College, Meadville, Pa., where he received a degree in 1924. For the next three years he was a graduate assistant in the Physics Department of the University of Wisconsin, receiving his M.Sc. degree in 1926.

In 1927 Mr. Lillie became associated with Corning Glass Works, joining the staff of the Research Laboratory as assistant physicist. He was made research physicist in 1933, working on the physical properties of glass, including viscosity, expansion, color, and refractive index. He has had many technical papers printed concerning his work and holds a number of patents.

The new President has been active in The American Ceramic Society since joining the organization in 1935. He was named a Society Fellow in 1942 and was Chairman of the Glass Division in 1948-1949.

William E. Cramer, President-Elect for the coming year, is president of his own company, Industrial Ceramic Products, Inc., of Columbus, Ohio. He has been Treasurer of The Society since 1946, in which year he was also elected a Fellow. He joined The Society in 1920 and has been prominent in the activities of the Central Ohio Section, having served as Section Chairman and Councilor.

Born in Fostoria, Ohio, on May 6, 1897, Mr. Cramer received a B.Sc. degree in ceramic engineering from Ohio

State University in 1920. The Professional Degree of Ceramic Engineer was conferred upon him by that university in 1936.

In 1920 Mr. Cramer became associated with the Mount Clemens Pottery Co., Mount Clemens, Mich., and the following year joined the General Porcelain Co., Parkersburg, W. Va. Later he was associated with Carl Harrop of Columbus, Ohio, specializing in tunnel-kiln design, operation, and sales, and in 1927 was associate organizer of the Harrop Ceramic Service Co. He organized his own company in 1936.

Vice-President Probert W. Dager is sales engineer for the H. C. Spinks Clay Co. at Van Nuys, Calif. He was born September 29, 1906, in Lorain, Ohio, and was graduated in 1923 from North High School, Columbus, Ohio. He received a bachelor degree in ceramic engineering from Ohio State University in 1929 and was presented the Professional Degree of Ceramic Engineer by Ohio State in 1939.

Mr. Dager was formerly associated with the Champion Spark Plug Co. of Detroit, Mich.; Joaquin Pottery Co., Stockton, Calif.; Edwin M. Knowles China Co. Newell, W. Va.; California Art Products Co., Santa Monica, Calif., and the Pacific Clay Products Co., Los Angeles, Calif. He joined the H. C. Spinks Clay Co. as Pacific Coast representative in 1946. Mr. Dager's membership in The Society dates from 1931. He became a Fellow in 1950 and is a member of the Institute of Ceramic Engineers.

Vice-President Ray W. Pafford is vice-president and general plant manager of the Acme Brick Co., Fort Worth, Tex. He has been associated with Acme Brick since January 3, 1921.

A native of Texas, Mr. Pafford was born April 30, 1900, in Denton and was graduated from Justin High School, Justin, Tex. He attended Southern Methodist University at Dallas, Tex., and the University of Texas at Austin. He has been a member of The Society since 1943.



W. E. Cramer  
President-Elect

Vice-President Arthur A. Wells is vice-president and general superintendent of the Homer Laughlin China Co., Newell, W. Va. He was born in East Liverpool, Ohio, October 17, 1898, and attended East Liverpool public schools and Lawrenceville School, Lawrenceville, N. J., from which he was graduated in 1913. In 1922 he received the Bachelor of Arts degree from Princeton University, Princeton, N. J.

Following his graduation from Princeton, Mr. Wells became affiliated with the Homer Laughlin Co. Here he worked under Albert V. Bleining until he became plant superintendent in 1928. He was made vice-president and general superintendent in 1934. Mr. Wells has been a member of The Society since 1923 and a Fellow since 1941.

Edwin M. Rupp, The Society's new Treasurer, is a sales engineer, representing United Feldspar and Minerals Corp. and National Engineering Co. He resides in Columbus, Ohio.

Mr. Rupp was born October 8, 1898, in Middletown, Ohio, and was graduated in 1917 from Middletown High School. He attended Purdue University, Lafayette, Ind., where he was enrolled in chemical engineering, and was graduated from Ohio State University in 1921 with a bachelor of science degree in ceramic engineering. He has been associated with the National Fireproofing Co. of Keyport, N. J.; U. S. Bureau of Mines; Surface Combustion Co., Toledo, Ohio; Cambridge Tile Manufacturing Co., Cincinnati, Ohio, and Square Deal Co., Peru, Ind.

Treasurer Rupp joined The Society in 1923 and was made a Society Fellow in 1947. He is a member of the Institute of Ceramic Engineers.

Charles S. Pearce, General Secretary of The Society since 1946, was born in Wichita, Kan., August 28, 1898, and was graduated from high school in Steubenville, Ohio, in 1916. After several years with the Weirton Steel Co., Weirton, W. Va., he entered Carnegie Institute of Technology at Pittsburgh, Pa., in 1920 and two years later transferred to Ohio State University where he received a bachelor's degree in business administration in 1924.

Mr. Pearce was formerly associated with the Tennessee Furniture Co., Chattanooga, Tenn., and the Delco-Light Co., Dayton, Ohio, which later became the Frigidaire Division of General Motors Corp. He was placed in charge of the Porcelain Enameling Department of the latter organization in 1930. In the fall of 1935 he was appointed assistant director of personnel for the Resettlement Administration with headquarters in Washington, D. C., and early in 1938, he became managing director of the Porcelain Enamel Institute. A member of The American Ceramic Society since 1942, Mr. Pearce joined the staff as Associate Secretary in 1944 and was elected a Fellow in 1948.



Probert Dager  
Vice-President



R. W. Pafford  
Vice-President



A. A. Wells



E. M. Rupp  
Treasurer



Charles S. Pearce  
General Secretary



Pittsburgh—to be scene of 54th Annual Meeting, April 27-May 1, 1952.



# Institute of Ceramic Engineers

## Engineers Council Appoints Regional Inspectors

The Engineers Council for Professional Development has appointed a list of regional inspectors upon the recommendation of the Institute of Ceramic Engineers. These inspectors are charged with the responsibility of inspecting collegiate ceramic engineering departments for ECPD accreditation. The inspectors for the seven regions are as follows:

### Region I (Me., Vt., N. H., Mass., Conn., R. I.)

M. F. Beecher, Norton Co., Worcester 6, Mass.  
J. H. Koenig, School of Ceramics, Rutgers University, New Brunswick, N. J.

### Region II (N. Y., N. J., Pa., Del.)

J. R. Beam, Trenton Potteries, Trenton, N. J.  
G. J. Easter, Electro Refractories and Abrasives Corp., Buffalo 19, N. Y.

### Region III (Minn., Wis., Mich., Ohio, Ind., Ill., Iowa)

H. M. Kraner, Research Dept., Bethlehem Steel Corp., Bethlehem, Pa.  
W. E. Cramer, Industrial Ceramic Products, Inc., 965 W. 5th Ave., Columbus 12, Ohio

### Region IV (D. C., Md., Va., W. Va., Ky., Tenn., N. C., S. C., Ga., Fla., Ala., Miss.)

J. W. Whittemore, Ceramic Dept., Virginia Polytechnic Institute, Blacksburg, Va.  
G. H. Spencer-Strong, Pemco Corp., 5601 Eastern Ave., Baltimore 24, Md.

### Region V (Kan., Mo., Okla., Ark., La., E. Texas)

C. M. Dodd, Ceramic Engineering Dept., Iowa State College, Ames, Iowa  
R. S. Bradley, A. P. Green Fire Brick Co., Mexico, Mo.

### Region VI (Calif., Nev., Utah, Colo., Ariz., N. Mex., W. Texas)

A. Lee Bennett, Gladding, McBean and Co., 2901 Los Feliz Blvd., Los Angeles 26, Calif.  
P. W. Dager, H. C. Spinks Clay Co., 14743 Morrison St., Van Nuys, Calif.

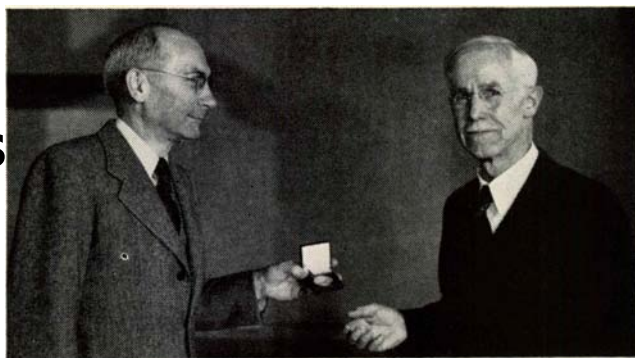
### Region VII (Wash., Ore., Ida., Mont., Wyo., N. D., S. D., Neb., Alaska)

J. A. Pask, Division of Mineral Technology, University of California, Berkeley 4, Calif.  
C. A. Freeman, Freeman Fire Brick Co., Box 606, Canon City, Colo.

## Members to Be Kept on Institute Rolls While in Service

Members of The Institute of Ceramic Engineers who enter the armed forces of the United States during the present national emergency will be retained on the membership rolls of The Institute without payment of dues. This service was adopted by vote of the Executive Committee of the Institute, and is expected to remain in effect throughout the national emergency.

To qualify for the plan, men must be members in good standing of The American Ceramic Society and The Institute of Ceramic Engineers at the time of entering the armed forces. They must notify The Society office of their entry into service, and upon leaving service must notify the office promptly and resume normal payment of dues.



Walter Austin Hull (right), ceramic engineer, Bureau of Mines, Electro-technical Laboratory, Norris, Tennessee, receives the Department of Interior silver medal for meritorious service from Hewitt Wilson, regional director, Region VII, the Bureau of Mines, Norris, Tennessee.

## Walter A. Hull Awarded Medal by Interior Department

Walter A. Hull, ceramic engineer in refractories at the U. S., Bureau of Mines' Electrotechnical Laboratory, Norris, Tenn., has been presented the Department of Interior silver medal for meritorious service. He also received a lapel pin, citation, and a National Parks life pass.

An official citation of the award, signed by Oscar L. Chapman, Secretary of the Interior, declared that Mr. Hull was retired May 31, 1950, and immediately retained on temporary duty because of his unusual value to the Bureau of Mines. "During his period of service with the Bureau of Mines," the citation read, "he has improved laboratory techniques and developed a new method for preliminary evaluation of the spalling resistance of special refractories, such as kyanite and mullite. His keen interest, exceptional ability, and the efficient and loyal manner in which he has undertaken all assignments entitle Mr. Hull to receive the Meritorious Service Award of the Department of the Interior."

Mr. Hull began work with the Electrotechnical Laboratory in August, 1944, as ceramic engineer. He had worked as a physicist with the National Bureau of Standards, first in a laboratory at Pittsburgh, Pa., and later at Washington, D. C., from March, 1914 to May, 1923. The following seven years he was with the Midland Terra Cotta Co., Chicago, which has its plant at Cicero, Ill. With that company, he was vice-president in charge of production and research. Immediately before coming to the Electrochemical Laboratory, Mr. Hull had worked two years with the Atlas Lumite Cement Co. near Chicago.

Mr. Hull was born in Orangeville, Trumbull County, Ohio, on September 5, 1879. He received the degree of engineer of mines in ceramics from the then new ceramics school at Ohio State University, Columbus, studying under the school's founder, Edward Orton, Jr. The professional degree of Ceramic Engineer was conferred on him in 1933 by Ohio State.

A member of The American Ceramic Society since 1921, Mr. Hull is a Fellow of The Society and belongs to the Tennessee Valley Local Section. He has written a number of technical papers, some of which have been published in the *Journal* and *Bulletin*.

## Chicago Engineers Club Elects New Officers

Richard D. Rudd of the Carborundum Co. was elected chairman of the Chicago Engineers Club at a meeting of the organization on March 30. J. Scott Griffith of Armour Research Foundation was named vice-chairman; George Rosenwinkle of North American Refractories Co., secretary-treasurer, and Dwight Bennett of the University of Illinois, counselor.

Retiring Chairman Robert Rea presided and introduced Charles S. Pearce, General Secretary of The American Ceramic Society, who spoke briefly.

Speaker of the evening was George Eyerly of Argonne National Laboratories. Mr. Eyerly presented an interesting discussion of "Ceramics in Atomic Energy" and illustrated his talk with sound movies. Fifty-one attended the dinner-meeting.

# MEET OUR AUTHORS



W. M. Conn

**Willi M. Conn**, assistant professor of physics at Rockhurst College, Kansas City, Mo., is author of the lead-off article in this month's *Bulletin*. He describes the recently developed solar furnace which has proved a valuable tool for high-temperature research. Dr. Conn received his doctorate in engineering from Berlin Institute of Technology and has specialized in high-temperature research both in Europe and America.

An investigation conducted at the New Jersey Ceramic Research Station under the sponsorship of the Office of Naval Research produced the paper, "A High-Temperature Vacuum Induction Furnace," presented by **Harold T. Smyth, Robert H. Meinken, and Leonard G. Wisnyi** on pp. 161-63 of the *Journal*.

The authors are, respectively, research professor, research associate, and research assistant at the Research Station, Rutgers University. Dr. Smyth holds B.Sc. and M.Sc. degrees from Queen's University, Belfast, Ireland, and obtained his Ph.D. in physics from Massachusetts Institute of Technology. He was formerly research physicist and later director of research for Corhart Refractories Co., Louisville, Ky., and for the Kellex Corp. at Johns Hopkins Applied Physics Laboratory, Silver Spring, Md. Mr. Meinken was graduated from Rutgers in 1949 and at present is a graduate student there.



Robert H. Meinken

Work done in fulfilling requirements for a master's degree is presented by **R. J. McEvoy**, with **A. I. Andrews** as co-author, in "A Study of Spalling Found in Porcelain Enamel After Repeated Freezing and Thawing in the Presence of Moisture," pp. 135-41 of the May *Journal*. Mr. McEvoy received his M.Sc. degree from the University of Illinois in 1950 and is now an instructor in the Department of Ceramic Engineering there. He served in the U. S. Marine Corps from 1942 to 1946 and finished his undergraduate work at Illinois in 1947. Dr. Andrews is head of the Ceramic Engineering Department at the University of Illinois. A Past President of The American Ceramic Society, he is currently secretary-treasurer of The Institute of Ceramic Engineers. His photograph is published on page 184 of this issue. Dr. Andrews received his B.S. degree in chemistry and his M.S. degree

from the University of Wisconsin at Madison. After receiving his Ph.D. degree in industrial chemistry at Ohio State University, Columbus, he became professor of ceramic engineering at Alfred University, Alfred, N. Y. In 1925 he became assistant professor at the University of Illinois, where in succeeding years he advanced to his present post as department head.



H. E. CoVan



Harold T. Smyth

Another Emeritus Member and another Past President of The Society are co-authors of a *Bulletin* paper this month. On pp. 170-73 **H. E. CoVan** and **John L. Carruthers** write about "A Carbon Resistance Furnace for P. C. E. Tests." Mr. CoVan, whose membership in The Society dates from 1908, attended the Ohio State University Clay Working Course from 1904 until 1907, after which he worked as chief burner for the Laclede-Christy Clay Products Co. In 1910 he became general manager of Price Pyrometer Co., Cleveland, and in 1926 joined the Bailey Meter Co., also of Cleveland, as head of the Pyrometer Department. In 1928 he became associated with the Edward Orton Jr. Ceramic Foundation in Columbus, Ohio, working on technical and production development. Mr. Carruthers, who was President of The Society from 1940-1941, is chairman of the Department of Ceramic Engineering at Ohio State University. He is a member of the founder's group of the Institute of Ceramic engineers. Prof. Carruthers received his bachelor of ceramic engineering degree from Ohio State University and holds a degree of Professional Engineer from Ohio State. He has been on the faculty there since 1925.

**Scott Anderson** and **D. D. Kimpton**, who discuss "Interference Films on Glass" in this month's *Journal*, pp. 141-55, are director and physical chemist, respectively, at the Anderson Physical Laboratory, Champaign, Ill. Dr. Anderson holds master's and doctor's degrees from the University of Illinois, where he was a University Fellow five years. Dr. Kimpton received a B.Sc. degree in industrial chemistry from Case Institute of Technology,

and later director of research for Corhart Refractories Co., Louisville, Ky., and for the Kellex Corp. at Johns Hopkins Applied Physics Laboratory, Silver Spring, Md. Mr. Meinken was graduated from Rutgers in 1949 and at present is a graduate student there.



R. J. McEvoy

Work done in fulfilling requirements for a master's degree is presented by **R. J. McEvoy**, with **A. I. Andrews** as co-author, in "A Study of Spalling Found in Porcelain Enamel After Repeated Freezing and Thawing in the Presence of Moisture," pp. 135-41 of the May *Journal*. Mr. McEvoy received his M.Sc. degree from the University of Illinois in 1950 and is now an instructor in the Department of Ceramic Engineering there. He served in the U. S. Marine Corps from 1942 to 1946 and finished his undergraduate work at Illinois in 1947. Dr. Andrews is head of the Ceramic Engineering Department at the University of Illinois. A Past President of The American Ceramic Society, he is currently secretary-treasurer of The Institute of Ceramic Engineers. His photograph is published on page 184 of this issue. Dr. Andrews received his B.S. degree in chemistry and his M.S. degree from the University of Wisconsin at Madison. After receiving his Ph.D. degree in industrial chemistry at Ohio State University, Columbus, he became professor of ceramic engineering at Alfred University, Alfred, N. Y. In 1925 he became assistant professor at the University of Illinois, where in succeeding years he advanced to his present post as department head.

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Theodore S. Jones



Cleveland, in 1945 and an M.Sc. in physical chemistry from Case the following year. He obtained his Ph.D. in physical chemistry from the University of Illinois in 1949 on the thesis "Ordinary Gaseous Diffusion."

A discussion of the program inaugurated by the Design in Industry Department of the Institute of Contemporary Art, Boston, Mass., is given by **Theodore S. Jones** in an article appearing on pp. 168-69 of this issue. Mr. Jones who has been director of the department since its inception in 1948, has an A.B. degree from Yale and an A.M. degree from Harvard, where he has also done admissions work. He was formerly dean of Hamilton College, Clinton, N. Y., and headmaster at Admiral Farragut Academy, St. Petersburg, Fla. From 1942 to 1945 he was an officer in the US NR, after which he served a year as editor of the Manual for Air Craft Anti-Submarine Warfare.

The "Effect of Grinding and Firing Treatment on the Crystalline and Glass Content and the Physical Properties of White ware Bodies" is told by **S. C. Sane** and **Ralph L. Cook** in this month's *Journal*, pp. 145-51. This work was carried out in the Department of Ceramic Engineering at the University of Illinois by the senior author in partial fulfillment of the M.Sc. degree. Mr. Sane is now in Arvi, India. Dr.



Frank Day, Jr.



Joseph P. Ambrosone

Cook is professor of ceramic engineering at the University of Illinois. He is serving this year as secretary of The Society's Ceramic Educational Council.

**Wilfrid R. Foster**, a former *Journal* author, returns this month to discuss the "Contribution to the Interpretation of Phase Diagrams by Ceramists" on pp. 151-60 of the *Journal*. Dr. Foster is petrographer with the Ceramic Division of the Champion Spark Plug Co.

**Frank Day, Jr.**, and **J. P. Ambrosone**, who collaborated on the final paper in this month's *Journal*, "Corrosion Resistance of Pure Alumina as a Glass Refractory," pp.

163-64, are associated with Corning Glass Works as manager of Melting Research and research chemist, respectively. Dr. Day received an A.B. degree in chemistry from Ohio State University in 1936 after which he was research engineer for Battelle Memorial Institute. He obtained his Ph.D. in physical chemistry at the University of Pittsburgh in 1941, the same year in which he joined Corning. Mr. Ambrosone, a 1943 chemistry graduate of Niagara University,

served in Chemical Warfare Service from 1943 to 1945 before becoming associated with Corning.

**Robert W. Cline**, who was a contributor to the *Bulletin* last August, presents another paper this month ("An Ink Absorption Test for Hotel Chinaware," pp. 174-75). Mr. Cline is plant ceramist for Buffalo Pottery, Inc.

Co-author of an article in the April *Bulletin*, **J. J. Keilen** has been associated the last 14 years with the West Virginia Pulp and Paper Co. Additional biographical data was published in the April *Bulletin*, p. 151.

### Purdy Award Nominations

Nominations should be made as soon as possible for the 1952 Ross Coffin Purdy Award, to be presented at the 54th Annual Meeting in Pittsburgh. Nominations should be based on technical articles published in recognized journals in the field of ceramics during the year 1950. Each Society Member may submit one nomination. Six copies of each nomination must be sent to General Secretary Charles S. Pearce at the Society offices, 2525 N. High St., Columbus 2, Ohio. Each nomination must be accompanied by a statement of the author's name, title of the technical article, where published, and a brief explanation of why the paper is considered suitable for the Award. For more complete information on the Ross Coffin Purdy Award, see the By-Laws and Rules of The American Ceramic Society as published in the February, 1949 *Bulletin*, articles B XII (pp. 64-65) and R XII (pp. 68-70).



Wilfrid R. Foster



J. J. Keilen

## New Members

### Personal

- ALLEN, BEN, Corning Glass Works, Corning, N. Y.; research chemist.  
 BLENKO, W. H., Jr., Blenko Glass Co., Inc., Milton, W. Va.; assistant general manager.  
 \*FERRARI, LEON, 1115—Castelar F.C.O., Buenos Aires, Argentina; industrial engineer.  
 LAWLESS, E. A., JR., Acme Brick Co., Millsap, Tex.; ceramic engineer.  
 MADSEN, LEIF E., A/S Den Norske Slipeskinfabr, Oslo, Norway; chemist.  
 SHAFFER, E. F., Ohio Power Co., 301-315 Cleveland Ave. S. W., Canton, Ohio; industrial sales supervisor.  
 \*TAILBY, ROLAND V., Stylon Corp., Box 341, Milford, Mass.; general manager.  
 TARQUINO, BRUCE L., Electro Refractories & Abrasives Corp., Willet Rd., Lackawanna, N. Y.; ceramic engineer.  
 YAMAMOTO, HIDEO, Asahi Glass Co., Ltd., Tokyo, Japan; deputy chief, research division.

### Junior

- \*SCHMITT, PAUL J., Mississippi Glass Co., 88 Angelica St., St. Louis, Mo.

### Students

- Me Master University:* PAUL A. MOSER  
*University of Texas:* HUEL H. CHANDLER, JR., CARROLL J. MAHAFFEY  
*Missouri School of Mines:* HELIO P. GUIMARAES, JAIME RAMIREZ  
*Clemson College:* RICHARD G. RION  
*Ohio State University:* SABAN S. ERDINC  
*University of Saskatoon:* EDWARD R. ARMSTRONG  
*New York State College of Ceramics:* DONALD F. BERGER, PIJUSH K. Roy  
*Virginia Polytechnic Institute:* WALLACE MERBLER

### Corporations

- KILGORE CERAMICS CORPORATION, P. O. Box 1619, Kilgore, Tex.  
 SOCIÉTÉ CERAMIQUE, Postbus 103, Maastricht, Holland

\* Former member of The Society rejoining.

## Endorsers for New Members

- Leo Moser 1, F. K. Pence 1, E. J. Weiss 1, C. E. Shulze 1, P. G. Herold 1, G. C. Robinson 1, R. Russell, Jr., 1, J. G. Brady 1, G. A. Kirkendale 1, V. D. Frechette 1, H. R. Forkaer 1, Frank Day, Jr., 1, M. Pafford 1, Rolf Knudsen 1, W. E. Williams 1, J. H. Koenig 1, A. C. Saunders 1, Y. Nakamura 1, Office 5.  
 TOTAL: 23.

## Roster Changes

### Personal

- BARNES, HARRY H., 166th Ftr. Sqd. Lockbourne AFB, Columbus, Ohio (New Lexington, Ohio)\*  
 BEAZELL, WILLIAM H., American Window Glass Co., Arnold, Pa. (Okmulgee, Okla.)  
 BIRD, PAUL G., 1928 N. Stoddard, Wheaton, 111. (Chicago, 111.)  
 BLACK, JONATHAN T., 315 South 11th St., Apt. 1-B, Bessemer, Ala. (Atlanta, Ga.)  
 BROWNE WELL, GEORGE E., 2445 Elm Ave., Columbus, Ohio (Somerville, N. J.)  
 BURCHFIELD, B. M., 4458 Westmoreland Court, Riverside, Calif. (Elsinore, Calif.)  
 BURNHAM, FORREST E., P. O. Box 197, Syracuse 1, N. Y. (East Liverpool, Ohio)  
 CAROTHERS, T. E., 509 E. Live Oak St., San Gabriel, Calif. (Arcadia, Calif.)  
 CORNELIUS, Y. R., 3125 E. Burnside St., Portland, Ore. (Seattle, Wash.)  
 DASGUPTA, A. K., 2903 E. Slauson, Huntington Park, Calif. (Los Angeles, Calif.)

- GREGORY, GLENN A., Owens-Illinois Glass Co., Alton, 111. (Charleston, W. Va.)  
 HELLRIEGEL, EDGAR J., 986 Hale St., Apt. B, Pottstown, Pa. (Hollis, N. Y.)  
 HOCKER, CLIFFORD F., 3009 N. Maryland Ave., Milwaukee 11, Wis. (Harrisburg, Pa.)  
 HOLDENER, IRWIN K., 433rd TCW 67th TCS, Greenville AFB, Greenville, S. C. (Bedford, Ohio)  
 JACOBI, PAUL, 729 W. 186th St., Apt. 5 M, New York, N. Y. (Syracuse, N. Y.)  
 JANSSEN, W. F., 15 Oak Ridge Rd., Basking Ridge, N. J. (Gillette, N. J.)  
 JEW ART, CHARLES N., 3997 S. Park Ave., Buffalo 19, N. Y. (North Boston, N. Y.)  
 JOHNSON, GEORGE E., JR., 3760 Thornton Dr., Cincinnati, Ohio (Blue Ash, Ohio)  
 KIRSCH, ALFRED J., 3151 Middlesex Dr., Toledo 6, Ohio (Hornell, N. Y.)  
 MCKEEN, RICHARD D., 2648 Robinson Blvd., Pittsburgh 21, Pa. (New Castle, Pa.)  
 REUNING, GEORGE W., JR., 13 Standish St., Frostburg, Md. (Alexandria, Pa.)  
 ROBERTS, MERVIN F., 116 Carpenter Ave., Crestwood, N. Y. (New York, N. Y.)  
 SALGO, ELMER T., International Ceramic Engineering, 1 Rue Lord Byron, Paris, France (Stockholm, Sweden)  
 SCHLEICHER, H. M., 408 Chilton St., Elizabeth, N. T. (Carteret, N. J.)  
 Seckman, HARRY D., 60 S. Miami St., Peru, Ind. (East Liverpool, Ohio)  
 SEITZ, WOLFRAM, General Delivery, Oceanside, Calif. (Los Angeles, Calif.)  
 SEVERSIKE, CARROLL L., 15 Intervale Rd., Nahant, Mass. (Erie, Pa.)  
 SMITH, W. L., Harris Clay Co., Spruce Pine, N. C. (Atlanta, Ga.)  
 URBAN, RICHARD F., 820 E St., Sparrows Point, Md. (Bethlehem, Pa.)  
 WELLS, RALPH G., 234 Atwood St., Pittsburgh 13, Pa. (Chicago, 111.)  
 YOUNG, JOHN C., Box 549, Whittier, Calif. (Long Beach, Calif.)

### Juniors

- DORSEY, JOHN J., 385 Good Ave., Indianapolis 19, Ind. (Wellsville, N. Y.)  
 FARR, ARCHIE E., 218 12th St., Holly Hill, Fla. (Batavia, N. Y.)  
 MULL, JOHN W., 280-A N. Main St., Cohasset, Mass. (Jeannette, Pa.)  
 RICHARDS, THOMAS Z., Room 457, Y.M.C.A., Worcester, Mass. (Selinsgrove, Pa.)  
 SHOPHER, STERLING D., 221 East Love, Mexico, Mo. (Rolla, Mo.)  
 WINSHIP, LEE C., 322 E. Allegany St., Emporium, Pa. (Salamanoa, N. Y.)

### Corporations

- LOCKE, INC., C. Lenz, Box 57, Baltimore 3, Md. (F. A. Ross)t  
 PYRO REFRACTORIES Co., O. E. Miller, Box 466, Oak Hill, Ohio (Chicago, 111.)  
 UNITED STATES STEEL Co., J. C. Eckel, 922 Carnegie Bldg., Pittsburgh, Pa. (Carnegie-Illinois Steel Corp.)

\* Address in parentheses is former address,  
 t Name in parentheses is former voter.

## Memberships and Subscriptions

	April 1950	April 1951	% Increase
Personal	2958	2861	- 3.3
Students	558	447	-19.9
Juniors	141	142	0.7
Corporations	355	355	0.0
Subscriptions	981	991	1.1
<b>Total Circulation</b>	<b>4993</b>	<b>4796</b>	<b>-3.9</b>



### Dr. Games Slayter Speaks to Central Ohio Section

Dr. Games Slayter, vice-president in charge of research for Owens-Corning Fiberglas Corp., addressed the Central Ohio Section when it met March 30 in Newark and Granville. "Potential Ceramic Modulus Combinations" was the topic of Dr. Slayter's talk, which discussed the combination of high modulus and low modulus components to produce high strength materials. One example of such a combination is the plastic-bonded Fiberglas fishing rod. The possibilities of extending such combinations into ceramics and other fields were discussed.

Preceding the dinner and evening meeting in Granville, members and guests enjoyed a tour of the Newark plant of the Owens-Corning Fiberglas Corp. About 80 persons were present. The next meeting will be May 25 at the Logan Clay Products Co. in Logan.

Chairman Thomas S. Shevlin has announced the following committee appointments for the year: program, John W. Lennon, Columbus, chairman; publicity, Scott Hagerman, Columbus, chairman, and Walter E. Hedden, Columbus; nominating, J. O. Everhart, Columbus, chairman, George D. Ford, Zanesville, A. C. Siefert, Newark, and Ralph Rose, Columbus; membership, Henry D. Bixby, Columbus, chairman, Charles E. Evans, Columbus, Donald E. Knowlton, Zanesville, Cletus L. Roberson, Newark, John Ridgeway, Cambridge, and William D. Wagner, Uhrichsville; Columbus Technical Council, Ralph Rose, representative, Henry Bixby, alternate.

### Baltimore-Washington Section

L. H. Bolz of the National Bureau of Standards, Washington, D. C., was elected *Chairman* of the Baltimore-Washington Section when it met in April. Other officers chosen were: G. M. Boyd of Locke, Inc., Baltimore, *Vice-Chairman*; G. H. Rynders, National Bureau of Standards, Washington, *Secretary-Treasurer*, and Charles H. Commons, Jr., Locke, Inc., Baltimore, *Councilor*.

### West Virginia Section

The spring meeting of the West Virginia Section was held at the Blennerhassett Hotel in Parkersburg April 6. Thirty-two were present for the meeting which followed a social hour and dinner. Chairman C. A. Walworth presided over the business session.

G. M. Ruoff, vice-president and general manager of Porcelain Products, Inc., of Parkersburg, W. Va., was speaker for the occasion. He briefly described the manufacturing process for making high tension porcelain insulators and then went into more detail regarding the problems involved in the manufacturing process and in meeting service requirements. In his discussion he called on P. H. Sanborn for explanation of some specific technical phases. A question period followed his talk.

### Michigan Section

Approximately 250 attended the joint meeting of the Engineering Society of Detroit and the Michigan Local Section April 11 at Detroit. "Red" Jones, well-known former big league baseball umpire, was coffee speaker, entertaining the gathering with stories of characters and happenings in the baseball world.

Principal speaker of the evening was Dr. J. O. Christianson, superintendent of the School of Agriculture and director of Agricultural Short Courses for the University of Minnesota. His lecture concerned the American heritage of freedom and what must be done to preserve it.

### Southern California Section Meets in Los Angeles

A discussion of statistical quality control featured the meeting of the Southern California Section March 28 at the Rodger Young Auditorium in Los Angeles. Myles Bennett, Robert Briix and Kenneth Kilbourne, all of Gladding, McBean and Co., conducted the discussion, outlining methods of sampling and checking instituted in the Los Angeles plant.

Mr. Bennett prefaced the discussion with some definitions of statistical quality control. It is not actually a control, he said, but a tool and it requires people to use it. Its main requirement is to fit the job it has to do, and it can be applied to any job or operation that is repetitive, he continued.

Mr. Briix outlined some of the details of how control has been used at Gladding, McBean and Co. since it was put into operation there two years ago. One of the most useful items connected with the control is a library of defects which is used in inspecting questionable pieces, the speaker said. In the opinion of Mr. Kilbourne, control methods should be tailor made for a particular job. Where the control point should be placed depends on where costs begin to go up, he said.

Clark Sutherland, chairman of the Section, presided at the dinner meeting, which was attended by 140 members and guests.

A meeting of the Design Division of the Southern California Section was held March 22 in Claremont. Following a dinner at the Claremont Inn, the 70 members and guests gathered at the Florence Rand Lang Art Gallery, where the Eighth Annual Invitational Ceramic Exhibition sponsored by Scripps College was on display. Some 250 pieces by 22 artists were exhibited.

Richard Petterson, chairman of the Design Division, appointed as committee chairmen for the year: Jane Ellis, sales and commercial; William O. Brandt, technical; Maurice Johnson, publicity; Laura Andreson, papers; Betty Davenport Ford, exhibits; A1 and Caroline Driscoll, program, and Helen Zillgilt, membership.

### Northern California Section

Nelson Gildersleeve of the West Lynn, Mass., office of the General Electric Co., and J. G. McCormick of the G-E San Francisco office were guests of honor at the dinner meeting of the Northern California Section on March 20 at Pland's San Lorenzo Village. Sixty-four were present, including two members of the Southern California Section, Ed Kunzman and Mitch Simmons.

A stimulating talk on the subject "Performance Characteristics of Temperature Control Instruments" was given by Mr. Gildersleeve. Without complete performance data for specific operating conditions, he pointed out, we may not know what or how accurately we are measuring temperatures. He spoke briefly of various sources of errors in thermocouples and in the different types of instruments, and gave his listeners a better idea of what to expect in the way of possible accuracy of controls.

### Trenton Section

Robert E. Gould, president and general manager of the Buffalo Pottery, Inc., of Buffalo, N. Y., was speaker at the meeting of the Trenton Section held March 16 at Jack Fowler's Restaurant in Trenton. Using as his subject "Mechanization in White ware Plants," Mr. Gould brought out many interesting problems which his company had encountered when it turned to mechanization. He pointed out the importance of the sulfate ions in the slip. A question and answer period followed the talk.

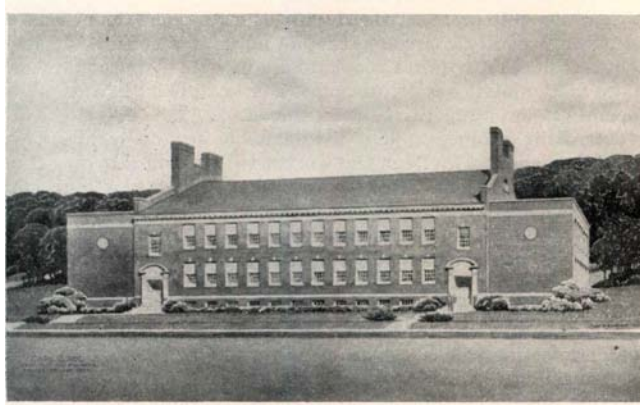
David W. Thomas, Section chairman, was in charge of the business session. Eighty-five members and guests were in attendance.

### Southern Ohio Section

Southern Ohio Section will meet June 8 at Terrace Park Country Club, Cincinnati. Golf will be played in the afternoon, starting at one o'clock, and a dinner will be served at 6:30, after which officers will be elected and golf prizes awarded.



# CERAMIC SCHOOLS



Architect's drawing of proposed Chemistry Building at Alfred University

## Alfred University Launches Campaign for New Chemistry Building

Alfred University of Alfred, N. Y., has launched the first phase of a ten-year development program designed to provide both the immediate and long-range needs of the University. The first objective in the program is the securing of \$400,000 for the construction and equipment of a new chemistry building, which is Alfred's most urgent need at present.

Chemistry, which has been on the curriculum at Alfred for more than 60 years, is taught at present in Allen Laboratory, which also houses the department of biology. Both departments have increased their enrollment nearly threefold in recent years. In addition to congested conditions in the classrooms and laboratories, the building fails to meet many other requirements.

The proposed new chemistry building will be erected to the south of Allen Laboratory so that it will be located in proximity to the College of Ceramics and the Hall of Physics. Plans provide for a two and one-half story building, 154 feet in length and 80 feet in width, covering 396,000 cubic feet of space.

On the first floor will be a large lecture room seating 200, an office for the chairman of the department, departmental library, two classrooms to seat 40 each, and washrooms for men and women. On the second floor there will be organic, inorganic, advanced inorganic, research and qualitative laboratories, a balance room, stock room, darkroom, and six offices for professors.

Provision has been made for the addition of wings to the building as the need may arise. These additions would contain eight more rooms for classroom or laboratory purposes.

Chemistry at Alfred takes on far greater importance because of ceramics. Every student in the New York State College of Ceramics, which is administered by Alfred University, receives his basic knowledge of chemistry in the regular University classrooms and laboratories. New York State College of Ceramics, which was established on the Alfred campus in 1900, is currently turning out one third of all graduates in the ceramic field. There are 452 graduates of Alfred University now employed in ceramic industries throughout the United States and many others have entered fields closely related to ceramics.

## Penn State Branch

Recent meetings of the Penn State Branch have had varied programs. At one meeting Lloyd G. Young, a senior in the Ceramic Department, reported on an inspection trip to the Spinks Clay Co. at Paris, Tenn., outlining the mining operations, the classification of the clays, and the preparation for shipment.

W. R. Kerr, chief chemist at the Beaver Falls, Pa., plant of the

Armstrong Cork Co., addressed the group on "The Relationship Between the Professionally Trained Mineral Industries Graduate and Other Industrial Personnel." With the aid of film strips prepared by Armstrong industrial engineers and which showed how some plant troubles arise, Mr. Kerr discussed several problems of the type that Mineral Industries graduates may have to face.

At another meeting the Branch heard George Leetch, director of the Penn State College Placement Service, who talked about the present job situation and offered pointers on job interviews with prospective employers.

## Ceramic Lectures Given

A series of orientation lectures are being given to the 18 freshman ceramic students at the School of Ceramics, Rutgers University, New Brunswick, N. J., by industrial representatives and staff members.

The following industrial representatives have already presented talks: Adrian W. Phillips, Seaboard Refractories Co., Perth Amboy, N. J.; Zale Dillon, Atlantic Tile Co., Matawan, N. J.; Lucien V. Bruno, Federal Seaboard Terra Cotta Corp., Perth Amboy, N. J.; George J. Lane, Edgar Plastic Kaolin Co., Metuchen, N. J.; H. C. Cooper, Sayre and Fisher Brick Co., Sayreville, N. J.; William W. Coffeen, Metal and Thermit Corp., Carteret, N. J.; W. C. Stott, A. P. Green Fire Brick Co., New York, N. Y.; Harry Barr, Consolidated Feldspar Corp., Trenton, N. J.

The orientation program includes a number of industrial films and plant inspection trips.

## Symposium on Ceramic Dielectrics Held at Rutgers

The 11th symposium on ceramic dielectrics, jointly sponsored by the Research and Development Board Subpanel on Dielectric Materials and the New Jersey Ceramic Research Station, was held March 30 at the School of Ceramics, Rutgers University, in New Brunswick, N. J. Approximately 100 representatives from industry were in attendance.

Dr. John H. Koenig, director of the School of Ceramics, acted as chairman for the program which was as follows: "Quality Control in the Manufacture of Ceramic Dielectrics," Chester Raymo, American Lava Corp., Chattanooga, Tenn.; "Control Testing of Dielectric Titanates and Some Anomalies Noted Therein," W. J. Baldwin, Titanium Alloy Manufacturing Division, National Lead Co., Niagara Falls, N. Y.; "Effect of Impurities Upon the Dielectric Properties of Barium Titanate," E. J. Graf, also of Titanium Alloy, and "Wollastonite as an Ultra Low Loss Ceramic Material," N. H. Snyder, New Jersey Ceramic Research Station, Rutgers University.

## ASTM Will Hold Annual Meeting

The 54th Annual Meeting of the American Society for Testing Materials will be held June 18-22 at Chalfonte-Haddon Hall, Atlantic City, N. J. Seven technical symposiums and many other technical papers on a wide range of subjects in the field of engineering materials are scheduled.

There will be an estimated 450 meetings of the various ASTM technical committees beginning Sunday, June 17, and extending through Friday, June 22. An important feature of the program will be the Edgar Marburg Lecture to be given by Frank L. LaQue, international authority on corrosion, who is in charge of the Corrosion Engineering Section, International Nickel Co. He will discuss corrosion testing.



## J. W. Hepplewhite on Staff of Ferro Enamel Corporation

J. W. Hepplewhite, who has just completed his term as President of The American Ceramic Society, has been added to the staff of Ferro Enamel Corp., Cleveland, it has been announced. According to Dr. J. T. Robson, vice-president in charge of the Allied Engineering Division of Ferro, Mr. Hepplewhite will employ his efforts in the Glaze Frit Division of Ferro, and company officials feel the addition of Mr. Hepplewhite to its staff will add considerably to the value of its services to the ceramic industry.



J. W. Hepplewhite

Mr. Hepplewhite was formerly employed by the Edwin M. Knowles China Co., Newell, W. Va., as research director. He was graduated from Ohio State

University, Columbus, with a degree of B.Sc. in Ceramic Engineering and took up the Koppers Company Fellowship at Mellon Institute, pursuing research and development work on silica refractories for coke ovens. He later joined the Johns-Manville Co. in its refractory cement and insulating brick division and then became associated with the Edwin M. Knowles Co.

Always active in affairs of The American Ceramic Society since becoming a member in 1919, Mr. Hepplewhite was elected President in 1950. He served as Trustee for the White Wares Division in 1944-1947, has served on several Division Committees and was Division Secretary in 1937-1938. He was made a Fellow in 1939 and is a charter member of the Institute of Ceramic Engineers. A member of the American Society for Testing Materials, he is serving on Committee C-21 on Ceramic White Wares as a member of Sub-committee I on Nomenclature, Sub-committee II-B on Processing Control, Sub-committee II-C on Products and the Executive-Committee Sub-committee.

Mr. Hepplewhite is a former chairman of the Research Committee of the United States Potters' Association and has been an officer in the Pittsburgh Section of The American Ceramic Society. He is a charter member of the East Liverpool, Ohio, Ceramic Engineers' Club.

## Staff Appointments Announced by Westinghouse

Several appointments to the various divisions of the Westinghouse Electric Corp. have been announced. Dr. Rolland M. Zabel has been made manager of engineering for the Westinghouse Lamp Division in Bloomfield, N. J., and George S. Evans has been appointed manager of commercial engineering for the Lamp Division.

Four regional managers of manufacturing have been named to direct the rapidly expanding facilities of the Westinghouse Corp. to produce light bulbs for defense and civilian use. Matthew Westphal has been named manager of the lamp plants at Bloomfield and Trenton, N. J.; William J. Williams as manager of parts plants in Bloomfield and Belleville, N. J., and at Paris, Tex., where ground has just been broken; Elwood W. Noxon as manager of southern lamp plants at Richmond, Ky., Bowling Green, Ky., and Little Rock, Ark., and James E. Woodall as manager at Fairmont, W. Va.

Harry D. Hanafus has been appointed purchasing agent of the recently formed Electronic Tube Division at Bloomfield, N. J., and Harry F. Blythe as manager of accounting for that division.

## Clark Hutchison with Association of American Railroads

Clark Hutchison, formerly director of research for Ingram-Richardson, Inc., of Frankfort, Ind., has joined the Freight Claim Division of the Association of American Railroads as ceramic engineer. Headquarters are in Chicago.



Clark Hutchison

This position was created in 1949 because of the large amount of damage claims paid by the railroads on articles finished in porcelain enamel and related products. The porcelain enamel engineer responds to requests from the individual railroads for inspection and advice as to the probable cause of damage. Where the manufacturing process may be involved or the packaging or loading of the product may not conform to accepted standards, the ceramic engineer calls upon

the manufacturer with a view to assisting him in working out the problem.

Mr. Hutchison is a graduate of the University of Illinois, class of 1936, and has been a member of The American Ceramic Society since 1940. He is affiliated with the Enamel Division.

## S. F. Walton Elected Vice-President of Exolon Company

Samuel F. Walton has been elected a vice-president of The Exolon Co. of Tonawanda, N. Y., and now has the title of Vice-President and Technical Director.



Samuel F. Walton

Mr. Walton joined the Exolon Co. in 1927 as a ceramic engineer. He is a graduate of Iowa State College with a Bachelor of Science degree in ceramic engineering. The new Exolon vice-president has been a member of The American Ceramic Society since 1917 and is also a Fellow and member of the Institute of Ceramic Engineers.

D. M. Ramsey, works manager of the Tonawanda plant, has also been named a vice-president of the company.

## Edward J. Bland Completes Course

Edward J. Bland, sales representative of the Johns-Manville Industrial Products Division, Cleveland, has completed an advanced sales course at Manville, N. J., designed to train salesmen to help the company's customers meet technical and merchandizing problems.

Mr. Bland joined Johns-Manville last December. He was graduated from Alfred University with a B.Sc. Degree in Ceramic Engineering, and has been a member of The American Ceramic Society since 1949. He is serving on the publicity board of the Northern Ohio Section of The Society.

## Katharine Blodgett Receives Annual Award of Chemical Society

Katharine B. Blodgett, who was author of a paper in the January issue of *The Journal*, received the 1951 Women's Award in Chemistry, the Garvan Medal, at the annual meeting of the American Chemical Society at Cleveland in April. Dr. Blodgett is on the staff of the General Electric Co.'s General Research Laboratory, where she has done much outstanding work in the field of glass-surface films.



Katharine B. Blodgett

A graduate of Bryn Mawr, Dr. Blodgett has an M.Sc. degree from the University of Chicago and received her doctorate in physics from the Cavendish Laboratory in Cambridge, England, the first such degree to be awarded a woman by that institution. She holds honorary doctorates from Elmira College, Western College, Brown University, and Russell Sage College.

Dr. Blodgett became affiliated with General Electric in 1918, the first woman to work in the G-E research laboratories. She started as assistant to Dr. Irving Langmuir, who was then beginning his studies of monomolecular films. Since that time her intensive studies and development of techniques of thin-surface films on glass have made her one of the best known women scientists in the country.

## Personal Notes

Robert E. Worden, consulting management engineer, will serve as general manager of the new Fiber Glass Division of Libbey-Owen-Ford Glass Co. during its development. Clinton F. Hegg, assistant to the general manager of industrial sales for L-O-F, has been transferred to the new Fiber Glass Division as sales manager.

Several changes have been made among staff members of the General Electric Co. William W. Kuyper has been appointed engineering manager of the Knolls Atomic Power Laboratory. William F. Oswald and Frank T. Gamec have been named assistant manager of manufacturing and production manager, respectively, of G-E's Control Divisions at Schenectady, N. Y. Succeeding Mr. Oswald as manager of manufacturing of the G-E Specialty Transformer and Ballast Divisions at Fort Wayne, Ind., is Elmer F. Paul. Mr. Paul will be replaced as manager of the G-E Danville, 111., plant by Donald Poland. Carl L. Ipsen, manager of G-E's Industrial Heating Divisions at Schenectady, has relinquished his duties in order to accept a position in an advisory capacity to the Machinery Division of the National Production Authority. In his absence E. W. Cunningham will act as manager.

Marvin L. Cleaton, Jr., has been transferred to the Foxboro Co.'s new branch office in Knoxville, Tenn., as branch manager. He was formerly in charge of the company's office in Columbus, Ohio.

The advancement of five Westinghouse Lamp Division production chiefs from superintendent to manager is announced. The new managers are Frank J. Camarata of the Bloomfield, N. J., pilot plant; Charles V. Iredell of Bloomfield wire products manufacturing; Rudolph Walz, Jr., of Bloomfield miniature lamp manufacturing; Harry A. Holden of the Belleville, N. J., lamp and electronic tube base plant, and Joseph Early of the Fairmont, W. Va., glass plant. Herbert E. Plishker has been appointed manager of lamp sales for the Lamp Division.

Olen E. Bee has retired as patent counsel for the Pittsburgh Plate Glass Co. He will continue to serve the firm in a consultant capacity.

William L. Peskin has been appointed chief ceramic engineer at the Edwin M. Knowles China Co., Newell, W. Va. Mr. Peskin has been associated with the company as a ceramic engineer since January, 1946, and has been a member of The American Ceramic Society since 1940.

## NECROLOGY



### Mary Elizabeth Cook

Mary Elizabeth Cook, 88, noted sculptress and potter, died April 4 in St. Anthony's Hospital, Columbus, Ohio, where she had been a patient the last seven years. She was hospitalized following a hip injury suffered in her Columbus studio when a heavy framework fell.

Miss Cook was born January 1, 1863, in Chillicothe, Ohio, a daughter of William Alexander and Anna Sappington Cook, and at an early age developed her talent as an artist. In 1910, at the age of 46, she entered the Ohio State University to take ceramic engineering, the first woman to enroll in that curriculum. In 1912 she went to Paris to learn sculpturing from the famous Paul Wayland Bartlett.

Her works have been exhibited in Paris salons and in museums and World's Fairs in this country. They may now be found in tablets, fountains, and decorative tile in many civic and private buildings and gardens, as well as in museums.

During the first World War, Miss Cook brought her skill into the service of her country by devoting her time and talent to help restore the disfigured faces of soldiers injured in combat. At Fort McHenry, Md., she assisted plastic surgeons by making the sketches and life masks necessary for the operation of facial reconstruction. Later she did the same work at the Army Hospital at Fort Hayes in Columbus.

Miss Cook was also a versatile and accomplished musician. She had given lecture courses in the history of art at St. Mary's of the Springs College in Columbus and was a contributor to *The American Magazine of Art*.

Her organizational affiliations included membership in art, music, and literary societies. She had joined The American Ceramic Society in 1921. A detailed biography of Miss Cook appeared in the December, 1944, issue of *The Bulletin*, pp. 452-56.

### Rudolf W. Staud

Rudolf William Staud, director of public relations and sales promotion of the Benjamin Electric Manufacturing Co. of Des Plaines, 111., since 1927, died March 28 in Evanston, 111. He was born in Berlin, Germany, in 1891.

President of the RLM Standards Institute since 1936, Mr. Staud was a past president of the Illuminating Engineering Society, the National Industrial Advertising Association, and the Porcelain Enamel Institute. He was a director of the Chicago Lighting Institute.

### S. Paul Ward

S. Paul Ward of South Pasadena, Calif., who operated his own company, S. Paul Ward, Inc., distributor of ceramic supplies, died April 29. He had been a member of The American Ceramic Society since 1944 and was affiliated with the Materials and Equipment Division.

### E. D. Harrington

Elliott D. Harrington, vice-chairman and secretary of the Defense Projects and Priorities Committee of General Electric's Small and Medium Motor Divisions at Schenectady, N. Y., died April 1 of a heart attack. He was 54. Mr. Harrington had joined G. E. in 1919 and was a pioneer in the company's air conditioning and commercial refrigeration activity.

### Eiichi Koizumi

Eiichi Koizumi, professor of ceramics at Hiroshima Higher Normal College and Hiroshima University, Japan, died February 4. Reviews of some of his published works have appeared in *Ceramic Abstracts*.

# Society's Last Surviving Charter Member Dies

Dr. Heinrich Ries, last surviving Charter Member of The American Ceramic Society, died April 11 at Ithaca, N. Y., where he resided. He was 80 years of age. Dr. Ries had played an important role in the growth of The Society as it kept pace with the progress of the ceramic industry. He had held the highest executive office of The Society and had been accorded the highest honors of membership, that of Honorary Member and Life Member. He was also a Fellow.

Born in Brooklyn, N. Y., on April 30, 1871, the son of Heinrich and Caroline Ries, Dr. Ries was educated at Columbia University where he received the degrees of Ph.B., A.M., and Ph.D. In 1897 while holding the Barnard Fellowship from Columbia, he studied clays in Professor Witts' laboratory in Berlin, Germany. He was a lecturer in the New York City public schools and an assistant in mineralogy at Columbia University during the 1890's and joined the faculty of Cornell University in 1898. He was made professor of geology at Cornell in 1906 and head of the geology department there in 1914, which position he filled until 1937. He retired in 1939.

During summer vacations Dr. Ries made geological surveys throughout the larger part of eastern United States and in Canada. He served as delegate from Columbia and Cornell to the International Geological Congress in Russia, France, Mexico, Canada, and the United States between the years 1897 and 1933.

Dr. Ries served as Vice-President of The American Ceramic Society from 1903 to 1904 and as President from 1910 to 1911. He had been an associate editor for The Society and chairman of the Committee on Geological Surveys. In 1935 he presented the Edward Orton, Jr., Memorial Lecture at the 37th Annual Meeting of The Society at Buffalo, N. Y.

## In Many Societies

Among the many other societies to which he belonged, Dr. Ries was a Life Fellow of the Geological Society of America; Life Member of the American Institute of Mining and Metallurgical Engineers and American Geographical Society; Honorary Member, American Foundrymen's Association, Rochester Academy of Science, and the Kentucky Academy of Science; Fellow of the American Association for the Advancement of Science and the American Mineralogical Society; member of the English Ceramic Society, American Association of Petroleum Geologists, Canadian Institute of

Mining and Metallurgical Engineers, Society of Economic Geologists, the Seismological Society of America, and the Society of Economic Paleontologists and Mineralogists.

He was also a member of four Greek-letter honorary societies, Sigma Xi, Phi Kappa Phi, Gamma Alpha, and Sigma Gamma Epsilon.

## Offices and Honors

Dr. Ries was vice-president of the Geological Society in 1926 and was elected president in 1929. He was a member of the Board of Managers, A.I.M.M.E., from 1902 to 1905, and chairman of the Committee on Nonmetallic Minerals from 1910 to 1926. He had served as president of the Cornell chapter of Sigma Xi, and for a number of years was chairman of the Committee on Standard Tests of Sands for the American Foundrymen's Association, as well as technical director in charge of sand research for the same Association.

In 1936 the Joseph S. Seaman Gold Medal was presented to Dr. Ries by the American Foundrymen's Association in recognition of his researches on foundry sands and their benefit to the foundry industry. The honorary degree of Doctor of Science was conferred upon him by Alfred University, Alfred, New York, in June of 1945 for his notable services to the ceramic interests of America.

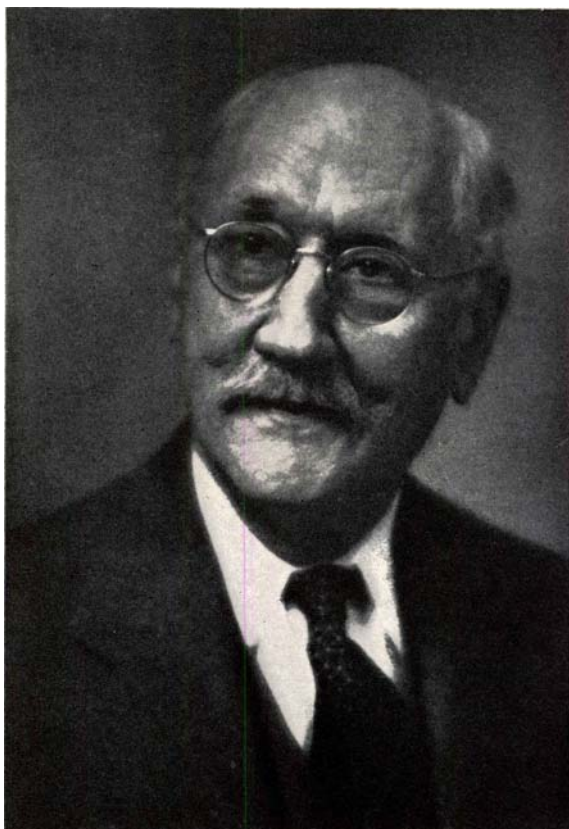
Major E. Holmes, dean of the New York State College of Ceramics, who presented Dr. Ries for the honorary degree, said after reviewing the ac-

complishments of the recipient: "Buttressing these material achievements is that rare combination of human qualities that have won for him a host of loyal friends. Unselfish devotion to his profession, strict observance of professional ethics, an inspiring personality, combined with his distinguished scientific achievements, have won an everlasting place for him in the minds and hearts of the members of his profession."

## Publications

Dr. Ries' contributions to ceramic literature have been outstanding. He is the author of more than 200 publications, including a number of textbooks and reference books which are standard texts in their fields. A list of 55 of his publications appeared in the December, 1938, *Bulletin*, page 491.

Additional biographical data concerning Dr. Ries were published in the December, 1938, issue and in the July, 1945, *Bulletin*, page 274.



Dr. Heinrich Ries

## O. Hommel Company Observes 60th Anniversary

Near the turn of the century in a small building on Penn Ave. in Pittsburgh, a new company began operations as a manufacturer and supplier for the ceramic industry. Today that company, the O. Hommel Co., is observing its 60th year of business and progress with a pledge of continued research to develop better ceramic colors and porcelain enamel.

Founded by Oscar Hommel, the company during its infancy concentrated on the importation of bronze powders. Ceramic colors and equipment were soon added to the product list, which was steadily enlarged until the O. Hommel Co. is now one of the world's most complete ceramic suppliers.

Further evidence of the growth of the company is indicated by the increase in staff personnel from three persons to approximately 200 persons engaged in manufacturing, sales and research. The small building on Penn Ave. was vacated in 1905 for larger quarters in downtown Pittsburgh. Then in 1909 when still more space was needed, the company broke ground in Carnegie, a suburb of Pittsburgh, on the site of its present plant. Installed in the new plant was the best machinery available at that time, most of which was designed and built in Europe.

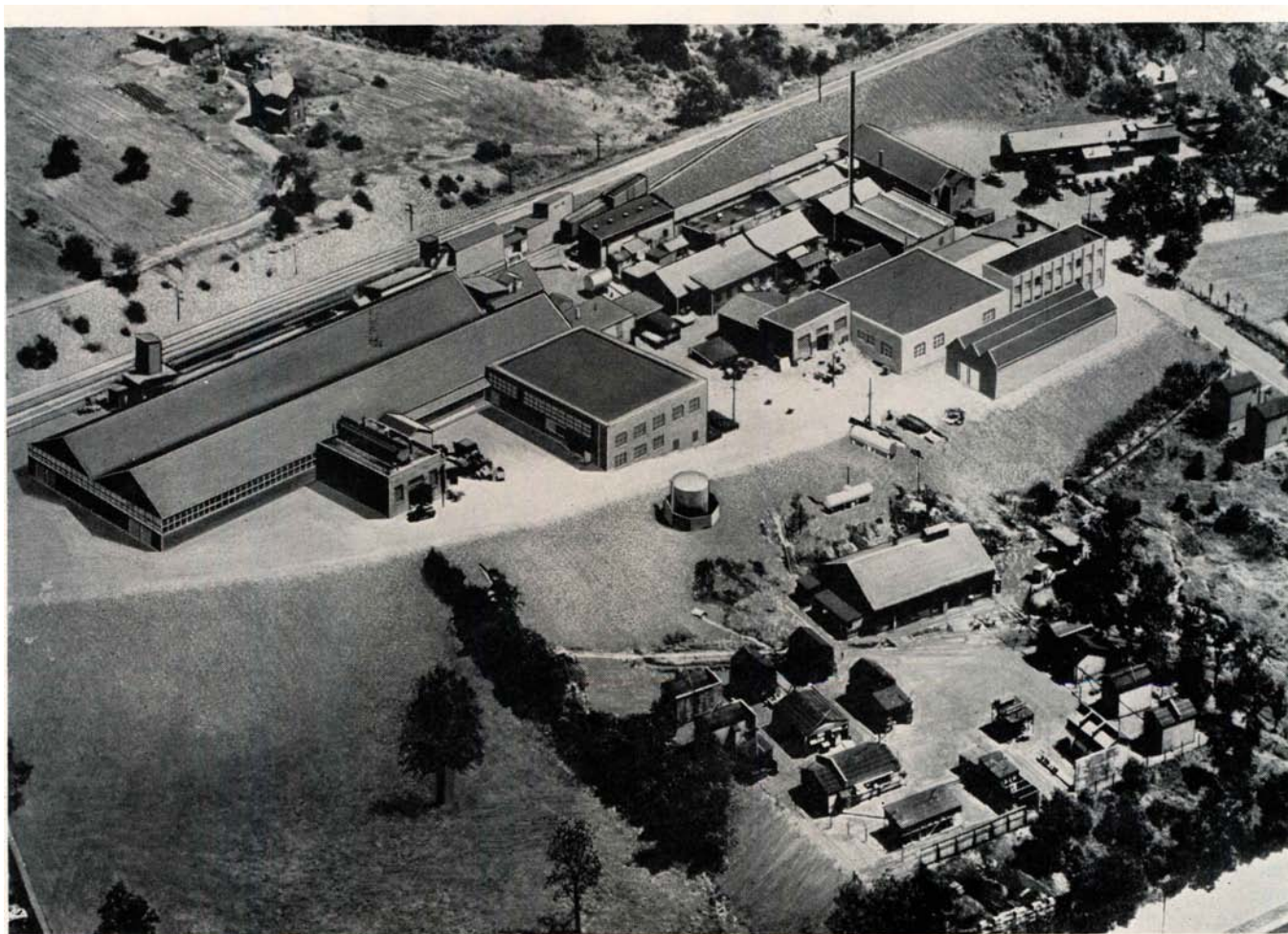
In 1916, when the world was in the throes of World War I, the plant was struck by lightning and destroyed by fire. The plant was reconstructed with machinery utilizing American ingenuity in improving on the equipment that had been lost.

During the second world conflict the O. Hommel Co. converted its manufacturing and research facilities to an "all out" effort for essential war production.

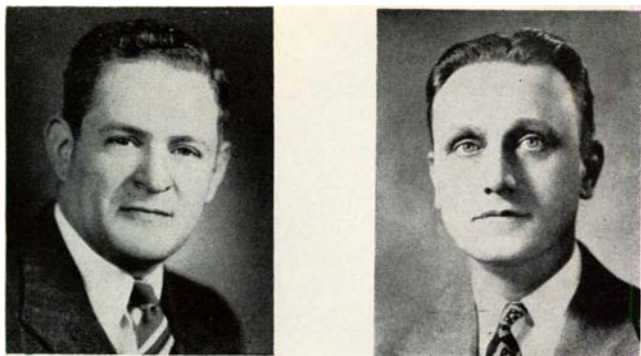
Through the years, the O. Hommel Co. has attracted to its staff some of the country's recognized experts in the ceramic and chemical fields. Ernest M. Hommel, son of the founder and president since 1940, has been intimately associated with the company's problems for more than 26 years. H. R. Urbach, general manager and treasurer, has been with the company for 48 years.

In charge of the various divisions of the company are men like E. J. Feeney, manager of the Porcelain Enamel Frit Division; J. F. Matejczyk, coordinator of research and manufacturing; Adolph Langerman, head of the Frit Control Laboratory; J. J. Kostishack, general foreman of the Ceramic Color Manufacturing Department; P. D. Henry, director of the Color Laboratory; W. E. Dougherty, manager of the Ceramic Color and Glaze Frit Division; J. B. O'Connor, who worked along with Mr. Dougherty for 23 years prior to his present sales position, and W. E. Naylor, who directs the Analytical Laboratory. Other old-timers are W. T. Campbell, secretary; J. F. McCrory, manager of the Chemical Resale Division; J. H. Sylvester, plant superintendent, and J. H. Clatty, who takes responsibility for frit manufacturing.

Although the company has always maintained its own re-



Aerial view of the O. Hommel Co. plant, Carnegie, Pa.



Ernest Hommel

John Matejczyk

search and development laboratories, these facilities were augmented in 1933 by the establishment of a Research Fellowship at Mellon Institute, where Dr. E. E. Marbaker (photograph on page 181 of this issue) has been its Senior Fellow since 1940.

Since its beginning, the company has always believed that research is closely allied to progress. As a result the company has made many valuable contributions to the ceramic industry and can claim a number of "firsts." The company was the only manufacturer supplying spray guns to the industry as long ago as 1903. It was the first to introduce the use of American clays in powder form to the nation's porcelain enameling industry in 1916. In 1917, technologists of the company pioneered a successful method for the application of vitreous coating to aluminum. Pioneering work was done also on alkali- and acid-resisting colors for beverage bottles and glass tableware. Silk screen colors for glass were developed by the squeegee process and hot screening methods.

O. Hommel's research on titanium white frits, which was started in the early 1920's under the direction of W. E. Dougherty (photograph on page 182 of this issue) culminated in the issuance of a patent in 1933. To serve the ceramic industry during the present emergency the O. Hommel Co. has developed two new series of ground coat frits that contain non-strategic materials.

### Structural Clay Products Conference

A Structural Clay Products Conference has been scheduled for May 31 and June 1 by the Ceramic Engineering Department of the University of Illinois at Urbana. This is the second to be held since the war years, during which the conferences were discontinued.

The program will be devoted to subjects of primary interest in production and plant operation. It should be of particular interest and value to superintendents and others who are concerned with the manufacture of structural clay products. W. J. Meid is conference chairman.

The following schedule has been planned: **May 31, 1:30 P.M.**—address of welcome, A. I. Andrews, head of the Ceramic Engineering Department at the University of Illinois; "Properties of Tests of Clay Materials," R. L. Cook, professor in the Ceramic Engineering Department at the University of Illinois; "Raw Materials Preparation," A. B. Christopher, Chambers Brothers Co., Philadelphia; "Instrumentation in the Structural Clay Products Industry," J. E. Casey, Leeds and Northrup Co., Philadelphia. **May 31, 6:45 P.M.**—group dinner; address, "Natural Resources and Geological Surveys," M. M. Leighton, chief of State Geological Survey, Urbana.

**June 1, 9 A.M.**—"Modernization in the Brick Plant," C. R. Filippi, Illinois Brick Co., Chicago; "Notes on Scumming," P. V. Johnson, assistant director, Structural Clay Products Research Foundation, Chicago; "Periodic Kiln Operation," R. K. Hursh, professor, Ceramic Engineering Department, University of Illinois; **12:15 P.M.**, luncheon.

**June 1, 1:30 P.M.**—"Tunnel Kilns for the Structural Clay Products Industry," Philip Dressier, Swindell-Dressier Corp., Pittsburgh; Panel Discussion, group of experts.

### Chief Engineer of Victor Insulators Announces Retirement

George H. Schoenthaler, chief engineer and a director of Victor Insulators, Inc., Victor, N. Y., has retired after 47 years of service to the insulator industry. He will be succeeded by David E. Alexander who has been assistant chief engineer since 1948.



George H. Schoenthaler

Mr. Schoenthaler, who helped organize Victor Insulators in 1935 and is one of the original stockholders, will continue as a director and will be available as consultant and counsel in company affairs. He started his work in the porcelain insulator field in 1904 as the only draftsman at the Locke Insulator plant in Victor and in 1924 moved to the Locke plant in Baltimore where he was chief draftsman and assistant chief engineer. He has been chief engineer at Victor since 1940.

Mr. Alexander's experience in the power transmission field began with the Niagara-Hudson Power Co. in 1937. Later he was associated with the New York State Electric and Gas Corp., Minneapolis-Honey well Regulator Co., and the Jeffrey Dewitt Insulator Co. of Kenova, W. Va. He also worked privately, specializing in power line and substation inspection, and for two years served as a civilian employee with the U. S. Army Signal Corps in Alaska.



David E. Alexander

### Joins Porcelain Enamel Institute

The Willard Manufacturing Co. of Miamisburg, Ohio, has been accepted for membership in the Porcelain Enamel Institute, according to announcement by D. H. Malcom, chairman of the Institute Development Committee. The new PEI member's principal product is a portable utility table which features a porcelain enameled top.

D. Me Workman, who was formerly associated with the Davidson Enamel Co., is president of the Willard Co., and his two sons, William O. and G. K. McWorkman, serve as his assistants.

### Spanish Company Constructs Plants

Messrs. Magnesitas Espanolas Ramon Quijano y Compania, a company owning important mines of magnesite of the spathic variety at El Escorial, near Madrid, Spain, has started construction of additional plants for the treatment of considerable quantities of magnesite. These new plants will enable the company to develop its export of raw, dead-burned and caustic magnesite

### Kaylo Distributor Appointed

The Luse-Stevenson Co., Chicago, has been appointed distributor-applicator for Kaylo Heat Insulation by Owens-Illinois Glass Co. in the Chicago area, according to announcement by W. M. Hankins, Jr., general sales manager of Owens-Illinois' Kaylo Division. The Kaylo line of heat insulation includes heat-insulating block for flat surfaces and pipe covering for pipes, tubes, and vessels.

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Society of Glass Technology,  
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SHEFFIELD 10, England.



Gordon H. Chambers, vice-president of Foote Mineral Co. (right), receives the ECA Certificate of Cooperation from Mayor Bernard Samuel of Philadelphia, who made the presentation on behalf of William C. Foster, ECA Administrator.

### Foote Mineral Co. Receives ECA Award

A Certificate of Cooperation has been awarded the Foote Mineral Co. by the Economic Cooperation Administration in recognition of Foote's part in the Technical Assistance Program carried out under the Marshall Plan. Representatives from Western European countries have been particularly interested in studying Foote Mineral Co.'s methods of reducing metals as well as the extraction and beneficiation of the lesser known elements such as zirconium, lithium and tungsten.

### Porcelain Enamel Institute Launches "Operation Porcelain"

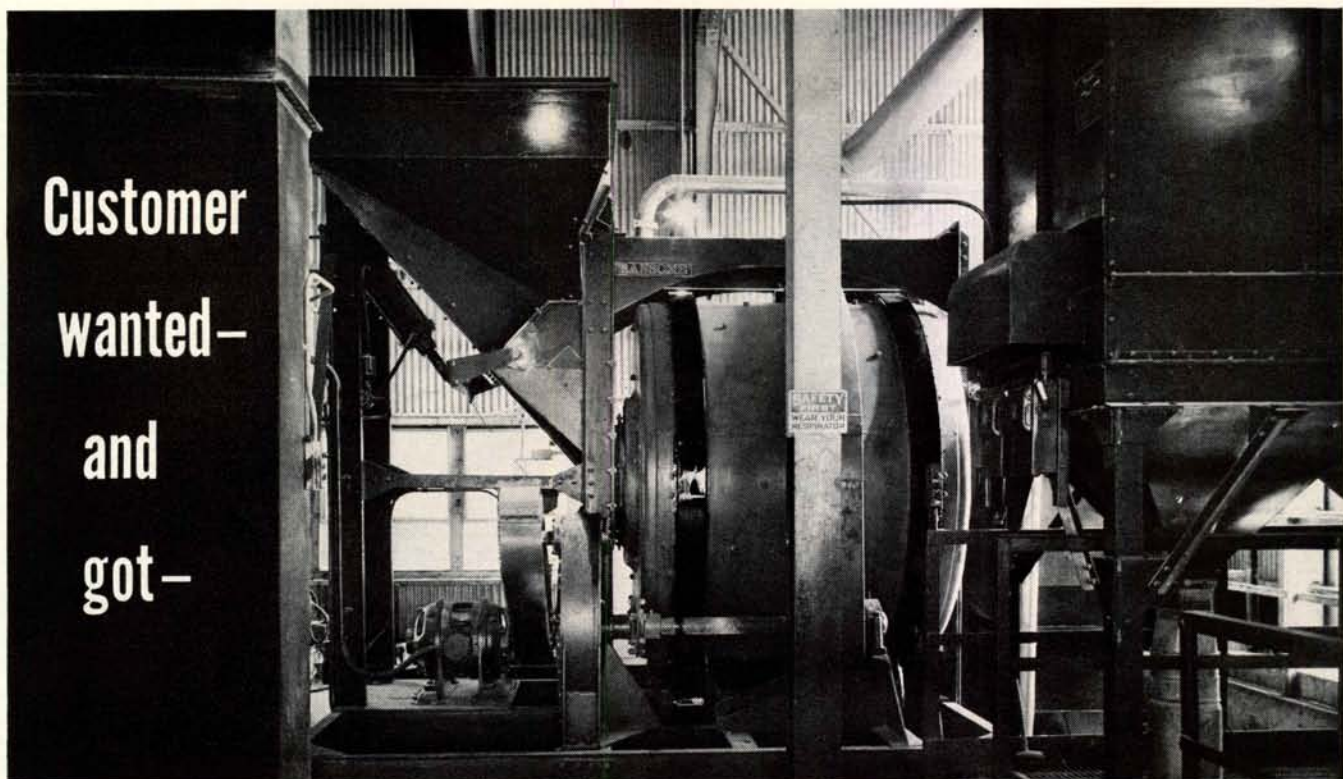
"Operation Porcelain," recently launched by the Porcelain Enamel Institute, already is proving its effectiveness as an aid to porcelain enamellers throughout the country in converting to defense work. Under the guidance of the newly created P. E. I. Government Business Committee, headed by Pierre B. McBride of Porcelain Metals Corp., Louisville, Ky., and the staff of the Institute's Washington headquarters, the primary functions of the operation thus far have been to relay information regarding prime and sub-contracts to and from Government procurement offices, as well as lay the groundwork for a complete analysis of the enameling industry's defense work potentialities.

Completely new uses for porcelain enamel as a finish are the goal set forth for the newly formed New Uses Committee of the P. E. I. C. P. Lohman of the Pemco Corp., Baltimore, is chairman of the committee, which plans the research of entirely new applications for porcelain enamel as a finish for all types of products from industrial equipment and components to building products. A secondary but more immediate goal will be the research of applications for porcelain for critical metals such as copper, brass, and zinc. Actual experimental and development work will be carried out in the plants and laboratories of member companies, and later completed information will be pooled for the benefit of the entire membership.

### District Enamellers Meet

Members of the Coordinating Committee for the District Enamellers Clubs met in conjunction with the 53rd Annual Meeting of The American Ceramic Society in Chicago. A luncheon was held at the Palmer House, April 24, followed by a business meeting. The Coordinating Committee reports there has been a better and more regulated exchange of information and greater cooperation between the several clubs than at any time in the past.

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## Research Program on Porcelain Enamels Undertaken at Battelle

Seventeen companies, representing a major segment of the country's manufacturers of porcelain-enameled steel products have undertaken a research program at Battelle Memorial Institute, Columbus, to establish the fundamental mechanics of adherence of ceramic coatings to steel. The problem has a two fold objective: to provide a scientific basis to pave the way for improved porcelain enamels for such products as refrigerators, and ranges and to provide fundamental information leading to the development of decorative and protective ceramic coatings prepared from nonstrategic materials.

Companies sponsoring the research include: American Stove Co., Benjamin Electric Mfg. Co., Borg-Warner Corp., Chicago Vitreous Enamel Product Co., Climax Molybdenum Co., Ferro Enamel Corp., Florence Stove Co., Frigidaire Division of General Motors Corp., O. Hommel Co., Ingram-Richardson, Inc., International Nickel Co., Inc., Nash Kelvinator Corp., Pemco Corp., Pfaulder Co., A. O. Smith Co., Tappan Stove Co., and Vitreco, Inc.

Particular attention is being given to the functions of cobalt, manganese, nickel, and other metallic oxides in promoting adherence and to the subjects of "wettability," constant angle, and stability of enamels. It is believed that from the research the industry will be in a strengthened position to develop new and improved ceramic coatings and base metals for conventional and special applications, new treatments for base metal, and improved shop control resulting in fewer rejects or re-runs.

The laboratory investigations at Battelle are under the supervision of Dr. C. H. Harman and are being coordinated by L. S. O'Bannon. Cooperating scientists include Dr. B. W. King, H. F. Reid, H. E. Elsea, F. L. Shubert, and G. K. Manning.

## New Corning Glass Center Opened at Ceremony May 19

Formal opening of Corning Glass Works' New Glass Center at Corning, N. Y., was held May 19 with New York Governor Thomas E. Dewey making the official dedication. Present at the ceremony was an audience of approximately 1800, including 100 national and international leaders of the industrial, labor, scientific, educational, and cultural fields, who were in Corning for a three-day conference on "Living in Industrial Civilization."

The conference, the first event to be held in the new Glass Center, initiates a series of notable events scheduled for the next several months in commemoration of Corning's centennial year. Amory Houghton, chairman of the board of Corning Glass Works, opened the conference sessions on May 17 with an address of welcome.

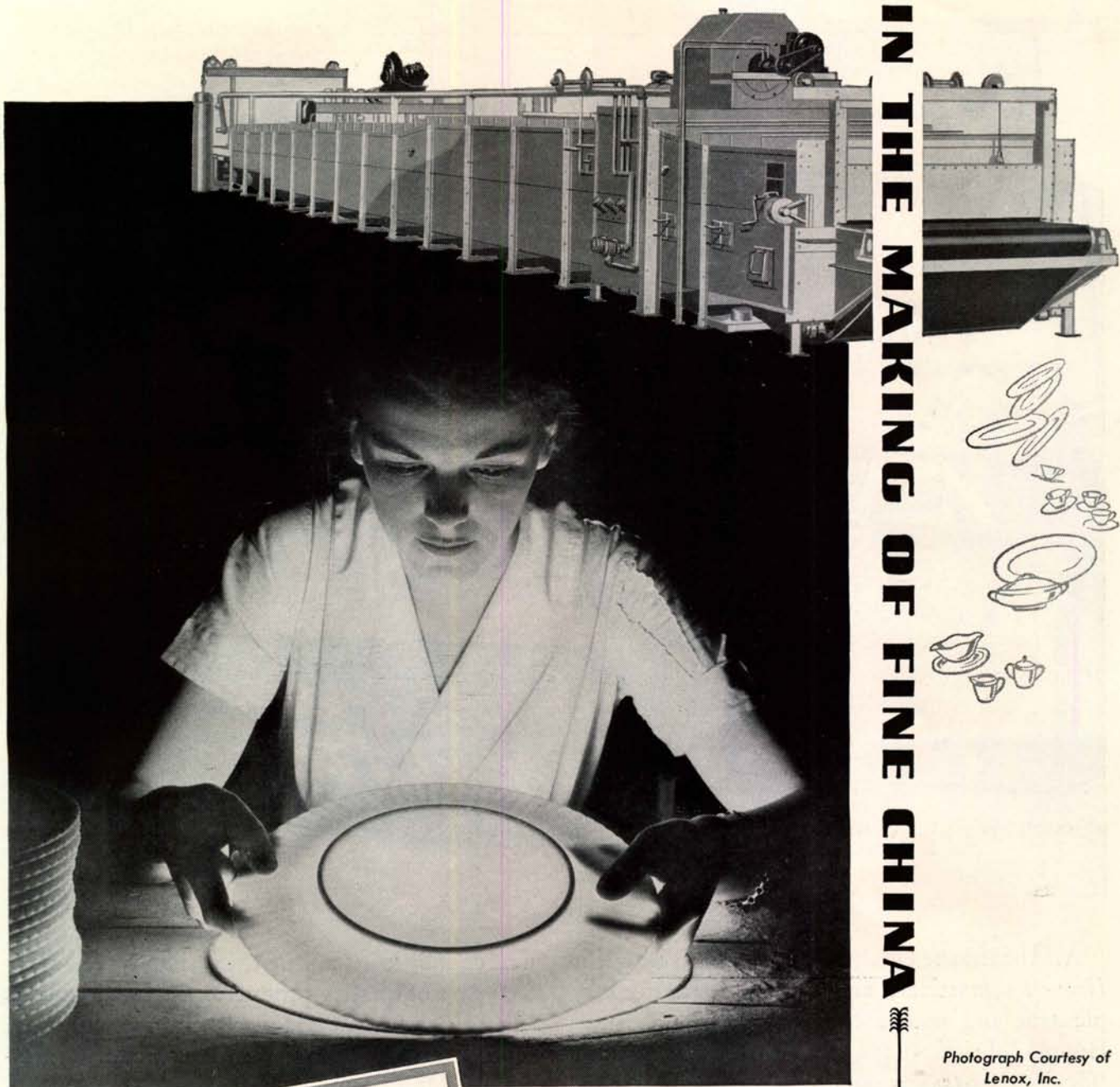
An article describing the new Glass Center, which includes a library containing the most comprehensive collection of books on glass in the world, and a museum displaying a superb collection of glass objects, was published in the March, 1950, issue of the *Bulletin*, pp. 125-26. Another feature of the building is a complete glass factory with visitors' galleries, from which may be seen the highly skilled processes of blowing, forming, and engraving glass entirely by hand.

## To Attend Glass Commission

Dr. Samuel R. Scholes, Sr., associate dean of the New York State College of Ceramics at Alfred University, will attend the International Commission on Glass in Paris, June 5-9. He will represent The American Ceramic Society in the absence of President Howard R. Lillie. The purpose of the Commission, which was organized in 1933, is to promote international cooperation in glass research.

## Plant Resumes Operations

Production has been resumed at the Los Nietos, Calif., plant of Pacific Clay Products Co., where a fire last Thanksgiving Day resulted in damage estimated at \$1,000,000. Enough of the major reconstruction planned had been completed by the middle of February to allow production at one-third capacity. Operations were resumed almost a month ahead of schedule.



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Refractories Division sales representatives of The Robinson Clay Product Co. are pictured at the firm's annual Refractories Sales Meeting, held recently in Akron. Front row, left to right: C. W. Unger, C. I. Thompson, J. E. Howard, R. W. Thurlow, and J. S. Blank. Back row, left to right: D. G. Braund, E. J. Hellriegel, R. J. O'Brian, R. E. McChesney, R. G. Scribner, M. F. King, and R. W. Dally.

### Company Holds Annual Conference

Discussions concerning methods of solving the production and distribution problems posed by existing business and industrial conditions keynoted the annual Refractories Sales Meeting of The Robinson Clay Product Co. at Akron, Ohio, manufacturers of clay pipe. Primary emphasis at the conference was placed on the solution of problems that have arisen in the servicing of customers.

Plans of Robinson management for expanding production to meet the increased demand for refractories were presented, and reports outlining new developments perfected by the research and production departments of Robinson's Refractories Division were given.

### Pyrometer Tube Manufacturer Expands Production

Wheatstone Corp., maker of high-refractory ceramic thermo-couple protection tubes, has announced the separation of its manufacturing and office locations with the establishment of a complete manufacturing unit at Foster, Ky.

For some years a plant was operated in Cincinnati, Ohio, where space limitations prevented the production increases urgently needed. With the manufacturing unit now at Foster, conditions permit an output five times greater than was possible in the out-grown Cincinnati plant. Beginning with basic equipment for initial processing of materials, the entire production pattern has been studied and refined. Firing is done in kilns of original design which were developed for the exclusive purpose of firing pyrometer tubes.

G. T. Desjardins, president of Wheatstone, has recruited a majority of the staff for the new factory from the wholly unceramic Foster neighborhood. He has made a gratifying demonstration of the ready adaptability of local workers to a strange field and new techniques.

When output reaches its expected peak, Wheatstone plans to make deliveries on an at-once basis for all but special sizes or specialties.

### Sell Interest in Foreign Companies

Libbey-Owens-Ford Glass Co. has completed its sale of European holdings by a transfer of stock in two foreign glass companies. For its 7% interest in the Compagnie Internationale pour la Fabrication Mecanique du Verre of Belgium and 17% interest in Deutsche Libbey-Owens Gesellschaft fur Machinelle Glasherstellung, A.-G., in Gelsenkirchen, Germany, a group of French and Belgian glass interests paid \$450,000, it was disclosed. The shares were acquired by Libbey-Owens Sheet Glass Co. in the early 1920's when the Toledoans granted licenses to the European companies to use their patents and furnished know-how, receiving the shares in payment.

You 30, No. 5 (1951)

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  - Harshaw Chemical
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  - Vitro Manufacturing
- Alumina (Fused) Brick and Tile
  - Carborundum
  - Electro Refractories & Alloys
  - Norton Co.
  - Remmey, Richard C., Son
  - Vitro Manufacturing
- Amblygonite
  - Footo Mineral Co.
- Ammonium Bifluoride
  - Drakenfeld, B. F.
  - Du Pont de Nemours, E. I.
  - Harshaw Chemical
  - Hommel, O.
  - Vitro Manufacturing
- Ammonium Carbonate
  - Drakenfeld, B. F.
  - Du Pont de Nemours, E. I.
  - Harshaw Chemical
  - Hommel, O.
  - Vitro Manufacturing
- Analyses
  - Louis G. Robinson Labs.
- Antimony Oxide
  - Drakenfeld, B. F.
  - Harshaw Chemical
  - Hommel, O.
  - Metal & Thermit
  - Vitro Manufacturing
  - Whittaker, Clarke & Daniels
- Antimony Sulphide
  - Ceramic Color & Chemical
  - Footo Mineral
  - Harshaw Chemical
  - Hommel, O.
- Aplite
  - Dominion Minerals
- Arches
  - Frazier-Simplex
- Arsenic
  - Drakenfeld, B. F.
  - Harshaw Chemical
  - Hommel, O.
- Automatic Brick Car Loaders
  - Posey Iron Works
- Ball Mills
  - Abbe, Paul O.
  - Drakenfeld, B. F.
  - Hardinge
  - Hommel, O.
  - McDaniel Refractory Porcelain Co.
  - Vitro Manufacturing
- Ball Mills (Laboratory Type)
  - Abbe, Paul O.
  - Drakenfeld, B. F.
  - Hommel, O.
  - International Clay Machinery
  - International Engineering
  - Pereny Equipment Co.
  - Vitro Manufacturing
- Barium Carbonate
  - Barium Reduction
  - Drakenfeld, B. F.
  - Du Pont de Nemours, E. I.
  - Hammill & Gillespie
  - Harshaw Chemical
  - Hommel, O.
  - Vitro Manufacturing
- Barytes
  - Clinchfield Sand & Feldspar
  - Harshaw Chemical
- Basic Oxides (see Oxides)
- Batch Systems & Chargers
  - Frazier-Simplex
- Batts
  - Carborundum
  - Electro Refractories & Alloys
  - New Castle Refractories Co.
  - Norton Co.
  - Remmey, Richard C., Son.
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  - Harshaw Chemical
  - Hommel, O.
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- Beryl
  - Footo Mineral
  - Beryl Ores Co.
- Bichromate of Soda
  - Ceramic Color & Chemical
  - Harshaw Chemical
  - Hommel, O.
- Bitstone
  - Potters Supply
- Blocks (Refractory)
  - Carborundum
  - Corhart Refractories
  - Electro Refractories & Alloy
  - Norton
  - Remmey, Richard C., Son
  - Vitro Manufacturing
- Blowers
  - International Clay Machinery
  - Robinson Ventilating
- Body Stains
  - Drakenfeld, B. F.
  - Du Pont de Nemours, E. I.
  - Ferro Enamel
  - Harshaw Chemical
  - Hommel, O.
  - Maxxon, Elwyn L.
  - Pemco
- Bone Ash
  - Drakenfeld, B. F.
  - Harshaw Chemical
  - Hommel, O.
- Borax
  - Drakenfeld, B. F.
  - Du Pont de Nemours, E. I.
  - Harshaw Chemical
  - Hommel, O.
  - Pacific Coast Borax
  - Pemco
  - Stauffer Chemical
  - Vitro Manufacturing
- Borax Glass
  - Drakenfeld, B. F.
  - Du Pont de Nemours, E. I.
  - Harshaw Chemical
  - Hommel, O.
  - Pacific Coast Borax
  - Stauffer Chemical
  - Vitro Manufacturing
- Boric Acid
  - Drakenfeld, B. F.
  - Harshaw Chemical
  - Hommel, O.
  - Pacific Coast Borax
  - Stauffer Chemical
  - Vitro Manufacturing
- Boron Carbide
  - Norton
- Brick Machines (also Barrows, Molds)
  - Posey Iron Works
- Brick (Refractory)
  - Carborundum
  - Corhart Refractories
  - Electro Refractory & Alloys
  - McDaniel Refractory Porcelain Co.
  - Norton
  - Remmey, Richard C., Son
  - Vitro Manufacturing
- Cadmium Sulphide
  - Drakenfeld, B. F.
  - Du Pont de Nemours, E. I.
  - Ferro Enamel
  - Harshaw Chemical
  - Hommel, O.
- Calcium Carbonate
  - Whittaker, Clarke & Daniels
- Carbonates (Barium Lead)
  - Drakenfeld, B. F.
  - Du Pont de Nemours, E. I.
  - Harshaw Chemical
  - Hommel, O.
  - Vitro Manufacturing
- Carolina Stone
  - United Feldspar and Minerals
- Castings
  - Posey Iron Works
- Caustic Potash
  - Du Pont de Nemours, E. I.
  - Harshaw Chemical
  - Hommel, O.
  - Solvay Sales
- Caustic Soda
  - Du Pont de Nemours, E. I.
  - Harshaw Chemical
  - Hommel, O.
  - Solvay Sales
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- Cements
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Ceramic Service  
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Cerium Oxide  
Ceramic Color & Chemical  
Drakenfeld, B. F.  
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Hommel, O.

Chromite (Natural Chromate of Iron)  
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Chromium Oxide  
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Du Pont de Nemours, E. I.  
Ferro Enamel  
Hommel, O.  
Pemco  
Vitro Manufacturing

Clay (Ball)  
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Georgia Kaolin Co.  
Hammill & Gillespie  
Harshaw Chemical  
Hommel, O.  
Moore & Munger  
Old Hickory Clay Co.  
Potters Supply  
Spinks, H. C., Clay  
Vitro Manufacturing  
United Clay Mines  
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Clay (Ceramic)  
Georgia Kaolin Co.  
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United Clay Mines

Clay (China)  
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Harshaw Chemical  
Harris Clay Co.  
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Maxson, Elwyn L.  
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Clay-Cleaners, Feeders  
Posey Iron Works

Clay (Electrical Porcelain)  
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Hammill & Gillespie  
Harris Clay Co.  
Hommel, O.  
Kentucky Clay Mining  
Moore & Munger  
Old Hickory Clay Co.  
Spinks, H. C., Clay  
United Clay Mines

Clay (Enamel)  
Ferro Enamel  
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Hammill & Gillespie  
Harris Clay Co.  
Hommel, O.  
Kentucky Clay Mining  
Metal & Thermit  
Moore & Munger  
Old Hickory Clay Co.  
Pemco  
Spinks, H. C., Clay  
Titanium Alloy  
United Clay Mines  
Vitro Manufacturing

Clay (Fire)  
Old Hickory Clay Co.  
Potters Supply  
United Clay Mines

Clay (Micronized)  
Pemco

Clay Miners  
Kentucky Clay Mining  
Old Hickory Clay Co.  
Spinks, H. C., Clay  
United Clay Mines

Clay (Modeling)  
Edgar Plastic Kaolin Co.  
Potters Supply Co.  
United Clay Mines

Clay (^Potters)  
Georgia Kaolin Co.  
Hammill & Gillespie  
Hommel, O.  
Kentucky Clay Mining  
Maxson, Elwyn L.

Moore & Munger  
Old Hickory Clay Co.  
Spinks, H. C., Clay  
The Charles Taylor Sons  
United Clay Mines

Clay (Process Equipment)  
Posey Iron Works

Clay (Sagger)  
Georgia Kaolin Co.  
Great Lakes Foundry Sand  
Hommel, O.  
Kentucky Clay Mining  
Maxson, Elwyn L.  
Old Hickory Clay Co.  
Spinks, H. C., Clay  
United Clay Mines

Clay-Slip (Albany)  
Ceramic Color & Chemical  
Hammill & Gillespie  
Hommel, O.  
Maxson, Elwyn L.  
United Clay Mines

Clay (Wad)  
Kentucky Clay Mining  
Old Hickory Clay Co.  
Spinks, H. C., Clay  
United Clay Mines

Clay (Wall Tile)  
Georgia Kaolin Co.  
Hammill & Gillespie  
Kentucky Clay Mining  
Maxson, Elwyn L.  
Moore & Munger  
Old Hickory Clay Co.  
Spinks, H. C., Clay  
United Clay Mines

Cleaners  
Harshaw Chemical  
Pemco  
Solvay Sales

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Drakenfeld, B. F.  
Du Pont de Nemours, E. I.  
Ferro Enamel  
Harshaw Chemical  
Hommel, O.  
Pemco  
Vitro Manufacturing

Cobalt Sulphate  
Drakenfeld, B. F.  
Du Pont de Nemours, E. I.  
Ferro Enamel  
Harshaw Chemical  
Hommel, O.

Colors  
Ceramic Color and Chemical  
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Du Pont de Nemours, E. I.  
Ferro Enamel  
Harshaw Chemical  
Hommel, O.  
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Photovolt

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Pressure  
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Conveying Equipment  
Frazier-Simplex  
Posey Iron Works

Copper Oxide  
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Harshaw Chemical  
Hommel, O.

Cornwall Stone (Imported)  
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Hammill & Gillespie  
Hommel, O.  
Maxson, Elwyn L.

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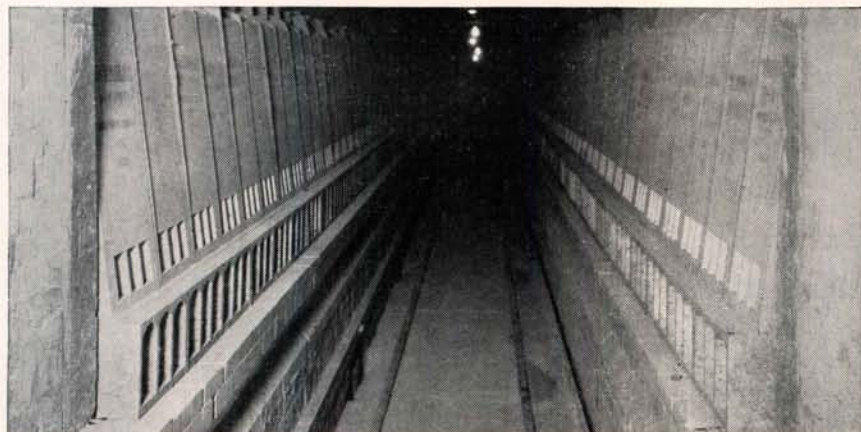
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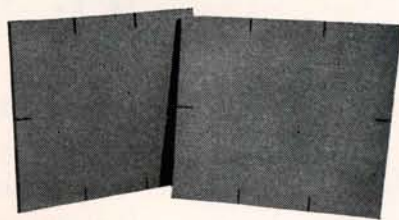


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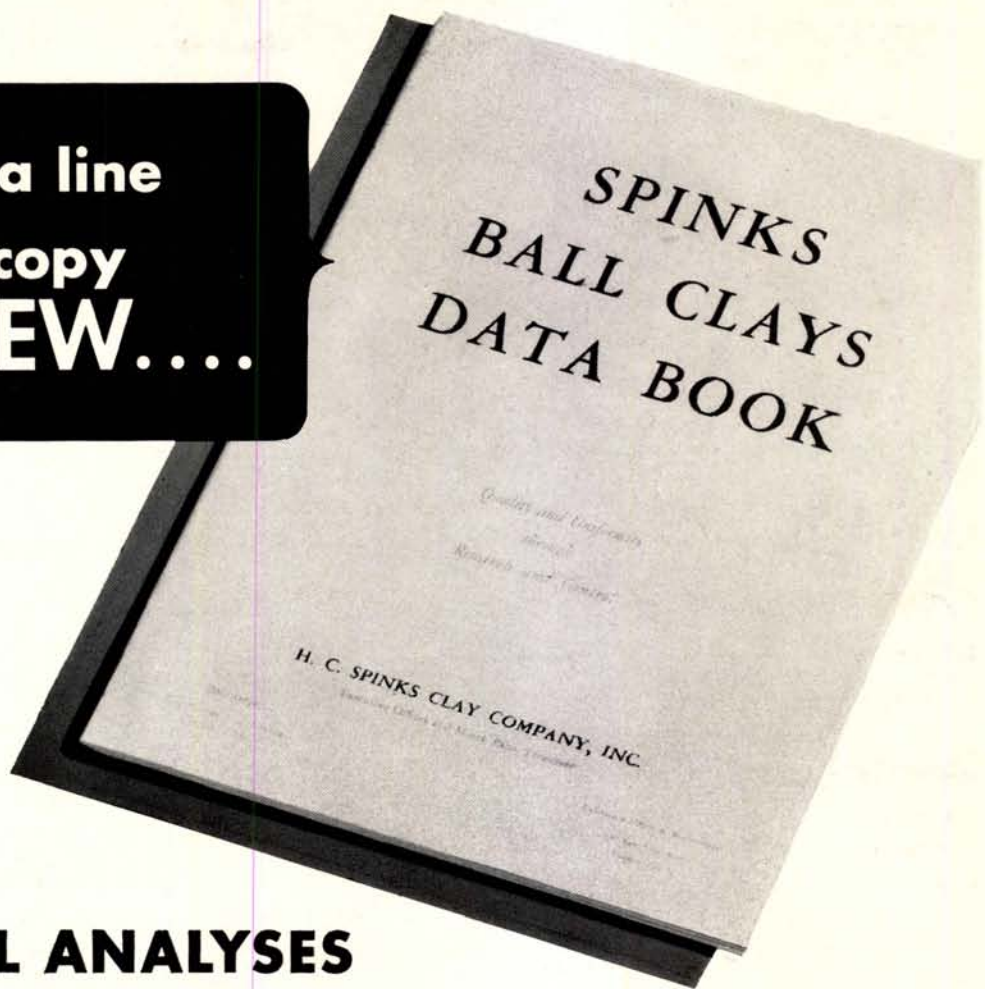
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