#### **APRIL** • 1946

#### Volume 53

Number 4

9.351/46/II

| S. D. KIKKPAIRICK          | . Editor |
|----------------------------|----------|
| IAMES A. LEEManaging       | Editor   |
| THEODORE R. OLIVEAssociate | Editor   |
| HENRY M. BATTERSMarket     | Editor   |
| LESTER B. POPEAssistant    | Editor   |
| RICHARD W. PORTERAssistant | Editor   |
| EDMOND C. FETTERAssistant  | Editor   |
| RICHARD F. WARRENAssistant | Editor   |
|                            |          |

CHEMIC

R

1

| FDITORIAL.  | REPRESENTATIVES   |
|-------------|-------------------|
| TDI I OWIND | VET VEDENTIATA ED |

| JOHN R CALLAHAM | San Francisco    |
|-----------------|------------------|
| J. V. HIGHTOWER | Washington       |
| EARLE MAULDIN   | Atlanta          |
| R. S. McBRIDE   | Washington       |
| E. S. STATELER  | Chicago          |
|                 | Sherright in the |

M. A. WILLIAMSON ..... Publisher

#### DISTRICT MANAGERS

2 1/ 1

| E. H. | BEDELLNew         | York   |
|-------|-------------------|--------|
| R. G. | FREDERICKNew      | York   |
| FRED  | GRANTClev         | eland  |
| L. A. | CUNNINGHAMCh      | icago  |
| W. D. | BOYD              | oston  |
| E. M. | SCHELLENGERPhilad | elphia |

Published monthly. Price 35 cents per copy. Abbay 1, N. Y. Address communications about subscriptions to Vice-President (for viculation operations), Chem. & Met. Sub-scription rates: United States, Mexico, Central and South American Countries: \$3 per year, \$4 for two years, \$5 for two years, \$6 for three years (payable in Canadian funds). Al price years, \$5 for two years, \$6 for three yountries; \$3 per year, \$10 for three years, Please indicate position and company onnection on all subscription orders. En-tered as second class matter September 3, 1936, at Post Office at Albany, N. Y., U.S.A meter act of March 3, 1879. Copyright 1946 by McGraw-Hill Publishing Company, Inc.-Michigan Avenue, Chicago 11, 68 Post Street, Street, Cleveland 15, Detroit 26, St. Louis 8, postor 4, C. 2, Washington 4, Philadel piaz 6, Cleveland 15, Detroit 26, St. Louis 8, postor 4, mer Postage Guaranteed

#### McGRAW-HILL PUBLISHING CO., INC.

JAMES H. McGRAW Founder and Honorary Chairman.

Publication Office 99-129 North Broadway, Albany 1, N. Y. Editorial and Executive Offices 330 West 42nd Street, New York 18, N. Y. JAMES H. McGRAW, Ja., President; CUR-TIS W. McGRAW, Senior Vice-President and Treasurer; HOWARD EHRLICH, Vice-Presi-dent and General Business Manager; EUGENE DUFFIELD, Editorial Assistant to the Presi-dent; JOSEPH A., GERARDI, Secretary; and J. E. BLACKBURN, Ja., Vice-President (for circulation operations). Member A.B.P. Member A.B.C. Member A.B.C. Member A.B.P.

Cable Address McGRAWHILL New York

### In this Issue

N

| What Price Exports?  |         |                             | 93  |
|--|---------|-----------------------------|-----|
| Unusual Techniques Feature Produ<br>By RICHARD W. PORTER   | uction  | of Synthetic Bead Catalyst  | 94  |
| Estimating Best Output and Fuel<br>By RALPH CIBBS          | Rates   | for Dry Feed Lime Kilns     | 99  |
| Rubber & Plastics as Materials of<br>By M. C. FONTANA      | Chemi   | ical Plant Construction     | 102 |
| Characteristics of Commercial Typ<br>By C. C. HERMANN      | oes of  | Dust Collectors             | 106 |
| Some Fundamental Factors in Cho<br>By I. S. BRUMAGIM       | oice of | Liquid Agitators            | 110 |
| Chem. & Met. Plant Notebook                                |         |                             | 115 |
| Weight Control, a Valuable Tool o<br>A CHEM. & MET. REPORT | f Proc  | ess Industries              | 125 |
| Synthetic Bead Catalyst.<br>A CHEM. & MET. PICTURED FLOWSH | EET     |                             | 138 |
| Watching Washington  | 78      | Industrial Notes            | 248 |
| Equipment News   | 120     | Convention Papers           | 258 |
| New Products   | 145     | Foreign Abstracts           | 286 |
| News   | 155     | Book Reviews                | 293 |
| Readers Views  | .170    | Government Publications     | 302 |
| Pacific Process Industries                                 | 174     | Manufacturers' Publications | 306 |
| Foreign News   | 194     | Economics                   | 317 |
| German Chemical Industries                                 | 206     | Production Trends           | 320 |
| Corrosion Forum  | 217     | Production Data             | 322 |
| Log of Experience  | 231     | Prices                      | 326 |
| Personals  | . 239   | New Construction            | 330 |
|  |         | 400 0 444                   |     |

| CHANGE   | Director of Circulation<br>Chemical & Metallurgical Engineering |
|----------|---|
| ADDRESS  | 330 West 42nd Street, New York 18, N. Y.                        |
|          | Please change the address of my Chem. & Met. subscription.      |
| 4-21     | Name  |
|          | Old Address   |
|          | New Address   |
|          | New Company Connection  |
| - Puller |   |

# Only A-C Builds

... THE WORLD'S LARGEST LINE OF BASIC PROCESS-ING EQUIPMENT ....

BUYING COMPLETE EQUIPMENT at one time saves trouble and expense. And as a rule it means better engineering-since one supplier is responsible for its performance. The customer gains, either through increased production or lowered costs.

Stand Harris C. Car

#### A-C BUILDS EQUIPMENT COMPLETE

If you profit in dealing with one source, think how much more it will mean to you when you specify A-C equipment. For Allis-Chalmers is the only company that builds basic processing machinery, as well as motors and drives! This fact is also reflected in our engineering. The A-C men you deal with are complete-line engineers - familiar with every step in the basic processes. They are qualified to figure both your mechanical and electrical needs . . . and correlate the two into a smooth-running, productive team.

#### **REPUTATION FOR QUALITY MACHINERY**

Even when you purchase individual A-C equipment, like motors and drives, for existing machinery you are assured of as good . . . and in many cases better quality equipment than you can find anywhere on the market. Next time you're pressed with equipment problems, why not find out how A-C can help you. Call our nearby district office, or write direct to Allis-Chalmers, Milwaukee 1, Wis. A 2005

HEAR THE BOSTON SYMPHONY Every Saturday Evening, American Broadcasting Co.

**REENS** Modern engineering—giving you more screen for less money — typifies the 8 different types of ing screens which A-C builds. "Stress-relieving", if cally designed support frames many other fea vibrating screens which A.C builds. "Stress-relieving", scientifically designed support frames, many other fea-tures contribute to longer screen life, low maintenance.

Send for These FREE HELPS!



CompleteLine of A-C equipment for Process Industries. Bulletin B6166D.







"Ripl-Flo" Screens-\_ 3 x 6 to 6 x 16 ftin 1, 2 or 3 docks. Bulletin B6151B.





Texrope Drives prices, sizes of belts, sheaves, etc. Bulletin B6051F.





...THE WORLD'S WIDEST LINE OF V-BELT DRIVE EQUIPMENT...

### LINE OF MOTORS WITH WHICH TO DRIVE THEM!





View above shows simplified parts assembly

of Grove ChexFlo Valves consisting of: 1. Valve

Body, 2. Flexible Synthetic Rubber Tube, 3. Slot-

\* Positive Bubble-tight shut-off

\* Instantaneous in Operation

\* Closes on Balanced Flow

\* Avoids Pressure Impulses

\* Requires no Maintenance

\* Silent in Operation

\* Self-compensating for Wear

ted Cup-shaped Core, 4. Flange Closure.

For AIR • GAS • LIQUIDS EMBODIES NO METALLIC

Theck

**POSITIVE** BUBBLE-TIGHT

#### **MOVING PARTS**

Contrasted to ordinary check valves the Grove Chex-Flo employs no metallic moving parts. Operation is effected by means of a synthetic rubber tube which expands to open and contracts to close over a slotted cup-shaped metal core. Uniform and constant spring rate of the flexible tube sets up no inertia to cause operation in excess of flow requirements. Tube closes instantly on balanced flow prior to inception of back flow. This eliminates any tendency to establish pressure impulses, shock or water hammer in flow line. For full details write for Bulletin 610 today.



GROVE REGULATOR COMPANY

65th & GREEN STREET, OAKLAND 8, CALIFORNIA • Eastern Sales and Export Office: 30 Rockefeller Plaza, New York City Factory Branches: 108 Portwood, Houston, Texas • 1930 West Olympic Boulevard, Los Angeles 6, California



A 60 h.p. drive, installed in 1934, operating continuously 24 hours per day, 6 days per week.

Two 60 h.p. drives installed in 1936, same service.

A 75 h.p., an 80 h.p., and a 125 h.p. drive, installed in 1938 and running continuously.

That these drives have operated without attention other than inspection and lubrication, moved the chief engineer of the company to describe their service as "phenomenal."

Silverstreak Silent Chain Drives are engineered and built for positive, efficient service, long life, and low overall cost. Reports such as the above show that "performance fulfills the promise."



Today's demand for greater production efficiency suggests the wisdom of investigating the advantages of this distinctive drive. Write today for Data Book 125.

#### LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities.



liminate

PUT TEETH IN YOUR DRIVES!

SLIP!

This interesting St. Louis plant follows a modern trend in industrial building construction. The exterior of the building, involving a total area of 200,000 square feet, is completely clad with one of the toughest and most durable of all sheathing materials...K&M "Century" Asbestos Corrugated roofing and siding.

#### BUILT TO LAST

Here is a roofing and siding that defies time and wear

### K&M "Century" ASBESTOS CORRUGATED

Whether your building plans call for new construction, remodeling or repairs, it will pay you to investigate the many distinctive features of K&M "Century" Asbestos Corrugated and Flat Lumber.

- TOUGH... made of asbestos and portland cement combined under tremendous hydraulic pressure.
- ADAPTABLE . . . for all types of industrial buildings-new construction, remodeling, repairs.
- ATTRACTIVE . . . has neutral gray color, practical finish, never needs protective paint.

Build to last, and save time and money the "Century" way. Bring your problems to your authorized K&M Distributor. He is well equipped to meet your material and installation requirements for "Century" Asbestos Corrugated and Flat Lumber.

- LONG LASTING ... will not rust, corrode, rot ... proof against weather, rodents, termites.
- FIRE RESISTANT . . . thus earning low insurance rates.
- TIME SAVING . . . comes in 19 different lengths and one standard width . . . easy to handle . . . goes up fast.

#### Nature made Astestos

... Keasbey & Mattison has been making it serve mankind since 1873.



# WHY USE Filter Cloths or Sereens when you can do the job continuously in a BIRD SOLID BOWL FILTER

#### IF YOUR SOLIDS ARE ANYTHING LIKE THESE,

the chances are that you can filter them faster, better and at lower cost with a Bird Filter. *Continuous centrifugal sedimentation* employing separating forces up to 1800 x gravity does the trick. Filter cakes are dry and uniform. Filtrates are clean. Operating attention and maintenance are at a minimum.

Judging by reports from the field you cannot afford to filter the old way and the hard way if the Bird Filter fits your product and production specifications. Wouldn't it be well to find out? ALUMINUM HYDRATE ALUMINUM AUM AMMONIUM ALUM AMMONIUM ALUM AMMONIUM CHLORIDE BARIUM CHLORIDE BARIUM SULPHATE BARIUM SULPHATE BARIUM SULPHATE BARIUM SULPHATE BARIUM SULPHATE BLACK ASH BORAX CALCIUM APSENATE CARNALITE COAL COPER SULPHATE FERROUS SULPHATE FERROUS SULPHATE FERROUS SULPHATE FUOTATION CONCENTRATES FUUTASY SANDS GLAUBERS SALT GLUTAMIC ACID HEMATIE HEXACHLORETHANE HEXACHLORETHANE IRON OXIDE LANGEENITE LEAD ARSENATE LEAD ARSENATE LEAD CHOMATE LEAD CHOMATE LITHOPONE MAGNESIUM CARBONATE OCHRE ORES PACKING HOUSE WASTE PHOSPHATE ROCK POTASSIUM CARBONATE POTASSIUM CARBONATE POTASSIUM HYDROXIDE POTASSIUM HYDROXIDE POTASSIUM HYDROXIDE POTASSIUM HYDROXIDE SODIUM GENERATE SODIUM CHCHOMATE SODIUM GENERATE SODIUM GENERATE SODIUM SUPHATE SOUTANIC RUBBER TALLOW TARTARIC ACID TITANUM DIOXIDE TIASTONUM PHOSPHATE TUNGSTEN SALTS VINTHEIC RESINS VYNTHE CARBINE SUFFICE SU

### BIRD MACHINE COMPANY SOUTH WALPOLE . MASSACHUSETTS

BUILDERS OF BIRD CONTINUOUS CENTRIFUGAL CLASSIFIERS

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •.

# VALVE TROUBLES Go out of the Picture



- 1. Maximum Capacity when needed most
- 2. Accurate Pressure Control under toughest working conditions
- 3. Trouble-free Service
- 4. Smooth Operation
- 5. Tight Closure
- 6. Accurate Regulation
- 7. Speedier Production Results
- 8. Elimination of Failures
- 9. Constant Delivery Pressure
- 10. Cost Saving Operation
- 11. No Spoilage
- 12. Practically zero in maintenance costs

CASH STANDARD

VALVES

CONTROLS.



#### • Find out in detail about the CASH STANDARD "1000" Streamlined Valve - see how you can apply it to your lines to do that

Treamlined TYPE

STANDARD "1000" Streamlined Valve — see how you can apply it to your lines to do that pressure reducing job most efficiently and with good cost savings.

Bulletin "962" features the CASH STANDARD Streamlined Type "1000" Pressure Reducing Valve — illustrates the streamlined construction and tells why you get exceptionally long, trouble-free, low-cost performance, points out why you get no turbulence and therefore can

meet peak demand at all times. Explains why straight-line flow gives you maximum capacity, close delivery pressure control, and tight closure.

A. W. CASH COMPANY

DECATUR, ILLINOIS

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES Send for them



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaparator corresponding to a constant temperature desired. Shows an Ammonia and Frean Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or all that is non-corrasive; and with refrigeraling fluids such as Ammonia and Frean. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chalter

# Hook Up...AND Pump!



\*Electrifugal' pump operates in any position—bas numerous applications. Built in stock sizes, ¾ to Built in stock sizes, ¾ to applied by Allie Chalmers en 25 bp. Allie Chalmers en gineers have developed and gineers have developed and perfected the close-coupled Perfected the close-coupled pump, through 20 years of pump, through 20 years of experience.



### A-C"Electrifugal" Pump Cuts Installation Time

This compact "Package" pump comes fully assembled. No coupling to line up. Just bolt it down, make pipe and power connections — prime and pump! More than that, this pump costs you *less to buy* — *less to operate*. Read these interesting facts:

#### SIMPLE, COMPACT DESIGN

Motor and pump are built into one rigid frame, with rotor and pump runner on a single shaft. Result: one third less space — fewer parts — *lower cost*.

#### EASY TO SERVICE

Packings, rotor, impeller, and all moving parts are easy to get at. Quickly taken apart, checked, and reassembled. Down time is reduced to a minimum.

#### LOW MAINTENANCE

Ample bronze wearing rings, bronze water seal and valve — shaft sleeve and deflector — five packing rings — precision workmanship — and other quality features all add up to longer life, less maintenance cost.

#### UNDIVIDED RESPONSIBILITY

Allis-Chalmers builds both pumps and motors — backs them up with unsurpassed experience and reputation in both fields. Call your A-C office for help on any pumping problem . . . or write for bulletin B6059. ALLIS-CHALMERS, Milwaukee 1, Wisconsin.

HEAR THE BOSTON SYMPHONY Every Saturday Evening, American Broadcasting Co.

ALLIS & CHALMERS Electrifugal PUMPS



**COMPLETE LINE** of centrifugal pumps and motors. Single or double suction — singleand multi-stage—capacities to 170,000 gpm. A 2010

# Kills Weeds-Spares Carrots!

#### New Spray Typical of Amazing Developments from Petroleum!

• You're looking at an artist's conception of a new miracle that is taking place on America's farm lands. It shows what happens 48 hours after spraying a weed-infested carrot patch with a new Socony-Vacuum selective weed-killer. The weeds have shriveled and died. The carrots are flourishing.

The secret is controlled toxicity deadly to weeds, yet harmless to carrots. Availability of this new spray means an end to laborious hand-weeding and a saving of up to 80% on weeding costs. This is another striking example of amazing new Process Products developed by Socony-Vacuum research. Already there are hundreds of such products, improving operations and processing, and cutting costs in over 30 U.S. industries. Every month sees new discoveries.

Typical examples of products already available to various industries are listed at right. Your local Socony-Vacuum Representative will be glad to discuss products developed for your particular industry.



#### No Matter What You Make... Here's Help for Your PROCESSING

128 Alis Sta

The industries and products listed below will give you an idea of the scope of Socony-Vacuum Process Products. Your Socony-Vacuum Representative can bring you the complete story, with facts and figures about the newest products for your industry.

#### TEXTILES

Complete line of processing oils for woolens, worsteds, cottons, rayons. Water repellents, mildewproofing agents.

#### PAPER-MAKING

Special wax emulsions for beater and top-sizing. Softening oils, solvents for pitch removal, defoaming agents.

#### METAL-WORKING

Rust preventives to retard rusting. Quenching and tempering oils. Special oils for metal inspection.

#### RUBBER

New line of processing oils for plasticizing GR-S and Ncoprene. Sun-checking wax.

#### PACKAGING

New waxes and emulsions to give flexible moisture-vapor resistant coatings for frozen foods and dehydrated foods.

#### FARMING

Base oil for manufacture of tree sprays to control insects. Wax emulsions and oils to protect potatoes, apples and eggs in shipment and storage.

#### **OTHER INDUSTRIES**

Electrical, Building, Cordage, Ceramics, Plastics, Lumber, Meat Packing, Printing, Paints.

SOCONY-VACUUM OIL CO., INC. 26 Broadway, New York 4, N. Y. and Affiliates: Magnolia Petroleum Co., General Petroleum Corp. of Cal.

Tune In "Information Please" Monday Evenings, 9:30 E. S. T.—NBC



## You Can Get Accurate Uniform Drying with this Link-Belt Roto-Louvre Dryer . . . . *Quickly, Economically*

DRIES UNIFORMLY — every particle of material is subjected to the same uniform treatment, eliminating "spotty" results.

**HANDLES GENTLY** — the Roto-Louvre design entirely eliminates cascading and avalanching — gentle rolling action preserves the desired form of material.

MINIMIZES "DUSTING" — the Roto-Louvre Dryer gives you "continuous aerated mass drying" which retains material in a compact bed yet exposes every particle to intimate contact with the transfer medium.

BUILT FOR SERVICE — no moving parts within the dryer shell — nothing to get out of order — longer service life — keeps maintenance and repair costs low.

**NO OVERHEATING** — highly heat-sensitive materials are exposed to an efficient high-temperature transfer medium without overheating — thermal input is reduced automatically to prevent a surplus of heat from raising the temperature.

HIGH EFFICIENCY --- you get maximum vaporization and prompt removal of the moisture-laden exhaust gases.

**OCCUPIES SMALL SPACE** — often less than 50% of the floor space is needed over that of conventional-type drying equipment of comparable capacity.

#### Let Link-Belt Engineering Service Analyze Your Drying Requirements...

Let Link-Belt engineers analyze your drying or cooling problems. Wide experience, based on laboratory tests in your own and other plants can help you get the best drying processes for your product. Tell us what you are drying and what your requirements are.

#### Some Link-Belt Dryers in Use in a Wide Variety of Plants



#### LINK-BELT MULTI-LOUVRE DRYER

This unit applies the Roto-Louvre principle in a smaller, more compact unit. For drying materials requiring a shorter retention period, with many advantages of the Roto-Louvre dryer.



LINK-BELT "SS" DRYER Designed for fast removal of surface moisture from coarse non-absorbent materials. Hot air is forced through the material as it moves forward along a shaker screen.

#### Send for this Catalog



Describes Roto-Louvre principle, construction and operation. Data sheet included on which to list your requirements. LINK-BELT COMPANY Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities. 10,243



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

#### of liquid heat-treatment

...let's get on with the st

Heat treatment of flow chemicals accomplished with radiant-gas-fired burners -no longer theory-but an actuality. Consider the continuous flow of a liquid through tubing-travelling just inches away from the heat source. New standards for uniformityflow rates-heat transfer. By design, the vest pocket tubestill is a refractory walled corridor studded with radiant-gas-fired burnerscontrolled heat patternfitted to the function. Through job engineered combustionthe improbabilities of today become accepted work plans of tomorrow by manipulating heat as an instrument of production.

I'd like to hear the rest of the story -especially in terms of my problem, stated on the attached sheet.

|         | Improved | Heat Proces |
|---------|----------|-------------|
| ADDRESS |          |             |
| COMPANY |          |             |
| Tranto. |          | 2           |
| NAME    |          |             |

SELAS CORPORATION OF AMERICA ERIE AVE. & D. ST. PHILA. 34, PA.

F

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

# 50% STRONGER CORDS PUT MORE PUILING POWER IN TEXROPE V-BELTS

### There's 20 Years of V-Belt Experience Behind this Rugged Construction

STRONGER CORDS—because they're firmly twisted of select long-staple combed cotton. More cords, too — accurately placed to carry heavier loads, and impregnated with gum rubber to absorb friction and heat.

Texrope "Super-7" V-Belts today are the finest in 20 years of continuous development by Allis-Chalmers—originator of the multiple V-Belt drive.

#### LONG WEARING - COOL RUNNING

Tough duplex cover to take the wear, keep the belt in shape. Thick cushion of war-proved Buna-S to protect the cord structure from shock. Precision molding to assure accurate section and a smooth running belt. For long service and highest efficiency on ALL V-Belt drives — make A-C your V-Belt headquarters! ALLIS-CHALMERS, Milwaukee 1, Wis. WHICH OF THESE SUPER-7, V-BELTS DO YOU NEED

TEXROPE offers you the most complete line of V-Belts — types specially developed to meet ALL operating conditions. Pick the right TEXROPE Super-7 V-Belt — it'll give you the most in efficient power transmission. Heat-Resisting Super-7 Stands temperatures up to 180°. The TEXROPE V-Belt for most drives. Oil-Resisting Super-7

Neoprene cover protects core against moderately oily or greasy conditions. Oil-Proof Super-7

Made of Neoprene throughout. Use it when the belt must swim in oil. Static-Resisting Super-7

Static-Resisting Super-7 Recommended where explosion hazard exists. Static-conducting element throughout cover won't wear off. Super-7 Steel

Twin steel cables, to pull extremely heavy loads with minimum stretch. GET THEM — through your Allis-Chalmers district office or dealer.

TEXROPE Super-7 V-Belts result from the cooperative research of two great companies-Allis-Chalmers and B. F. Goodrich-and are sold exclusively by A-C.



HEAR THE BOSTON SYMPHONY: Every Saturday Evening, American Broadcasting Co.

A 2009

15



# Swenson Process Engineering brings increased Efficiency and Economy...

During more than 60 years that Swenson has served the process industries, its developments have increased plant efficiency and reduced production costs.

This success is due not only to skill and experience, but to the continuous program of research and development which has been an integral part of Swenson activities from the beginning.

Driving inquisitiveness in scientific exploration, combined with the "know how" gained from working out the problems of highly complicated chemical processes, has led to numerous developments of methods and equipment which today are widely used.

Swenson Process Engineering probably can help you, too, achieve higher production efficiency and economy. It will pay you to consult Swenson freely in the early stages of project planning.











Periodic Check-Ups Inly SWENSON PROVIDES THIS FIVE-WAY SERVICE ...







16

Ċ

LIQUID Seare

COP. 125 100 /HR

STORAGE

ile · FLOW SHEET MATERIAL BALANCE

9-9365

Capacity

For

Scale 1/2" = ONE FT.

Appr.

Appr

"That is not clear. Why? . . . There is some foreign matter in it . . . some matter that we do not want . . . GET IT OUT!

LET'S GET THIS CLEAR

Gravity Settling is TOO slow . . . and all too often it is INCOMPLETE.

Use Centrifugal Force . . . it is FAST . . . it breaks stubborn mixtures.

Sharples Centrifugal Force has a power 13,000 times greater than gravity.

Get Sharples . . . and you'll get not only scientifically designed and precision-made equipment . . . but what is even more important, you will get the benefit of more than 30 years Centrifugal Process Experience.

If you have a CLARIFICATION PROBLEM . . . put it up to Sharples."

# The SHARPLES Corporation

CENTRIFUGAL AND PROCESS 2300 WESTMORELAND STREET + PHILADELPHIA 40 + PENNA.

LONDON • PARIS • NEW YORK • BOSTON • PITTSBURGH • CLEVELAND DETROIT • CHICAGO • DALLAS • SEATTLE • SAN FRANCISCO • LOS ANGELES



ENGINEERS

et e

ARPIN

TRIFUG

SHA



## Vanillic Acid Esters

Tests conducted recently indicate that esters of vanillic acid are potent agents against microorganisms - particularly molds and heat-resistant bacteria. Since these compounds are claimed to be nontoxic as well, it is likely that they will be used as preserva-tives for perishable foodstuffs shipped or stored without benefit of refrigeration. At present, sodium benzoate is the only preserva-

tive used for this purpose. Laboratory studies have shown that, in general, the anti-microbial efficiency increases with increasing weight up to the butyl ester, and then decreases. Actual food preservation studies demonstrate the efficiency of vanillic acid esters in preserving salt fish, fresh fruit juices, vegetable juices, cheese spreads and bread.

The esters were produced by dissolving vanillic acid in the desired anhydrous alcohal, then either saturating the solution with dry hydrogen chloride, or adding sulphuric acid and boiling for a short time under reflux. The esters are substantially odorless and tasteless. The discovery is reported in a technical paper published recently.

#### **Tall Oil Constituents** Separated by New Method

An improved process for separating tall -fatty and oil into its main constituents resinic acids — is claimed in a recent patent. Tall oil, or "talloel,". which is Swedish for pine oil, is the chief by-product in the produc-tion of paper pulp from resin-bearing woods by the so-called "sulphate process." According to the separation method de-cribed in the patent the tall oil is first treated

scribed in the patent, the tall oil is first treated with esterifying agents, preferably monohy-dric alcohols. The esterified oil is then dis-solved in a suitable solvent which retains the resinic acids, or derivatives, in solution at low temperatures. The solution is chilled, and the fatty acid esters separate out. Some of the solvents employed are: acetone, ethyl methyl ketone, and ethylene dichloride.

#### THE MONTH IN CHEMURGY

A new product from sugar will help make resins, plastics, and food products...Bamboo is used as a raw material in the manufacture of rayon . . . An improved "milk" is made from soybeans . . . Oil bearing seeds are seen as a new source for proteins . A modified cotton fabric will not mildew or rot . . . A chewing gum base is prepared with the aid of sunflower, peanut, and oiticla seeds . . . A new book on chemurgy is published . . . Food yeast is produced from the waste liquor in the process of pulping beech wood . . . A new company is formed to produce glucose from wheat . . An inexpensive type of buckwheat will supply large quantities of a drug helpful to those afflicted with high blood pressure . . . Peanut butter can now be made in orange, vanilla or chocolate flavored bricks which can be sliced and laid on bread like cheese.

## Are New Preservatives By New Chemical Treatment

Wool can now be stabilized against laundry shrinkage, according to the claims made in a patent issued recently. Shrinkproofness is accomplished by a chemical process which involves the use of a defelting agent and a

volves the use of a defering agent and a synthetic resin-forming material. In the first step of this process, the wool is treated with a solution of potassium hydrox-ide in ethyl alcohol in order to reduce the felting quality. This treatment is stopped when the wool has lost approximately 16.7% of its pitiel treatle streagth. It is then treated of its initial tensile strength. It is then treated with a synthetic resin-forming material in water dispersion containing not more than 6% solids. The resin-forming material is then cured.

The American Wool Council warns, however, that it will take one or two years of technological development before "washable" woolens will be flooding retail counters.

#### **New Compounds Rival** Penicillin and DDT

Two of the most publicized of the wartime chemical developments-penicillin and DDTare already being equalled or bettered, according to recent announcements. A new insecti-cide, known as "1068," is said to be several times nore toxic to insects than DDT, and a synthetic benzyl derivative is claimed to rival penicillin in therapeutic value.

#### Arsenic Antidote Found

A new and effective antidote for arsenic poisoning is the result of 20 years work by British scientists. Known as 2,3-dithiopropanol, this new drug is reported to remove the poison from the tissue by forming an arsenic addition compound which the body excretes. It is administered by injection, using peanut oil and benzyl benzoate as the vehicle,

Wool Shrinkage Eliminated | New Quick-Dry Resin **Meets Demands for** Lowered Oil Content

> Aroplaz 1314 Replaces Aroplaz 1306 - Exhibits **Many Similar Properties**

In response to the current urgent demands for lower oil-content resins, U.S.I. now offere its new alkyd-type resin, Aroplaz 1314. De-signed as a replacement for U.S.I.'s highly popular Aroplaz 1306, it contains 12 per cent less oil on the solvent free basis than the older resin vet exhibits approximately the care resin, yet exhibits approxim tely the same superior qualities. Manufacturers will find the resin suited for use in architectural and in-dustrial coatings of the brushing, dipping or spraying types.

Properties

Aroplaz 1314 is a hard resin modified.

| <b>Specification for Aro</b>   | plaz 1314       |
|--------------------------------|-----------------|
| Solution: 74-76% solids in M   | Aineral Spirits |
| Viscosity (G.H.):              | Z-Z.            |
| Acid Number                    |                 |
| (solvent free basis):          | 9-13            |
| Color (G.H. 1933)              | 8-10            |
| Weight per gallon              | 1171 1 - 14     |
| at 25°C.:                      | 9-8.0 lbs.      |
| Oil Content                    | The section     |
| (solvent free basis) :         | 54%             |
| PhtHalic Anhydride             | - a the         |
| Contant:                       | None            |
| Solubility: Complete in pe     | troleum and     |
| coal-tar solvents; insoluble i | n ethyl alco-   |
| hol. Compatible with many      | oils, resins    |
| and alkyds                     |                 |

phthalic-free, oxidizing alkyd-type resin of medium oil length. It is even faster, drying than Aroplaz 1306 - air-drying to hard, tack: free finishes overnight, and baking hard in <sup>34</sup> to 1 hour at 250 degrees F. Finishes http pared with Aroplaz 1314 have moderately good flexibility, and good resistance to water and alkali. PETER PE

(Continued on next page)

Popular with safety engineers is the new system of painting plant machinery in eye-catching colors that call workers' attention to danger areas and set off moving parts against contrasting backgrounds. Here a punch press is being painted to remove the camouflage of solid drab colors. Aroplaz 1314 and other U.S.I. resins add durability and flexibility to many coatings used in this new and improved safety technique.



ADVEREISEMENT-This entire page is a paid advertisement.

# **U.S.I. CHEMICAL NEWS**

#### New Alkyd-Type Resin (Continued from preceding page)

Set - 22 Cart

APRIL \*

Aroplaz 1314 is pale in color. Coatings made from it not only have good initial color, but exhibit high color-retentive properties as well. White enamels made with this new resin approach the whiteness of enamels based on philialic-alkyd resins. In gloss and gloss re-tention, it is superior, in both clear and pigmented films, to many alkyds.

Wide Uses

Manufacturers will find this new resin ideal



Aroplaz 1314 - excellent for interior finishes -is helping to meet the current demand for resins with reduced oil content.

for use in a wide range of air-dry or lowbake industrial finishes - white or colored. It will also prove popular in numerous interior architectural coatings. However, finishes pre-pared with Aroplaz 1314 have only moderately good exterior durability. This property, though, can be improved by the addition of relatively small quantities of bodied oils.

#### **Highly Acidic Fatty Oils Purified by New Process**

The purification of fatty oils containing strong acids is described in a recent French patent. According to the claims made, the acidic oils are first neutralized with the equivalent amount of alkali, producing a mixture of oils and soap. The oils are separated from the soap by extraction with a soap solvent such as acetone, ethyl alcohol, methanol, or their mixtures. Separation of the soap solu-tion is effected by mechanical means.

#### Ultrasonic Energy Now Available for Research

Ultrasonics-the region of sound frequencies higher than our ear can hear-is opening one of the newest and most interesting research fields. This new force has been engineered into a single compact laboratory instrument which is solving research problems in chemical, metallurgical, biological, and medical laboratories, according to the manu-

facturer's announcement. About the size of a good-sized radio, this instrument operates on any 110 volt. 50-60 cycle line, and produces over 500 volts of high frequency energy. Highly accurate ground quartz crystals control the frequency of the oscillations produced. Four frequencies are possible-100, 400, 700 and 1000 kilocycles per second.

Among the interesting effects reported to be produced by this instrument are: the production of hydrogen peroxide from water, the oxidation of potassium iodide to free iodine, the emulsification of mercury and water, the destruction of pathogenic bacteria, the dcrease in germination time of seeds, and the sterilization of milk and other liquids.

#### **Quick-Curing** Neoprene

Neoprene compounds can be quickly cured at low temperatures by adding from 0.1 to 35 parts of sulphur chloride, according to the claims made in a recently-issued patent. The addition of small amounts of ethyl alcohol. amyl alcohol, or a ketone, such as acetone is said to prevent gelation.

#### **Invention of New Plastics Claimed** in British Patent

The preparation of a new series of plastic compounds is described in a recently-issued British patent. These compounds are pro-duced when a linear-polyamide-forming substance, such as a hexamethylene-diammonium salt of adipic acid, is reacted with a formaldehyde condensation product in the presence of butyl alcohol. The condensation product is the result of the reaction of formaldehyde with one or more of the following substances: urea, thioureas, guadidine, substituted guanidines, aminotriazines, and substituted aminotriazines. The plastics are said to be useful in the manufacture of decorative or protective film-forming compounds.

TECHNICAL DEVELOPMENTS

Further information on these items may be obtained by writing to U.S.J.

To extend the life of concrete and terrazo floors, a special liquid is offered for application. It is claimed to give protection against the effects of alternate freezing and thawing, as well as the disintegration resulting from concrete dust. [No. 053] USI

1946

A colorless waterproofing liquid is claimed to provide moisture protection for stone, brick, and stucco exteriors. The product is described as becoming invisible on drying. (No. 054)

USI

An acid-resistant wood, said to withstand the attacks of moisture, decay, and insects, has been announced. It is claimed to weigh more and to be harder than ordinary wood. (No. 055)

#### USI

A new moth proofer, claimed to be non-toxic and non-inflammable, is reported to impregnate wool fabric evenly and quickly. It is stated to be un-affected by dry cleaning or exposure to the air. (No. 056) USI

To dye nylon, a dye carrying penetrant is offered which is said to produce exceptional evenness of color, and to simplify and improve the dyeing process. (No. 057) USI

To remove rust, a new compound, claimed to be relatively non-corrosive to steel even after long exposure, is offered for application by brush, spray, or dip methods. (No. 058)

USI

A new textile soliener now makes it possible to control almost completely the smoothness and suppleness of all types of fabrics regardless of what other types of chemical treatment they re-ceive, according to the claims made by the manufacturer. (No. 059) USI

A new stainproof wall covering is reported to have withstood severe wear and tear in numer-ous public places such as government office buildings, restaurants, theatres, and hotels, ac-cording to claims made. Heretofare indeltble stains, such as lipstick, hot grease, crayon, and ink may be easily washed off. (No. 060)

USI

A new universal slide rule, made of plastic, is described as having razor-sharp graduations resulting in extreme accuracy. The new 10-inch rule is claimed to be easy to read and to operate. (No. 061) USI

A new-type grinding mill is reported to speed up the manufacture of fine dispersions (of particle sizes of one micron or less). The machine is de-scribed as containing very few wearing parts. (No. 062)

USI



### DESIGNED TO CREATE A CONSTANT ILL WIND

Durco exhaust fans create a never-failing ill wind that carries away corrosive fumes from processes like these.

After you install one of these "ill-wind makers" you can practically forget it, because Durco fans are almost entirely immune to the destructive fumes, vapors and gases in these and many other processes. There is virtually no upkeep. Most of the operating attention is made with an oil can – on the motor.

#### Features:

- 1. All parts in contact with the fumes are of Durco castings. These are corrosion resistant throughout; require no coating or painting for protection.
- 2. The impellers are mounted directly on the shafts of oversize motors, with the shortest practical overhang. The shaft is protected from contact with corrosives through the stuffing box.
- 3. The stuffing box prevents the escape of fumes and condensate; is readily repacked when extremely unusual corrosive conditions or removal of motor make this necessary.
- 4. Housing is of one piece. This minimizes time of assembly and adjustment. The motor can be removed without disturbing the fan connections.

DC-2

CORROSION RESISTING

There's a Duriron, Durichlor or Durimet fan for whatever size ill wind you need - from 50 to 5000 cubic feet per minute.

Write for Bulletin 1101.













DAYTON 1, OHIO, U.S.A.

THE DURIRON COMPANY, Inc.

# "I'm fussy about alignment"

### TEXROPE "MAGIC-GRIP" SHEAVES make the job easy!

 $\mathbf{J}$  us slide it on the shaft — move it into exact alignment, using a straightedge if desired — then tighten three cap screws. It's easy as that.

Sheave and bushing come completely assembled. No hammering, no filing or reaming. The patented "Magic-Grip" Sheave gives a powerful clamp fit without backlash, shear or wobble. Yet it can be taken off as easily as it goes on. You save manhours and money the first time you mount a Texrope "Magic-Grip" sheave — and every time after. In addition, there are no set screws to score shaft. And because you don't *hammer* it on, you can't damage motor bearings!

These advantages cost you nothing extra. For details call your A-C office or dealer, or write for Bulletin B6310. Allis-CHALMERS, MILWAUKEE.



HEAR THE BOSTON SYMPHONY: Every Saturday Evening, American Broadcasting Co.

A 2008



# PLACE A DUBLE GUALD ON THE QUALITY AND UNIFORMITY OF YOUR PRODUCT

In production . . . in laboratory control . . . let B&A Reagents and Fine Chemicals stand "double guard" over the quality and uniformity of your product . . .

As raw materials, for example, B&A Fine Chemicals offer an extra measure of purity not obtainable in ordinary process chemicals. With them, you can build quality into your product right from the start. With them, you may find, too, that purification processes can frequently be avoided or cut to a minimum, and manufacturing costs can be reduced. For chemical control, B&A Reagents are always thoroughly dependable and reliable ... "precision made" to decimal-point accuracy for your most exacting analyses. With them, you work in certainty ... protecting your product every step of the way until it comes "off the line" worthy of your guarantee.

So, when quality counts, be sure! Specify General Chemical B&A Reagents and Fine Chemicals for every possible operation . . . in production . . . in chemical control . . . in .the research laboratory!



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

# LEAD WOOD STEEL

# EQUIPMENT FOR THE

# **PROCESS INDUSTRIES**



"Look, Here's What We're Using Now. Two standard winch motors on each elevator . . . doing a good job too. But we want something better. Because *two* motors mean extra space, weight and repairs - things we've got to cut down for more important ordnance."



How To Get Light Weight - yet maintain the generous motor design for which we are famous - presented still another problem. This one we solved by skilful substitution of copper for steel . . . of war-proved fabrication for casting. Yes, we cut down weight and maintained ample, generous design!



"What We Want" said Navy, "are 1/2-hour rated elevator motors that'll lift planes from carrier hangar decks, up at 42 ft, down at 52 ft a minute. And they must be exceptionally dependable-under all conditions-because these planes have to be in the air when we need 'em !"



Whew! High elevator speed, low motor speed ... stronger . . lighter . . . smaller - this'll take 6 months to design ! Then we rolled up our sleeves, tackled first the problem of developing extremely high torque for fast starting under load - solved it with a special field.



Came the Big Surprise! After we put on finishing touches - special corrosion-resistant marine parts, new kind of insulation - we added up design time . . . just one month! And much-needed motors were rolling off the lines less than 41/2 months later.







HEAR THE BOSTON SYMPHONY: Every Saturday Evening, American Broadcasting Co.

OTHER Trecision Tump

Only 3500 al Cett



This McIntyre Series 100 precision gear-type pump ... for capacities from ¼ GPM to 3 GPM at pressures from 0 to 1000 psi for oil or 0 to 200 psi for water at speeds up to 3000 rpm ... puts accurate performance into the smallest space. Yet it costs no more than larger pumps made to less exacting specifications.

#### MCINTYRE PRECISION

Because McIntyre machining methods are capable of holding flat surfaces to one light band and vital dimensions to a plus or minus tolerance of .000025", it is routine instead of special production when McIntyre makes precision pumps and fluid motors carrying the light-band trade-mark. That's why they cost so little.

#### **APPLICATION FACTS**

Bulletin 425 . . . describing how center plates and spur gears of different widths determine capacity ... how they handle even corrosive liquids . . . how adapters fit all drives ... suggests how McIntyre Model 100 precision pumps can improve performance of washing machines, dish washers, machinery control mechanisms, pressure lubrication, circulation systems for coolants, cutting oils and other fluids, and aircraft hydraulic systems. Write for your copy, specifying intended application. The McIntyre Co., 15 Riverdale Ave., Newton 58, Mass.

THE ULTIMATE IN PRECISION



THE IVI-IN I I ALE CO. (FORMERLY ZENITH ASSOCIATES) PUMPS AND FLUID MOTORS IDENTIFIED BY THE LIGHT BAND



#### Meet the Man Who Makes a Virtue of a ONE-TRACK MIND

Ordinarily, it is no compliment to say a man has a "one-track" mind. But in the special sense in which we apply the term to S-A engineers, it describes a singleness of purpose that saves American industry countless thousands of dollars on bulk material handling operations.

It describes an ability to approach any problem with but one thought in mind: the development of a system that will convey the *right* volume to the *right* 

AVENUE.

ULK

B

place, at the *lowest* cost per ton. S-A engineers are aided in this task by an unrestricted choice of equipment a complete line of conveyors and accessories designed and built by the company that for 45 years has led the field with new units and new methods.

If you want the man whose "onetrack mind" can help you achieve utmost material handling efficiency, talk to an S-A engineer.

MFG. CO.

MATERIAL HANDLING EQUIPMENT

Designers and Manufacturers of All Types of

Lowest Handling Cost Per Ton Over the Long Term

LOS ANGELES, CALIF . BELLEVILLE, ONT.



AURORA, ILLINOIS

# **MODERN STEAM GENERATORS**

The C-E Steam Generator, Type VU is exceptionally well suited to the process industries. The process industries like the VU Unit-like it well enough to have purchased an aggregate of over 25,000,000 pounds of steam capacity comprising VU Units-much of which represents repeat orders.

The reason for this wide acceptance is simple enough. The VU Unit is a highly devel-

oped, completely standardized steam generator, service-proved in hundreds of plants. It is compact, efficient and reliable. It handles fluctuating steam demands quickly and easily. It performs well with all types of firing -pulverized coal, oil, gas or combinations of those fuels as well as with all types of stokers.

VU Steam Generators are in service for capacities ranging from 20,000 to 325,000 lb of steam per hr; for pressures from 200 to 1000 psi; for steam temperatures to 900 F.

On its record the VU Unit merits consideration when you are in the market for steam generating equipment.



### quality=built PRESSURE VESSELS

As the fabrication of pressure vessels of various sizes and shapes necessitates manufacturing facilities and methods identical with those required for boiler manufacture, C-E is exceptionally well qualified for such production, from small classes of work to the largest and heaviest pressure vessels employing any type of carbon, alloy or clad steel. C-E shops, equipped with all modern facilities for forming, machining, welding, X-raying and annealing, are unsurpassed by any in the country.

With the improved methods and techniques developed to meet the unusual requirements of a large volume of war work Combustion Engineering is now better qualified than ever before to meet the most exacting pressure vessel specifications. So, whatever your pressure vessel requirements-large or small-you can depend upon Combustion Engineering to give you a thoroughly satisfactory job. We shall appreciate an opportunity to quote on work to your designs and specifications. A-959



C-E PRODUCTS INCLUDE ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS.







• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

Sectional view of the C-E Steam Generator, Type VU. Here is a steam generating unit incorporating design and construction features that bring the high performance standards of utility practice to the industrial field.



The vessels shown here are typical examples of the range of C-E work in the field of pressure vessel fabrication. Above is a large atmospheric tower 107'-4" long x 13'-0" I.D. at the large section; at the left are small stainless steel jacketed vessels for chemical process work. Pressure vessels of virtually every type and size used in the process industries have been produced in large numbers in C-E shops.

• Six years of development and practical application have proved Fedelco Liquid Plastic Coating a remarkably effective new protection against corrosion.

Properly applied, it protects wood, metals, and concrete for long periods against mineral acids, alkalis, and their salts, against moisture, and electrolysis.

Fedelco Liquid Plastic Coating comprises most inert plastic resins. When the coating is applied by dipping, spraying, or brushing, the solvent evaporates, leaving a sheet of actual plastic. This plastic coating is tough, tenacious, and highly flexible, so that it does not crack under bending or expansion or contraction of the material to which it is applied.

Fedelco is remarkably resistant to abrasion; does not chip; has high dielectric strength; will not ignite once it has thoroughly dried; withstands severe shock from temperature changes, and while the coating is not resistant to high temperatures, it will withstand up to 200 degrees Fahrenheit.

FEDELCO HAS THESE UNUSUAL PROPERTIES AND CHARACTERISTICS



These three steel torpedoes have been kept in a 45% solution of ferric chloride for 2054 hours (nearly 3 months). Torpedo no. I had no protective film of any kind; nos. 2 and 3 were coated with Fedelco Liquid Plastic Coating FE-70. As the photos show, no. 1 is

nearly half caten away: no. 2 shows deposits of corroded metal from no. 1, and ferric chloride salt at the water line, over the FE-70; no. 3 has been washed with clear water. The FE-70 coating on both nos. 2 and 3 is still fully intact, still giving 100% protection to the steel.



П

Π



# NOW AVAILAB

d Plastic Coal

#### What Users Say

"On two metal tanks, the coating answered our purpose perfectly. The job of applying it was really very simple, and we had no trouble."

"Extensive research to determine its resistance to corrosion in salt water showed absolutely no signs of corrosion in a period of over five months of 24-hour service, and 100% protection from any possible solution of copper and brass."

"We have found it to withstand the action of our muriatic acid and hypochlorite satisfactorily. We applied six coats." \*1

"Numerous tests for over five months indicate excellent qualities as a protective coating for industrial equipment."

"We have conducted extensive tests on many different kinds . . . Of all the products tested so far, none has stood up as well as your product."

"As an insulating material and protective coating in our anodizing process with 10% chromic acid solutions at 95° F., it has performed satisfactorily over a period of 8 months."

Fedelco Liquid Plastic Coating FE-70 is now available for immediate delivery. This product is not a cure-all. It will not withstand aromatic or chlorinated hydrocarbons, ketones, some ethers and esters, or certain concentrated or strong oxidizing acids. But its protection is so broad, so long-lasting, that it is worth investigating.

#### DIP, BRUSH or SPRAY

Fedelco Liquid Plastic Coating may be applied in either of these three ways. When dipped or sprayed, it should be thinned with FE-70 thinner only.



For general maintenance work, not less than three coats should be applied, and five to seven coats for processing equipment. The degree of protection is directly proportionate to the amount of Fedelco applied to the surface.

#### Packed for Easy Handling



Fedelco Liquid Plastic Coating is packed in convenient 1-gallon and 5-gallon containers for easy on-the-job handling. Coverage varies but can be estimated at 200 square feet per gallon on average surfaces.



### WRITE FOR BULLETIN A technical data

bulletin describes properties, characteristics, and other tests. Write for Bulletin FE-70.



Fedralite Shot Hole Casing . . . Fedelco Plastic Pipe . . . Fedelco Liquid Plastic Coating . . . . Fedelco Tank Cleaning Service . . . Electrical Advertising Signs . . . .



Chicogo 1, Illinois 10.00 200,5000, 12, 725 St. Grantes St. \* 100000005, 24, Press 255, 488 \* 201020555 19, 43, 2720 St. State St.

#### What Tests Show

Extensive tests have been conducted in our own and in users' laboratories, and in practical, day after day service. The results of some of these tests are given below, to indicate what may be expected of Fedelco Liquid Plastic Coating.

The coating was in excellent condition after it had been used with the following products for the time indicated:

Kerosene, 4 years; lubricating oil, 4 years; Foamite, 1 year; salt water, 4 years; sulfuric acid, 10%, 14 months; sewage treatment, 4 years; atmosphere, 4 years.

The coating was in good condition after these tests; 80 octane gaso-line, 1 year; fuel oil, 2 years; ethyl alcohol, 18 months; sulfuric acid, 557 14 months; sulfuric acid 25%, 14 months; and after 18 month tests on each of the following gases: chlorine, sulfur dioxide, hydrogen sulfide, flue gas, carbon dioxide.

The coating was in poor condition after 3 months in 100 octane avia tion gasoline; 3 months in full strength carbon tetrachloride; 2 months in concentrated sulfuric acid.

For any specific use, consult Fedelco engineers, who can advise you on the probable results and best application.

ACID SLUDGE BLOOD CAUSTIC SODA CHICLE CITRUS JUICES COOKING FAT ESSENTIAL OILS FIRE EXTINGUISHER FLUID FISH OIL FORMALDEHYDE GLUE LIQUOR GLUTEN **IRISH MOSS** LACQUER LATEX LIVER OIL OLIVE OIL PAINT & VARNISH PENICILLIN PHARMACEUTICALS PRINTING INK PROTEINS SERUM STARCH STREPTOMYCIN TOMATO JUICE VEGETABLE OIL WAX WOOL GREASE YEAST

9s your problem of CONTINUOUS SEPARATION similar to these?



PPORTUNITIES for simplifying processes by changing from old fashioned gravity or filtration systems to the faster, more efficient, continuous separation with De Laval centrifugals come up every day. The list at the left is far from complete, nor are all the applications "new" — but it does show the wide variety of problems of separation, clarification, or concentration that De Laval engineers have solved.

Perhaps you have always regarded your problem as different or especially difficult. Yet from De Laval's large line of highly specialized machines, which includes more than a dozen distinct types, usually each problem of applying centrifugal force can be met in the most efficient, economical manner.

In addition to speeding up operations by converting a process to a continuous basis, De Laval centrifugals have two additional advantages worth noting: (1) they effect material savings and (2) generally, if not invariably, they improve the product.

In writing De Laval, it will be helpful if you specify whether you are interested in separation, clarification or concentration. Ask for Bulletin No. 225.

> THE DE LAVAL SEPARATOR COMPANY 165 Broadway, New York 6 427 Randolph St., Chicago 6 DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19 THE DE LAVAL COMPANY, Limited MONTREAL PETERBOROUGH WINNIPEG VANCOUVER



FOR SEPARATION • CLARIFICATION • CONCENTRATION



Our customers say .... this warehouse system means fast service and prompt deliveries

ANY of our customers avoid the problems of long-distance MANY of our customers around their drum lot chemicals from one of our nearby warehouses.

Warehouses located in principal industrial centers carry stocks of our chemicals that are most in demand in the surrounding area-and can get them to you quickly.

Carbide and Carbon Chemicals Corporation is a producer and supplier of more than 200 synthetic organic chemicals. This warehouse service is one part of its many activities to aid its customers.

#### CARBIDE AND CARBON CHEMICALS CORPORATION Unit of Union Carbide and Carbon Corporation ULE 30 East 42nd Street, New York 17, N.Y.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

#### We have warehouses in:



CONNECTICUT HARTFORD

GEORGIA ATLANTA

ILLINOIS CHICAGO

INDIANA INDIANAPOLIS

KENTUCKY LOUISVILLE

MARYLAND BALTIMORE

**MASSACHUSETTS** BRIGHTON INDIAN ORCHARD

MICHIGAN DETROIT GRAND RAPIDS

MISSOURI NO. KANSAS CITY ST. LOUIS

NEW JERSEY ELIZABETH JERSEY CITY NEWARK

NEW YORK BROOKLYN BUFFALO LONG ISLAND CITY SYRACUSE TROY

NORTH CAROLINA CHARLOTTE

OHIO CINCINNATI CLEVELAND DAYTON

OREGON PORTLAND

PENNSYLVANIA PHILADELPHIA PITTSBURGH

**RHODE ISLAND** PROVIDENCE

TEXAS DALLAS HOUSTON

WASHINGTON SEATTLE





A VERSATILE INDUSTRIAL TOOL, the G-E amplidyne looks like an ordinary generator, yet performs as a nowerful amplifier. Responding immediately to current impressed on one or more of its small conoutput current sufficient to put controlfield o effect instantaneously. On a mixer drive, ampliproduces the lorque and speed characteristics charted orque (solid black line) increases as shaft load increases, speed (broken black line) shows a smooth, stepless descent. At maximum torque (X), motor will cut out, thereby preventing shaft damage

G-E amplidynes can give you similar operating advantages when applied to drives for grinding mills, rotary cutters, pulverizers, and other processing equipment. If you have a problem reactors. involving control of speed, torque, or a combination of the two, we'd like to show you how amplidyne can whip it.

### Where can you use this new mixer drive? Its speed is automatically reduced as liquids thicken — it eliminates gear changing.

A tough mixing problem was encountered by a large chemical company in one of its batch-mixing processes. After adding the precipitating agent to a mixer charge, the material thickened rapidly, necessitating a reduction in mixer speed. The unit had to be stopped while speed-reducing gears were changed. But before the mixer could be re-started, the material often "froze" and had to be chipped out by hand.

To solve this problem, G.E. developed a variable-speed drive which may be the answer to the same or similar problems in your plant.

This new amplidyne-controlled G-E drive makes it possible to adjust mixer speed over a wide range without stopping the machine. Speed changes are made automatically as the material thickens. To prevent damage to the mixer or drive, motor torque is automatically limited to a safe maximum.

By eliminating shutdowns for mixer speed changes, you save valuable production

TO MIXER FREEZE-UPS

time. Chances of "freeze-ups" are considerably less, and operators do not have to watch mixer load so carefully. Maintenance costs are lower, too, because there are no gears, slip clutches, or speed changers to look after. What's more, the over-all cost of the new drive is less than that of similar drives with mechanical speed changers.

Our engineers will be glad to help you explore the possibilities of using G-E amplidynes to save production time and lower costs. Write or phone the G-E office nearest you. Apparatus Dept., General Electric Company, Schenectady 5, N.Y.

### AMPLIDYNE-CONTROLLED MIXER DRIVES

--prevent mixer "freeze-ups" --eliminate speed-changer maintenance --reduce lost production time

88

0091

8

P. M.

8008

600 BI

400 9

200

0

100 200 PER CENT FULL MOTOR TORQUE



-save power -make close supervision unnecessary -cost less than gear-type drives





## **Specify Aluminum Equipment**

ACETIC ANHYDRIDE, chemical intermediate in the production of cellulose acetate, is produced from acetaldehyde by the process charted above.

In the equipment of such a plant, lightweight, high strength aluminum alloys can be used to advantage.

Highly corrosion-resistant, aluminum equipment lasts longer, is easier to keep clean. Furthermore, its salts are odorless and colorless; a clearer, purer product is thus assured.

Another advantage is aluminum's favorable *strength*weight factor which permits lighter, more economical plant construction.

Whatever your interest, Reynolds technicians are ready to work with your engineers. Offices in principal cities. Phone nearest office ... or write Reynolds Metals Co., Aluminum Div., 2534 S. Third St., Louisville 1, Ky.

CONSIDER ALUMINUM .... CONSULT REYNOLDS

#### QUICK FACTS FOR QUICK READING

• Aluminum alloys developed by Reynolds possess unit strengths greater than many structural steels.

- Section for section, they weigh only  $\frac{1}{3}$  as much as steel.
- Highly corrosion-resistant, they resist attack by a wide variety of corroding elements common to the chemical and food processing industries.
- Favorable strength-weight factor permits construction economies.
- Fabricating ease, combined with low material costs, insures low over-all cost.

Write for Catalog 102-A, "Reynolds Aluminum in Chemical Process, Food, Textile Industries."





# Two services that help you to lower lubrication and maintenance costs

Two HELPFUL services described at the right are offered by Standard Oil to manufacturers in the Middle West. They are designed to take guess work out of plant lubrication. First, by providing experienced Lubrication Engineers to help you choose the right lubricant for every application. Second, by insuring that the *right* lubricant is applied in the *right* places by means of a coded lubrication system. You can get both of these services by writing Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80. Illinois, and asking for the Lubrication Engineer nearest you.



#### Lubrication Engineering Service

Standard Oil has experienced Lubrication Engineers located in principal cities throughout the midwestern states shown on the map.

These Engineers have two advantages when analyzing your lubrication needs. They are familiar with the operation of all types of plant equipment — as are your plant personnel — and they have a complete knowledge of the lubricants available to meet your requirements. Thus Standard Oil Lubrication Engineers can help you get the right lubricant.

# CODED 2 LUBRICATION

In addition, these Engineers can supply you with a simple Coded System for applying lubricants. Briefly, the system provides for numbering all lubricants used in your plant. Every drum, oil can, or grease gun used for dispensing lubricants is identified by a number to indicate the lubricant it contains. Each spot to be lubricated is also marked by a number to indicate the lubricants required.

Your oilers follow the code numbers. The right lubricant is applied to the right places every time.

STANDARD OIL COMPANY (INDIANA

# Improved STANOILS

# ... last longer in gear cases



# ... in bearings



# **1**...in compressors



# .. and hydraulic systems

STANOILS have long been outstanding for relative freedom from deposit formation, and for their long lasting quality in all types of service. Now by the addition of an oxidation inhibitor, developed by Standard Oil, the oxidation stability of Stanoils has been improved many-fold.

With improved Stanoils, oil acidity will remain at a safe low figure for long periods of operation. At the same time, deposit formation is practically eliminated. In addition, an effective defoaming agent is used.

These advantages can be secured for a variety of

applications, because improved Stanoils are available in a wide range of viscosity grades. In fact, you may find that Stanoils can be applied to all your lubricating jobs, with consequent simplification of ordering and stocking.

A Standard Oil Lubrication Engineer will be glad to help you test improved Stanoil and point out equipment in your plant in which the high stability and clean operation of Stanoil can save maintenance time and money. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.



Another example of Taylor Forge "know-how that means extra value in WeldELLS

# More tons of "know-how"-

ASA Standards cover welding flanges only in sizes through 24", but when a flange becomes part of a pressure vessel, big ones like this are often required. And when you see one of these big ones you can be pretty sure it was made by Taylor Forge because we have been the leading suppliers of such flanges for the manufacturers of pressure vessels for more than 25 years.

Of course the problems attending the design and fabrication of boilers and other pressure vessels merge with and overlap those in the piping field. So the knowledge gained in working with boiler manufacturers has made a vital contribution to our knowledge of what constitutes good piping design.

THE knowledge of piping design and related forging technique accumulated through years of solving all kinds of unusual problems has been drawn upon fully in the design and manufacture of our standard line of WeldELLS and other Taylor Forge fittings for pipe welding. It has resulted in fittings of advanced engineering design with features which add to their strength, service life and convenience—others that speed up the job and lower the cost of pipe installation.

Check the features of WeldELLS listed opposite. Here are features that are not combined in any other welding fittings. Surely you want every one of these features in *your* welding fittings. You get them only in WeldELLS and other Taylor Forge fittings, for in the opinion of those best qualified to know, WeldELLS alone "have everything"!



TAYLOR FORGE & PIPE WORKS, General Offices & Works: Chicago, P.O. Box 485 New York Office: 50 Church Street • Philadelphia Office: Broad Street Station Bldg.

#### WeldELLS alone combine these features:

• Seamless --- greater strength and uniformity.

• Tangents — keep weld away from zone of highest stress—simplify lining up.

• Selective reinforcement—provides uniform strength.

 Permanent and complete identification marking—saves time and eliminates errors in shop and field.

• Wall thickness never less than specification minimum — assures full strength and long life.

 Machine tool beveled ends provides best welding surface and accurate bevel and land.

• The most complete line of Welding Fittings and Forged Steel Flanges in the World—insures complete service and undivided responsibility.

# ... it's a job for B&W

DISPLAXED here is striking evidence of the complex problems of design, construction, and application of pressure vessels-problems whose solution demands the efforts of an organization exceptionally diversified and well-equipped. Well known as that kind of organization is Babcock & Wilcox. Well proved is B&W's ability to fabricate pressure vessels from plates of any thickness, and in any size, shape, and weight that can be shipped.

Augmenting the unexcelled B&W manufacturing facilities in meeting the most difficult pressure vessel requirements is the pioneering research of the large, well-equipped B&W laboratories. Out of it have come such "firsts" in pressure vessel fabrication techniques as Fusion Welding, X-ray Inspection, Welded Drums, Stress Relieving, and Streamlined Openings.

Bring your requirements to B&W with confidence of getting pressure vessels that are soundly engineered and fabricated by the most advanced methods.



Canal gates



Three-section 60 ft. x 8 ft. O.D. piston Welding 753 tubes and 4¼ inch tube sheet Fabricating cone for one of many pres-(wt. 278,000 lb.) made by B&W to close - into huge butadiene converter is typical sure vessels up to 27 ft. dia. and 115 ft. tolerances for operating new Panama of difficult stress distribution problems long built by B&W for aviation gosoline solved by B&W designers



production.





Modern design makes it possible to "make hay in a day" with John Bean Mfg. Company's "Haymaker." Morse Nos. 50 and 60 Roller Chains in the drive assembly, using teeth not tension, mean positive, efficient, trouble-free operation. MORSE CHAIN COMPANY, ITHACA, N. Y., DETROIT 8, MICHIGAN.

11135



6

A PRODUCT OF

BORG-WARNER

0







# Pointing to Progress in Modern Electroplating

Progress and important advancements in modern electroplating lie ahead with the broadening use of General Chemical Metal Fluoborate Solutions. Today-fluoborate baths are proving outstanding for many lead, tin, lead-tin alloy, copper, zinc and other applications. Tomorrow-Metal Fluoborates hold still greater promise since their superiority to ordinary baths is indicated both by the unusual characteristics of the fluoborate electrolyte and by the type of deposits obtained.

To the electroplater, the Metal Fluoborates, generally, offer such advantages as: 1. Concentrated solution form; no mixing or dissolving necessary. 2. Simplicity of bath preparation and ease of control. 3. Stability of composition, high conductivity, and good covering power. 4. Fine-grained deposits of good color. 5. High-speed operation, with practically 100% anode and cathode efficiency.

These advantages can mean real economy, efficiency, and convenience in your plant. So investigate the Metal Fluoborates now by writing for technical data and trial samples of the products that interest you. As always, General Chemical's skilled Engineering and Technical Servicemen are available to assist you in preparing for test or full-scale runs.



#### COMPANY CHEMICAL GENERAL 40 RECTOR STREET, NEW YORK 6, N. Y.

Soles and Technical Service Offices; Atlanta · Baltimore · Boston · Bridgeport (Conn.) · Buffalo Charlotte (N. C.) · Chicago · Cleveland · Denver · Detroit · Houston · Kansas City · Lôs Angeles Minneapolis · New York · Philadelphia · Pittsburgh · Providence (R. I.) · San Francisco · Seattle St. Louis · Utica (N. Y.) · Wenalche · Yakima (Wash.) In Wisconsin: General Chemical Wisconsin Corporation, Milwaukee, Wis. In Canada; The Nichols Chemical Company, Limited · Montreal · Toronto · Vancouver

#### **Special Technical Manuals**

Available now ... extensive operating data on the Metal Fluoborates in the technical manuals outlined here. For copies, write or phone the nearest General Chemical Sales and Technical Service Office listed above.

#### Lead-Tin Alloy Plating MANUAL LT-1

Full description of the practical, economical fluoborate method for plating lead-tin alloys in any desired ratio (particularly low-tin ranges) with high degree of uniformity and minimum of control measures.

#### Zinc Fluoborate MANUAL ZF-1

Covers high-speed plating with Zinc Fluoborate electrolyte from which zinc is deposited at higher rate than from other acid baths. Also explains tank and barrel plating on cast or malleable iron.

#### Copper Fluoborate MANUAL CF-1

Ready soon. Comprehensive details on Copper Fluoborate electrolyte which deposits copper at higher rate than any other known acid baths . . . without addition agents ... with unusual simplicity of control.

#### Metal Fluoborates BULLETIN 1015-A

General information on Metal Fluoborates plus spe-cific operating data on plating with Lead, Tin, and Cadmium Fluoborate.
# earthbound or skyborne they have this in common

To solve the complex problems arising in the operation of such mighty airliners as the Lockheed Constellation, Foote Bros. have developed Power Units, light in weight, compact in size, that apply power exactly where it is needed at the force required, whether it be measured in ounces or tons.

In small personal planes, these units will relieve the pilot of many manual operations and in jet propulsion engines they have proved of great value in operating accessory drives.

Because Foote Bros. Power Units permit great flexibility in the transmission and control of power, many other applications have been developed other than aircraft. On road construction machinery, printing presses, radar antenna drives and literally hundreds of other types of equipment—these compact, efficient units can aid in assuring more instantaneous response—in providing quieter, better operation. They make performance more nearly automatic and assure more precise control.

Foote Bros. engineers will work with you on the design of a Power Unit to meet your specific need.

A recently issued bulletin on Power Units giving complete engineering data on "packages of power" will be sent on request. Also available is a bulletin on Aircraft Quality Gears. Mail the coupon.





0.0 0 0 0 0

FOOTE BROS. GEAR AND MACHINE CORPORATION Dept. H, 5225 South Western Boulevard, Chicago 9, Illinois

| Foote Bros. Gear and Machine Corporation<br>5225 S. Western Blvd., Chicago 9, Illinois<br>Gentlemen: Please send me Bulletins checked below.<br>□ Power Unit Bulletin □ Aircraft Quality Gear Bulletin 1 |
|--|
| Name   |
| Position   |
| Firm   |
| Address  |
| CityState  |

**G-R BUILDS** ALL THESE UNITS FOR HEAT TRANSFER SERVICE . . .

ONE OF A

ADVERTISEMENTS DE-

SCRIBING THE MANY

TYPES OF G-R HEAT

TRANSFER APPARATUS

SERIES OF

Evaporators **Stage Heaters Gas Coolers Drain Coolers** Aftercoolers **Air Preheaters Fuel Oil Heaters** Jacket Water Coolers **Process Heat Exchangers** Transformer Oil Coolers **Generator Air Coolers** Lubricating Oil Coolers Storage Tank Oil Heaters

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

FFLES

. an important element of

efficient STAGE HEATER design

and ethcient transfer of heat from steam to water of wear of tubes in the stage heaters you buy.

coming in contact with the neuter she pansion strains and possible warping.

plant requirements.

Look to the baffles if you want to make sure you will get most complete and efficient transfer of heat from steam to water as well as prevention Look to the balles if you want to make sure you will get most complete and efficient transfer of heat from steam to water as well as prevention of wear of tubes in the stage heaters you buy.

The balile design and arrangement of G-R Stage Heaters are based on more than seventy-live years of experience in building closed water The balle design and arrangement of G-R Stage Heaters are based on more than seventy-live years of experience in building am balle pro-heaters. For example, the patented G-R enveloping steam, This exclusive vides cross-over temperatures with superheated steam.

THE GRISCOM RUSSELL CO.

285 Madison Ave., New York 17, N.Y.

**GRISCOM-RUSSELL** 

Pioneers in Heat Transfer Apparatus

heaters. For example, the patented G-R enveloping steam baffle pro-vides cross-over temperatures with superheated steam. This exclusive design not only permits heating the boiler feed water several dearees

vides cross-over temperatures with superheaded steam. This exclusive design not only permits heating the boiler feed water several degrees above the dry and saturated temperature of the extraction steam.

design not only permits heating the boiler feed water several degrees above the dry and saturated temperature of the extraction steam from also is the only type of baffle that prevents the superheated steam for

above the dry and saturated temperature of the extraction steam, but also is the only type of baffle that prevents the superheated steam excessive ex-coming in contact with the heater shell, 50 as to prevent excessive

also is the only type of baffle that prevents the superheated steam from coming in contact with the heater shell, 50 as to prevent excessive ex-pansion strains and possible warping.

The steam impact battles, drain inlet battles and air battles, too, all have advantageous features in G-R Stage Heater designs. To learn The steam impact balles, drain inlet balles and air balles, too, all have distinctive advantageous features in G-R Stage Heater designs. To learn about these exclusive benefits, write for our Bulletin 277 which describes distinctive advantageous features in G-R Stage Heater designs, To learn about these exclusive benefits, write for our Bulletin 277 which describes in detail the various G-R designs for all pressures, temperatures, and about these exclusive benefits, write for our Bulletin 277 which describes in detail the various G-R designs for all pressures, temperatures, and plant requirements.



PHTHALIC ANHYDRIDE MEETS BROADENING DEMAND. The high degree of purity and low cost of this extremely useful dibasic acid anhydride is a tribute to modern science and engineering. Cyanamid pioneered in the development of Phthalic Anhydride and operates the largest producing unit in America. Cyanamid's AERO\*\* Phthalic Anhydride is used in the manufac-ture of dyes, pharmaccuticals, rubber plasticizers, and phthalic alkyd resins for surface coatings.

| Molecular Weight                            |
|---|
| Phthalic Anhydride, Min                     |
| Ash, Max0.005%                              |
| Water Insolubles, Max                       |
| Solidification Point, Min                   |
| Appearance: Pure White, free-flowing flakes |
| Odor: Very mild and characteristic          |

Address your inquiries to Protective Coating Products, Dept. 19, American Cyanamid & Chemical Corporation.







AERO Phthalic Anhydride is the basic ingredient for alkydres-ins used in outstanding refrigerator and automotive finishes and in esters for rubber plasticizers.



# CHEMICAL NEWSFRONT

We have a second second of the second of the second second second second second second second second second sec



(Right) BUY-APPEAL CONTAINERS AND CLOSURES-BEETLE\* PLASTIC containers for Charles of the Ritz cream rouge, cake rouge, and eye shadow have distinction, style, beauty, and product identity. Such colorful, practical packages can, and do, help self cosmetics, beauty preparations, and other items that depend on popular appeal and approval for initial as well as repeat sales. BEETLE plastic is an ideal packaging ma-terial for many reasons. It is chemically inert, dimensionally stable, resistant to wear, and abrasion. It can be produced in any standard color, or combination of colors, by mass packaging methods at low cost. Cyanamid's BEETLE plastic has been a sales success in a host of other fields as well.

BEETLE housings for clocks, razors, radios, and other electric mechanisms give needed and other electric mechanisms give needed protection to delicate mechanisms, and have the charm of color, pleasantness of texture, and lastingly beautiful finish to please customers. BEETLE lighting fixtures and reflectors have proved most efficient for scientific lighting. Complete information on BEETLE, the "Plastic That's All Color in All Colors," is available from Cyanamid's Plastic

is available from Cyanamid's Plastic Division.

\*Reg. U. S. Pat. Off. \*\*Trade-mark



(Left) A FINISH THAT STARTS A NEW TREND IN TEXTILE PROCESSING. Superior, lasting softness for textiles is imparted by DECERESOL\* 1861 Softener, a durable type softener composed of surface active colloids and possessing a high degree of compatability. At optimum concentrations it imparts a superior softening with a soft, silky, but not raggy hand to woolens, cottons, and rayons, as well as to other yarns and threads. DECERESOL 1861 reduces bleeding of direct colors, decreases crocking of napthol colors and inhibits gas-fading tendencies of certain acetate colors. In warm water solutions, ordinary stirring produces good dispersion and stable suspension.

DECERESOL 1861 Softener has a number of other important advantages for textile finishing. It is excellent for yarns, fabrics, and knit goods where maximum fabrics, and knit goods where maximum elasticity is desired. It will not discolor white goods when specified concentra-tions are applied, and will not develop odors on goods. It retains its softening properties after repeated washing or dry cleaning of fabrics. Detailed information as to special properties and methods of application of DECERESOL 1861 will be sent on request

request.



# **American Cyanamid & Chemical Corporation**

# A <u>new</u> unit process for industry!



Imagine-A Water of This Quality at Such Low Cost!

Permutit's Demineralizing Process produces a water which can be used in many applications where distilled water would otherwise be required. Yet the cost is only a fraction of the cost of distillation. Send for free bulletin.



## Industry is finding many uses for ion exchangers outside the field of water conditioning...

With the development, in recent years, of improved ion exchangers, the chemical industry got a *new* unit process. The possibilities for industrial use of the ion exchange process outside the field of water treatment are numerous, and growing.

Already Permutit\* Ion Exchangers are at work in such processes as the removal of harmful metallic ions from foodstuffs, in the manufacture of vitamin extracts, in sugar manufacture, in the recovery of alkaloids, in catalysis. Promising results have also been obtained in the recovery of valuable metals and other substances from waste solutions, in the removal of electrolytes from organic chemicals in solution, in the concentration of electrolytes, and so on.

There are scores of such practical applications, any one of which may suggest to you a way to utilize Permutit's Ion Exchange Processes in developing new and better products and processes.

Write for a copy of "Ion Exchangers for Industrial Processes" to The Permutit Company, Dept. C4, 330 West 42nd Street, New York 18, N. Y. or Permutit Co. of Canada, Ltd., Montreal. \* Trademark Reg. U S. Pat. Off.

PERMUTIT

WATER CONDITIONING HEADQUARTERS



2½ mesh .1055 in. Dia. Wire Galvanized (After Weaving)



4 mesh .0625 in. Dia. Wire Galvanized (After Weaving)



# **ROEBLING** Makes the Right Screen to Mesh with Your Job!

HERE'S HOW TO SELECT the most efficient Roebling screen for your purpose: Add your knowledge of the material to be screened and our knowledge of what metal and mesh, weave and wire size best does it. Result: you get top screening value . . . whether for filtering or grading, sizing or cleaning.

Choosing between square or oblong mesh, for example, depends on many considerations. Ordinarily, accurate sizing of materials is better obtained with square mesh, since all the openings are exactly alike. Where strict accuracy of sizing is not the prime factor, and greater screening capacity is more desirable, an oblong space screen is often recommended. It is possible to increase the percentage of open area considerably with oblong space screen without sacrificing appreciably the "hour-life" of the screen.

In the last analysis, however, remember that the over-all cost per ton of material screened is your most important consideration. A Roebling representative will gladly show you how the correct screen for your job means long-run production economies. Check with our nearest branch office today.

Woven Wire Fabrics Division JOHN A ROEBLING'S SONS COMPANY TRENTON 2, NEW JERSEY Branches and Warehouses in Principal Cities



Wire Rope and Strand - Fittings - Slings - Round and Shaped Wire - Wire Cloth and Netting - Aerial Wire Rope Systems - Cold Rolled Strip - Suspension Bridges and Cables - Electrical Wires and Cables - High and Low Carbon Acid and Basic Open Hearth Steels - Aircord, Swaged Terminals and Assemblies

# MISCO Precision Castings to Micrometer Tolerances without Machining





MISCO offers quantity production of highly finished precision castings, weighing from a fraction of an ounce up to about one pound. Materials include several high strength and hardenable grades of stainless steel, in addition to the austenitic types such as 18-8. Misco precision castings compare favorably in soundness, perfection of surface, and dimensional accuracy with parts machined from forgings or from rolled bars. Very intricate shapes can be produced in minute detail and, in most cases, no machine work is necessary. The illustration shows a variety of precision castings made in stainless steel. We can offer early delivery in quantities running into thousands per day, and your inquiries will receive prompt attention.

# PRECISION CASTING DIVISION Michigan Steel Casting Company



One of the World's Pioneer Producers of Heat and Corrosion Resistant Alloy Castings 1999 GUOIN STREET - DETROIT 7, MICHIGAN

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

Introducing

ANCE-FREE **LEVEL CONTROL** 

> Dependable, Maintenance-Free Level Control is a "must" in modern Chemical and Food Processing Plants.

With Photoswitch Type P18, only a metal probe enters the tank . . . there are no floats, bellows seals, or stuffing boxes. With A.C. in the probe circuit, no electrolytic action is possible. The liquid to be controlled makes or breaks contact with the probe and transmits to the control a minute electrical current at low voltage. Without the use of vacuum tubes, the current controls a power circuit which operates a relay to actuate signals, valves, or pumps.

Selection of four sensitivity ranges in probe circuit . . . mica insulated probes insure against leakage.

Write today for General Level Control Bulletin 201-P, or Sanitary Level Control Bulletin 200-P.

Our General Catalogue covering Photoelectric and Electronic Controls for In-dustry is available at your request.

UNLIMITED LIFE-NO MOVING PARTS TO WEAR OUT

SAFETY-LOW VOLTAGE IN THE PROBE CIRCUIT

MAINTENANCE TUBES

SIMPLICITY-NO FLOATS, SEALS, OR

MOVING ELEMENTS

## HOTOSWITCH INCORPORATED

CAMBRIDGE 42, MASSACHUSETTS

District Offices in All Principal Cities

CONTROLS FOR EVERY INDUSTRIAL PURPOSE PHOTOELECTRIC & ELECTRONIC

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

Lere is the main crankshaft of a Gardner-Denver Class "HA" Horizontal Air Compressor. Notice those Timken roller main bearings—an exclusive Gardner-Denver feature. The shaft is a steel forging, heat treated and finished all over. The crank discs are steel castings and counterweights are cast integral.

That crankshaft tells you a lot about an "HA" Compressor — because it is typical of the kind of

construction used throughout. That's why the "HA" is a *heavy-duty* compressor in every sense of the word. That's why it gives year after year of continuous service -24 hours a day if you like—with a bare minimum of maintenance.

If you're looking for a compressor that's a standout for service—and a miser on costs—let us tell you more about the "HA". For complete information, write Gardner-Denver Company, Quincy, Illinois.

### OTHER "HA" FEATURES

- Air cylinders designed for highest volumetric efficiency and lowest horsepower requirements.
- Large water jacket areas for cooler-running ... lower discharge temperatures and lubricating economy.
- Duo-plate "cushioned" valves for high delivery capacity, high compression efficiency and lowest power consumption.
- Five-step capacity control regulates air output in five steps to suit your air needs.

What is the only extra thing needed to make this installation 100% perfect? Answer: A Gardner-Denver After-Cooler.



Lou can learn a lot about a compressor from its crankshaft!



Gardner-Denver Class "HA" Two-stage Horizontal Compressor. Available in capacities from 316 to 2012 cubic feet displacement per minute. FOR HIGHER CONDUCTIVITY... FOR HIGHER EQUIP YOUR ELECTRIC FURNACES WITH N·B·M Electrode HOLDERS

> To provide maximum service and efficiency, your electrode holders should combine: • High electrical and thermal conductivity • Great structural strength. Strength is important to assure a tight grip. The greatest resistance in the entire circuit occurs between the holder and electrode. Ill-fitting, oxidized holders may waste up to 500 KW.

> The special copper alloy we have perfected for N-B-M Electrode Holders has an extremely dense, non-porous grain.

This provides greater strength-clamps electrodes in a vise-like grip that assures the best possible contact. By combining maximum gripping strength and conductivity, this well-balanced formula reduces resistance, saves you power.

To insure absolute pressure-tightness, all water-cooled castings are carefully tested under 50 to 75 pounds hydrostatic pressure.

For longer life and more efficient performance under the most rigorous conditions, specify



NOLDER ASSEMBLY

0

Ø.

0



PLANTS IN: ST. LOUIS, MO • PITTSBURGH, PA. • MEADVILLE, PA. • JERSEY CITY, N J. • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL. CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 • 53



Bailey Pyrotron Recorder-Controller

# Looking for Better Temperature Instruments? ....Then check these features of Pyrotron Electronic Resistance Thermometers ....

### **FUNDAMENTAL ACCURACY**

Bailey Pyrotron Resistance Elements are made of highest purity platinum—the material used by the Bureau of Standards in establishing basic standards for temperatures from  $-190^{\circ}$ C to  $+660^{\circ}$ C.

### THREE TYPES OF CONTROL

Pyrotron Controllers may operate: on-off electrical systems by either electronic relays or electric contacts, modulated electronic systems, or air-operated systems. Two temperatures may be recorded on the same chart and controlled by a single instrument.

### FACTS PUT INTO USABLE FORM

Bailey Pyrotrons may be arranged to put temperature facts into convenient usable forms. If two or more temperatures are related, they may be recorded as continuous records on the same chart for easy comparison. The average of several temperatures or the difference between two temperatures may be recorded as a single continuous record which may be retransmitted to a distant point or used to actuate a control system.

### **EASY INSTALLATION**

Bailey Pyrotrons do not require careful leveling or protection against vibration. Three ordinary copper wires are all that is needed to connect each temperature sensitive element with the recorder. Power may be taken from any 115 volt 60 cycle circuit.

### MINIMUM MAINTENANCE

The absence of galvanometers, batteries and standardizing equipment, together with the use of interchangeable unit assemblies, reduces Pyrotron maintenance to the vanishing point.

### **ABUNDANT POWER**

A separate motor drive for each temperature furnishes abundant power to operate a recording pen, a controller and an alarm switch.

For the full story on this unusual electronic resistance thermometer which is suitable for ranges between —100°F and 1200°F, ask for Bulletin No. 230-A. P.9



# Prevent Runaway Losses



# Specify LADISH, Forged Steel Fittings

Insure economy in piping installations through the use of Ladish Controlled Quality Sorged Stead Fittings. Sharp, clean cut threads machined to exacting tolerances, together with the polaed strength and endurance afforded by Controlled Quality Ladish Forged Steel Fittings are years of trouble-free, efficient operation and perdom from costly fittings failures.

Machined from drop forgings—Ladish Controlled Quality Fittings give you the ultimote in satisfaction, economy and dependability

Write for your copy of Ladish Fr. and Steel Fittings Catalog Volume 2.

Insure economy in piping installations through the use of Ladish Controlled Quality barged Steat Fittings. Sharp, clean cut thread, mathined to exacting tolerances together with the product of the provided by Drop Former Start S

1-22

LADISH 2"2000#

RESISTANCE TO FATIGUE is accurately controlled grain fic strength at vital points provided by the English

- RESISTANCE TO SHOCK Record by the second strength and toughness of metal produces by Drop forging.
- FREEDOM FROM INTERCIPAL DEFECTS is essigned by the denser, more comparisons metal structure of Drop Forging.

UNIFORM WELD BILITY ... FREEDOM FROM LEAKS ... Conservation

Controlled Quality



those six Bemis Multiwall plants!" "Just look at the locations of "Yes, that's another reason IT PAYS TO BE A BEMIS MULTIWALL PAPER SHIPPING SACK CUSTOMER!"

The strategic locations of the six Bemis Multiwall plants mean quick service to all sections of the country. • And that's not all . . . working as a team, these plants support each other in filling the needs of Bemis customers. In emergencies, the plant with which an order is placed can depend on five other Bemis plants for assistance in meeting scheduled shipping dates. Such advantages are why folks say: • "It pays to be a Bemis Multiwall Paper Shipping Sack Customer."



LINED WITH U-S-S STAINLESS STEEL for greater product purity and freedom from troubles caused by corrosion. This auto-clave, used for making quinine, operates at a temperature of minus 140°F, and at an internal pressure of 350 pounds.

# **TO INSURE BIGGER YIELDS** —

# BETTER PRODUCT AND LOWER COSTS

I N Stainless Steel equipment the chemical engineer has found a trustworthy ally in his never-ending battle against the destructive forces of corrosion. Stainless Steel, properly used, will prolong equipment life. Will reduce operating costs. Will increase output. It safeguards product purity and uniformity. It provides greater flexibility in plant operation. Stainless Steel's superior resistance to so many types of corrosives which no other commercial metal can equal-is the prime reason why in so many applications it outlasts other less efficient materials, requires less maintenance and on the basis of true costs is cheapest to use. Especially important in the manu-

facture ot dyes, paints and varnishes,

in textile dyeing, and in the making

of paper and pharmaceuticals is the

fact that Stainless Steel is impervious

to contamination and will not con-

taminate materials in process. Prac-

tically immune to stain and tarnish

as well, it introduces no foreign

flavor, color or odor that might de-

grade the product.



The high strength and toughness of Stainless Steel, its greater resistance to creep, to high temperatures and pressures give it outstanding ability to endure long, hard, continu-ous service. Its good looks are permanent, they offer an incentive to better plant upkeep which its ease of cleaning makes possible with minimum cost and labor.

All these money-saving advantages of Stainless Steel you can obtain at top perfection in U.S.S Stainless, a service-tested steel which for years has been used by leading users and manufacturers of chemical engineering equipment. Our engineers will gladly help you select the grade of U·S·S Stainless Steel that will give you best results in service.

EVERY SUNDAY EVENING, United States Steel presents The Theatre Guild on the Air. American Broadcasting Company coast-to-coast network. Consult your newspaper for time and station. STEEL STAINLESS 0.5.5 SHEETS - STRIP - PLATES - BARS - BILLETS - PIPE - TUBES - WIRE - SPECIAL SECTIONS AMERICAN STEEL & WIRE COMPANY, Cleveland, Chicago and New York CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh and Chicago COLUMBIA STEEL COMPANY, San Francisco NATIONAL TUBE COMPANY, Pittsburgh TENNESSEE COAL, IRON & RAILROAD COMPANY, Birmingham United States Steel Supply Company, Chicago, Warehouse Distributors United States Steel Export Company, New York ΓES E



Cocktails

• Soaking up a seemingly endless amount of moisture, yet always eager for another drink! What's the secret?

BAR

Activated alumina is the drying agent; it has a tremendous appetite for water. (Dewpoints as low as -110° F. are possible.) The dual character of an automatic Lectrodryer accounts for its ceaseless capacity; part of the machine is doing the DRYing job while the other part is being regenerated by heat.

May we put this DRYing ability to work for you? For help on drying air, gases or certain organic liquids, write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

> In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham. In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.



LECTRODRYERS DRY WITH ACTIVATED ALUMINAS



• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

# CALL IN THE FLUOR SPECIALIST'NOW!

Last summer's operating records show what your water cooling requirements were during warm weather peaks. To be sure you maintain the efficiency of your Cooling Towers to meet this summer's demands, let Fluor make this vital Maintenance Check-Up now while demands on your towers are lessened:



Inspect decks and filling for sagging, accumulation of foreign matter, loss of parts, etc.



Inspect distributing system for scale, rust, clogging, leaks, loss of pressure, etc.

Determine quality and quantity of water flow. Look for rapid corrosion of metal parts and delignification in the wood.



Check flow of effluent air for recycling troubles in mechanical draft towers.

PR



Inspect ladders, handrails, stairs and walkways for signs of weakening.



Inspect structural members including bolts and castings for cracks, breaks and other causes of failure.



Check motors, pumps, gears, fans, couplings and other mechanical equipment.

FLUOR Maintenance and Repair Service covers ALL MAKES and TYPES of Cooling Towers. As manufacturers of Fluor Aerator and Fluor Counterflow Cooling Towers, Fluor M & R Service is complete and economical.



# ENGINEERS · MANUFACTURERS · CONSTRUCTORS

PROCESS PLANTS AND EQUIPMENT FOR THE OIL, GAS AND ALLIED INDUSTRIES THE FLUOR CORPORATION, LTD., 2500 So. Atlantic Blvd., Los Angeles 22 • New York, Pittsburgh, Kansas City, Houston, Tulsa, Boston

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

Fig. 2125 Bronze Gala

ig. 1430

Gote Body

UNKENHEIMER

THIS NA

Where you

# you know you're buying BETTER EQUIPMENT

LUNKENHEIM

• The installation of Lunkenheimer Valves, Lubricators, or Air Devices on power equipment is an indication that the equipment itself is of superior construction and efficiency.

It's the quality-minded manufacturer who selects Lunkenheimer products for his equipment. He knows the Lunkenheimer reputation for correct engineering, advanced design, superior workmanship ... he knows his equipment will give better performance with less trouble, when fitted with Lunkenheimer Valves or other devices. He knows, in short, that his own product is thus given added salability, and in use will give the purchaser maximum results at minimum cost.

Whenever and wherever you purchase power equipment units, you'll be wise to look for the Lunkenheimer name on valves and lubricators—a positive guide to value. THE LUNKENHEIMER COMPANY, Cincinnati 14, Ohio, U.S.A. (Offices: New York 13, Chicago 6, Boston 10, Philadelphia 7. Export Department: 318-322 Hudson Street, New York 13. N. Y.)

Gale Fig. 16 Renewo'

Globe

UNKENHEMER

Perhaps YOU Have A Product That Can Be Given This Added Sales Advantage. If your products require the use of valves, lubricators, air devices, or boiler mountings, the name Lunkenheimer on such equipment will provide extra sales appeal. For further information see your nearest LUNKENHEIMER DISTRIBUTOR.

VALVES

Fig. 1571 Air Cock 150 Lb.

Fig. 1834 "Alvor" Constant Level Oil Control

APRIL 1946
CHEMICAL & METALLURGICAL ENGINEERING



# TO HELP YOU OVERCOME YOUR INSULATION PROBLEMS

Methods of applying insulation have progressed so rapidly that many clianges and advancements have taken place in just the past few months. These most recent advancements have revealed new ways of making insulation more efficient and longer-lived (Amosite ashestos fibres have been found to afford more resilient strength and lower conductivity) at lower applied cost (sectional insulation is now available for large size piping and you can use one insulation in single-layer construction to 1200°).

FOL IN, TEAR OFE, AND MAD

UNION ASBESTOS MEANS PROGRESS IN INSULATION AND RUBBER CO.

A mathematical argumization of field Engineers, qualified distributors and contractors — strategizally located to most effectively serve you.

# UNION ASBESTOS & RUBBER COMPANY 1821 SOUTH 54TH AVENUE • CICERO 50, ILLINOIS

Gentlemen: Send me the latest data and technical information on the following. No obligation on my part, of course.

| mation off the        | PIPING           | AND STREET |
|-----------------------|------------------|------------|
|                       | LENGTH OF RUN    | BENDS      |
| PIPE SIZE             | EXPANSION JOINTS |            |
| TEMPERATURE           | FITTINGS         |            |
| FLANGES               |                  |            |
| BOILER FEED THING     | BOILERS          |            |
|                       | PRESSURE         |            |
| TEMPERATURE           | BOILER WALLS_    | FUIES      |
| SETTINGS.             | HEADERS          | - UTNT     |
| DRUMS                 | WESSELS AND      | EQUIPMENT  |
| TANKS,                | VESSEE           | RECEIVERS  |
| HEATERS               |                  |            |
| LARGE OUTDOOR TANKS A | IND VESSELS      |            |
| and the second second | REMARKS          |            |
|                       |                  |            |
|                       |                  |            |
|                       |                  | D :10      |
| A1                    |                  | _position  |
| Name                  |                  |            |
| Company               |                  |            |
| Address               | Jone             | State1     |
| City                  | Maria Maria Cast |            |
| and the second second |                  |            |

# Producers of SULPHU

Large stocks carried at all times, permitting prompt shipments ... Uniformly high purity of 991/2% or better . . . Free of arsenic,

selenium and tellurium.

TEXAS GULE SULPHIU. 75 E.45<sup>th</sup> Street New York 17, NY.

Mine: Newgulf, Texas

PHIUR

INC.

# Why free air has become

less expensive .

BOVAIRD & SEYFANG Manufacturing Co.

CLARK Bros. Co., Inc., Oleon, New York

BRYANT Heater Company, Cleveland, Ohio

DAY & NIGHT MIG. Co., Monrovia, Calit.

DRESSER Manufacturing Company, Limited, Toronio, Onk, Canada

DRESSER Manufacturing Div., Bradford, Pa.

INTERNATIONAL Derrick & Equipment Co., Columbus, Nariello & Delawore, Ohio; Beaumont, Texasi Torrance, Colit.

KOBE, Inc., Huntington Park, Calif.

PACIFIC Pumps, Inc., Huntington Park, Calif.

PAYNE Furnace Co., Beverly Hills, Calif.

Compressed air has over 600 industrial uses. And that air isn't free. It costs as much as the expense of the machinery that compresses it. In the last decade, industry has demanded more and more compressed air

until now air as an industrial material is consumed by the millions of tons. It takes more than a ton of air to melt a ton of iron; more than 400 pounds of air to spray a pound of paint.

Dresser Industries is constantly at work engineering down the cost of moving air. And what goes for air goes for any other gas. Whatever the job calls formillions of cubic feet of natural gas at 2,000 pounds per square inch for putting the final squeeze on an exhausted oilwell, or a precisely measured stream of air for supercharging-Dresser has engineered the right type of equipment.

It may be a Clark compressor built on the "Angle" principle to deliver more horsepower per unit of space than any other gas engine-driven compressor; it may be a Roots-Connersville Rotary Positive Blower engineered with such ingenious simplicity that there is virtually no maintenance needed; or an R-C Centrifugal, if that's what's needed. And, in every case, there is Dresser Manufacturing Division's unique flexible pipe coupling that prevents leakage caused by vibration in air lines.

If air or any other gases are to be moved, or compressed, Dresser Industries, Inc., can do it at lower cost with equipment that is First to be new-Last to SECURITY Engineering Co., Inc., Whittier, Calif. wear out. ROOTS-CONNERSVILLE Blower Corporation

> - CLEVELAND 13, OHIO TERMINAL TOWER Geared to anticipate the course of industry Oil and gas equipment a specialty

STACEY BROS. Gas Construction Com

S

Creative Engineering FOR GENERAL INDUSTRY

VAN DER HORST Corp. of America, Olean, N. Y. and Cleveland, O.



Brown & Root, Inc.

Engineers,

Constructors

PROCESS ANALYSIS

The Skill To Handle Any Problem



MILTON H ROTHS F. W. BELL H. M ANDERSON MANAGER PROCESS ENGINEER ENGINEER

A combination of 46 years experience in design, engineering and construction of process plants for the oil, gas and chemical industries assures that the key men of the Brown & Root, Inc., Petroleum and Chemical Division can handle all of your problems quickly, competently and economically.

Ready For

Immediate Service

\*NATURAL GASOLINE PLANTS \*RECYCLING PLANTS \* COMPRESSOR STATIONS \* DEHYDRATION PLANTS \*GAS TREATING PLANTS \*VAPOR RECOVERY PLANTS \* FRACTIONATION AND TREATING OF REFINERY VAPORS \* REFINERY UNITS \* CHEMICAL PLANTS



ANNOUNCE EXPANSION OF THEIR INDUSTRIAL SERVICES THROUGH CREATION OF A

> Brown & Root, Inc., one of the oldest firms of engineers and constructors in the Southwest, invite the attention of the petroleum and chemical industries to their expanded services in design and construction of process plants of all types.

# The Experience to Tackle Any Job From Start to Finish

For more than a decade, Brown & Root, Inc., have done a wide range of work for the oil, gas and chemical industries, including engineering and construction of chemical plants, compressor stations, pumping stations, pipe lines and gathering systems. In addition, the firm now offers services of process analysis and design in creation of process plants, and can give you the advantages of a turnkey job in which you deal with only one responsible organization from start to finish.

# Petroleum & **Chemical Division**

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

# Petroleum & Chemical Division

# The Equipment to Do it Right

The superbly-equipped shops of the Brown Shipbuilding Co., Inc., which turned out 359 warships for the Navy with machine tools of every type, are ideally suited for fabrica-tion of process plants. Plant units can be loaded on ship or barge at the factory. All other types of transportation are available.



COMPLETION

P. O. BOX 2634 PHONE W-6-9411 HOUSTON 1, TEXAS

# ... so you benefit

Uniformity is one of many advantages of Hackney Hackney Cylinders offer users. Every cylinder is uniform in thickness and temper, Tank Con due to the Hackney cold-drawing process. types of Every one is not only ample in strength of gas but light in weight as well . . . assuring In long life and lower transportation costs. ben The uniformity of Hackney Cylinders is m found not only in physical characteristics, but in performance records, revealing their durability and economy. The success

FOR

of Hackney Cylinders is due in no small part to the vast experience of Pressed Steel Tank Company in working with many types of metals and in the extensive study of gases—for more than forty years. In choosing Hackney Cylinders you are

benefiting by advanced heat-treating methods, thorough testing, careful selection of raw materials and complete underg standing of every requirement. Write ess today for full details—no obligation.

## ressed Steel Tank Company

Manufacturers of Hackney Products

GASES, LIQUIDS

1447 South 66th Street, Milwaukee 14 1325 Vanderbilt Concourse Bldg., New York 17 553 Roosevelt Bldg., Los Angeles 14 208 S. La Salle St., Room 2070, Chicago 4

CONTAINERS

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

AND

SOLIDS

# For Distinguished Service in Saving Time and Money



Series 150, 300, 600 and 900 3-Bolt Line Blind

The reports from users of these new 3-Bolt Line Blinds, testifying to the time they save, constitute a real blue ribbon award of merit. With either of these two Line Blinds, ONE MAN can close the line with a positive, leakproof shutoff, or turn it from closed to full-open, in ONE MINUTE — an important fact in these days of man-power shortages.



4-Bolt Line Blind

Geared Standard Line Blind

SEND FOR NEW HAMER LINE BLIND BULLETIN

Series 900 (Ring-Joint) 3-Bolt Line Blind

Union-Type Line Blind

Standard Line Blind

HANER OIL TOOL COMPANY 2919 GARDENIA AVENUE LONG BEACH 7, CALIFORNIA

# WHY **STURTEVANT** for dust and fume removal?

This electric furnace, at Textile Machine Works, Reading Pa., used to give off oil fumes that played havoc with men, equipment and production rates, until the Sturtevant-engineered system (shown here) ended the problem. Now fumes are exhausted before they get into the atmosphere. Results like this are typical of those you get from Sturtevant-because our engineers have every type of air handling equipment to work with, plus an 85-year fund of experience to draw upon. That's why, wherever dust and fumes are a problem, Sturtevant has the answer!



1. RESPIRATORS NOT NEEDED in this Paint-Spray booth since this Sturtevant air conditioning system was installed to remove dangerous fumes. Operator can now handle more parts per day since he got rid of his respirator.

2. EMERY DUST AND METAL PARTICLES used to be a problem with this stationary grinding wheel at Potter and Johnson Plant in Rhode Island until the Sturtevant Dust Removal system shown above was installed. 3. AWAY WENT DUST from this Gardner flat grinder! Sturtevant system above collects and removes dust, returns clean air to the grinding room without loss of heat. Installation shown at Pawtucket, R. I. plant of Potter and Johnson.

CONTROL

٠

## HEATING · VENTILATING · AIR CONDITIONING

AND

DUST

DRYING .

FUME

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

# NOW HAS <u>New</u> Importance

Sturlevant Puts Air to Work

# FOR YOUR INDUSTRY

Sturtevant is now "Putting Air to Work" as a Division of Westinghouse Electric ... 3 new advantages!

BY POOLING RESOURCES with Westinghouse Electric, Sturtevant now offers the most complete line of air handling systems ever available from a single manufacturing source. To plant management everywhere this means three important new advantages:

WHY THIS FAMOU

1. UNDIVIDED RESPONSIBILITY in dealing with one source for all air handling equipment ... from Sturtevant-engineered systems to Westinghouse motors, controls and air conditioning units ... from planning to final assembly, installation and service.

2. IMPARTIAL ENGINEERING HELP because the two organizations together manufacture many different types of air handling equipment, and in such variety as to be able to recommend — and assemble — exactly the right equipment for any particular system. 3. cost savings that come from buying air handling and air conditioning equipment in one complete "package." No extras, no added costs.

Illustrated on the opposite page are four applications of dust and fume control systems as engineered by Sturtevant leader in this field for more than 80 years. And now Westinghouse rounds out this famous line by the addition of motors, controls, and the electronic air cleaner, *Precipitron\**, considered one of the most important air cleaning developments of recent years.

A Sturtevant engineer will gladly study

your air handling problems, and show you what the Sturtevant-Westinghouse combination can mean to you in higher efficiency, better service and lower cost. Inquiries should be addressed to B. F. Sturtevant Company, Division of Westinghouse Electric, Hyde Park, Boston 36, Massachusetts.

•Trademark registered in U.S.A.

TRADE SLOGAN

3601-50



B. F. STURTEVANT COMPANY · DIVISION OF Westinghouse

PRECIPITRON

MECHANICAL DRAFT

CHEMICAL & METALLURGICAL ENGINEERING · APRIL 1946 ·

ANNOUNCING TH

# a new and highly versatile basic processing tool

**T**HE *levelite* makes it possible—for the first time —to reduce centrifugally any *flowable* material (from the most fluid to the most viscous) to a microor mono-particle film without the application of mechanical pressure and without any temperature rise.

The slope and speed of the disc produce a highly turbulent, essentially "all-surface" film—an ideal state for the application of vacuum or pressure, heat or cold, diffusional processes, or irradiation.

Through-put capacities range from 10 to 100 gpm. Power consumption is less the 7½ hp for viscosities no greater than those of heavy lubricating oils and somewhat higher for really viscous materials.

Versatile, the Versition may be used for homogenizing ... emulsifying ... reversing emulsions ... dispersing solids in liquid vehicles ... de-gassing or deaerating solutions ... for evaporating, dehydrat-

ing, or distilling extremely heat-sensitive materials without thermal decomposition (heat is only applied for 1/7 of a second in the presence of a vacuum) ... the impregnation, wetting, or hydration of fibers or solid particles ... for diffusional processes... for oxidations or continuous hydrogenations ... for instantaneous, continuous reactions ...

This is only a partial list ... the Venator is a new tool and its uses are still being explored ... in short, it is a new and basic process tool that offers revolutionary economies and



Model "HO" Versator . Disc speeds 900-1800 r.p.m. Capacity range, 10-100 g.p.m. Available in steel, stainless steel, nickel, Monel Metal, Everdur, etc.

improvements in processing. If you use ball mills, colloid mills, conventional homogenizers, emulsifiers, batch mixers, deaerators, evaporators, roller mills, dough mixers, vacuum stills, or similar process equipment, it will pay you to investigate the *Ventor*. Full-scale units are available for rental for a full year at nominal rates, thus permitting ample time for both experimental and trial or commercial production runs.

For further details, literature, or a discussion of a specific problem or problems, write, wire, or call.



The Cornell Homogenizer has been used as standard equipment by America's leading oil companies for over 8 years—for homogenizing and deaerating greases and for compounding, blending, deaerating, dehydrating, and homogenizing lubricating oils.

## THE CORNELL MACHINE COMPANY, IOI PARK AVENUE, NEW YORK 17, N.Y.

The Word "LimiTorque" has a definite meaning, because an exclusive potented Torque Switch actually limits the torque applied to the operating parts.

with

0.5

C

Type "S" LimiTorque

By a push on a button, the opening and closing operations of valves of all types are speeded up, while labor costs are simultaneously reduced. Doors, damper controls, sprinkler systems, feeder disconnect switches, marine ventilating covers, water tight bulkhead doors, as well as Gate, Globe, Butterfly, Plug valves and sluice gates can be easily and automatically operated.

l'initorque On extremely hot or cold lines, - in the most out-of-the-way places, -- indoors or outdoors, -nearby, or miles away, all valves can be instantly, safely and dependably closed by LimiTorque.



ushSutton

CONTROL

VALVES

DESCRIPTION OF OPERATION: Motor is coupled to worm shaft through helical gears. In closing, worm drives worm gear until lugs on gear meet matching lugs on clutch. Torque is transmitted to the nut through splines connecting the clutch to sleeve and nut. When valve disc reaches its seat, the impact is absorbed by expansion springs. Torque spring is then com-pressed by axial movement of worm on worm shaft. When torque spring has been compressed to predetermined setting, torque switch is actuated by a tripping collar on worm shaft... this interrupts current to holding coil of controller and stops motor. Inertia of motor is absorbed in further compression of torque spring. The opening travel is governed by geared limit switch.





LimiTorque Valve Controls

# To help you make it



I N plants and factories of every type and size, speed and quality of production go up, unit costs go down, when machinery is effectively lubricated. Experienced management everywhere assures this with Texaco Products and Texaco Specialized Engineering Service. Here are some of the benefits Texaco brings—

- Service-proved lubricants in a complete line to meet the requirements of your particular type of equipment, plus...
- 2. Expert lubrication engineering serv-

ice to assure your use of the right lubricant, in the right amount, in the right place, plus...

3. The advantages of centralized purchasing—whether for several plants or a hundred—with prompt delivery right to your door, through Texaco's nation-wide distribution set-up.

Let Texaco prove what it can do for you. Just call the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

# **TEXACO** Lubricants, Fuels and Engineering Service

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON EVERY SUNDAY NIGHT-CBS

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

Spical of the many "staple" materials in which quality should not be "taken for granted" is Paradichlorobenzene. The basic efficiency of this material as an insecticide for the control of the peachtree borer or sugar cane grub ... as a moth-killing fumigant and deodorant ... or as a dye intermediate, depends in large measure on the clean, pure quality of "Para" crystals. Long experience has given Niagara special knowledge in the processing and handling of Paradichlorobenzene. In addition, Niagara is equipped to cooperate expertly with customers regarding its use in a wide range of applications.

An Essential Part of America's Great Chemical Enterprise Niagara Alkali Company CAUSTIC POTASH · CAUSTIC SODA · PARADICHLOROBENZENE · CARBONATE OF POTASH · LIQUID CHLORINE · NIATHAL 60 EAST 42nd STREET · NEW YORK 17, N.Y.

PARADI



• Boiler Headers are perhaps the most vital part of any piping system. Adequate strength is necessary because a breakdown here means that the whole system has to be shut down. In addition, maximum efficiency of the system depends to a great extent on full capacity flow into every header take-off. To further complicate matters, take-offs are often close together and working room is usually at a premium.

The use of WeldOlet Fittings for making header take-offs will simplify these problems in practically all boiler-header construction jobs. These fittings are designed so that they provide full original pipe strength at the joint and their funnelshaped openings insure full flow into the branch lines. They also make it possible to place outlets close together, and require a minimum amount of working room. Only enough space is required to allow room for welding.

To get full specifications and description of these safer, more efficient, easier-to-install fittings, write today for the new 16-page WeldOlet Fittings Catalog.

Forged Fittings Division BONNEY FORGE & TOOL WORKS • 344 Green Street, Allentown, Pa.





FOR 100 YEARS. Powell has been concentrating on making valves-and valves only-to meet the ever-changing demands imposed by the amazing progress of American Industry. And through these years Powell has built up a notable line of Bronze and Iron Valves of all types and many designs. This line is so complete that today there's a Powell Bronze, Iron Body Bronze Mounted or All Iron Valve for every service in which these valves are applicable.

These, together with a complete line of Cast Steel Valves and all types of Valves for Corrosion Resistance, make up the Powell Line of Valves for the Chemical and Process Industries. The Corrosion Resistance Line includes many specially adapted patterns and is available in the widest variety of pure metals and special alloys ever used in making valves. Fig. 150

Fig. 386-200-pound Bronze Gate Valve with screwed ends, outside screw rising stem, screwed-on yoke and bonnet, re-newable, wear-resisting "Powellium" seat rings and taper wedge solid disc.

Fig. 190-150-pound Iron Body Bronze Mounted "Irenew" Globe Valve with screwed ends, union bonnet and regrindable, renewable wear-resisting "Powellium" seat and disc. Also available in All Iron for steam and water lines.

Fig. 150-150-pound Bronze Globe Valve with screwed ends, union bonnet and renewable composition disc.





CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

11.50

Fig. 1793

Cincinnati 22, Ohio

APRIL 1946
CHEMICAL & METALLURGICAL ENGINEERING



Fig. 241

Flg. 1793-125-pound Iron Body Bronze Mounted Gate Valve, Flanged ends, outside screw rising stem, bolted flanged yoke, bronze seat rings and taper wedge solid disc. Also in All Iron for steam and water lines

> Flg. 500-125-pound Bronze Gate Valve with screwed ends, inside screw rising stem, screwed-in bonnet and either taper wedge solid or double disc.

The Wm. Powell Co.

Fig. 241-125-pound Iron Body Bronze Mounted Globe Valve. Flanged ends, outside screw rising stem, bolted flanged yoke and regrindable, renewable bronze seat and disc. Also available in All Iron for steam and water lines.

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

# WATCHING WASHINGTON

R. S. McBRIDE, Editorial Consultant . D. D. HOGATE, Chief of McGraw-Hill Washington Bureau . J. V. HIGHTOWER, Washington Correspondent

Provisions of Veterans Housing Order will interfere with construction of new plants . . . Indications are that at least one-third of our future rubber will be general-purpose synthetic . . . Interagency rubber committee favors manufacture of butadiene from petroleum . . . Sale of government surpluses will be speeded up . . . Navy embarks on huge peacetime research program . . . War Assets Corp. favors retention of pipelines for petroleum service . . . Slow progress made in leasing government synthetic ammonia plants . . . Marked scarcity of silver for industrial purposes . . . Slow deliveries of Chilean nitrate aggravate nitrogen shortage . . . Five-day week slows unloading of freight cars

### CONSTRUCTION WILL LAG

HOUSING preference under the program adopted by the Washington "hysteria" method will seriously interfere with all industrial construction. Administrative officials of Washington have been forced into unworkable orders on the ground that the need for housing for returning veterans must take precedence over everything else. Political panic and not considered technical judgment has produced this result.

There are theoretical permit possibilities in the construction control regulations which are going to be administered by CPA, but adequate interpretation to give prompt industrial construction seems wholly impossible under the sweeping restrictions of Veterans Housing Order No. 1. Instead of permitting those who wanted to build desired housing at points of need to get permits, the arrangement is that anyone can build any kind of housing anywhere, within certain price limits; but no one else can do any other sort of construction, repair, or maintenance except within extremely limited cost figures.

Washington expects a deluge of more travelers seeking exceptions to this housing order than came to Washington for WPB, OPA, and other wartime approvals. The theory that regional offices can grant adequate relief is ridiculed, probably rightly. Certainly any process industry management can expect to require political influence as well as sound business reasons to go ahead on needed projects.

#### **STUDY HOUSING ORDER NO. 1**

THE INVOLVED provisions of Veteran's Housing Order No. 1, effective Mar. 26, demand careful attention by executives and chemical engineers. The order forbids the beginning of construction and of repairs on structures without specific authorization. The restrictions apply whether or not the materials needed are on hand or are available without priorities assistance.

The word "structure" means "any building, arena, grandstand, pier, moving picture set, or billboard," whether permanent or temporary, although temporary re-erection of used structures is not covered by the order. The order says that "No person shall begin to construct, to repair, to make additions or alterations, to improve, to convert from one purpose to another, or to install or to relocate fixtures or mechanical equipment in any structure" with certain exceptions unless specially authorized. The term "structure" also does not include "anything that is not attached to the land or to a structure to a building or other structure."

Chemical manufacturers wishing to undertake work coming within the scope of the order may apply for authorization on Form CPA.4423, which should be filed with the appropriate construction field office of CPA. General communications which request clarification of the Order or call for specific interpretations should go to Civilian Production Administration, Washington 25, D. C., Ref.; VHP-1.

#### **EXCEPTIONS TO ORDER NO. 1**

ONE exception is that "The order does not apply to work begun before March 26, 1946, and which was being carried on at that date and which is carried on normally after that date." Another exception permits construction, maintenance, repair, alteration or installation work the cost of which does not exceed "\$15,000 for a factory, plant or other industrial structure which is used for the manufacturing, processing or assembling of any goods or materials . . . or for a research laboratory or pilot plant . . . " However, "No maintenance or repair work which is capitalized" is applicable under this exception.

Another exception is that the prohibitions of the order "do not apply to the minimum work necessary to prevent more damage to a building or structure (or its contents) which has been damaged by flood, fire, tornado or similar disaster. This does not include the restoration of the structure to its former condition."

#### RUBBER CONTROLS TO STAY

CONTINUED government controls in the rubber industry for at least several years and the virtual guarantee of a market for general-purpose synthetic rubber are policies clearly evident in the first report of the Interagency Policy Committee on Rubber to OWMR Director Snyder. Basic is the committee's recommendation that hereafter the production and consumption of such rubber, achieved by legislation if necessary, must be roughly 250,000 tons annually or, more specifically, at least one-third the total national rubber consumption, whatever that may become.

Establishment of an interagency rubber control body in Washington is urged. In its next report, expected in July or August, the committee will get down to brass tacks on such matters as development of the best means of assuring a minimum use of generalpurpose rubber, encouragement of research and development, creation of rubber supervisory agency and determination of policies for disposal of government-owned rubber plants. Until the forthcoming recommendations are made, Rubber Reserve Co. and War Assets Administration are not expected to frame a comprehensive plant disposal policy for submission to Congress.

#### NEXT RUBBER REPORT

THE rubber committee's present views, unanimously expressed, strongly indicate or openly disclose the nature of the recommendations to be filed in the report due this summer. The administrative method of assuring that at least one-third of our future rubber will be general-purpose synthetic will be offered in detail. Although the committee says it hopes the consumption of general-purpose will be so high that no legislative action will be needed to make its consumption mandatory, "nevertheless it feels strongly that the national security and interest will not be served in the long run



## LOWER MAINTENANCE COSTS LESS PLANT "DOWN-TIME" LESS SOLUTION LOSS

When you use versatile Tygon Plastics to protect buildings, tanks, ducts, pipe, valves, pumps and other equipment from corrosive attack, you're not only sure of longer, maintenancefree life, but: 1. You reduce "Down-time" resulting from taking equipment out of production for repairs or replacement, and 2. You avoid product or solution loss from corrosive contamination.

Tygon Plastics are resistant to a wider range of chemicals than any other material of construction, with the exception of glass and chemical stoneware. Yet, Tygon Plastics have a versatility in use approached by no other material.

For example: Tygon sheet linings 32" thick can be applied to tanks, ducts, pipe and valves from 2" dia. up. Tygon cut or molded gaskets provide pressure tight, corrosion-resistant seals; Tygon molded mechanical goods items can be made to virtually any shape and in a wide range of hardnesses; Tygon flexible

PROCESS EQUIPMENT DIVISION . . .

Tubing makes an excellent piping medium for gas, air or liquids, and Tygon extruded strips, tape or special cross-sections solve difficult sealing and insulation problems.

The same basic Tygon sheet stocks, liquefied to form a paint, provide unexcelled protection for tank exteriors, machinery, walls, structural steel, in fact for any surface where corrosive attacks from fumes, condensates or spillage may occur.

Tygon Plastics bring to the corrosion engineer, a versatile, flexible, effective material for saving maintenance dollars. If you're not acquainted with Tygon Plastics, drop us a note, today.



unless a specified minimum consumption is assured."

Also, plans will be laid out for the structure of continued national rubber supervision "until the situation becomes clearer." A disposal program for the government butadiene and copolymer plants will be set up, with recommendations that the plants be turned over to private industry as rapidly as they can be disposed of. Judging from its present attitude the committee is opposed to continued government ownership of rubber plants.

### ALCOHOL BUTADIENE OUT

IN URGING continued manufacture of general-purpose synthetic rubber for security reasons the interagency rubber committee says that "at the present time it cannot sce sufficient economic justification for the maintenance in operation of any butadiene plant using alcohol as feedstock," and adds that "the high cost of alcohol makes competition with petroleum feedstocks impossible." Furthermore, "If this country should adopt a policy of converting farm surplus into industrial alcohol, it would be undesirable to burden the synthetic rubber industry with responsibility for maintaining an agricultural subsidy."

However, the committee asks that at least one butadiene plant using alcohol as feedstock be retained in standby. The committee says that "It is possible in the event of a future emergency it might again be necessary to divert petroleum feedstocks to the manufacture of products not producible from alcohol. The maintenance in standby condition of limited alcohol-butadiene facilities is a form of insurance against this contingency."

#### **INSTITUTE FILLS A GAP**

THE rubber committee's recommendation to maintain in standby condition at least one plant which produces butadiene from alcohol was quickly proved prophetic. The Office of Rubber Reserve has found it necessary to continue in operation the government's alcohol-butadiene plant recently reopened at Institute, W. Va., after a short shutdown. Need for butadiene to meet the synthetic rubber requirements of climbing tire production, coupled with declining optimism about the volume of rubber expected from the Far East this year, led to reopening of the plant to supplement butadiene manufacture from petroleum facilities. Consumption of general-purpose synthetic rubber this year is thought to be over 600,000 long tons. Rubber men in Washington look for operation at Institute to continue through most of 1946, possibly longer.

#### WAA BEGINS TO SELL

SHARP acceleration in the disposal of government surpluses is assured by Lt. Gen. E. B. Gregory, sworn in on March 25 as War Assets Administrator. Admitting that

"we are just now beginning," he discloses that he promised President Truman that a substantial proportion of surpluses will be marketed within one year. Gen. Gregory says he is banking on a rapid rate of disposal resulting from the new policy of decentralization of authority in the WAA machinery. The regional directors have been given broad authority to initiate sales up to \$1,000,000 (original cost) with only summary approval from Washington, and have received greater freedom in pricing and methods of sale. These changes, Gregory indicates, go to one of the roots of delay-paper work. He looks for results from the new policies in about 30 days.

### CHEMICAL CONTROL CHANGES

BETWEEN February 1 and the latter part of March, CPA issued two new orders within the Chemicals Division jurisdiction. Under M-390, which is about the same as the former M-368, revoked last September, the use of hide glue chrome stock for purposes outside the manufacture of animal glue is prohibited. CPA found recently that revocation of M-368 led to such heavy consumption of the stock for gelatine and fertilizer manufacture that essential adhesive requirements were not being met. The use of cane alcohol in alcoholic beverages was banned by Order L-353.

In addition to the above orders, the issuance of Schedule 119 to the general allocation order, M-300, instituted the allocation of streptomycin, the mold derivative similar in some respects to penicillin. Monthly allocations began in March. CPA officials say that about two-thirds of the available supply is being allocated to the Navy, Army, U. S. Public Health Service and Veterans Administration, the remainder going to clinical research.

#### **USDA ALTERS OIL ORDERS**

IN Amendment 9 to WFO-42b the Department of Agriculture has announced that synthetic detergents made from fats and oils go under the quota limitations on use of fats and oils in the manufacture of soap. Recent termination by CPA of allocation control of such detergents caused Agriculture to take the step. Makers of the detergents from fats and oils are required to submit a new or revised report on Form FDO-42-1 showing the total base period (1940-1941) use of fats and oils in soaps including the synthetic detergents.

To improve the supply of marine paints Agriculture has issued Amendment 7 to WFO-42a in order to exempt from quota the use of fats and oils in those paints. At the same time the amendment provides that manufacturers subject to the order who were operating prior to July 1, 1943, may use 20,000 lb. of fats and oils per quarter for each class of products covered by the order without quota restriction. Previously the quantity was 15,000 lb. Late in March, Agriculture was considering a cut in the paint, varnish and lacquer industry's quota of linseed oil for the second quarter of 1946. The figure under consideration was 60 percent of the 1940-1941 base, as compared to 75 percent in the first quarter.

#### NAVY'S 1947 PROGRAM

THE Navy has embarked on the most ambitious peacetime research program in its history. With several million dollars already carmarked for contracts, the Navy has formulated through its Office of Research and Inventions its 1947 program. Emphasis is laid on close cooperation between Navy scientists and those in industry, private research institutions and universities, to the end that new developments will be promptly applied. As of March 1 the following contracts on chemical or chemical engineering subjects were nearing execution: with Massachusetts Institute of Technology for high velocity heat transmission work; University of Pittsburgh for thermochemistry of hydrides and thermochemical studies of alloys; Standard Oil Development Co. for combustion investigations; and Yale University for work on the structure of electrolytic high polymers. A number of other contracts are under discussion.

The 1947 plans call for intensive investigations of new synthetic fuels, combustion, lubricants, hydraulic fluids, paints, batteries, polymers and polymerization, properties of gases, new propellants, explosives, production of piezo- electric crystals, chemical warfare and corrosion. Similar broad programs have been laid out for other fields. The Planning Division of ORI is reviewing communications concerning the Navy's programs.

#### **PIPELINES DRAW BIDS**

WAR ASSETS ADMINISTRATION is receiving many statements of interest in the big government-owned pipelines, and up to a few weeks ago had received a dozen or so serious proposals. Use of the carriers for oil or natural gas or a combination of both is indicated. WAA, having taken over Surplus Property Administration, stands squarely behind the disposal program which SPA filed with Congress in January. WAA wants to dispose of the lines on terms that will keep them moving petroleum liquids, not natural gas.

First disclosed bidder is Trans-Continental Gas Pipe Line Corp., a recently organized group of Texas independent natural gas operators. This concern, says Federal Power Commission, has offered \$40 million for, excluding pump stations, the Big Inch, Little Big Inch and Southwest Emergency lines (a \$150 million aggregate) and has asked FPC authority to convert the lines at a \$40 million outlay for movement of gas from Texas to the East Coast. If the deal falls through, Trans-Continental asks, as an al-

# Specify **COLUMBIA**







Columbia products meet exacting requirements ... plants are favorably located ... distribution facilities are organized for superior service. Equally important—Columbia policies contribute to enduring business relationships.

That's why it's good insurance for your business to specify "Columbia" when ordering alkalies and related chemical products.



PITTSBURGH PLATE GLASS COMPANY · COLUMBIA CHEMICAL DIVISION

FIFTH AVENUE AT BELLEFIELD, PITTSBURGH 13, PA. • Chicago • Boston • St. Louis • Pittsburgh New York • Cincinnati • Cleveland • Philadelphia • Minneapolis • Charlotte • San Francisco ternative, authority to build a 26-inch, \$80 million line starting at Corpus Christi, Tex. It is also understood that the Big Inch Gas Lines Corp. has offered \$80 million to put the three lines into a combination oil and gas service. WAA suspects that in the clutch the majors won't sit idly by while the independents are talking turkey.

#### WHY WAA FAVORS OIL

IT IS RECOGNIZED by War Assets Corp. that from an engineering standpoint, conversion of government pipelines to natural gas service is feasible. However, WAA favors keeping the lines in petroleum service for several reasons. Foremost is the ever-present specter of "emergency." The Army-Navy Petroleum Board wants the lines kept in condition for prompt movement of crude or products in time of war. Engineers point out that if the lines were converted to natural gas movement the resultant dependency of large population masses and vital industries on this gas supply might seriously interfere with a quick reconversion to petroleum transmission. Whether adequate manufactured gas standby capacity could be maintained and depended on for such reconversion is called doubtful. Aside from these considerations, WAA spokesmen declare, the disposal value of the lines as gas carriers may be as low as 50 percent of their worth as petroleum carriers.

In any event, Congress is still a factor in the pipeline picture, even though Congress failed to act against the SPA disposal program. Representatives of coal and railroads can be expected to put up a fight against natural gas transmission in a showdown. Four or five bills relating to the lines are in congressional committee files.

### DENATURED URANIUM

WASHINGTON is making a great point of the report sent by the State Department to Congress recommending that a special denatured type of uranium be released from secrecy controls. Members of the Senate Atomic Energy Committee were much interested but are asking for a much more convincing report from impartial scientists to make sure that these fissionable elements can safely be so released from secrecy controls. Obviously there has been no explanation of the denaturing process.

#### AMMONIA PLANT LEASES

SLOW progress has been made by surplus disposal agencies in completing leases for industry to take over synthetic ammonia plants. The latest estimates are that May 1 is absolutely the earliest date at which any such transfers can occur. Even then it is likely that only one plant will be made available for unrestricted private operation,

Much confusion has been caused several times lately as to the status of Ordnance plants which have been operated. One of

these at South Point, Ohio, has been under lease to Allied Chemical and has been run just as if it were privately owned with marketing by the operator at his own choice. That short-term lease expires soon. Other plants which have been operating under Ordnance control have functioned to make up deficits in ammonia supply for fertilizer and industry. Their output has been distributed through Defense Supplies Corp. (an RFC subsidiary) or through Commodity Credit Corp., according to the character of the products involved. Only when formal leases by private enterprise have taken effect will the distribuition come under the control of the operating companies which have been so engaged.

### SILVER SCARCITY

Shortage of silver for industrial purposes is very real, and Washington knows this. But the major activity regarding this metal about the Capital is further effort by Western State legislators to strengthen the price of silver for the benefit of the mining industry.

Washington does not seriously doubt the report frequently heard that the only way business can get needed silver supply often is to enter the black market. This is not surprising when there is the present spread between the price promised miners for newly mined silver and the prevailing commercial market limits. Congressional committee estimates are that annual industrial needs for silver now exceed 100 million ounces which is at least three times the present domestic new silver production. Imports are not sufficient to make up the deficiency, and are not likely to become so under ceiling prices.

#### NITROGEN SHORTAGE GROWS

**PROMISED** delivery in the United States of 700,000 tons of Chilean nitrate for this fertilizer year will not be accomplished. Up to January 31 only 200,000 tons of the expected total had been made available. There is no chance that the balance can be made up before June 30.

To aggravate the fertilizer-nitrogen shortage thus created by delay arrivals from Chile, the industry is suffering from reduced production of ammonium sulphate. Apparently the supply of potash and superphosphate is better in most of the country, though there is some shortage in a few areas, especially of superphosphate on the West Coast. Most fertilizer distribution is being made commercially. AAA, has been compelled to limit its "give away" program by a shortage of funds.

#### FOOD BOARD RULINGS

THE United States is not alone in its suffering on fertilizer materials. Late in March Combined Food Board estimates indicated that this fertilizer year will see a shortage of over 450,000 tons of nitrogen and well over 3 million tons of phosphate rock to meet urgent agricultural requirements. The shortage in the case of nitrogen is in part due to the inability to convert some of the fixed nitrogen from ammonia into transportable and usable solid compounds. These matters are spotlighted in Washington by their effect on the prospective food shortage of next year as well as this.

### NEW WAGE LIMITS

CONGRESS is making substantial progress on the proposal to raise minimum wages applicable nationally under the Wage-Hour law. Washington does not expect immediately the enactment of the original Pepper proposals raising the statutory minimum to 65 cents at this time and to 75 cents in four years. In fact, there was considerable doubt early in April as to whether Congress would before its summer recess complete passage of any new bill. But observers seem to agree generally that if not enacted this year such higher minimums are sure to be enacted during the next election year, 1948. In fact, it is reported that some members of Congress think that re-election of Democrats in the presidential election year will more need this legislative aid than do Congressmen who must seek re-election in 1946.

#### INSECTICIDE LEGISLATION

THE Flannagan Bill providing for a new insecticide inspection law has made substantial progress in Congress. Following hearings and numerous conferences with Department of Agriculture officials a new draft was prepared by the Committee on Agriculture. This was made ready for action of the House during the early part of April but prospective speed in House action could not be accurately forecast at that time. The Senate has done little or nothing yet, and is not expected to take any action on the measure until it receives the bill approved by the House. This may result in delay beyond this year in the final adoption of the new law.

#### SAFETY DATA SHEETS

"FORMALDEHYDE" is the subject of the first Chemical Safety Data Sheet released by Manufacturing Chemists' Association. These sheets are designed to assist producers, transportation agencies, and users of chemicals in securing complete personnel safety at all stages from production to ultimate use. They present in a concise form all essential information to guide in the handling of chemicals. As described by MCA:

"They cover important physical and chemical properties; hazardous characteristics, including physiological and fire; usual shipping containers; unloading and emptying containers; container storage and handling; caution labels; personal protective equipment; medical controls; and first aid. Medical information is prepared by the Medical



Water-driven power wheel in ore mining and stamping establishment, France, 18th Century.

SPEEDAIRE

NT TO TO TO TO TO TO TO TO TO

# and — More Horsepower for your Dollar!

**Today it's** 

Floor area-time-manpower-all were easy to come by in the leisurely 18th Century. But with today's premium on everything, interest in power transmission focuses on the great savings made possible through Speedaire-the new Worm Gear Reducer by Cleveland. Speedaire is compact, space-saving, but does more work-delivers up to double the horsepower of standard worm units. Economical in first cost-you can profit by using this compact, right-angle Drive on more of your machines. Send today for Catalog 300-complete with charts, rating tables and dimension

data. The Cleveland Worm & Gear Company, 3273 East 80th St., Cleveland 4, O. Affiliate: The Farval Corporation, Centralized Systems of Lubrication In Canada: PEACOCK BROTHERS LIMITED Why Speedaire—the New Cleveland Fan-Cooled Unit Delivers "More Horsepowerfor your Dollar"

Delate the set

Reducer

• The Induction Fan continually removes heat by means of a highvelocity air stream scouring the surfaces of the oil reservoir.

Because Speedaire is Fan-Cooled, it will do more work — and deliver up to double the horsepower of standard worm units of equal frame size, at usual motor speeds.

Speedaire can be installed economically on many applications where other types have been used heretofore—giving you the advantages of a compact right-angle Drive.

•Speedaire is furnished in 6 standard sizes—from 3 to 95 H.P.


Advisory Committee of the Manufacturing Chemists' Association."

This first sheet of this series is offered for sale at 15 cents per copy on orders to Manufacturing Chemists' Association, Woodward Building, Washington 5, D. C.

#### "FIVE-DAY" FREIGHT

SHORTAGE of freight cars is being aggravated by the five-day week. Washington is urging that industrial managements provide some way in which regular loading and unloading of cars can be carried on more days per month than is now likely with five working days constituting a full work week. Since the end of the war the effective supply has been reduced by more than 100,000 cars per week because of the shortening of the work period, official Washington estimates. The average turn around on car movements is now at least 17 days, instead of the wartime average of 13. Chemical managements experiencing car difficulties, which means most such managements, may find it necessary to take drastic steps as their part in correcting this serious shortage.

#### ENGINEERS RECOGNIZED

CONGRESS has been urged repeatedly to raise the top limit on salaries for government people so that the better workers would not have to leave Uncle Sam's employ in order to get more than \$10,000 per year. During March the legislators gave the first evidence that they thought this was the thing to do. But their recognition was limited to a committee decision that fixes the ceiling salary at \$14,000 per year for engineers and scientists. Such higher salary limit was voted down for other classes of personnel, even for other professional men such as lawyers and economists. Apparently the atomic bomb blasted loose the salary ceiling only for the technologic groups.

#### **NEW SCIENCE GROUP**

WITH primary interest in legislative matters affecting the sciences, a new group, the Washington Association of Scientists, has organized in the Capital. This organization, containing a nucleus of Bureau of Standards men, has principles approximating those of the recently established Federation of American Scientists in Washington, and is expected to become a member of the Federation. A short time ago the WAS had several hundred actual or prospective members and was preparing to adopt a constitution and elect officers. The organization is distinct from the Science Society of Washington, another and older Washington group.

A temporary executive committee to guide WAS in its early stages consists of: Dr. R. K. Cook (chairman), Roy J. Britten, Dr. L. B. Heilprin, Herbert Insley, T. H. Projector, Joseph G. Reid, Jr. H. E. Robinson, Dr. Charles P. Saylor, William A. Wildhack and Helen Ross (secretary). All are Bureau of Standards employees. Membership in WAS is confined to scientists in the Washington vicinity.

#### WPB DATA MOVE SLOWLY

As MARCH ended, the statistics on chemicals and allied products collected by WPB during the war were, in general, still resting in the file cases at Civilian Production Administration headquarters. Few files had been released by CPA operating divisions and sent to the claimant agencies intending to publish them, although the Census Bureau, chief claimant of chemicals data, was working on CPA files and rounding up end-use figures on certain chemicals. Late in March, it was reported from CPA, some files on miscellaneous minerals, aluminum and magnesium were about to be transferred to the Bureau of Mines. Nothing to speak of had gone to the Tariff Commission and Department of Agriculture.

#### ARMY VS. SCIENCE

No one seems able to define an arrangement by which atomic science and engineering can be put under complete civilian control to the satisfaction of the Army. All of the nominal orders and decisions to that effect sooner or later get held up under the influence of military demand for greater secrecy. It still remains a question as to how the President and the members of Congress who very clearly prefer civilian control are going to get that without either real or claimed jeopardy to national security.

#### NEW CHEMICALS DATA ISSUED

THE Census Bureau in conjunction with Civilian Production Administration began this month the release of the first of a new series of chemicals statistics collected during the war by WPB. The series, Facts for industry, Series No. 6-8, cover initially the end-uses of benzene, aniline and phenol. All data are based on 1944 with the exception of the figures for benzene, which will cover 1944 and the first half of 1945. Soon following the above will be releases on formaldehyde, casein and naphthalene. Others are on the way.

#### MINOR NEWS GLIMPSES

The Anglo-American petroleum agreement, framed by Mr. Ickes and associates, is facing a fight in the Senate soon. It has been on ice lately because and only because, says Ralph K. Davies, State Department officials have been too busy with other worries to participate in the hearings. Groups of independent oil men have whetted their axes to battle the arrangement.

A contract \$848,000 for mechanical work at the Bureau of Mines synthetic liquid fuels laboratory at Bruceton, Pa., has been awarded the George H. Soffel Co. of Pitts-

burgh. With steel erection finished, all the buildings are ready for masonry.

"Goop," or Pyrogel, an incendiary bomb filler used against the Japs, is being tested for forest fire prevention by the U. S. Forest Service in cooperation with the Chemical Warfare Service. About ten carloads has been furnished for trials following promising results obtained in the Pacific Northwest.

S. 1850, the omnibus Science Foundation bill put forward as a compromise of the Kilgore-Magnuson et al principles, wins the support of OSRD's Vannever Bush. Dr. Bush says "I'll go along with it, as it's prob ably the best compromise obtainable." He says the patent clause is needlessly elaborate but equitable.

Petroleum Administration for War, having asked that an Executive Order be issued to terminate its existence, was preparing to fold its tents with the close of April. Friends and critics generally agree that PAW was one of the most efficient war agencies in Washington.

Rotenone shipments to this country will be acutely limited during the 1946 growing season, the rotenone importers and processors have informed CPA. Crippled transportation for crude rotenone along the Amazon and unsettled future trade agreements with Peru are given as important factors. Department of Commerce says there is little prospect of much derris from the Far East this year.

Interior Department policies are likely to be changed slowly by the new Secretary, Julius A. Krug. It is noticeable, however, that the more drastic type of regulation and the bombastic publicity items of the depart ment seem to have stopped coming out. Krug, a trained engineer, is expected to give much more factual attention to policy ques tions than did his predecessor.

Veteran rights to employment do not extend to the privilege of having a civilian worker of equal or greater seniority dis charged in order to give work to a veteran. This decision of the Second Circuit Court of Appeals may go to the U. S. Supreme Court, but apparently Washington does not really expect a reversal. And some members of Congress who have commented privately say that the lower courts have frequently given veterans much more privilege than Congress really intended when it passed the G. I. Bill of Rights.

National Roster executives are wondering where they will go after July 1 if a national Science Foundation is not established. Their present status as a special unit in the Department of Labor will end with the fiscal year on June 30. WORLD'S LARGEST PRODUCER OF SYNTHETIC RESINS



# GREAT NEWS7

# New "G" Series BECKOSOLS alleviate Alkyd Shortage prove perfect replacements for scarce glycerine-base resins!

# FROM THE CENTER OF RESIN RESEARCH

RCI experience proves its worth again with an answer to the current scarcity of glycerine and the consequent shortage of many essential alkyd resins. The new "G" series Beckosols—now available in quantity—require little change in your formulation methods yet are equal or superior to the glycerine-base Beckosols they replace. The new No. 1307-G Beckosol, for example, is fully equal in gloss, flexibility, adhesion, mineral spirits tolerance and water and gasoline resistance to scarce No. 1307 Beckosol and definitely superior in hardness. Remember—these new "G" Beckosols are not substitutes, but fully satisfactory replacements. Get the facts and get back into full production.

#### REICHHOLD CHEMICALS, INC. General Offices and Main Plant, Detroit 20, Michigan

Other Plants: Brooklyn, New York • Elizabeth, New Jersey • South San Francisco, California • Tuscaloosa, Alabama • Liverpool, England • Paris, France • Sydney, Australia SYNTHETIC RESINS • CHEMICAL COLORS • PHENOLIC PLASTICS • INDUSTRIAL CHEMICALS

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



In a chemical world that is forever moving forward and highly competitive!--it is natural that manufacturers should desire to keep control of the processes and plant designs their engineers have developed . . . often at great expense.

Badger offers chemical managements and their engineers the truly constructive outside viewpoint . . . with the assurance that confidence will not be violated -that private plans, processes or designs will not be disclosed or diverted into competitive reach.

Badger's broad cumulative experience and constantly developing engineering methods can provide a fresh approach to old as well as to new problems ... and the Badger design and construction organization is experienced in efficient co-ordination with its customers.

Making new processes work efficiently in largescale production, improving designs and decreasing operating costs, saving time and initial plant costs ... these are some of the pay-offs Badger has achieved for many a client.

More and more important concerns are finding out that they have often locked out more than they have locked in. Have you?



PROCESS ENGINEERS AND CONSTRUCTORS FOR THE CHEMICAL, PETRO-CHEMICAL AND PETROLEUM INDUSTRIES PROCESS INROUTING

HEWIDERS

OPERATING ECONOMIES

SPEED

PRIVATE PROCESSES



## DIAMOND SODA ASH SODIUM CARBONATE

Na2

serves American Industry

in hundreds of applications

An indispensable ingredient in the manufacture of many products



GLASS

ALUMINUN

.....

MOND ALKALI COMPANY  $\mathbf{D}$ Pittsburgh, Pa. and everywhere

# Feed and New Mine and New Excavating Equipment to Increase Production of Higher-Grade Phosphate

• World-wide requirements for food are expected to increase the demand for phosphates to a new high level in the United States, Europe and the Far East. To increase production to meet this demand International is expanding its sources of raw material and adding new mining equipment.

International has recently purchased a 2,000-acre property at Bartow, Florida, containing large deposits of higher grade ore which will be developed into the largest phosphate mining operation in

America. It will be completely mechanized for efficient, low cost operation and will have a life of twenty-five years.

At its Peace Valley Phosphate Mine, International has recently placed in operation the largest dragline excavator ever used in the industry. It will greatly increase the output of phosphate and achieve far more efficient and economical production. Another unit has been ordered for the new operation at Bartow.

Since 1909, International's mining operations have kept pace with the growing world-wide need for phosphates as a result of its research and development of new processes to increase production, improve the product and reduce costs. Today, with its huge resources of high-grade ore and its mining facilities, International is well prepared to supply expanding domestic and foreign markets with phosphates for both agricultural and industrial purposes. International Minerals & Chemical Corporation, General Offices: 20 North Wacker Drive, Chicago 6.

MINERALS and CHEMICALS

INTERNATIONAL MINERALS AND CHEMICALS serve you in many ways through industry and agriculture: POTASH and PHOSPHATE for industrial chemicals and fertilizers. HIGH-ANALYSIS PLANT FOODS for larger yields of quality crops. CHEMICALS: Potassium Chlorate, Silica Gel, Epsom Salt, Defluorinated Phosphate, Sodium Silico-Fluoride, Sulphuric Acid. AMINO PRODUCTS for the food and pharmaceutical industries: Mono Sodium Glutamate for finer tasting foods, Glutamic Acid, Glutamic Acid Hydrochloride, Betaine, Betaine Hydrochloride.

The bucket of the new

dragline has a capacity of 21.4

cubic yards, so large it can hold a full size automobile.



OF HIGHER VACUUM POSSIBILITIES

High Vacuum

New products and processes, undreamed of yesterday, are realities today because of higher vacuum processing in the low micron range. Penicillin, chemicals, dehydrated food specialties, metals evaporation are only a few examples.

> The important thing is this: There are no horizons yet in the future possibilities of higher vacuum applications. Countless new products await only the imagination and skill of forward-thinking engineers

and research chemists to release them from experimental stages.

For 40 years Stokes has pioneered in the new world of higher vacuum - pioneering that has meant the development of pumps, gages and related equipment for complete higher vacuum processing systems.

We invite you to discuss your problems with us.

F. J. STOKES MACHINE COMPANY 5920 Tabor Road Philadelphia 20, Pa.



**PUMPS · GAUGES · EQUIPMENT** 

### CHEMICAL & Metallurgical ENGINEERING

ESTABLISHED 1902

#### APRIL 1945

S. D. KIRKPATRICK, Editor

## What Price Exports?

N a topsy-turvy world in which peace is still a fleeting goal, it seems almost futile to think about foreign trade. Yet there will come a time, sooner perhaps than we realize, when domestic needs will have been satisfied and our industries will be looking hungrily for markets abroad. Whether or not they find them may well depend upon decisions that must be made within the next few weeks and months.

In the first place, what do we want most to export? Should it be capital, capital goods, consumer products, or that very intangible export we have come to call "technical know-how?" Each has its advantages and disadvantages. As far as money is concerned, our government is already committed to several billions in foreign loans over which we apparently will have little control. Presumably part of these funds will go to reviving and rehabilitating old-world industries that may or may not be able to compete with modern machinery in efficiently managed plants elsewhere in the world. If they can't compete our money is wasted; if they can, some people fear we may be undermining our own business prospects.

Would it be better to export finished products as consumer goods, and to depend for payment on imports of foreign raw materials or non-competitive manufactures? In countries that can pay us, either in money or goods, we would be smart to begin that trade at the very earliest opportunity, even if it means setting aside a certain percentage of production for which there is still urgent need in this country. One important chemical company has allocated a sixth of its output to foreign markets. Another is determined to meet its prewar quota for exports. Management in both feel that this is essential, because otherwise they will lose their markets to other exporting countries or build up competition by encouraging domestic production.

Or should we export engineering services and technical know-how, rather than money or goods? Since further industrialization of the world is inevitable, and probably desirable, should we not do what we can to promote the use abroad of the best of our processes and equipment? A heavy export of capital goods and equipment designed, constructed and perhaps operated at least temporarily by American technologists, would seem to be our most logical chemical engineering contribution to the financial recovery of the world. But would it be the best for us? We tried it in Russia, and to a lesser extent in Mexico and elsewhere in Latin-America before the World War, and our experiences were none too heartening.

Col. Allan M. Pope, president of the First Boston Corporation, had a slightly different solution for this problem when he recently addressed the American Section of the Society of Chemical Industry. He would favor the establishment by an American chemical company of a foreign subsidiary which would build a branch plant abroad partly financed by local funds, but efficiently designed, operated and managed by American engineers and technologists. As its operation succeeded, most of the American investment would be retired, preferably through foreign exchange created by the enterprise itself. Eventually the American company would have its original principal repaid and receive a continuing return from a well-run foreign company employing local labor and substantially owned by local interests. Should such a plan prove attractive to American businessmen and technologists Colonel Pope assured us that the investment bankers will readily provide the necessary funds.

The foreign trade problems of chemical industry cannot be solved by any single formula or procedure. They will continue to depend on political, economic and social developments which cannot yet be forecasted with certainty. But we can be sure that foreign needs for goods and processes and equipment are going to be met, and probably with the help of American money, so it is good business on our part as taxpayers as well as technologists to insist on sound financing and maximum efficiency in production and distribution, whether in this country or abroad.

# Unusual Techniques Feature the Production of SYNTHETIC BEAD CATALYST

Unusual processing methods are used to produce bead catalyst. Forming the beads, in particular, is a new operation worthy of note. Of interest, too, are the techniques and equipment employed to control the quality and properties of the catalyst. Ingenuity of design solved many problems while noncritical construction materials and coatings were used to combat corrosion of process equipment. For a clear idea of the complete process, from raw materials to finished product, see the Chem. & Met. pictured flowsheet shown on pages 138 to 141.-Editors

ATALYTIC CRACKING has been recognized C as one of the most important advances in petroleum refining of the past two decades. In back of this progress, but not so well known, are the strides taken to improve refinery production by making available better catalysts. An outstanding example of catalyst development is the production of synthetic bead catalyst by the Socony Vacuum Oil Co. Inc., at Paulsboro, N. J. Developed for use in the Thermofor catalytic cracking process, this new catalyst was responsible for markedly increasing production of aviation gasoline during the war. The production of synthetic bead catalyst embodies new chemical engineering techniques, and illustrates again the ingenuity and progressiveness of this industry.

It seems quite in keeping with the tradition of the Socony Vacuum Oil Co. to have fathered this development. Outstanding for progressiveness even in an ultraprogressive industry, this company has pioneered in many developments including the installation and operation of the first commercial catalytic cracking plant in this country (Houdry fixed bed type). Having been active in the development and final use of the TCC process, it is natural for this com-



Based only on laboratory data, Socony Vacuum's bead catalyst plant at Paulsboro, N. J., was built and operating within six months after ground was broken

pany to have continued its work in improving the catalyst involved. Original catalyst was clay pellets and it was while attempting to improve this material that the new bead catalyst was evolved. The commercial plant was designed and construction begun without benefit of pilot plant experience. Operation started in March 1944 and the design capacity of 50 tons per day was reached in July of that year.

Consisting of activated alumina contained in silica gel, synthetic bead catalyst has now replaced clay pellets in many TCC units and is gaining use in Houdry plants. The important advantage of the synthetic bead over pelleted catalysts lies in its great physical ruggedness, its high and sustained activity, and its low resistance to vapor flow. These important features permit either increased output or a substantial rise in quality level. The over-all advantage of the bead catalyst in terms of increased production, savings in tetraethyl lead, and reduced finishing costs, mark a high standard of performance in the field of catalytic processing.

The process for making synthetic beads is based on the principle that when solutions of sodium silicate and an acid are mixed in the right proportions a gel is formed. Into this gel, a catalytic material, activated alumina, is chemically bound. The gel is readily formed into a desirable shape after which removal of water leaves an extremely porous, active and durable residue. Finished beads average 3 mm. in diameter, are spheroidal in shape, hard, translucent and consist of approximately 89.5 percent silica, 10 percent aluminum oxide, and 0.5 percent water. Beads of about 0.70 bulk density have a particle density of 1.10, a true density of 2.42, a pore surface area of 420 sq. m. per g., and a pore volume of 0.50 cc. per g. Average pore diameter is 47 angstroms or 470 billionths of a centimeter. The large surface area, of course, is made possible by the large number of fine capillaries which permeate the gel structure.

#### OLD PRINCIPLE-NEW PROCESS

Manufacturing the bead catalysts consists of several steps: (1) Preparing the raw materials into the two gel forming solutions; (2) continuously blending the two solutions in correct proportions and forming the blend into separate drops of gel, each of which becomes a bead after further treatment; (3) wet heat-treating, base exchanging and washing the green beads; (4) drying the treated wet beads by reducing their water content to approximately 10 percent moisture on the bone dry basis; (5) final drying, followed by tempering the dried beads at elevated temperatures; (6) screening, bulk storage, packaging and shipping.

Basic raw materials include silicate of soda, sulphuric acid, aluminum trihydrate and demineralized water. Fluid chemicals are received by barge and pumped to the plant storage tanks, while dry chemicals are received by rail. Ten outside tanks are used for storing fuel (propane for heating the tempering kiln), chemicals, treated water, and for mixing and storage of chemical solutions. Steam for processing and drying is provided by the refinery power plant. Water of the high purity required in the process, free of catalyst poisons such as iron, copper, chromium and sodium, is obtained by demineralizing Delaware River water in a 750 gal. per min. plant, using the cation-anion exchange process.

Gel forming solutions consist essentially of sodium silicate and acid-alum. The latter is prepared and handled in lead lined equipment. While the sodium silicate solution is prepared merely by diluting the "N" brand silicate of soda with water, the acid-alum solution is prepared from aluminum trihydrate and sulphuric acid. The aluminum trihydrate is added to 50 percent sulphuric acid and preheated to about 240 deg. F. The reaction is vigorous, exothermic and is maintained at 250 deg. F. by the addition of aluminum trihydrate. The latter part of the reaction involves a digestion period of about 14 hr. during which the alum batch is continuously agitated with direct steam and maintained above its solidification temperature of about 210 deg. F. Upon completion, the alum is diluted to a 20 percent concentration which remains liquid at room temperature and which can be safely pumped to the solution preparation tank. Here the 20 percent solution is further diluted to 10 percent and stored for use directly in the base exchange treatment of the wet beads. Sulphuric acid is carefully mixed with this alum solution in the right propor-



Fig. 2—Nearly two billion beads amounting to 50 tons of finished catalyst per day are produced in this battery of individually controlled, lead lined forming towers containing light mineral oil

tion to produce the acid-alum for the gel forming operation. Aluminum sulphate solution is prepared from the basic raw materials rather than from commercial alum because of the need for high purity.

#### KEY OPERATION

Final preparation and mixing of the solutions takes place in six 42,000-gal. tileinsulated steel tanks, four of which are lead lined (used for alum and acid-alum solutions). In three of these tanks solutions are being prepared while the other three are being emptied for use. They are all equipped with educator mixers, as shown in Fig. 1, developed by Paulsboro engineers for mixing and blending liquids in large tanks.

Key operation of the whole process is forming the beads. The temperatures of both forming solutions are adjusted to optimum values and are then carefully metered to the mixing head on each forming tower. While the actual proportions of the two solutions may be varied to obtain a particular quality of bead, once this is established, it is necessary that the rate of solution be continuously maintained within 0.5 percent in order to form the gel at the required pII. Variations in pH substantially affect the final bead structure as brought about by subse-

Fig. 1—A high eduction to jet discharge ratio, together with the specially designed suction standpipe, insures rapid, thorough mixing of tank contents



sol which emerges from the nozzle, and distributes evenly over a fluted cone dividing into 60 smaller streams. These flow off the bottom of the cone directly into a laver of light mineral oil, over a bottom layer of water. At about 3 in. below the oil surface the sol breaks into individual droplets averaging 1 in. in diameter and consisting of 90 percent water and 10 percent solids which gel to form beads as they descend through the oil layer. Approximately 90 million beads per day are produced in a single tower. Complete gelation must take place before the drops reach the oil-water interface to prevent partial dissolving and consequent agglomeration of the beads. At this stage the

quent processing steps. As the two solutions

are mixed, they form a liquid hydrogel or

Top—Freshly formed beads containing 90 percent water; Bottom— Finished catalyst has a surface area of about 2,000,000 sq. ft. per lb.



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



Fig. 3—Liquid hydrogel emerging from the Lucite nozzle is divided by the fluted distributing cone into 60 equal streams which break into droplets forming beads of gel while descending through the oil

beads consist of a tender gel which can be easily crushed or chipped and therefore must be carefully handled.

The complete installation comprises 32 forming towers arranged in two sections as shown in Fig. 2, each consisting of two parallel rows of eight individual units. Each unit operates independently of the others and consists essentially of an automatic flow controller, mixing head, distributing cone, and forming tower. The acid-alum and silicate solutions are pumped to the forming units at constant pressure. Electronic rotameter flow controllers operate a motorized valve on each solution line to maintain a constant rate of flow to the mixing head.

From the control valves the two solutions pass through Saran tubing to the cast bronze mixing head which discharges to the distributing cone through a polished Lucite tube (Fig. 3). Kinetic energy of the high velocity silicate solution entering the low velocity acid-alum stream creates sufficient

Fig. 4—Over 20,000 gal. of water per day are used to sluice the 30 tons of freshly formed beads (containing 90 percent water) from each forming tower to the wet processing tanks



turbulence to cause thorough mixing of the two components before they emerge as a single stream from the Lucite nozzle.

The fluted distributing cone with concave surface is made of plaster of paris covered with an anti-wetting resin coating. It contains 60 evenly spaced vertical grooves cast in the surface beginning about three inches below the apex, and increasing in depth to  $\ddagger$  in.•at the base. Since the gel starts forming immediately upon mixing the two solutions, the cone surface must be cleaned manually at intervals of 10 to 15 min. with a multi-prong rubber fork. This prevents unequal distribution due to deposited gel.

Bead-forming towers (Fig. 4) consist of vertical, open top, lead-lined cylindrical tanks, 3 ft. in diameter and 10 ft. deep with a conical bottom tapering to a 3 in. outlet. This contains a 7 ft. deep oil layer and a 3 ft. water layer. Sluice water runs continuously into the lower part of the tank and out the bottom, carrying the beads with it up a riser pipe into an open weir box. The level of the oil-water interface is held constant by adjusting the height of the weir. Fluctuations in the oil level, which must be kept even with the base of the distributing cone, are prevented by adding oil at the rate of about 3 gal. per min., and allowing it to overflow through a level control weir in the tower, and then to a central recirculating surge tank where any water or gel particles are settled out and removed.

#### WET PROCESSING

Wet or raw bcads, continuously removed from each tower, discharge into one of two resin coated steel flumes, 18 in wide, 6 in. deep with a slope of 1 in. per 10 ft. of length, between two rows of eight towers. They meet to form a central flume which runs the full length of the wet processing room and from which the wet processing tanks are filled.

This is accomplished in three stages, namely, hot-water treating, base exchanging, and final washing. The hot-water treatment sets the structure and controls the density of the finished bead. It is important that the concentration of soluble salts in the heattreating liquor be kept in equilibrium with the soluble salt concentration of the freshly formed hydrogel. The pH of the treated liquor must be accurately controlled within close limits. Unless properly controlled, this treatment lowers the final yield by increasing the proportion of beads fractured during drying operations.

Removal of the zeolitic sodium present in the raw bead is accomplished by base exchanging with aluminum sulphate. The zeolitic sodium is replaced with aluminum. To lower the sodium content from  $3\frac{1}{2}$  to 0.2 percent requires aluminum sulphate in the amount of three equivalent weights of the zeolitic sodium present. The effluent from this operation contains appreciable amounts of aluminum sulphate which are discarded. Final washing; which takes place in about 18 hr. removes sodium sulphate and other soluble salts remaining in the beads. At the beginning, small amounts of a sodium scavenger are added which help to reduce the sodium content to about 0.1 percent or lower. This operation requires about 2.5 volumes of water per volume of hydrogel, or about 15,000 gal. of demineralized water per ton of finished beads. During the wet processing operations, the beads shrink in volume about 10 percent.

Wet processing takes place in 16 concrete tanks set underground to minimize temperature fluctuations due to atmospheric conditions. They are arranged so that the three phases of wet processing take place without moving the beads from one tank to another. As shown in Fig. 5 a typical processing cycle consists of one tank filling, three hotwater treating, five base exchanging, five washing, one discharging to the dryer flume and one undergoing inspection, cleaning or repair. The whole operation is balanced so that when a tank is ready to discharge to the dryers the process in each tank moves ahead one step in the washing, exchanging, hot-water treating and filling operations. Hotwater treating is accomplished in a closed system consisting of three or four tanks in series, a sump and a direct steam heater. The treating liquor is recirculated within the system, thus maintaining as nearly as possible an equilibrium concentration of soluble salts between the liquor and the hydrogel.

Washing and exchanging take place as a multistage countercurrent operation in which

Fig. 5—Three phases of wet processing are accomplished by rearranging the circulation of treating liquors without moving the hydrogel beads



water enters the final tank in the series and passes from one to another of the five tanks in the washing cycle. To the wash liquor is then added the aluminum sulphate solution used for base exchange operation.

Each of the 16 concrete tanks (shown in Fig. 6) has a 45,000 gal. capacity, is 18 ft. deep and 22 ft. in diameter. The bottom slopes to a 4 ft. diameter centrally located pump well. The bead mass which completely fills the tank is supported by a sloping baffle system of five wooden slatted decks located 3 ft. apart vertically, built in sections and hinged at the periphery so that they may be oscillated vertically with a lever to dislodge the hydrogel beads when the tank is being emptied. By supporting the bead mass in this manner, crushing and deforming of the beads is prevented and channeling of the treating liquor and wash water is minimized to provide maximum uniformity of treatment.

#### UNIQUE DESIGN

Treating liquor or wash water passes through the mass and is removed from the bottom of the tank by 12 collectors consisting of 3 in. lead pipes radiating outward from the center well. The under portion of the pipe is cut away and replaced with an 8-mesh stainless steel screen which holds back the beads but allows free flow of liquor. This provides sufficient screen area to reduce flow velocities, thus eliminating plugging due to forced impingement of bcads against the screen. A vertical, axial flow centrifugal pump takes suction at the top of the well and pumps the liquor through a flexible rubber hose to any one of four compartments of a diversion box. Each of these compartments connects to large lead pipelines so that no valves are necessary to divert the flow from one tank to another, to the sewer, or to the hot water, sluice or forming tower sumps.

When final washing is completed, the beads are sluiced out of the tanks through four manually-controlled discharge openings at the base of the center well. It should be noted that beads are not pumped anywhere in the process, but are always sluiced with a moving stream of water. These connect to an 8 in. vertical lead pipe which rises to about 3 ft. below the normal operating level before passing horizontally out the side of the tank (see Fig. 6). An 8-in. rubber hose, which can be raised or lowered to stop or start the flow extends from the tank to the flume which conveys the processed beads to the dryers. Concrete, pyramidal buttresses which fill the "dead spaces" between the discharge openings aid in directing the bead flow to the individually controlled discharge gates. Water is added to maintain the operating level and the beads flow to the outlets and up a vertical discharge pipe to the flume.

While this system readily removes most of the beads from the tank, it becomes less effective as the tank becomes nearly empty. A unique airlift system was designed to accomplish the complete removal necessary. It consists of two annular walls, one 4 in. inside the tank wall extending from a few



Dryers in this building are capable of evaporating 650 tons of water per day; sluice water is collected in basin and reused

inches below the normal operating level in the tank to within 10 in. from the bottom. The second wall is 6 in. inside the first one extending from a few inches above the normal liquid level down to 3 ft. below it. Between the two walls and near the bottom of the second is suspended a 3 in. perforated pipe for introducing low-pressure air which raises the liquid in the annular space to a level higher than in the rest of the tank. This air-lift action induces large volumes of water to circulate at low velocity down between the tank wall and the first annular wall and along the bottom of the tank toward the discharge gate. This movement of water causes any remaining beads to flow away from the tank walls across the bottom towards the center where they are picked up by the water stream leaving the outlet gates.

#### DRYING

Completely processed beads are drained of excess water and mechanically spread to a depth of 3 to  $3\frac{1}{2}$  in. on perforated stainless steel dryer belts in a tunnel dryer. Drying time averages about four hours at a temperature of about 280 deg. F. for the first three hours, and increasing to 300-350 deg. F. for the last hour. Drying takes place in a 100 percent steam atmosphere to prevent the beads from drying too fast and bursting. Beads shrink in drying to approximately 1/11 of their original volume, during which operation substantial stresses are set up in the gel structure, particularly during the latter part of the drying operation when drying occurs by diffusion of the water vapor through the bead capillaries to the surface. It is important that the temperature and relative humidity be maintained uniformly to prevent undue fracturing of the beads. Beads containing about 10 percent moisture (bone dry basis) discharge from the dryer conveyor to a hopper and then to the tempering operation.

Wet beads are scooped from the feed trough by perforated dryer feed elevator buckets which drain excess water from the beads. A tilting device causes alternate buckets to dump into the top or bottom dryer feed chutes. The chutes are designed to act as steam scals and hoppers for smoothing out any irregularities in the feed and an adjustable gate at the bottom of the chute regulates the depth of the beads on the conveyor belt.

Drying takes place in three main units, 150 ft. long, each consisting of two adjacent tunnel dryers separated by a central corridor. Each of these tunnels is divided into an

Fig. 6—Beads rest on slatted decks while treating liquors are drawn through collector pipes to the pump well; beads are sluiced out through the discharge pipe



upper and lower section containing an endless stainless steel dryer belt 91 ft. wide, perforated with 1s in. by 1 in. slots. Every conveyor travels through seven drying compartments, each of which is equipped with steam-heating coils and an automatic temperature controller. Low-pressure blowers recirculate the drying medium over the funed heating coils, through the head bed and perforated conveyors. 'The total drying surface of all 12 drver belts is approximately 15,000 sq. ft., with a drving capacity of 60 tons per day of finished beads. This corresponds to an evaporation rate of nearly 650 tons of water per day. Any one or any com-Bination of the dryer conveyors may be operated at one time to match the output of the bead forming and the processing operation.

#### TEMPERING

Heat-treating or tempering relieves the stresses set up by the drying operation thereby imparting ruggedness and good wearing qualities to the finished catalyst. Here also, final drying takes place. This operation takes place in three steps. First, the beads are preheated before they enter the tempering zone to permit the remaining water to diffuse slowly to the surface. The 10 percent moisture remaining in the beads is removed before beads enter the tempering zone. They remain in the tempering zone under regulated conditions of time, temperature and gas composition. This relieves stresses, sets the final structure and decreases the cokeforming tendencies of the catalyst during the cracking operations. The beads then pass into the cooling zone where they are gradually cooled to a temperature suitable for storage.

The tempering kiln is a vertical cylindrical unit. 10 ft. in diameter, 35 ft. high, consisting of a steel shell with a firebrick lining which in turn is lined with a thin stainless steel shell. Beads discharge from the elevator tube in the top of the kiln to a slowly rotating feed spout which distributes them uniformly across the top of the preheater. The beads descend through the tubes of the preheater section into a void section which constitutes the tempering zone. Hot gases pass from the top of the tempering zone between the preheater tubes and discharge to the atmosphere. The bead mass descends through the tempering zone then passes through another tube section into the cooling zone where cold air is introduced. Hot gases, at about 1.500 deg. F., from the line burner enter the kiln between the tubes and mix with the air from the cooling zone then pass up to the tempering zone through a system of louvers or baffles which prevent the beads from entering this air mixing section. When cooled the beads discharge into a small hopper and are transferred by means of a skip hoist to the screen house at the top of the storage silos.

The vibrating screen, consisting of a tie-

rod screen with 1-in. long slots and made from 0.035-in, steel wire satisfactorily removes the fines from the good beads without plugging or fouling. Both the beads and fines are stored in concrete tanks or silos with a capacity for 650 tons of beads and 200 tons of fines. The bottom of each silo discharges to an automatic filling and weighing machine where the beads are packaged in 5-ply moistureproof self-scaling bags containing 70 to 80 lb. each.

#### ANTI-CORROSION EQUIPMENT

The use of acid-alum, and its presence in process liquids throughout the wet processing operations, made corrosion the No. 1 problem in selecting materials of construction for process equipment. Not only was it necessary to avoid corrosion from the standpoint of damage to equipment, but more important was the necessity to avoid contamination of the product. While the processing of such corrosive liquids as dilute aluminum sulphate mixed with sulphuric acid is not ordinarily a simple problem, it was further complicated by the fact that wartime scarcitics made certain valuable materials relatively unobtainable. In addition, the urgency of the project prevented sufficient experimentation for prior determination of the suitability of various pieces of equipment used in this service.

Throughout the plant, lead is used extensively to combat corrosion. Approximately 125 tons of lead pipe and equipment were installed. Certain storage tanks are lead-lined, as are the aluminum sulphate reactor and the gel-forming towers. Lead pipe, valves and fittings are used almost exclusively for process liquids, except for the resin-coated flumes used to convey the wet beads to different stages of the process. The use of diversion boxes for each wet processing tank, and of flexible hose connections which function as valves by raising or lowering the free ends, provides troublefice operation and at the same time eliminates the need for many costly, large size lead valves.

Acid leaching of the concrete processing tanks is effectively prevented by a coating of ceresin wax. The inside surface of the tanks was spray coated with  $\frac{1}{16}$  in. of wax and flamed with a torch to fill and cover all surface pores with a continuous wax coating. Originally the plaster of paris distributing cones were covered with a coat of antiwetting wax, but this wore off rapidly, necessitating resurfacing of the cones daily. After considerable experimenting a resin coating was found that proved to have superior anti-wetting properties, as well as being resistant to wear thus increasing the cone life almost 30 fold.

Considerable corrosion difficulty was encountered in such vital equipment as pumps, control valves and fittings used to handle the forming solutions. Worthite, a high nickel-chrome content stainless steel, was found satisfactory, but it was not obtainable. Valves and fittings from Everdur, although suitable from the corrosion angle, caused considerable trouble due to seepage of the acid alum through the pores in the castings. Most of these difficulties were overcome by the use of Lucite, machined to replace corroded parts, such as the inner parts of control valves. In some cases pump rotors were attached to their shafts by means of Lucite keys. All of the acid-alum control valves were replaced by new ones built in the refinery instrument shop using Lucite parts. Saran tubing and fittings were also found satisfactory and were used extensively, throughout the plant.

Extensive corrosion took place in the dryers, particularly at the feed end where water from the beads, plus saturated steam vapors, caused deterioration of both ordinary steel and stainless steel parts. Internal drains for removing water in the first compartment plugged with bead fines, causing the liquid to accumulate. This was overcome partly by placing steel, concrete-lined pans with large external drains under the first five fect of each conveyor. Other dryer surfaces subject to corrosion were painted with red lead, followed by a coat of high-temperature aluminum paint. The drvers are so constructed that replacement of corroded members is quite difficult, so that the ultimate operating life of the dryers will be determined by the corrosion rate.

#### NEW PRODUCTS-NEW MARKETS

Bead catalyst requirements of the refinery industry were reduced appreciably by the decreased demand for aviation gasoline caused by the termination of the war. However, the past several months have seen its use gaining in Houdry units.

Exploration of the field of desiccants, however, has led Socony-Vacuum to install the additional equipment necessary for production of silica ge! in bead-form. Essentially, the process for making desiccants is the same as for bead catalysts. Composition of the forming solutions as well as the forming and wet processing conditions are somewhat modified. Drying operations are unchanged, but instead of tempering, the desiccant bead will undergo final drying in a newly designed kiln. The advantages of the bead desiccant are quite similar to those of the bead catalyst. Most important, however, is the low flow resistance of the desiccant bed due to the spheroidal shape of the bead. It is now expected that this plant will operate at full capacity in producing bead catalysts and bead desiccants.

Acknowledgement for cooperation and assistance in the preparation of this article is made to Mr. H. W. Sheldon, general manager and Mr. E. H. Atwood, engineering superintendent, Socony-Vacuum Oil Co., Inc., Paulsboro, N. J., and to Mr. P. D. Valas, chemical engineer and plant foreman, synthetic bead catalyst plant.



Two 300-ft. lime kilns in one of Dow's magnesium plants

RALPH GIBBS Chemical Engineer, York, Pa.

# Estimating Best Output and Fuel Rates of DRY FEED LIME KILNS

ALL OPERATORS of rotary kilns burning lime, either from dry, crushed and sized limestone, or from calcareous sludges or slurrics, know the production rates and fuel requirements of their operations. It is very doubtful, however, if many of these operators know just what their kilns are capable of doing as a maximum in production, and as a minimum for fuel. This article will help them find out.

There is no great cause for wonder that such a state of affairs exists, since very little information of this sort is available in the literature. Furthermore, the practical operator is so busy holding his kiln operations up to their present standards that he has little, if any, time to give to the problem, in-studying and correlating the facts he has accumulated.

That the problems associated with such a study appear to be highly involved goes without question. And his confusion, no doubt, is further, increased by the tall tales of fantastic production rates and fuel ratios that are related when such operators do get together.

In any operation of the type under dis-

This is the first of two articles which give in detail the author's methods of estimating optimum rates of production and fuel consumption for rotary lime kilns. The present article deals with dryfeed kilns, while an article to appear in an early issue will present similar estimation methods for

cussion, two phases of the combustion process itself are of paramount importance. They are:

1. The time-rate of firing the fuel must be just sufficient to develop the desired qualities in the product.

2. The air for combustion must be so regulated that the combustion process itself is practically balanced, i.e., there is no great excess either of air or fuel.

In the following discussion, these conditions are presumed prevailing. wet-feed kilns. As the author states, accurate information on actual performance is available to every lime kiln operator, but it is unusual to find a plant that has investigated thoroughly the questions of maximum possible lime production, and minimum fuel consumption.—Editors

#### DRY-FEED ROTARY KILNS

In an earlier article (Rock Products, November 1942) the writer presented an empirical relation for the optimum production rates of rotary kilns. This relation is:

$$Q_d = k \ D^2 \ L/100 \tag{1}$$

where  $Q_a$  is the optimum tons of material produced per day; D is kiln shell diameter, feet; L is kiln shell length, feet; and k is the production coefficient, its value depending upon the kind of material being processed and other circumstances attending the kiln operation.

The relation in Equation (1) represents very closely results that generally obtain in practice, providing the ratio of L/D is not exceedingly large. Coefficient k remains practically constant for L/D ratios between 15/1 and 25/1. Since most rotary kilns in industry today are dimensioned within this range, the relation as presented can be applied with good practical accuracy.

If the physical dimensions of the kiln are related as:

$$R_k = L/D$$
 and  $L = R_k D$  (2)  
here (1) becomes:

$$Q_d = \frac{k \ D^2 \ L}{100} = \frac{k \ R_k \ D^3}{100} \tag{3}$$

When burning dry, suitably sized limestone particles to good quality lime in rotary kilns without heat-exchange devices in or at the feed end of the kiln, and discharging the lime from the kiln at 2,200 deg. F. (which is about normal), the value of the production coefficient k has been observed to be 1.5 with very good kiln operating practice.

For dry-feed lime burning, Equation (3) then becomes:

$$Q_{dd} = \frac{1.5 \ R_k \ D^3}{100} \tag{4}$$

where  $Q_{da}$  is the optimum daily production rate for dry-feed rotary kilns burning lime.

Table I tabulates the relations in Equation (4), while Fig. 1 shows the same relations graphically.

### Fig. 1—Optimum production rate of dry-feed lime kilns for various L/D ratios and kiln diameters (Table I)







Fig. 3—Heat per pound of lime produced lost through kiln shell for various values of kiln diameter and coefficient k

Fig. 4—Heat per pound of lime produced carried out in exit kiln gases from dry-feed kilns at various fuel-throughput ratios and various exit temperatures

#### HEAT UTILIZATION

In a previous article (Tech. Ass'n. Papers, T.A.P.P.I. Series 28, p. 152, Sept. 6, 1945) the writer discussed the heat requirements of the various items demanding heat in rotary kiln operations burning lime sludge in paper mills recovering lime.

The total heat required by the operation is apportioned to calcining the material to a satisfactory degree, and supplying the attending heat losses. These heat losses are: (a) That heat escaping with the exit kiln gases, (b) heat escaping through the wall of the kiln, and (c) heat lost in the hot lime discharged from the system. Thus

$$h_{rd} = h_{ed} + h_{sd} + h_{gd} \tag{5}$$

where  $h_{rd}$  is the heat required to produce 1 lb. of lime with the dry-feed kiln, B.t.u. per lb.; and  $h_{ed}$  is the heat required to calcine 1 lb. of lime and discharge it from

#### Table I—Optimum Production Rates in Tons per Day for Rotary Lime Kilns Using Dry, Sized Feed

|    |      |      | Kiln Dian | neter Foot |       |         |
|----|------|------|-----------|------------|-------|---------|
| R  | 5 .  | 6    | 7         | 8          | 9     | 10      |
| 15 | 28.2 | 48.6 | 77.4      | 115.4      | 164.2 | 225.0   |
| 16 | 30.0 | 51.8 | 82.4      | 123.0      | 175.0 | 240.0   |
| 17 | 31.9 | 55.1 | 87.5      | 130.9      | 185.9 | 255.0   |
| 18 | 33.8 | 58.4 | 92.7      | 138.5      | 196.9 | 270.0   |
| 19 | 35.7 | 61.5 | 97.8      | 146.0      | 208.0 | - 285.0 |
| 20 | 37.5 | 64.9 | 102.9     | 153.7      | 219.6 | 300.0   |
| 21 | 39.4 | 68.0 | 107.9     | 161.3      | 230.0 | 315.0   |
| 22 | 41.3 | 71.4 | 113.3     | 169.0      | 241.0 | 330.0   |
| 23 | 43.1 | 74.7 | 118.3     | 177.0      | 252.0 | 345.0   |
| 24 | 45.0 | 77.9 | 123.5     | 184.9      | 263.0 | 360.0   |
| 25 | 46.9 | 81.2 | 128.5     | 192.0      | 274.0 | 375.0   |

 Table II—Millions of B.t.u. per Ton Lime That Must Be Supplied for Normally

 Operated Dry Feed Kilns With Exit Gas at 2,200 Deg. F.

|    |      | Kiln Diameter, Feet |      |      |      |      |  |  |  |
|----|------|---------------------|------|------|------|------|--|--|--|
| R. | 5    | 6                   | 7    | 8    | 9    | 10   |  |  |  |
| 15 | 6.78 | 6.74                | 6.78 | 6.86 | 6.98 | 7.15 |  |  |  |
| 16 | 6.68 | 6.62                | 6.65 | 6.71 | 6.81 | 6.95 |  |  |  |
| 17 | 6.60 | 6.53                | 6.54 | 6.58 | 6.67 | 6.78 |  |  |  |
| 18 | 6.52 | 6.45                | 6.44 | 6.46 | 6.53 | 6.63 |  |  |  |
| 19 | 6.45 | 6.37                | 6.36 | 6.37 | 6.43 | 6.51 |  |  |  |
| 20 | 6.39 | 6.30                | 6.28 | 6.29 | 6.33 | 6.40 |  |  |  |
| 21 | 6.34 | 6.24                | 6.22 | 6.21 | 6.25 | 6.31 |  |  |  |
| 22 | 6.29 | 6.19                | 6.15 | 6.15 | 6.17 | 6.23 |  |  |  |
| 23 | 6.25 | 6.14                | 6.10 | 6.10 | 6.10 | 6.15 |  |  |  |
| 24 | 6.21 | 6.10                | 6.05 | 6.03 | 6.04 | 6.09 |  |  |  |
| 25 | 6.18 | 6.06                | 6.01 | 6.00 | 6.00 | 6.03 |  |  |  |

the system at some temperature,  $T_{o}$ , B.t.u. per lb.  $h_{sd}$  is the kiln shell heat loss for each pound of lime produced with dry feed, B.t.u. per lb.; and  $h_{od}$  is the heat lost in the exit kiln gases, B.t.u. per lb. of lime produced with dry feed.

#### HEAT FOR CALCINATION

Fig. 2 shows the computed total quantity of heat involved in preheating, calcining and superheating the lime from dry feed to produce I lb. of lime. The relations are:

$$h_{cd} = 0.25 \ T_c + 1,630 \tag{6}$$

where  $T_e$  is the temperature, deg. F., at which the lime is discharged from the system.

It will be noted that  $T_e$  has been so chosen and defined as to absorb the heat loss in the discharged lime as part of the heat requirement for calcination. No great error is involved in so doing. However, if the lime is cooled by air being preheated for combustion and this is done external to the kiln, some error will be involved in assuming the coolers to be 100 percent thermally efficient in effecting the exchange of heat.

#### KILN SHELL LOSS

An empirical relation for the kiln shell heat loss has been proposed by the writer (Tech. Ass'n. Papers, T.A.P.P.I. Series 28, p. 152, Sept. 6. 1945) as follows:

$$h_{sd} = 4,340/k D$$

or when k is 1.5 this becomes:

$$h_{sd} = 2,890/D$$

Fig. 3 shows the kiln shell heat loss, from this relation, for kilns of various diameters and different values of k.

#### EXIT GAS LOSS

Fig. 4. shows graphically the computed heat carried from the system by the exit kiln gases under dry-feed conditions for various heat-lime ratios and exit kiln gas temperatures. These data are rather closely correlated by:

 $h_{gd} = 35.4 H_{ed} (0.00334 T_{gd} - 1)$  (9) where  $H_{ed}$  is the heat supplied to the system, millions of B.t.u. per ton of lime produced from dry feed; and  $T_{gd}$  is the temperature of the gases leaving the dry-feed kiln, deg. F.

#### EXIT GAS TEMPERATURE

In another paper presented by the writer, he proposed an empirical relation (Chem. & Met., April 1944, p. 106) for computing the normal exit kiln gas temperature with dry feed. This relation is:

Log 
$$T_{gd} = 3,623 - 10 \left( \frac{L - 5D}{D^3 + 10L} \right)$$
 (10)

In this form the relation is unwieldy for the present use, and the writer proposes to use in its place a modified form such as:

$$T_{gd} = \left(\frac{4,700 + 1,550D}{R_k}\right) + 287 \quad (11)$$

Thus Equation (9) becomes:

$$h_{gd} = 35.4 \ H_{sd} \left( \frac{15.7 + 5.18D}{R_k} - 0.04 \right)$$
(12)

#### TOTAL HEAT REQUIREMENTS

With the relations presented for  $h_{cd}$ ,  $h_{ed}$ and  $h_{pd}$ , the component parts of  $h_{rd}$  are available, and can be equated as follows (as in Eq. 5):

$$h_{rd} = (0.25 \ T_e + 1,630) + \frac{2,890}{D} + 35.4 \ H_{sd} \left(\frac{15.7 + 5.18D}{R_k} - 0.04\right)$$
(13)

Since, by definition:

$$1,000,000 H_{sd} = 2,000 h_{rd}$$

Then

(7)

(8)

$$500 H_{sd} = h_{rd}$$
 (15)

Fig. 5—Heat supply per ton of lime produced required for dry feed kilns of various L/D ratios (See Table II)

(14)



 $500 H_{sd} = (0.25 T_e + 1,630) + \frac{2,890}{D} +$  $35.4 H_{sd} \left(\frac{15.7 + 5.18D}{R_k} - 0.04\right)$ (16)

Which reduces to

Or

$$H_{sd} = \frac{0.25 \ T_s + 1,630 + 2,890/D}{501.4 - (556 + 183.3D)/R_k} \quad (17)$$

Thus, knowing the diameter and length of the dry-feed kiln, and the temperature at which the lime is discharged from the system, the normal heat requirement per ton of lime produced can be computed.

Table II is a tabulation of Equation (17) while Fig. 5 shows graphically the average of the relations. The tendency for kilns with the larger values of  $R_{\star}$  to have a reduced heat requirement per ton of product is well pronounced. No doubt the information given here can be used to establish the most economical  $R_{\star}$  for any kiln under specific conditions.

With the heat requirement per ton of lime for a normally operated dry-feed rotary kiln established, and with the production rate known, the normal time-rate of firing fuel or supplying heat can be determined from previous relations. Since by Equation (4)  $Q_{ad} = 0.015 R_k D^3$ , then:

$$Q_{hd} = \frac{0.015 \ R_k \ D^3}{24} = 0.000625 \ R_k \ D^3 \quad (18)$$

where  $Q_{kd}$  is the normal tons of lime per hour produced by the dry-feed kiln. The normal time-rate heat requirement  $H_n$  then will be:

$$H_n = Q_{hd} H_{sd} \tag{19}$$

$$= 0.000625 R_k D^3 H_{sd}$$
(20)

 $= 0.000625 R_k D^3$ 

$$\left( \frac{0.25 \, T_c + 1,630 + 2,890/D}{501.4 - (556 + 183.3D)/R_k} \right) (21)$$

Thus the normal time-rate heat requirement that must be provided for in a normally operated dry-feed lime kiln can be approximated by knowing the physical dimensions of the kiln and the temperature at which the lime is discharged from the system. M. G. FONTANA Engineering Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.\*

## **RUBBER & PLASTICS** As Materials of Chemical Plant Construction

Synthetic rubber and plastics are valuable materials of construction, but to use them profitably you must use them correctly. There are many types and each has its province. This article is designed to act as a guide in their selection; it discusses each of the important types, points out the strength and weakness of each and describes some typical applications.-Editors

#### PART I - SYNTHETIC RUBBERS

THERE ARE five "commercial" types of synthetic rubber; they are listed in Table I. (Notice that only vulcanizable materials will be considered as synthetic rubber; other "rubber-like" materials will be discussed later as plastics.) Table I also gives a comparison of the "chemical" and "physical" properties of natural and synthetic rubbers. This comparison is only general: properties and performance can be varied considerably by processing, by compounding, and by varying the proportions of the constituents used. Here are two general conclusions.

#### Selected References

- Anon., Chem. Industrics, March 1945.
  E. R. Bridgewater, Trans. AIChE, 1939. pp. 435-446.
  T. S. Carswell and R. U. Haslanger, Trans. AIChE, 1943. pp. 755-767.
  E. I. du Pont de Nemours & Co., Ind. Eng. Chem., 1936. pp. 1160-1163.
  H. E. Fritz and J. R. Hoover, Am. Soc. Testing Materials reprint, 1932. 17 pp. 2. 3. 4. 5. 17 pp. F. C. Hahn, M. L. Macht, and D. A. Fletcher, Ind. Eng. Chem., 1945, pp. Fletcher, Ind. Eng. Chem., 1945, pp. 526-533.
  G. M. Kline, R. C. Rinker, and H. F. Meindl, Modern Plastics, 1941, pp. 59-66, 88.
  "Plastics Catalog," New York, Plastics Catalogue Corp., (1945)
  C. A. Rauh, Trans. AIChE, 1939, pp. 463-472.
  K. Schergeld, Trans. AIChE, 1959, pp. 463-472. 7. 463-472.
  10. F. K. Schoenfeld, Trans. AIChE, 1939, pp. 447-462.
  11. H. R. Simonds, M. H. Bigelow, and J. V. Sherman, "The New Plastics," New York, D. Van Nostrand Co., Inc. (1945).
  12. D. E. Strain, R. G. Kennelly, and H. R. Dittmar, Ind. Eng. Chem., 1939, pp. 382-387.
- pp. 382-387.
  13. D. R. Williams, Chem. & Met. Eng., Nov. 1945, pp. 112-113.

1. Natural rubber usually has better physical characteristics.

2. Synthetic rubber usually has better resistance to deterioration.

A table on the resistance of synthetic rubber to acids and alkalis is not included. Such a table would be quite complicated and necessarily incomplete because of the paucity of data available. We will cover this aspect of the discussion by describing actual applications in chemical plants.

#### GR-S (BUNA-S)

GR-S (copolymer of butadiene and styrene) is being made in by far the largest quantity and it has been the most generally available synthetic rubber. This and favorable plant experience have shown that GR-S has been a "life saver" during the war period as far as rubber equipment in the chemical plant is concerned. It has been a satisfactory alternate for natural rubber in many cases involving acids, alkalis, water, and other process solutions. Experience shows that it is quite safe to install GR-S for any service where natural rubber has been used successfully; the exceptions to this rule during the last two years have been few and minor.

GR-S was extremely helpful for another reason. It could be made into items previously made of rubber, such as linings, roll coverings, and molded parts. In most cases the old molds were entirely satisfactory. All these items have been produced from GR-S in both the soft and hard conditions. A year or so ago the softer compounds were not available but the hardness range is now well covered, as shown in Table I.

One of the first tanks of commercial size to be lined with GR-S was field lined with soft sheet in one of our plants during October, 1943. This tank was 16 ft. in diameter and 16 ft. high. Similar tanks were lined immediately afterward to make a total of about a dozen. They handle concentrated hydrochloric acid containing small amounts of chlorine at slightly over atmospheric temperature. Strip tests were pulled from the wall of one tank after four months and again after seven months; no loss in adhesion was observed. Tensile tests on these strips showed a strength of 960 psi. A slight surface hardening, typical also of rubber in hydrochloric acid and chlorine, was observed. More recent inspection showed that the tank lining was still in good condition, including the patches on the stripped areas. Incidentally, a natural rubber lining in similar service showed a very large number of blisters after 32 months. This case, however, should not be regarded as representative for natural rubber in this service.

Several hundred thousand square feet of GR-S linings have been installed in tanks, lines, and valves handling process water and dilute sulphuric acid. In one plant, pipe up to 42-in. dia. was lined with semi-hard GR-S (85-90 Durometer). GR-S gaskets were used in these lines, which were successfully tested at 200 psi.

The following items involving GR-S, with length of service to date, have been in operation in rayon and cellophane plants:

- 1. Coal filters. 1.5 years.
- Evaporator bodles, 1.5 years.
   Crystallizers (soft GR-S lining). 2
- years.
- 4. Agitators. 2 years.
- 5. Nutsche tanks, 1 year.
- 6. Wash rack manifolds. 1.5 years.
- 7. Roll coverings (transfer, squeeze, and quetsch rolls). 1.5 years.
- 8. Six-inch lined valve. 9 months.
- 9. Hard rubber wash pans. 2 years.
   10. Hard rubber pipe and fittings. 1.5 years.
  - 11. Hard rubber cocks. 1 year.
- Cake rods (rubber-covered metal tub-ing). 1.5 years.
   Candle filters.
- 14. Miscellaneous gaskets.

Items 1-8 are steel or cast iron covered or lined with sheet GR-S. Items 9-13 are

\* This paper was presented before the Ameri-can Institute of Chemical Engineers, Chicago, Dec. 19, 1945; since its preparation Dr. Fontana has left the Du Pont Co. to become professor of metallurgical research at Ohio State University.

molded parts. The above equipment operates in contact with a variety of process solutions including rayon coagulating bath, desulphuring, bleach. size, and softener solutions at temperatures in the range 20-140 deg. F. The rayon bath contains about 10 percent sulphuric acid along with sodium sulphate, zinc sulphate, and various sulphides.

The candle filters, Item 13, handle viscose under pressure. Hydraulic bursting tests on GR-S showed strengths equivalent to natural rubber for filters made in the same molds.

Tank cars lined with GR-S are used for hydrochloric acid, latex, formaldehyde, and phosphoric acid. Large formaldehyde storage tanks were lined with it in 1942. Paper pulp washing machines have been lined and covered. Other items include hose and tubing for a variety of services; one of the tubing applications concerns Moore filter equipment where the tubing is in contact with sulphuric acid up to 30 percent concentration at 125 deg. F.

Small parts can now be covered with hard or soft GR-S by the dipping process, but little experience is available to date.

The temperature limitations on GR-S linings are the same as those generally used for natural rubber: 150 deg. F. for soft and 180 deg. F. for semi-hard or hard linings.

#### BUTYL

Butyl (copolymer of isobutylene and a diolefin) rubber has been used almost exclusively for the manufacture of inner tubes during the war period. Few developments have been made with regard to materials of construction. In one respect butyl is unique in the field of natural and synthetic rubbers: it possesses good resistance to nitric acid. This characteristic should result in many applications in the chemical plant.

#### GR-A (BUNA-N)

The two outstanding properties of GR-A (copolymer of butadiene and acrylonitrile) are its resistance to aromatic solvents and heat. During the last two years of the war, GR-A was generally not available for chemical plant work and accordingly few new uses were developed for it.

One application where it is performing well while all other tried materials failed concerns wash chuck gaskets in the washing of acid from rayon cakes. These U-shaped circular gaskets handle water, dilute sulphuric acid, and some hydrogen sulphide and carbon bisulphide at 140 deg. F. Natural rubber and other synthetics failed primarily because of excessive swelling. GR-A gaskets have been used in this service for over three years.

A large number of CR-A sleeves for roll coverings have been used for several years in contact with dilute sulphuric acid, wash water, bleach, and other solutions. Fabrication or molding difficulties were encountered



in connection with these sleeves. Roll coverings made by wrapping sheet stock of GR-A are also used. Quetsch rolls in the rayon plants are covered with it. GR-A rolls used in the processing of nylon thread are in good condition after two years' service. A large number of rolls covered with GR-A are being used in the printing industry because resistance to the solvents in inks is required. Rolls for applying wax to paper have been covered with GR-A.

Steel tanks lined with GR-A are being used in the petroleum industry to handle hydrochloric acid containing hydrocarbons. For conditions involving resistance to both mineral acids and aromatics, one of the modifications of GR-A, such as Hycar, is often preferred. GR-A hose is used in some quantity in the oil industry. Hard GR-A compounds became available recently and should find considerable application, for example, in molded parts for handling aromatics. Small valve stems machined from hard GR-A are now being tried in one of our plants.

#### THIOKOL

The outstanding properties of Thiokol (organic polysulphide) are its resistance to aliphatic and aromatic solvents. Thiokol also shows excellent impermeability to gases. It has been used extensively for lining concrete and steel storage tanks for aviation gasoline and is also used for printers' blankets and printers' rolls. Thiokol does not possess good cold-flow characteristics.

A substantial quantity of Thiokol is applied by the flame-spraying process for covering steel equipment, particularly for protection against salt water. In general, however, it is less resistant to acids and alkalis than some of the other synthetics and natural rubber. Our experience with Thiokol in the chemical plant has been quite limited. NEOPRENE

Ncoprene (polymer of chloroprene) had been in commercial use for ten years prior to Pearl Harbor and would have been immediately useful to the chemical industry had it not been for restrictions imposed upon its distribution. Neoprene was one of the first five materials (four were metals) placed on allocation.

Neoprene closely resembles soft vulcanized natural rubber in physical properties and accordingly can be used where the physical characteristics of natural rubber are required. Neoprene has been used in many places in chemical plants where its chemical properties were not required. Rubber-covered squeeze rolls are a good example; neoprene was used because GR-S compositions having the desired strength and toughness could not be commercially produced in a hardness below 40 Durometer. However, recent advances in compounding technique have improved the properties of such compositions. Numerous other examples include gaskets and soft molded parts.

Neoprene cannot be made into a hard rubber and accordingly cannot be used for hard molded parts such as hard rubber pipe and fittings. And note that neoprene possesses favorable properties for all the items listed in Table I except for electrical properties and resistance to aromatics. Neoprene has been most valuable for its resistance to heat and its resistance to aliphatic hydrocarbons. The adhesives used to bond neoprene to steel also show good heat stability.

One of the chief uses has been in belting for conveying materials. In one case, <sup>1</sup> neoprene-impregnated glass cloth belting hasbeen reported as being used for handling a chemical (not identified) at 300 deg. F. Considerable flexing and contact with oil was involved. Rubber-covered cotton belts lasted six weeks but most of the neoprene-glass

| Table | II - Effect of | Exposure  | to Distilled Water | on |
|-------|----------------|-----------|--------------------|----|
|       | Natural and    | Synthetic | Rubber Linings     |    |

|   |             |            | Tuttial              | After Exposure       |                      |  |  |
|---|-------------|------------|----------------------|----------------------|----------------------|--|--|
| Material  | pH of Water |            | Tensile<br>Strength, | Tensile<br>Strength, | %<br>Elonga-<br>tion | Adhesion to<br>concrete, lb./<br>lineal inch |  |
| Neoprene<br>(sheet)                                       | 6.6         | 7.2        | 1,400                | 1,400                | 540                  | 30   |  |
| Neoprene<br>KNR<br>Natural                                | 6.6         | 4.7        | 1,200                |                      |                      | 6  |  |
| rubber<br>(cured<br>sheet)<br>Natural<br>rubber<br>(cured | 6.6         | 8.2        | 2,100                | 1,700                | 640                  | 4  |  |
| after<br>lining)<br>Thiokol                               | 6.6<br>6.6  | 7.5<br>6.7 | 1,900<br>650         | 1,300<br>350         | 520<br>260           | 10<br>6                                      |  |

belts showed a service life of seven months.

Ncoprene sheet lining in the hot end of a rocker crystallizer handling alum showed a life of four years; the temperature of the liquor in contact with the neoprene is 180-205 deg. F. Natural rubber is satisfactory for the cold end of this long crystallizer but not for the hot end.

Neoprene-covered fans are used on gases at 200 deg. F. from a Cottrell precipitator; the fan is in contact with 10-20 percent sulphuric acid mist and sulphur gases. Another neoprene-covered fan showed a life of approximately three years handling hot hydrochloric acid fumes in a plant making this acid. A blender agitator covered with neoprene showed a more economical life than natural rubber for handling a pigment slurry at 175 deg. F. Neoprene-covered filter frames showed three times the life of natural rubber when in contact with a slurry containing an "organic treating agent."

Small flexible ducts and flexible tubing made from combinations of neoprene and asbestos cloth or glass cloth are claimed to be resistant to temperatures up to 400 deg. F. Neoprene gloves are widely used. A large

| 200<br>190-<br>170-<br>160-<br>170-<br>160-<br>150-<br>140-<br>100-<br>90-<br>90-<br>50-<br>50-<br>50- | ASTM Hardness Gage<br>00 00<br>06<br>06<br>06<br>06<br>06<br>06<br>06<br>06<br>06<br>06<br>06<br>06<br>06<br> | 85<br>80-<br>75-<br>70-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55-<br>5 | 40-<br>45-<br>1-<br>1-<br>1-<br>1-<br>1-<br>1-<br>1-<br>1-<br>1-<br>1-<br>1-<br>1-<br>1- | 30-<br>35-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55-<br>55 |
|--|---|---|--|--|
| pue 70-<br>60-<br>50-<br>40-<br>30-<br>20-<br>10-  | UPDEH W150-<br>W15V 30-<br>20-<br>IQ-   | 000 40-<br>35-<br>30-<br>25<br>20-<br>15-<br>10-<br>5-                                      | 07 65-<br>70-<br>75-<br>80-<br>85-<br>90-<br>95-<br>100-                                 | 55-<br>60-<br>65-<br>70-<br>75-<br>80-<br>85-<br>90-                     |

quantity of ncoprene - impregnated cotton sheeting was used to seal the side walls to the floating tops of large tanks handling deaerated water. A host of other uses include linings for hydrofluoric acid, roll coverings, and tank linings. For additional information on neoprene, we suggest a previous paper.ª Another form of

neoprenc used in the

chemical industry is the "brush-type." This is applied by brushing, spraying, or dipping, and it gives an inexpensive lining because it can be applied in thin layers. Brushtype neoprene has been used for lining tanks, lines, and valves for handling a variety of process liquors. Tank cars lined with brushed neoprene are being used for shipping 70 percent caustic, which is loaded at approximately 200 deg. F. Neoprene putty and troweling compounds are also available.

#### RUBBER IN GENERAL

As a result of unfavorable reports on the performance of natural rubber when handling distilled water, a series of tests was made on concrete buckets lined with two natural rubber stocks, neoprene, and Thiokol. Apparently, the chief difficulty had been due to water penetrating the lining and destroying adhesion with subsequent formation of blisters. The concrete buckets were filled with distilled water and exposed for 14 months at room temperature. The data obtained are shown in Table II. Note that neoprene alone suffered no loss in strength. Data on adhesion prior to exposure were not obtained but the indications are that adhesion was decreased for all the materials except perhaps neoprene.

A conversion chart for the several methods of determining hardness is shown as Fig. 1; it will be helpful to the chemical engineer interested in the use of rubber equipment. Here are some Type-A Durometer hardnesses for familiar materials: Art gum 25, tire tread about 60, sole leather (about the same as semi-hard rubber linings) 85-90, and hard rubber 100.

For use as a guide in the selection of rubber for a given service, we suggest reference<sup>5</sup> which points out the resistance of rubber (natural only) to a large number of chemicals. (Keep in mind the information supplied above on comparative properties of natural and synthetic rubber.)

Fig. 1—Comparison of hardness scales; for equivalent hardness read horizontally

#### PART II - PLASTICS

A number of new plastics have been developed during war years and many applications have been found in chemical plants. A previous paper<sup>3</sup> contains data on physical and mechanical properties of plastics and information on chemical applications. Numerous data on the resistance of plastics to chemicals are given in a reference.<sup>7</sup>

#### PHENOLICS

The phenol-formaldehyde or Bakelite-type resin was one of the first plastics developed and practically everyone is familiar with it. Phenolics are available as molded parts, rods, sheet, tubing, and pipe. Generally speaking, the phenolics show good resistance to acids but poor resistance to alkalis.

Thousands of spinning buckets are used in the manufacture of rayon; they are usually molded and the resin is reinforced with woven cloth. Resistance to sulphuric acid and good strength are required. Tests were made to determine the effect of long exposure and the data obtained are shown in Fig. 2. Notice that all of the materials except the glass cloth laminate show a substantial drop in impact and tensile strength after a few months' exposure. The glass cloth showed a surprising effect in that the strengths increased. The tests were repeated under somewhat different conditions, but the same effect was observed.

A relatively new use for the phenolic resins involves 10- and 12-ft.-dia. fans for water cooling towers. Numerous fatigue failures of "light metal" cast blades occurred. The metal blades were replaced with "compregnated" wood about three years ago and excellent results obtained. The blades are made by treating strips of wood with a phenolic resin and then forming under pressure in a mold. Hollow fan blades made by the "bag-molding" process and solid blades containing a cloth base have since been made and good performance reported.

Phenolic bearings are frequently used where lubrication is difficult. Tests of nine months' duration were made on combinations of bearings and trunnions made of phenolic resin and bronze. The phenolic lasted several times longer than the "acid" bronze. These were actual service tests in a plant machine. The bearings were lubricated with dilute sulphuric acid at 190 deg. F.

Pump impellers made by molding a phenolic resin on a steel spider have given good service in contact with acids. Other uses for the phenolics, wherein acid resistance is required, are rollers, heat exchanger tube inserts, casters, gears, bolts, tank baffles, doors, wash chucks, brackets, splash guards, pipes, and valves.

Baked phenolic coatings are extensively used for tanks and pipe lines. Phenolic lined tank cars are used to ship formaldehyde, latex, nylon intermediates, and sulphuric acid. A glauber's salt crystallizer was coated to avoid iron contamination and the coating served its purpose, but it also doubled the capacity of the equipment because the crystals did not adhere to the smooth coating.

#### VINYLS

Vinyl resins are important because resins such as polyvinyl chloride possess good resistance to both acids and alkalis. These materials can be "heat-scaled" or joined by heating. The vinyl resins, however, do not show good heat resistance and for continuous operation are generally limited to 170 deg. F.

Saran, a vinyl chloride-vinylidene chloride copolymer, is widely used in the chemical industry and several actual applications may be of interest. Two 2-in. pipelines, one handling hypochlorite bleach and the other solutions of sulfamic acid, have been in service for over one year. A large number of injection-molded spinneret adapters have been used for over two years in rayon plants; these are in contact with an alkaline liquid on the inside and with acid rayon bath on the outside. Oil feed tubes for lubricating moving parts have been used successfully. Saran is used in many cases as an alternate for copper tubing. Fabrication, forms available, and some more applications for Saran

pipe are given in a reference.<sup>18</sup> Vinyls are used in the chemical industry as hose and tubing, protective paints, gloves, aprons, valve diaphragms, tank linings, motor cords, and belts. Vinyon has found wide application as a filter cloth material. Tygon linings were installed in large steel tanks handling hydrochloric acid in a magnesium producing plant. Pyroflex is used as an intermediate lining between brick and steel for boiling and concentrating tanks handling chemicals such as zinc sulphate and ammonium chloride. Pyroflex<sup>9</sup> and Koroseal<sup>10</sup> have been discussed in previous papers.

#### NYLON

Wartime restrictions on nylon have prevented its full exploration as a material of construction but its properties indicate that it may find considerable application in this field. Some of the desirable properties are as follows: high strength and excellent toughness of molded parts; heat resistance; good resistance to oil, grease, and solvents such as aromatic gasoline and chlorinated solvents; and resistance to alkalis. Tests in 60 percent caustic at 240 deg. F. for 8 hr. showed no visible effect on nylon.

A large number of nylon bushings installed in rayon spinning buckets showed good performance, as did bushings made of phenolicimpregnated nylon cloth. Nylon should be a desirable bearing material where low loads and poor lubrication (for example, water) are involved. Nylon has promise also for gaskets, filter cloth, and thin extruded tubing. The tubing is expected to find considerable use as a tough flexible tubing for resistance to oils and heat.

#### POLYTHENE

Polythene (polyethylene) will be used for its good resistance to chemicals, as shown in Table III. Additional information, including physical properties, was recently published.<sup>9</sup> Polythene is perhaps the lightest of all plastics; its specific gravity is 0.92-0.93. Films of polythene can be "heat-scaled" with a hot iron.

Polythene can be applied by the flamcspraying (powder-pistol) process and the films have good chemical resistance and physical properties. A chromium plating tank has been lined with flame-sprayed polythene.

Other applications are as follows: tubing for a DDT process solution, gaskets for lines handling nitric acid in explosives plants, acid buckets and funnels, battery parts, bottles for hydrofluoric acid, and protective coatings and linings.

#### HAVEG

Haveg is a phenolic-asbestos composition. It is discussed here in a separate section because its chief use is in chemical plant. construction and because its properties differ from other phenolics. Haveg equipment is produced in comparatively inexpensive molds; high molding pressures are not required.

Haveg is produced in four grades: 41, 43, 50, and 60. Haveg 41 is the "general purpose" material and most widely used; 43 contains a graphite filler and its chief use concerns hydrofluoric acid and related materials; 50 is used primarily for handling strong alkalis; 60 is a new material which (Continued on page 109)

Fig. 2—Effect of exposure to acid on tensile and impact strengths of phenolic laminates



#### Table III – Effect of Various Chemicals on Polythene (After three months' exposure at room temperature)

|   | On I<br>from  | Removal<br>Reagent  | After 24 hr.<br>Conditioning<br>at Room Temp.   |   |                           |  |  |
|---|---|---|---|---|---------------------------|--|--|
|   | Change<br>in Wt.,   | Appearance  | Tensile<br>Strength,<br>psi.  | Elonga-<br>tion,<br>%   | Resist-<br>ance<br>Rating |  |  |
|   |   | Inorganic A   | cids and Bas  | es  |                           |  |  |
| H <sub>1</sub> SO <sub>4</sub> , conc.<br>H <sub>1</sub> SO <sub>4</sub> , 10%<br>HCl, conc.<br>HCl, 10%<br>HNO <sub>4</sub> , conc.<br>HNO <sub>4</sub> , 10%<br>NaOH, 50%<br>NH <sub>4</sub> OH, conc.                              | $\begin{array}{r} + \ 0.13 \\ + \ 0.04 \\ + \ 0.13 \\ + \ 0.20 \\ + \ 3.02 \\ + \ 0.22 \\ + \ 0.13 \\ + \ 0.31 \end{array}$ | No change<br>No change<br>No change<br>No change<br>No change<br>No change<br>No change<br>No change  | 1,458<br>1,370<br>1,406<br>1,442<br>1,093<br>1,387<br>1,432<br>1,378  | 462<br>483<br>258<br>336<br>71<br>325<br>313<br>371   | eeceree<br>Feee           |  |  |
|   |   | Oxygenated Or   | ganic Compo   | unds  |                           |  |  |
| Ethanol (denatured)<br>Acctone<br>Ethyl acetate<br>Dioxane<br>Butyraldehyde<br>Linseed oil<br>Triethanolamine<br>Camphor oil<br>Ethyl gasoline<br>Benzene<br>Xylene<br>Lubricating oil<br>Carbon tetrachloride<br>Ethylene dichloride | $\begin{array}{r} -0.02 \\ +0.03 \\ +2.76 \\ +0.38 \\ +0.08 \\ +0.08 \\ +17.42 \\ \end{array}$                              | No change<br>No change<br>No change<br>No change<br>No change<br>No change<br>Swollen<br><b>Hydro</b><br>Swollen<br>Swollen slightly<br>Swollen slightly<br>Swollen | 1,550<br>1,363<br>1,205<br>1,368<br>1,245<br>1,410<br>1,408<br>1,375<br><b>ccarbons</b><br>1,430<br>1,464<br>1,623<br>9,54<br>1,560<br>1,526<br>1,450 | 421<br>379<br>325<br>382<br>417<br>483<br>379<br>483<br>503<br>429<br>479<br>167<br>475<br>300<br>449 | EEEEEEG GEEFEEG           |  |  |
| Trichlorobenzene  | +20.33 Swollen 1,450 442 O  |   |   |   |                           |  |  |
| Na bisulphite, 10%<br>Ca chloride, 15%  | + 0.17<br>+ 0.70  | No change<br>No change  | 1,310<br>1,380  | 483<br>483  | E<br>E                    |  |  |
| (bleaching soln.)   | + 0.06  | No change   | 1,330   | 375   | E                         |  |  |
| Duponol ME (fatty<br>alcohol sulphate), 10%<br>Ferric sulphate, 15%   | + 0.04 + 0.02   | No change<br>No change  | 1,225<br>1,307  | 403<br>467  | G<br>E                    |  |  |
| Key: E = excellent, G = g   | bou, r — miny   |   | Trease in allows  | of the Addition of the  |                           |  |  |

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

# Characteristics of Commercial Types of DUST COLLECTOR

In two previous articles (February and March) Mr. Hermann talked about hood design and ductwork. In the over-all picture of dust control that brings us to the point where we have a pipeful of dustladen gas. The question now is how to dispose of it and in most cases that is the same as asking how to get the dust out of the gas. So here is No. III in our series; it is a critical survey of the various kinds of dust collector.—Editors

**S**OMETIMES it is all right to discharge dust-laden air directly to the atmosphere, but usually there are good reasons for taking the dust out first. Frequently, the dust has cash value and is worth salvaging. In most congested areas it is illegal to spray dust over the neighborhood. Much of the dust discharged outside the building eventually finds its way back and that complicates your own air conditioning problem. There may be other reasons for dust collection but these will do; we are primarily interested in the operating characteristics of the different kinds of device used for the purpose.

#### SIMPLE SETTLING CHAMBER

The ordinary gravity settling chamber is practical only for removing coarse particles of 50 microns or larger. The removal of small particles is possible if the length of the chamber is increased to 10 or 12 times the height. This is reasonable if you consider the terminal velocity of the smallest particles to be removed and the retention period of the air in the chamber. Particles of 10 microns may be separated if certain conditions are met: Elimination of turbulence, streamline flow, uniform distribution of all inlet air over the entire cross sectional area of the inlet, velocity through the chamber of about 60 ft. per min., and a height-to-length ratio of





0.01. However, a chamber with an h/l ratio of 0.01 would be too large to be practical in the average plant, so some other device is always used to remove the small particles.

Fig. 1 shows a favored design of rectangular settling chamber in which the h/l ratio is rarely less than unity and is frequently greater. The baffle plate in this design is a

#### Fig. 3—Small-diameter cyclone (Western Precipitation Co.)







definite departure from theory, but it permits higher inlet velocity and that results in a smaller chamber. Turbulence within the chamber and particularly around the edge of the baffle plate makes it impossible to remove particles of less than approximately 50 microns.

The settling chamber is frequently used as preliminary treatment to reduce the burden on a more efficient device.

#### **CENTRIFUGAL DEVICES**

There is a large family of dust collectors which, in one form or another, is found almost everywhere in industry. There are many variations of the principle, but they all have one thing in common: Centrifugal force is the real agent of separation. Some machines have a built-in impeller and some do not; some are wet and some dry. The use of an impeller has several advantages: It acts as a fan to move air through the system; it accelerates the particles and thus increases the centrifugal force; it removes the finer particles by impingement against the advancing surfaces of the impeller



Fig. 4—Van Tongeren cyclone (Buell Engineering Co.)

blades. However, the impeller has the disadvantage of any moving part; it requires power and maintenance. The use of water also has its pros and cons. It wets the dust particles, thereby increasing their mass and extending the range of collection to finer particles; it wets all collecting surfaces with a flowing film of water, thereby minimizing abrasion and capturing permanently all particles that strike the collecting surface. The principal disadvantages are corrosion and the tendency of some materials to become pasty.

Dry Centrifugals, Without Impellers— The basic device in this class is the ordinary large-diameter cyclone (Fig. 2). The cyclone was originally designed for use in woodworking and pattern shops for the collection of shavings and sawdust. It has since spread far and wide and is now one of the most commonly used collectors. The unmodified cyclone is not capable of scparating out the very fine dust because of turbulence, especially along the surface at the periphery of the rotating air column. However, there are several modifications of the cyclone which improve its efficiency.

The first is the small-diameter cyclone like the Multiclone in Fig. 3. A nest of small-diameter chambers has two important advantages over a single large-diameter chamber. The particles reach a higher angular velocity, thereby increasing the centrifugal force; there is a larger area of collecting sur-



Fig. 5-Dry centrifugal collector with impeller (Amer. Blower Co.)

face and the particles are forced to move through a much shorter distance to reach it. A second modification is the van Tongeren cyclone (Fig. 4); it is designed to negate the disadvantage of secondary, double eddy currents which are present in any whirling body of gas. In an ordinary cyclone the upper eddy carries the lighter particles upward where they accumulate and tend to enter the clean-air stream. The van Tongeren design provides an escape for these light particles and by-passes them down around the upper eddy and into the lower eddy, which is sweeping the walls downward.

There have been other modifications. In one, the shell rotates at the same velocity as the gas so that particles thrown to the surface by centrifugal force will drop down into the lower chamber. In another there is an inner wall with slots in it; particles of dust pass through the slots into a zone of relative quiescence.

Dry Centrifugals, With Impellers-Fig. 5 shows a prominent collector of this type. It also has a secondary unit, a non-dynamic centrifugal collector. Dust-laden air is drawn through the dynamic separator by an exhaust fan having its inlet connected to the central outlet "a." The wheel operates in reverse direction from that of a regular fan; it drives the dust-laden air outward but at the same time a suction is being drawn at the center by the auxiliary fan. Thus the solids are skimmed at "b" while the main body of air passes out through "a" to the exhaust fan. The solids with some air pass into the centrifugal settling-device at "c" where the dust moves downward and the clean air passes upward through the pipe and into the center of the dynamic unit where it joins the main stream of clean air.

Wet Centrifugal, Without Impeller-



Fig. 6-Wet centrifugal collector without impeller (Schneible Co.)

This type collector is illustrated in Fig. 6. Air is pulled through the unit from bottom to top by an auxiliary exhaust fan. The inlet extends into the shell to about half the diameter and is located tangential to the shell. The bottom of the unit is essentially a wet-wall cyclone above which are located impingement elements and baffle plates which cause the air to take a tortuous path upward through the body of the unit to the exhaust point. Water is directed downward onto the curved baffle plate of the top element; it flows evenly over the plate and downward in front of the apertures of the impingement element to the shelf plate of the element. This shelf directs the water

#### Fig. 7—Wet centrifugal collector with impeller (American Air Filter Co.)





inward and onto the baffle plate of the succeeding element. The water so progresses down through the unit to the drain in the bottom. An entrained-liquid remover is located above the water inlet. Dust particles are removed by impingement on the wet surfaces and are then washed downward and out the bottom to a settling tank; the water is used over and over again.

#### Fig. 8-Washer (Schmieg Industries)

Wet Centrifugal, With Impeller-The collector shown in Fig. 7 has built into it a wet-wall centrifugal precleaner which removes the bulk of the dust before the air is directed up and into the blades of an impeller. A water jet is located in the center of the air inlet; it sprays a cone of water against the impeller blades. No attempt is made to wet the dust particles in the air stream; instead, they are trapped by impingement against the moving film of water on the collecting surfaces and discharged to a secondary sludge circuit while the cleaned air leaves the forward portions of the blades to the scroll section of the housing. This arrangement, that is, with wet precleaner and wet impeller, was developed to handle heavy concentrations of dust having a wide range of particle sizes. Also, in common with most wet collectors, its performance is not affected by humidity or the presence of steam or fumes in the exhaust air.

#### WASHERS

Fig. 8 illustrates a different type of collector in which the air is washed free of dust particles. In this equipment the dusty air is drawn through the outer chambers down through the liquid sheet and up through the central chamber into the suction side of an exhaust fan. The liquid, almost always water, is picked up by the rotating drums and is discharged with considerable force from their periphery. The sheet of water strikes the division walls and breaks up into a mist which assists materially in wetting the dust. The air must pass through the sheet and the mist in its course through the machine. Collected solids are removed by a continuous scraper conveyor in the bottom trough of the unit.

#### FILTERS

Filters are probably better known than any other type of dust collector. There are two general types: One handles heavy dust loads and requires from  $\frac{1}{2}$  to  $\frac{1}{2}$  sq.ft. of filter area per cu.ft. of air; the other is designed for air conditioning where the dust load is extremely light and the air velocity through the filter may vary from 50 to 300 ft. per min. This discussion is concerned only with the heavy duty type.

Fig. 9 illustrates the internal construction of the cloth filter. Dusty air enters the inlet expansion chamber and passes up into the filter tubes from below. The bottoms of the filter tubes are secured to the cell plate and the tops to shaker members by special suspension hooks. The shaker is driven by

#### Fig. 9, Below-Cloth Filter (Amer. Foundry Equipment Co.)

Fig. 10-Electrostatic precipitator (Amer. Air Filter Co.)



an electric motor and is used to clear the tubes of accumulated dust; inlet air must be shut off when the tubes are being shaken. Air is pulled through the collector by an exhaust fan. Dust is removed from the hopper through a special valve in the bottom of the unit.

A perfect seal must be maintained between the dust side and the clean air side so that all the air goes through the filters. Starting with a clean filter the resistance of the unit is low, about I in. water gage. As the dust builds up on the surface of the filter tubes the resistance increases; the frequency of shaker operation depends upon the dust load of the incoming air. In general this type of collector can handle an unlimited dust loading if frequent shutdown for cleaning is not objectionable. From a practical viewpoint a dust load exceeding 10 to 15 gr. per cu.ft. of air would dictate the installation of a continuous type of filter collector. Such a unit is made up of two or more complete cells connected in parallel; one collects while the other shakes. Filter resistance of 5 to 6 in. water gage should not be exceeded for satisfactory operation and low maintenance.

The cloth used is either heavy cotton (about 10 oz. per sq.yd.), wool, or asbestos fabric. Cotton will stand temperatures up to about 180 deg. F. and wool up to 220 deg. F.; for higher temperatures asbestos is required. Where extremely high dust loadings are encountered, pre-separators should be used; this is usually some type of settling chamber. Where high temperature is accompanied by sparking, a spark arrester should be installed ahead of the collector; this is a fine-wire screen in the inlet pipe. Spark arresters must be cleaned periodically because the screen will become clogged with lint; these linters have been known to ignite and carry fire into the collector itself.

#### ELECTROSTATIC PRECIPITATORS

Electrostatic collectors operate by giving the suspended solids or mists a negative charge; the particles are then attracted to and precipitated on the positive electrode. The air stream passes between the electrodes. One type of apparatus for accomplishing this is shown in Fig. 10. The negative electrode is considerably smaller than the positive. The limitation of the device lies in the available surface of the electrodes and the capacity of the field. Usually electrostatic precipitators are recommended only for light dust or mist loading; for heavy loads it is best preceded by a dry collector or settling device in which the heavier dust is removed.

#### EXHAUST FAN AND DRIVE

Air flow through the dust control system is maintained by an exhaust fan. The prime mover is usually, but not always, an electric motor. Because most dusts are abrasive the fan should be of sufficiently heavy construction to withstand more than normal wear; at the same time, the weight must be kept within reason for the sake of efficient operation. The location of the fan in the system, the temperature of the gas, and the chemical constituents of the solids will dictate the type of fan and the materials of construction.

If the fan is located on the dust side of the collector, which should only rarely be the case, a heavy, slow-wheel fan should be used. It may have straight or curved blades but straight blades are preferred. For a fan located on the clean side of the collector the more efficient "High Static" fan will be more economical. The usual upper limit of temperature for the steel plate exhauster is about 250 deg. F. for plain and antifriction bearings and about 500 deg. F. for watercooled types.

The exhaust fan may be located at any convenient point but it ought to be at some distance from the collector to accommodate slow turns and straight runs in the intervening ductwork. The fan inlet should always be a length of straight pipe—never an elbow; eddy currents reduce the capacity of the fan considerably. In cases where space necessitates the use of an elbow at the inlet, splitters should be put in the elbow (Fig. 11). Splitters straighten out the air and insure a more nearly even flow over the entire inlet area. It is advisable to use a square or rectangular elbow since it is very difficult to install splitters in a round ell.

#### **RUBBER & PLASTICS**

(Continued from page 105)

may replace the 50 grade. Haveg 60 is claimed to possess a good combination of acid and alkali resistance. None of the Havegs are recommended for nitric acid service.

#### STYRENES

The polystyrenes show good resistance to acids, alkalis, and some solvents. Two of their outstanding properties are low water absorption and high dimensional stability. Polydichlorostyrene, one of the more recently developed materials, shows better moisture resistance than polystyrene and a heat distortion point of 245 deg. F.

Polystyrene is used for C. P. acid bottle closures, plating tank racks, battery boxes and jars, acid sprays, rotameter tubes, sight tubes, and sight glasses.

#### ACRYLICS

Wartime demands for transparent methacrylate resins have restricted their development as materials of construction. Methyl methacrylate<sup>4,12</sup> shows good resistance to

d FIG. 11 Table to determine number of splitters and radius r. Number of d, In Splitters r.in. 10 4 6 20 5 52 30 6 54 40 7 5 50 8 41 60 9



Direct connection of the driving motor to the exhaust fan is not advisable in view of the necessity for adjusting the speed of the fan. Belt drives are better because of their greater flexibility and the preferred arrangement is to have the motor on the discharge side of the fan scroll; that places the tight strands of the belt on the bottom of the drive.

acids and alkalis except for oxidizing acids such as nitric. This plastic is available as **sheet**, rod, tubing, solutions, and molded parts. A recently developed "boilable" grade of methyl methacrylate does not soften or distort when exposed to 212 deg. F.

Several applications for methyl methacrylate are as follows: screws, splash guards and enclosures on rayon spinning machines, pump parts (for example, metering pump parts for handling water-treating solutions), sight glasses (for example, sight glasses in contact with mixtures of hydrochloric and hydrofluoric acids), dialysis equipment, and protective coatings.

#### SILICONES

A new family of plastics, the silicones, became available recently but because of wartime restrictions little experience has been gained in chemical plants. The silicones are used for insulating wire, sheet insulation, impregnating fabrics, lubricants, and for parts requiring "rubber-like" properties. The lubricants show little change in viscosity over substantial temperature ranges.

A silicone has been used for approximately one year in our plants as a lubricant for plug cocks handling 50 percent caustic and 93 percent sulphuric acid; it performed better than previous greases. I. S. BRUMAGIM Struthers Wells Corp., Warren, Pa.

# Some Fundamental Factors in Choice of LIQUID AGITATORS

Choice of suitable equipment for the solution of various kinds of mixing and agitating problems is much less complex, the author shows, than has been generally considered. Taking the propeller, shrouded turbine, open impeller and the newer radial propeller, the author discusses the principal characteristics of each and shows how these may be combined with the characteristics of different types of vessel to produce effective combinations of ingredients over a wide range.—Editors

**S**<sup>o</sup> MANY combinations of conditions must be met in the design of liquid agitating equipment that uncertainty and confusion often exist, both on the part of the designer and the user. This confusion has been multiplied by the numerous theorics and formulas which have been published, supposedly to provide for every condition. Generally these expressions involve constants depending on experimental data, which make them worthless except on rare occasions.

In fact, the whole subject seems to be needlessly surrounded with mystery and confusion. This is particularly true with regard to the so-called high speed liquid agitators, the turbine and propeller.

While it will probably always be necessary to resort to experiment to ascertain how to meet the more unusual conditions, adequate data are actually available for the purposes of ordinary agitator design, providing a few simple fundamentals are borne in mind.

Use of propellers or turbines for agitating liquids involves two separate and distinct problems: (1) The circulation of the mass, and (2) the physical change imparted to the component parts of the mass by the agitator. This article will deal with the essential phases of these two problems, first

from the standpoint of circulation (the "hydraulics of agitation") and second, from the standpoint of physical change (the "mechanics of agitation").

#### THE PROPELLER

Prime requisite to the use of propellers or turbines as agitators is the circulation of the mass to and from the agitator. Since the propeller presents the greater complication, it will be dealt with first. The propeller is in reality a section of a screw and imparts movement to a stream of liquid of a diameter approximately that of the propeller. This stream flows forward and outward, falls back around itself and is recirculated into the propeller, a combination of movements illustrated in Fig. 1.

In this sketch lines A, B, C, D, and E indicate the movement of the liquid through a cross-section of the area at the propeller which derives its motion directly from the propeller. We will consider this area as the zone of primary flow. This zone actually takes the shape of a large doughnut with the propeller located at the center. The outer periphery of the stream, indicated as Line E, turns back quickly in a circle of a small radius and re-enters the propeller. The center of the stream at Line A flows forward a greater distance and finally turns back on a circle of relatively larger radius. Immediately adjacent to the propeller the streams of liquid in Lines A to E move with approximately the same velocity. These velocities decrease, however, in proportion to the distance any particle of liquid is removed from the propeller, with the result that the part of the liquid moving along Line E maintains a much greater velocity than that which follows Line A. That portion of the liquid that follows Line A through one cycle is then dissipated at the propeller and is thrown out along one of the infinitely great number of available lines, all of which move at different velocities. This results, then, in a continuous change of position of each particle and all the other particles in the primary zone, which constitutes good mixing.

The condition illustrated in Fig. 1 could exist only where the agitator is mounted in a vessel of such large size that the primary

zone is not restricted or in any way affected by the walls of the container. The liquid surrounding the primary zone, however, does retard the flow of moving liquid along the outer periphery of the primary zone, thereby being set in motion in a direction reverse to that of the primary zone. These areas will be considered as zones of secondary motion or secondary zones. In gasoline or liquids of extremely low viscosities, the areas of secondary motion extend through great distances and satisfactory blending is thereby obtained.

However, the majority of agitating problems involve liquids of greater viscosity, in which the secondary motion is quickly dissipated, resulting in areas in which there is little or no blending. Hence it has been necessary to devise ways of extending the primary zone to the entire mass to be blended. In some cases this has been accomplished simply by making the vessel of a size and shape which will just contain the area of primary flow.

Fig. 2 shows the ideal design of a tank for use with a propeller mounted on a vertical shaft. In order to contain the flow emanating from the propeller it is necessary to provide an inverted cone extending downward to a junction with a specially curved head which follows the natural path of the liquid as it reverses direction upward along the walls of the vessel. The upper surface need not be contained, but the depth must not be so great that the upward movement is dissipated before it reaches the surface. Naturally, the cost of fabrication makes this vessel impractical.

A substitute design incorporating a conventional bottom head as shown in Fig. 3 is often used. This method is effective only in low-viscosity liquids where there is no great variation of specific gravity between the elements to be blended. The cone shaped secondary zone below the agitator provides a dead pocket for the accumulation of the heavier elements, resulting in incomplete blending.

A much more effective method is to locate the propeller on a horizontal shaft near the bottom of a vertical cylindrical vessel, with the shaft a few inches off the center line of the vessel. The flow from the propeller is thereby directed in two directions, first in a whirling motion around the vessel, and second, in an over-turning motion across, up and back over to the propeller. The whirling motion naturally extends upward to the surface of the liquid and amplifies the distance to which the over-turning motion is carried. In this manner the area of primary flow can be more than doubled. The plan and elevation shown in Fig. 4 indicate the whirling and over-turning components of flow created by such a propeller.

Direct impingement against a right angular surface is eliminated in the last described method, thereby preventing a considerable loss of velocity. The whirling component does not give much blending or recirculation to the propeller, except in that level of the liquid adjacent to the propeller. It is, therefore, necessary to locate the propeller at the proper distance from the center line so that the whirling motion will not be so excessive that the over-turning component will be lost. The best results are obtained when only sufficient whirling is created to extend the over-turning motion to the surface of the liquid. It is this over-turning motion, with its wide variation in component velocities, that is the major source of intermingling within the mass.



Fig. 5—For intense agitation of extremely viscous mixtures such as rubber cement this double-propeller design is used

A highly efficient arrangement is that used in the Struthers Wells rubber cement mixer shown in Fig. 5. The flow of the mass is indicated in Fig. 6. Here the bottom agitator is mounted to direct the flow

Figs. 1 to 4—These sketches illustrate the flow lines produced by a propeller under various circumstances. Design is influenced largely by viscosity and vessel size



on a line tangent to the hemisphere which forms the bottom head. This flow follows the curve of the vessel upward and enters into the zone of agitation of the upper agitator which is mounted in the top hemisphere of the vessel. The upper agitator then forces the liquid back into the lower agitator. This combination gives a high degree of streamlining to the liquid motion and decreases the distance to which the liquid must be thrust in order to be within the range of primary motion. If the size of the agitator and vessel are properly proportioned and sufficient power is provided, masses of unbelievable viscosities can be thoroughly and efficiently agitated in this mixer.

The cost of this equipment, however, restricts its use to agitation problems of the most severe nature.

There are other methods in which the primary flow set up by a propeller may be made to reach the farthest corners of the container. All of these methods, however, employ the three general plans noted above, using some variation or combination of the three.

#### PROPELLER APPLICATION

Before discussing the turbine it may be well to review the range of application to which propeller agitators lend themselves.

Propellers may be used in liquids of lower viscosities without restriction as to the size and shape of the vessel-within reasonable limits. In viscosities ranging roughly from 500 to 5,000 centipoises, a propeller mounted on a vertical shaft may be used successfully in vessels ranging in volume up to roughly 1,000 gal., especially if the agitator is mounted off the center line of the vessel. The propeller is not generally considered a good agitator for liquids of viscosities over 5,000 centipoises, although when located within a properly streamlined vessel, with sufficient power provided, it can be used efficiently in extremely viscous liquids. Where mechanical cutting and shearing of a viscous material is required, as in rubber cement mixers, the excellent shearing characteristics of the propeller can be exploited by providing vessels that are exceptionally well streamlined.

#### THE TURBINE

Circulation created by a turbine differs materially from that of the propeller. The areas of unrestricted flow shown in Figs. 1 and 7 illustrate how the two streams differ. Fig. 7 indicates the flow that is typical of any of the various agitators classified as turbines, namely the shrouded turbine, the open impeller, the straight bladed turbine with the blade at 45 deg. from vertical, and the radial propeller agitator of Struthers Wells.

First of the major differences between the streams emanating from the propeller and the turbine lies in the fact that a rightangular change of direction occurs in the turbinc, while the stream goes straight through a propeller. This is a distinct advantage in the effectiveness of the turbine and will be analyzed further.

The second major difference is due to the fact that the flow from a propeller is a cylindrical stream parallel to the propeller shaft, while the flow from a turbine proceeds radially outward in a complete circle prependicular to the shaft. The natural direction of flow is not truly radial but lies between the radius and tangent of the turbine circle. This condition can be extremely advantageous and will also be considered later.

In the turbine the right angular change of direction simplifies the problem of containing the area of primary flow, especially with the use of a single turbine in the bottom of a cylindrical vessel. A single turbine is one which is so designed that as the liquid is thrust outward by the turbine blades it is replaced from one side of the turbine only. The liquid is sucked into the double turbine from either side as in Fig. 7. If the single turbine is mounted on a vertical shaft, near the bottom and on the center line of a cylindrical vessel as shown in Fig. 8, the head and shell of the vessel just nicely contain the primary zone and it is necessary only to proportion the agitator diameter to the vessel diameter correctly to insure effective movement to the contents.

This arrangement has several important advantages. The movement of the mass originates in the lowest part of the container where the heavier components are actually thrust away by the turbine blades. As the zone of greatest velocity is in the circle just adjacent to the turbine, the heavier materials are thrown a maximum distance away from the turbine, where they mingle with the other components to form a homogencous mass. The right angular change of direction within the turbine gives a natural unobstructed flow down the shaft and radially outward parallel to the bottom head, eliminating impingement of the stream against the head of the vessel, which adds considerably to the area of primary flow.

Furthermore, as the outward thrust is dissipated and tends to turn back toward the turbine, the cylindrical walls of the vessel conform to and direct this movement without scrious impingement, providing the agitator and vessel are properly proportioned. The flow along the vessel head and shell is uniform at any point on a given periphery. This movement is analogous to the waves set up by throwing a stone into a pond of water in that the velocity of the wave decreases uniformly as it moves away from its point of origin. This is an important factor in problems of agitation. involving heat transfer through the vessel wall.

The natural tendency of the turbine to create a substantial whirling component in the movement of the mass is an important advantage which, however, must be properly

controlled. Again emphasis must be placed on the fact that whirling motion does not contribute much to blending or recirculation to the agitator, but is an excellent means of extending movement upward throughout the vessel contents. It is possible therefore, where no physical change of the components to be processed is required, to obtain excellent blending by simply removing or otherwise adjusting the stators or baffles which are used to retard the whirling of the contents. There must, however, be a noticeable over-turning on the surface of the liquid to maintain satisfactory blending.

Viscosity has much to do with the distance to which movement of the mass can be extended. As the viscosity increases the whirling component becomes more essential and in agitating liquids of high viscosity baffles and stators are usually eliminated. This is possible because the friction within the mass is sufficient to eliminate excessive whirling, the whirling being necessary as a vehicle for over-turning. The use of baffles adjustable from the outside of the vessel is often advisable where viscosities vary throughout the process.

Although the area of primary movement may be greatly amplified by releasing the whirling component from the turbine, in so doing much of the turbulence at the agitator is sacrificed. In many cases this makes it necessary to find other means of solving this problem and still maintaining turbulent or violent agitation.

As it is necessary in maintaining maximum turbulence to eliminate all possible whirling, the extent of the primary zone can reach only as far as a maximum allowable original velocity will thrust the liquid in a simple over-turning movement. The extent of the initial primary zone being thus limited, a second primary zone may be created above the first by simply adding another turbine on the common shaft a few feet above the first. If the turbines are properly spaced to provide ample intermingling along the plane of contact between the zones, violent agitation and excellent blending can be thus provided in large volumes of liquids. Fig. 9 illustrates this application. Here a single turbine is mounted in the vessel bottom, in combination with double turbines mounted higher in the vessel on the same shaft.

Right angular changes of direction in the turbines contribute much to the success of this arrangement. By mounting several agitators on a common shaft, the cost of the







Figs. 10 to 13-Four fundamental agitating devices including (10) the propeller; (11) the shrouded turbine; (12) the open impeller; and (13) the radial propeller

drive and agitator-supporting equipment is made much more favorable.

Another phase pertaining to liquid circulation, which becomes important with viscosity increase, is the ratio of volume to velocity. The curve of power vs. increasing velocity for viscous masses moves upward at a sharp angle. This can easily be demonstrated by moving a paddle through a viscous liquid, first slowly, and then rapidly. It is possible to move a large volume of viscous liquid at low speed, thereby overturning a contained mass with much less power than is required to impart sufficient velocity to a smaller volume to over-turn an equal mass. This phenomenon is important in the design of agitating equipment for the simple blending of viscous liquids.

The range of application to which a turbine lends itself is identical with that of the propeller. Both are limited by the possibility of recirculation into and away from the point of applied agitation. However, the turbine can be used with less complication of vessel design, especially in more viscous liquids. Also, the turbine can invariably be mounted on a vertical shaft, which permits the shaft stuffing box or seal to be above the liquid level. This is often a real advantage.

#### MECHANICS OF AGITATION

While good circulation is a "must" in liquid agitation, the physical change imparted to the components of the mass by the action of the agitator itself is also important. This may be thought of as the "mechanics of agitation."

The several general types of high speed liquid agitators, namely; the shrouded turbine, the open impeller, the propeller and the radial propeller are illustrated in Figs. 10 to 13. Each of these agitators differs in the manner in which it imparts movement to the liquid. The propeller (Fig. 10) cuts sharply through the liquid and pushes it forward by propulsion. The shrouded turbine (Fig. 11) is a simple centrifugal pump without a housing. It imparts motion by centrifugal force rather than propulsion, its blades sweeping by the liquid without actually cutting through. The shrouds simply direct the flow and confine it to the blade area. The open impeller (Fig. 12) does exactly the same work as the shrouded turbine, the only difference being in the fact that the flow is not directed by shrouds to the blade area. Both the turbine and the impeller have a great tendency to whirl the contents.

The radial propeller (Fig. 13) creates a flow similar to that of a turbine but when designed with its blade pitch comparable to that of a propeller, the blade actually cuts through the liquid in the same manner as the propeller and actuates the liquid by propulsion rather than centrifugal force. As the pitch is increased beyond ordinary propeller pitches and approaches the angle of the turbine blade, the radial propeller also acts in the manner of a centrifugal pump.

The shrouded turbine and the impeller provide good turbulence and create excellent blending. Shearing action does not become an important factor, however, until the peripheral speed becomes so high as to cause cavitation. The speed necessary to bring about shearing with the turbine or the impeller, on account of the necessity of forcing the flat side of a blade through the liquid at excessive velocity, requires exorbitant power. This is analogous to attempting to chop wood with the flat side of the ax, rather than the edge of the blade.

Cutting-through action of the propeller and the radial propeller makes it possible to obtain excellent shearing and destructive effect by actual impact of the agitator blade. This is important in the dispersion and the dissolving of solids, particularly where the solids are in sizable lumps. This is well demonstrated by the use of the propeller for the processing of rubber cement. The same advantage is available in the dispersing of gases in liquids, since dispersion can be obtained by the mechanical action of the blade rather than partial cavitation of the liquid which is necessary to accomplish the same result with the turbine.

Power required to obtain destructive action with these devices, by cutting through the liquid and shattering the solid lumps or gas pockets, is much less than is necessary in sweeping a turbine blade through the liquid at sufficient speed to break the liquid down and cause cavitation. It is doubtful if comparable results can be obtained even at maximum speed of the turbine, as complete cavitation would result before an equal destructive action could be obtained.

In deciding what type of agitator is best for the many combinations of conditions that pertain to a particular process, it is necessary to analyze the problem first from the standpoint of adequate circulation and, second, with regard to the most economical means of providing the physical changes necessary to the process. In considering these phases it is also well to give thought to ease of operation and maintenance of the equipment.

Stated in other words, those characteristics peculiar to the several common types of agitators should be studied and that agitator selected which provides the greatest number of functions favorable to the particular problem. Some of these characteristics are tabulated below.

The propeller is:

1. Self cleaning in operation.

2. Operated at a wide range of speeds commensurate with pitch.

3. Pitched at a wide range of angles

commensurate with speed. 4. An excellent shearing device at high speed.

5. Non-destructive at low speed.

6. Economical in power consumption through its full range of speed, provided pitch is proportionate to the speed.

7. More difficult to locate in the container than other types in giving a circulation which can be amplified and contained.

8. Often mounted on a horizontal shaft, necessitating a stuffing box in the liquid.

9. Not effective in viscous liquids without expensive streamlining of the vessel. The shrouded turbine is:

1. Excellent in providing circulation which is easy to contain and amplify. 2. Normally mounted on a vertical shaft with stuffing box (if one is needed) above the liquid.

3. Effective in high viscosities without

the necessity of expensive streamlining of vessels.

4. Easily fouled or plugged by solid particles.

Somewhat expensive to fabricate.
 Restricted to a narrow range of

speeds.

7. Non-destructive economical at speeds.

8. Limited in area of input flow.

The open impeller is:

1. Somewhat more self cleaning than the shrouded turbine although it has inaccessible pockets around the impeller hubs.

2. Excellent in providing circulation which is easy to contain and amplify. 3. Ordinarily mounted on a vertical shaft with stuffing box (if one is needed) above the liquid.

4. Effective in high viscosities without the necessity of expensive streamlined vessels.

5. Comparatively inexpensive to fabricate.

6. Limited to a narrow range of speeds. 7. Non-destructive at economical speeds.

8. Limited in input area by obstruction

of blades emanating from hub.

The radial propeller agitator is: 1. Self cleaning.

2. Excellent in providing circulation which is easy to contain and amplify. 3. Invariably mounted on vertical shaft with stuffing box (if one is needed) above the liquid.

4. Effective in high viscosities without expensive streamlining of vessel.

5. Inexpensive to fabricate.

6. Capable of economic operation at a wide range of speeds commensurate with the blade pitch.

7. Designed in a wide range of blade

pitch commensurate with speeds. 8. Excellent in shearing and destruc-

tive action at high speeds.

9. Non-destructive at low speed.

10. Economical of power through the full range of speeds providing pitch is proper for the rotational speed.

When the functions best suited to the given problem have been checked off, and the type of agitator to be used has been chosen, there is still the possibility that the viscosity of the liquid may lie in the borderline range where only actual experiment can prove whether the agitator specified is adequate. It may be that circulation of the mass in the volume to be handled may approach or be beyond the capacity of the agitator, in which case experimentation is necessary. Ordinarily, however, the data published in good chemical handbooks, supplemented by that accumulated by the mixing equipment manufacturer, is ample for the solution of the ordinary mixing problem. Such data are being checked continuously and improved and amplified by laboratory, pilot plant and actual industrial plant tests. When used in the accepted formulas of hydraulics and mechanics they serve as a satisfactory basis of liquid agitator design.

### **Government Surplus Plants to Be Adapted to Private Needs**

W ITH the assistance of a special staff the War Assets Corp., successor to RFC in plant disposal, is making a systematic effort to intcrest prospective buyers or lessees of government-owned surplus chemical plants in adapting the installations to profitable operation by the addition of facilities or alteration of existing equipment. The group engaged in this enterprise is the Plant Utilization Section of the Engincering Division, War Assets Corporation.

It is recognized that many plants will be difficult to sell or lease on terms acceptable to both the buyer and the government by reason of an oversupply of products the plants were designed to manufacture. The alteration of such plants to produce other products for which there is a profitable market is regarded as the logical solution. This is one of the major approaches along which the Plant Utilization Section is working. The section has outlined a group of plants which are being studied with a view to their adaptation to postwar use. Chemicals hitherto produced by this group include caustic and chlorine, nitrogen (atmospheric fixation), peroxygen chemicals, sulphuric acid and oleum, hydrofluoric acid, industrial gases, aviation gasoline, carbon black, synthetic rubber, insecticides and pharmaceuticals.

It is believed that the plants are capable, through technological ingenuity, of an appreciable degree of adaptation. In the event that leases are attractive, rents can be based on units of production, usually with a minimum yearly rent guaranteed. Where alterations are made at lessee expense such expense can be amortized as a credit against rental. Although government operation is not contemplated, the Plant Utilization Section has assembled a staff to aid industry in the study of plant potentialities and the making of necessary changes. In addition, well equipped laboratories and pilot plants of a number of surplus chemical plants are available to prospective buyers or lessees to carry out development work by interim leasing agreements.

An important element in the alteration of plans under this program is the fact that much of the machinery and other equipment from idle plants becomes immediately available for use in plants capable of being converted. To expedite determination of the location and character of the individual equipment work is under way on the cataloging and indexing of the various items. Duplicate cards identifying these by name, Standard Commodity Classification and other descriptive matter are being filed in Washington and at the disposal agency where the property is located. In the event a sale is made in the field, a sale card is sent to Washington to cancel the listing.

Surplus aviation gasoline facilities seem to constitute a promising field for conver-sion at reasonable cost. Developments in catalytic cracking in recent years have resulted in a type of process capable of yielding a wide variety of hydrocarbons, the proportions of which may be altered by changes in operating conditions. Aromatics and unsaturated hydrocarbons are some of the chemical raw materials that may be produced in large volume by catalytic cracking. Catalytic alkylation is another aviation gasoline process subject to variation of products by selection of different charge stocks and operating variables. The adaptation of these and associated processes to the manufacture of chemicals from petroleum is particularly promising.

The synthetic ammonia plants offer another field worthy of investigation. Some are well located for serving the agricultural market through the conversion of ammonia to fertilizer chemicals such as agricultural solutions, sodium nitrate, ammonium phosphates and ammonium sulphate. Excess sulphuric acid manufacturing capacity, in the South, for instance, could be utilized in combination with ammonia plants to produce ammonium sulphate. Ammonium phosphates could also be manufactured. Morgantown Ordnance Works is equipped to produce methanol, which can be synthesized at 4,500 psi. All ordnance works operate at this pressure except the Morgantown and Missouri works, which are 10,000 psi. plants. The availability of numerous ammonia oxidation units at TNT and smokeless plants enables HNO, to be made.

Surplus plants for manufacturing oxygen and acetylene are worth investigating in view of transportation methods that are alternative to movement of the gases in cylinders. The cost to consumers can be materially reduced if the production plant is near the point of usage, as delivery can then often be made by pipeline at low pressure. It has been estimated that in some instances savings of 4 to 6c. per 100 cu.ft." of oxygen are possible through pipeline movement and low-cost electric power. Also, the shipment of liquefied oxygen in 30-ton lots in insulated cars is a recent development which should make oxygen available for chemical and metallurgical operations that were previously impracticable because of high oxygen costs.

Although it is impossible here to cover in detail the numerous types of chemical plants and the new products they may be adapted to manufacture, the principles outlined above underlie that phase of the government's plant utilization program looking to plant conversion. It is regarded as a policy presenting many opportunities to industry.

## CHEM. & MET. PLANT NOTEBOOK-

THEODORE R. OLIVE, Associate Editor

#### \$50 CASH- PRIZE FOR A GOOD IDEA!

Until further notice the editors of Chem. & Met. will award \$50 cash each month to the author of the best short article received that month and accepted for publication in the "Chem. & Met. Plant Notebook." The winner each month will be announced in the issue of the next month: e.g., the April winner will be announced in May, and his article published in June. Judges will be the editors of Chem. & Met. Non-winning articles submitted for this contest will be published if acceptable, in that case being paid for at space rates applying to this department. (Right is reserved, however, to make no award in months when no article received is of award status.)

Any reader of Chem. & Met., other than a

McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible. Neither finished drawings nor polished writing are necessary, since only appropriateness, novelty and usefulness of the ideas presented are criteria of the judging.

Articles may deal with any sort of plant or production "kink" or shortcut that will be of interest to chemical engineers in the process industries. In addition, novel means of presenting useful data, as well as new cost-cutting ideas, are acceptable. Address entries to Plant Notebook Editor, Chem. & Met., 330 West 42nd St., New York 18, N. Y.

#### February Contest Prize Winner HOW A COMBINED HOIST, CARRIAGE AND TIPPER WAS BUILT FOR ACID CARBOYS

L. K. ARNOLD Engineering Experiment Station Iowa State College Ames, Iowa

CONSTRUCTED to simplify carboy handling the device shown in the illustrations has been used effectively in moving carboys of sulphuric acid from the first floor to the second floor of a building where no elevator is available. The boxlike upper part shown in the drawing was constructed of wood and  $\frac{1}{2}$ -in. flat iron of a size such that a carboy of standard size can readily be accommodated. At each side are attached by means of floor flanges 3-in. lengths of  $\frac{3}{2}$ -in. iron pipe which act as an axis about which to swing the carboy holder when emptying the carboy. These set down into wooden bearings or sockets in the base section, or carriage. Except when the carboy is being tipped to



A \$50 Series E Savings Bond will be issued in the name of

> A. C. GUILLEN Engineer Algiers, North Africa

For an article dealing with a novel idea for a self-cleaning orifice for solids-carrying lines that has been judged the winner of our March contest.

This artice will appear in our May issue. Watch for it!

empty, the upper section of the holder is supported in the pipe bearings and the rear edge of the base. Handles for tipping are built into the upper section. Attached to

These views show how the carboy holder is elevated to the second floor, then lowered into its carriage







CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

steel rings on the upper section are four pieces of steel chain connected at their upper ends to a central steel ring to which may be hooked a hoist for lifting. A wooden spreader piece is inserted between the handles to prevent the frame from collapsing inward when the load is put on the chains. When a carboy is to be put in or out of the holder, this spacer bar is lifted out. Four large casters on the base facilitate moving the holder over the floor. Operation of the carboy holder is as fol-

Operation of the carboy holder is as follows: The upper section of the holder is placed where it can be picked up readily by a chain hoist. A carboy of acid is moved over to it on a two-wheeled warehouse truck and placed on its bottom. The spacer bar is inserted. The hook in the holder and carboy are hoisted to the second floor. The top section of the holder is then lowered into the carriage and the hoist disconnected. The holder with the carboy is now pushed to the position where it is desired to remove acid into smaller containers. The acid is emptied by the handles by merely tipping the upper section containing the carboy.

This device has been used to handle acid in a pilot plant where it has been found both convenient and practical.

#### A CHANGE THAT IMPROVED BOTH MORALE AND PRODUCTION

JOHN S. TOOKER

Acetate Research Section E. I. du Pont de Nemours & Co.

Waynesboro, Va.

**I**NA PLANT of which the writer was recently superintendent, gas pumping capacity and consequently production were lowered due to flyash depositing in 12-in. pipelines and eventually plugging them, necessitating frequent shutdowns. Cleaning took much time as the gas was odorless, poisonous and explosive and very adequate safety precautions had to be taken. Needless to say, in such an atmosphere psychological tension was high.



Fig. 1—Here is how the water seal system was arranged originally Fig. 2—This sketch (and detail) shows how water spray was installed

Fig. 1. shows one of the worst spots (the 12-in. exit pipe from the tank would become completely plugged) in the setup before any changes were made. It will be noticed that the seal water was introduced through a line not solid with the tank. A potential hazard of this arrangement was the possibility of air being entrained by the water flowing into the tank and forming an explosive mixture—especially when the washer had been out of service for a while.

Alterations were made to the system as shown in Fig. 2 and the detail. The well pipe in the seal tank was blocked off, and the 12-in. pipe between tank and valve was drilled and tapped for a 2-in. nipple and standard flange. A 1-in. perforated T pipe was inserted in the center of the 12-in. pipe with a 1-in. x 6-in. dutchman, and the water line was then connected to the latter.

The turbulent cutting spray produced was very satisfactory, and four results were obtained: (1) The line was kept clear of flyash averting shutdowns and production losses. (2) Placing the water line in a more strategic spot served not only to scrub the pipe and gas, but also to maintain the seal since the water merely drained from the bottom of the pipe into the seal tank. (3) By making the water line solid to the system, the possibility of air entering and forming an explosive mixture was avoided. (4) Lastly, and perhaps this should be first, psychological tension was eliminated.

As a corollary to the above a system of internal water spray pipes was installed in all such lines to yield smooth and safer operation.

#### NOMOGRAPH FOR TOTAL VOLUME 16-E 100,000 80,000 60 OF CYLINDRICAL TANKS 50 60,000 14 -COLEMAN J. MAJOR - 40,000 Chemical Engineer -40 Nomograph for to-12 -Sharples Chemicals, Inc. tal capacity of Wyandotte, Mich. 30 - 20,000 cylindrical tanks T IS OFTEN necessary for the engincer to 10-I estimate quickly the total capacities of with standard Fee 9 flanged and dished cylindrical storage tanks. The conventional 10,000 -20 Side, - 8,000 ends 8method consists in first calculating the vol-- 6,000 -15 ume of the cylindrical portion of the tank Volume, Gallons of Straight 7 --4,000 and then adding to this figure the combined volume of the two heads. Owing to the 10 6-2,000 Volume Corrections for Heads Other Than Standard Flanged 8 and Dished Type 5-- 1,000 Length -6 Volume Correction, Gal.-Shallow A.S.M.E. Inside Elliptical Diameter - 600 Type Type Flat Head Dish Type Ft. 4. + 10 + 20 + 25 + 55 + 65 + 8530 20 35 400 3 -4 .... 50 3.5 $\begin{array}{rrrr} - & 35 \\ - & 50 \\ - & 100 \\ - & 140 \\ - & 180 \\ - & 285 \\ - & 420 \\ - & 600 \\ - & 825 \\ -1,100 \\ - & 1 & 420 \end{array}$ . . . . . 70 4 .... -3 -60-70-83-210135 5 200 180 5.5 140 180 3 230 67 100 80 60 50 +140 370 For tanks with 420 600 +210+300 555 standard flanged 8 9 -270 790 and dished heads -480 10 +410 +1,085 11 12 -600 -725+550+1,440+1,870 -1,430 2

Diameter, Fee

Inside

somewhat time-consuming nature of such a procedure, a nomograph has been prepared which enables one to obtain a quick estimate of tank volumes sufficiently accurate for most purposes. To obtain the total volume of a given tank it is simply necessary to connect the diameter and length scales of the nomograph with a straight line. The volume is read at the point of intersection of this line with the volume scale.

The accompanying nomograph solves the following empirical equation:  $V = 6.5 L^{0.94} D^{\perp or}$ 

 $V = 6.5 L^{0.51} D^{-0.51}$ where V = total tank volume, U. S. gallons; L = tank length, straight side, feet; and D = internal diameter, feet.

This equation is applicable to tanks equipped with standard flanged and dished heads. For tanks whose length is from one to five times the internal diameter, the calculated volume may deviate from the true volume by not more than about 3 percent. The equation is not recommended for tanks whose length is less than three-fourths or more than ten times the internal diameter.

For tanks equipped with other than the standard flanged and dished type of head, the volume may be estimated by using the accompanying nomograph and applying a volume correction which is a function of the type of head and the diameter of the tank. Approximate volume corrections are presented in the tabulation.

To illustrate the use of the nomograph and volume correction table, the following examples are given: Example 1—Estimate the capacity of a

Example I—Estimate the capacity of a tank of outside diameter, 6 ft.; straight side

length, 8 ft.; shell thickness; ‡ in.; with standard flanged and dished heads.

The internal diameter of the above tank is equal to 6-0.5/12 = 5.96 ft. By connecting 5.96 on the diameter scale with 8 on the length scale, one reads the volume as approximately 1,850 gal. The true volume, based on tank head volume data<sup>1</sup> is calculated as 1,849 gal.

culated as 1,849 gal. Example 2—What would be the capacity of the above tank if it were equipped with A.S.M.E. heads?

From the tabulation the volume correction for a tank equipped with 6-ft. O. D. A.S.M.E. heads is found to be + 80 gal. The estimated volume is, therefore, equal to 1,850 + 80 = 1,930 gal. The true volume, based on tank head volume data<sup>2</sup> is calculated as 1,934 gal.

#### REFERENCES

1. Bethlehem Steel Co., "Steel Plates," page 145 (1935). 2. Buffalo Tank Corp., "Handbook, Welded Steel Plate Construction," page \$1, First Edition.

#### LATENT HEAT-TEMPERATURE NOMOGRAPHIC CHART

#### IRA J. HOOKS and FRANK KERZE, JR. Department of Chemical Engineering New York University New York 53, N. Y.

**F**OR correlating latent heats and temperatures for any substance, the Watson equation is as follows:

$$\frac{L}{L_{1}} = \left(\frac{1 - T_{r}}{1 - T_{r1}}\right)^{0.4}$$

NOMOGRAPH FOR PARTIAL PRESSURE OF 1.000 HYDROCHLORIC ACID ERNST BERL\* and G. A. STERBUTZEL Pittsburgh, Pa. and Buffalo, N. Y. A LINE connecting concentration and temperature of hydrochloric acid, when extended, gives partial pressure of HCl over the aqueous solution. -10 10 FIG 10 £100 pressure of HCl, Inches of 20 도 Vapor Pressure of HCI, Mm. Mol Percent of HCI fo Pressure Vapor 20 Vapor 10 0.1 Deceased



Nomograph correlating latent heats and temperatures for any substance

where L = latent heat at absolute temperature T;  $T_r = T/T_e$ ; and  $T_e =$  absolute critical temperature. The subscripts apply similarly.

For constructing a nomograph the equation has been transformed to:

 $\frac{L}{L_1} = \left(\frac{T_c - T}{T_c - T_1}\right)^{0.38}$ 

The chart permits use of decimal factors on the latent heat or temperature scales, any latent heat units, and any temperature scale, if applied consistently.

Use of the chart is indicated for ethyl alcohol where  $L_1 = 204$  cal. per gram,  $t_1 = 78.3$  deg. C.,  $t_c = 243$  deg. C., and t = 180 deg. C. Here  $(t_c-t) = 63$  deg. C. and  $(t_c-t_1) = 164.7$  deg. C. Connect L to  $(t_c-t)$ ; then connect  $(t_c-t_1)$  through x to L; read L = 142 cal. per gram.

The variation of latent heat with temperature may also be obtained graphically from one set of values by means of a log-log plot of  $(T_e-T_1)$  or  $(1-T_{r1})$  vs. L<sub>1</sub>, using a line having a slope of 0.38, although single values are obtained quickly and accurately from the nomograph.

#### REFERENCES

Watson, K. M., Ind. Eng. Chem., 35. 398 (1943).
Hougen, O. A., and Watson, K. M., "Chemical Process Principles", Vol. I, p. 233, John Wiley & Sons, Inc., New York.

#### **DID YOU NOTICE**

the new rules for the Plant Notebook Contest? Starting this month the prize will be \$50 cash rather than a \$50 Bond.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

## FROM THE VIEWPOINT OF THE EDITORS-

S. D. KIRKPATRICK, Editor • JAMES A. LEE, Managing Editor • THEODORE R. OLIVE, J. R. CALLAHAM, Associate Editors • HENRY M. BATTERS, Market Editor, L. B. POPE, R. W. PORTER, J. V. HIGHTOWER, E. C. FETTER, R. F. WARREN, Assistant Editors • R. S. McBRIDE, Consulting Editor

#### TRANSPLANTING TECHNOLOGY

CHEMICAL engineers and others have been translating many technical reports from the German and the other foreign languages in which wartime development has been recorded. A good linguist aided by a competent technologist can do that translating without too much trouble. But it is far more difficult to translate the technology from a foreign setting into processes that can become useful and economic under American conditions.

American technologists must use with great care many of the reports being published by Office of the Publication Board. Even the most poorly developed reports of OPB, do need to be read carefully to find whether or not there may be gems of information hidden in the careless language in which some of them are presented. The good ones are easier to read and to understand, but no less deserving of critical analysis.

Some of these reports describe technology that would be new to the United States but which on careful analysis would prove weird or worse if anyone tried to apply it directly here. All that the chemical engineer can hope to do is to make his own reappraisal of foreign activity judged in the light of American practice. The result is apt to be disappointing even on many novel ideas that seem at first glance to have merit.

In this reappraisal there is perhaps greatest importance in making a new weighing of the relative worth of money, materials, and man hours. The different relative cost of these here and abroad makes a negative economic conclusion inevitable in many instances.

#### A PURPOSEFUL CENTENNIAL

"IF some day they say of me that in my work I have contributed something to the welfare and happiness of my fellowmen, I shall be satisfied." So wrote George Westinghouse many years before his fellows were to honor him with the John Fritz medal and acclaim him as "the world's greatest living engineer." This year we celebrate the centennial of his birth and it is particularly appropriate that on at least one occasion this should take the form of an international discussion of "Science and Civilization."

Archibald V. Hill of the Royal Society, Peter Kapitza, the great Russian physicist, Karl T. Compton of M.I.T., Hugh S. Taylor of Princeton, Robert P. Russell of Standard Oil Development Co.—these are some of the chairmen selected for the George Westinghouse Centennial Forum which convenes in Pittsburgh, May 16 and 17. Scientific ethics, the future of atomic power, of the biological sciences, of transportation as a measurement of civilization—these are some of the subjects that have been assigned such brilliant speakers as Oppenheimer and Fermi, Linus Pauling, Kettering, Warner, Admiral Land and President Clement of the Pennsylvania Railroad.

These men and the hundreds of engineers and scientists who will meet with them next month have an obligation to carry on and build for the future with the same pioneering spirit that characterized George Westinghouse's active leadership during fifty years of industrial progress. The great industries that sprung from his many inventions are but at the beginning of their contributions "to the welfare and happiness" of mankind.

#### NOW IS THE TIME

MUCH has been said in recent months about the shortage of scientists and engineers and the overcrowded conditions at the institutions of learning caused by the swelling tide of returning veterans seeking engineering education. Quantitative information, which is just now becoming available, would seem to show that the actual situation is not all that it seems on the surface. One of the most serious problems is the distribution of veterans among the various fields of learning.

Dr. Howard A. Meyerhoff, of A.A.A.S., recently advised General Hershey of Selective Service that contrary to gencral opinion, enrollment in engineering and scientific courses is abnormally low. On March 11 he reported: "A survey covering 110 institutions with engineering departments revealed that, during the first semester of the current academic year, the total enrollment of veterans was considerably less than the normal freshman enrollment in engineering courses during prewar years. A similar enrollment in chemistry covering 70 institutions is now in progress and is giving us the situation as it stands at the beginning of the second semester of the current academic year. Returns from most of the institutions included in this survey reveal that veteran and non-veteran enrollment in chemistry is seriously beneath the prewar norm, and that veteran enrollment accounts for less than 40 percent of the total."

Actual figures obtained from the largest accredited institutions show there is no prospect whatever of the veteran enrollment providing much more than the equivalent of one or two normal classes in a total of four. These facts, and others, have led Dr. Meyerhoff to "conclude and insist that it is a serious error to induct any competent student who is successfully meeting the rigid requirements of engineering and scientific training. We are merely increasing the shortage of highly trained personnel by such a policy, instead of making some effort to correct the deficiency incurred during the emergency of war."

The solution proposed to the head of Selective Service is most interesting and seems to us entirely logical: "This is not a case of asking for special treatment for a particular

group of students or a particular group of people. The 12 organizations which I am attempting to represent would have no objection whatever to the induction of every youth of 18, and would actually welcome the introduction of selective machinery that would screen out those with the mental qualifications for engineering and scientific study. Indeed, we would welcome this method of recruiting competent student personnel. But we believe that students with these mental qualifications should be sent to the schools to study, for they constitute replacements of a kind now needed more vitally than replacements among the armed forces. Scientific personnel was expendable without replacement during the war, and if we continue to expend it without replacement we shall pay the penalty of retarded industrial and educational recovery during the peace, and of utterly inadequate technological preparedness for the eventuality of war. The problem needs solution as urgently as the problem of placing our returning veterans in institutions of learning." Now is indeed the time to correct the errors made during the emergency of war.

#### LEST WE FORGET

A PROPOSED American rubber policy has been offered in preliminary form by the first report of Inter-Agency Policy Committee on Rubber. That report points out the necessity for meeting the rubber needs of America by following certain "short-run recommendations" and the observance also of "long-term recommendations." It is fortunate that this committee has recognized in the two groups of recommendations those which deal with expediency and those which deal with the long-time welfare of America. The memory of political Washington is much too short to be trusted without urgent and frequent reminder of difficulties resulting from our past experiences.

We like the thought that at no time should America be allowed to drift into such condition that it would not have a ready-to-serve capacity to produce 600,000 long tons yearly of synthetic rubber in American factories. We trust that Congress will not only remember, but also establish a businesslike basis under which American enterprise can maintain and, if necessary, operate that capacity for the good of the American people. We can do that much without destruction of the proper interests of the British and the Dutch in Malaya and the Netherlands Indies. We can not do less without sacrifice of American safety.

This rubber report deserves careful study by every chemical engineer. Each of us should see to it that our less technical friends, and our Congressmen, are properly informed as to the technical meaning of the facts set forth.

#### ON BACKING S. 1850

CONFLICTING policies of various groups favoring a National Science Foundation have crystallized in a so-called "compromise" measure now before the Senate as S. 1850. Few of us think that bill is perfect. But most observers who have studied the prospects for science legislation know that it is far superior to anything we had expected to get before Congress so soon.

There is one school of extremists who think that the scientists should have control of everything,—even unlimited access to the United States Treasury. There is another school, equally extreme in their views (and we have some sympathy for them), who would rather not see Congress support any scientific research, principally because it competes with the private industrial laboratorics. But we also think that both schools are fundamentally in error and that some compromise or at least some harmonizing of these conflicting viewpoints is in the national interest.

Who can say that some competition of government with private laboratories may not be a good thing? Perhaps it will make us more alert. Certainly it would give us an argument to use with the boards of directors of our companics. That argument can legitimately be: "We'd better hurry. If we do not work vigorously in our own laboratories we may expect to find that some public institution has gotten there first; and we may then find that their research results are public property, available to all comers." And from what we know of past experience with governmental research, such results are not always developed promptly by competitive enterprises.

We are still hopeful that a better drafting of the patent features of the Science Foundation bill may now be brought about. There is time for that as it goes the rest of the way through Congress. But we are inclined to think that this bill is going to pass, and in a form that will do the public substantial good. Much will ultimately depend upon its administration and our responsibilities as informed citizens will not be ended with the passage of any compromised legislation. It will be up to us to continue to fight for the principles of private enterprise and to oppose any political domination of science and research.

#### MORE AWARD WINNERS

IN accordance with the rules agreed upon by the Committee of Award and the commanding officers of the Manhattan Engineer District (see page 110 of our February issue), a workable procedure was set up for the reconsideration of any company or university that might have been omitted inadvertently in compiling the list of recipients for the seventh biennial Award for Chemical Engineering Achievement. As Chem. & Met. readers may recall, the first qualification was a prime contract with MED and the second was that the contractor should have contributed significantly to the scientific research and engineering phases of the atomic bomb project.

We are pleased to announce that after such reconsideration by the Manhattan District, the following companies have now been added to the list of 118 institutions and organizations that share in this great group award: A. S. Campbell Co., Inc., East Boston, Mass.; Farrar & Trefts, Inc., Buffalo, N. Y.; Herron-Zimmers Moulding Co., Detroit, Mich.; Lukens Steel Co., Coatesville, Pa.; The Patterson-Kelley Co., Inc., East Stroudsburg, Pa.; Henry Pratt Co., Chicago, Ill.; Republic Flow Meters Co., Chicago, Ill.; Salem Engineering Co., Salem, Ohio; Shock, Gusmer & Co., Inc., Hoboken, N. J.; Wagner Electric Co., St. Louis, Mo.; and The Whitlock Manufacturing Co., Hartford, Conn.

To all of these Chem. & Met., as sponsors of this award, extends its belated congratulations and the humble apology of the Secretary of the Award Committee who will continue to serve as the clearing house for bringing the pertinent facts to the attention of the determining agencies.

## PROCESS EQUIPMENT NEWS-

THEODORE R. OLIVE, Associate Editor

#### **CORD FILTER**

EXHIBITED for the first time at the 1946 Chemical Show (Chem & Met., p. 130, March 1946), the Wright cord filter, manufactured by the Filtration Department of Titeflex, Inc., Newark, N. J., has been installed in the sewage treatment plant at Perth Amboy, N. J., as shown in the accom-panying view. The present arrangement dif-fers considerably from the original cord filter developed by Arthur Wright a number of years ago. In the new arrangement a vacuum drum filter is used, the face of which is divided into shallow compartments by a number of cross members serving as separators. An ingenious arrangement is provided whereby a single continuous cord is laid down on the drum in two layers. The first layer is wound many times around the drum and over a series of rollers, and then a second layer of cords is laid down to fill the interstices between the cords of the first layer. These cords also pass over rollers for discharge and for washing of the cords after discharge and for washing of the weave of the cord, or its coating, can change the porosity and provide a wide range of filter characteristics.

It is not claimed by the manufacturer that the cord idea is universally applicable or a "cureall." Nevertheless, it is maintained that a continuous filter can for the first time be operated at constant capacity without the usual decrease caused by clogging or plugging of the filter medium. Thus, liquors that tend to form scale within the drainage system and in the pores of the cloth can be handled without scaling of the cord medium. This includes sewage sludge treated on the alkaline side, sugar liquors in the carbona-tion process, cyanide slimes with alkaline cyanide solutions, and many chemical liquors of similar character. Cloth-plugging solids encountered in the filtration of wastes from grain alcohol distilleries and other fermentation industries can be handled, according to the manufacturer, with a drier discharge of grain, and increased yield. In fact, it is claimed, continuous filters can now be used for some applications where previously only intermittent filters were practicable.

#### HAND TRACTOR

For the pushing and pulling of industrial loads up to 6,000 lb. continuously (or up to 20,000 lb. intermittently) the Automatic Transportation Co., division of Yale & Towne Mfg. Co., Chicago. III., has introduced the Transtractor, a new electricpropelled hand tractor which combines features of the electric hand truck and the conventional warehouse tractor. This device, as shown in the accompanying illustration, is a battery-powered unit which is guided manually but pulls its load electrically. It is intended especially for applications that require more maneuverable equipment than standard electric tractors. The unit is equipped with a heavy duty bumper plate for pushing and a coupler for towing operations. Except for the fact that it is not equipped with a lift platform or lift forks, the unit is similar to the Transporter manufactured by this company.

#### OPTICAL MICROMETER

MANUFACTURERS of large sheets of transparent plastics and glass have difficulty in gaging the central portions of such sheets since they are inaccessible to ordinary micrometers. Furthermore, the measurment of curved plastic sheets is exceedingly difficult by ordinary means. To overcome these troubles the Aireon Manufacturing Corp., 166 West Olive Ave., Burbank, Calif., has developed an optical micrometer which consists essentially of a microscope that can be screwed up or down in an outer tube. The lower end of this tube is a plastic nosepiece which is held against the sheet to be measured. The transparent sheet is marked with a crayon on the side away from the instrument. The measurement consists in sharply focusing the mark in the microscope. This immediately gives the thickness of the sheet in about the same time that would be required with a purely mechanical instrument.

#### SPEED CHANGER CONTROL

FOR THE remote control of variable speed drives, Yardeny Laboratories, Inc., 105 Chambers St., New York 7, N. Y., has introduced the Flectrol, which consists of a control motor and remote control box, connected together by means of a flexible shaft. The motor is applied to the speed changer, as shown in the accompanying illustration. The dial on the control box can be set to any desired speed and the speed changer will follow as rapidly as the electric servomotor can drive the speed adjusting screw. The setting of the control dial is said to give precise indication of the speed to the operator. This dial can be calibrated in revolutions per minute, feet per minute, gallons per hour, or other units as desired. Any speed within the range of the speed changer

#### Wright cord filter installed in Perth Amboy sewage treatment plant

Optical micrometer for transparent materials



Hand guided electric tractor





Roylyn quick coupling



Principle of new "Outward Feed" flotation machine aerator



Magnified view of stainless filter medium

can be selected with an accuracy of better than 2 percent, according to the manufacturer. In addition to its use on speed changers, the device can be built in or added to motor-operated valves, conveyors or other equipment having motor-operated adjustments.

#### QUICK COUPLING

REGULARLY available in standard thread sizes from  $\frac{1}{4}$  to 2 in., with larger sizes to order, a new quick coupling for hoses and lines operating under pressure has been announced by the Roylyn Mechanical Laboratory, 8928 Santa Monica Blvd., Los Angeles 45, Calif. The coupling employs three major parts, a cam ring, ball cage and nipple. By rotating the cam collar, steel balls are forced inward into a groove in the nipple, forcing the halves together. The gasket retained in the ball cage provides a positive seal against dirt, as well as the separating spring force necessary to operate the lock. Depending on the construction material and size a variety of operating pressures can be handled. For example, the alloy steel model is claimed to have a safe pressure limit of 1,680 lb. for the 2-in. coupling



Heavy-duty vibratory grizzly-feeder



Two-nozzle industrial humidifier

and 11,500 lb. for the  $\frac{1}{2}$ -in. unit. Couplings are also available in aluminum, brass and stainless steel, with gaskets suitable for handling a variety of fluids.

#### FLOTATION MACHINE

KNOWN as the Massco-Fahrenwald, an improved mechanical flotation machine has been announced by the Mine & Smelter Supply Co., Marcy Mill Division, P. O. Box 5270, Terminal Station, Denver 17, Colo. The new feature, which is the development of Dr. A. W. Fahrenwald, dean of the University of Idaho School of Mines, is known as the "Outward Feed" principle, as distinguished from the center-standpipe characteristic of most mechanical flotation machines. The accompanying sketches make the difference of the new machine readily apparent. The pulp to be aerated is fed by gravity through a stationary housing (not shown) through the feed ports in the stationary follower plate shown in Fig. 1, into the revolving impeller. Air enters around the impeller shaft through a tube supporting the follower plate and, as in Fig. 2, first contacts the whirling pulp at the perimeter of the feed port circle. The center portion of the impeller is, of course, kept clear of feed by centrifugal force. Fig. 3 illustrates the conventional arrangement where both air and pulp are introduced through the central standpipe. The new arrangement is said to result in greatly in-creased aeration, in the introduction of more air per unit of power input, in better diffusion and more uniform distribution of the air, and in ability to increase aeration with feed overloads. Impeller assemblies may be installed in metal, wood or concrete tanks provided with the necessary feed, recirculation and discharge connections.

#### STAINLESS FILTER MEDIUM

A POROUS filter medium produced from fully alloyed stainless steel powder, with the particles welded together at points of contact to form a strong porous body, has



Light-weight low-cost welder

been introduced by Micro-Metallic Co., 99-16 Metropolitan Avc., Forest Hills, N. Y. This product is produced in the form of thin sheets which can be bent about a small radius and can be fabricated by conventional resistance welding techniques. Its applications include filters, aeration units, breathers, flame arrestors, pressure snubbers, selective separation devices for fluids, and others. Various porosities are available, with average pore openings ranging from 4 to 165 microns.

#### VIBRATING GRIZZLY

A LARGE-CAPACITY, heavy-duty screening grizzly-feeder of the electrically vibrated type has been introduced by the Svntron Co., 610 Lexington Ave., Homer City, Pa. The design is such that the full length of the grizzly is utilized for material separation and discharge, actual conveying of the feed being restricted to oversize material, since the bulk of the fines are vibrated through at the rear of the trough upon introduction to the feeder. The Model F-45 feeder shown in the illustration has an actual conveying capacity, according to the manufacturer, of 200 tons per hr. The feeder can be controlled by a rheostat, enabling the operator to equalize the feed of material with the capacity of the crusher it feeds. Automatic control can be used if desired.

#### INDUSTRIAL HUMIDIFIER

PRODUCED as a compact unit which is delivered ready for installation, a new industrial humidifier has been introduced by Spraying Systems Co., 4023 West Lake St., Chicago 24, 111. The humidifier is made in both two- and four-nozzle units with humidstat control, designed so that the nozzle can be set at various angles to increase the efficiency of moisture distribution. The nozzles use compressed air, mixed externally, to produce an extremely fine full-cone spray.

#### PORTABLE ARC WELDER

WHAT is said to be the first portable gasoline-engine-driven arc welder of inexpensive, light-weight construction is the Shield Arc, Jr., a 200-amp. welder recently introduced by the Lincoln Electric Co., Cleveland 1, Ohio. According to the manufacturer the new welder, complete with engine, sells for substantially the price that is normally paid for the welding generator alone. With a current range from 40 to 250 amp., the compact design measures 24 x 48 x 30 in., and weighs much less than usual equipment of this type and size. Control



Power factor regulator



#### Dry chemical extinguisher

of welding current is accomplished by adjusting the speed of the four-cylinder aircooled engine between a maximum of 2,100 r.p.m. (22 hp.) and a minimum of 1,500 r.p.m. (16 hp.). The welder can be mounted either on the floor or on a road-type two-wheel trailer.

#### POWER FACTOR REGULATOR

REACTORS and transformers of the dry type and capacitors filled with a non-flammable liquid which climinates the need for fireproof inclosures are used in the Haug system of power factor regulation recently announced by Modern Control Co., 176 West Madison St., Chicago, Ill. According to the manufacturer, shunt capacitors hitherto used without control circuits for power factor correction have been instrumental in provoking circuit conditions requiring either their removal or the need for providing costly corrective measures. The new system has no moving parts, requires little or no maintenance, is small in size and can be installed in almost any desired location. This system raises the power factor by taking the magnetizing or wattless current off the line, the regulator itself providing the necessary magnetizing component. It is claimed that the use of this equipment greatly reduces the monthly power bill, in-creases low voltage to the desired value if voltage was previously low due to poor power



Computer for 12 simultaneous equations



Swivel pipe coupling

factor, and improves voltage regulation. Current consumption of the capacitor itself and its control circuit is negligible.

#### DRY CHEMICAL EXTINGUISHER

ALL-OUT is the name of a new dry chemical extinguisher which utilizes gas pressure for discharge of its flat stream of dry chemical extinguishing compound. It is manufactured by Pressurelube, Inc., All-Out Fire Extinguisher Division, 609 West 134th St., New York 31, N. Y. The extinguisher meets the requirements of Associated Factory Mutual Laboratories and Underwriters Laboratories. It is said to perform effectively under all climatic conditions, in extreme temperatures, and in the presence of winds or drafts. Instantly forming a dense, firesmothering cloud over a flaming area up to a distance of 18 ft., the chemical cloud is said to create an insulating barrier between the operator and the flame, thus providing protection from radiant heat. The chemical used forms no toxic gases, is a non-conductor of electricity, is non-abrasive. and is harmless to finished surfaces.

#### ELECTRICAL COMPUTER

ORIGINALLY developed for the solution of mass spectrometer and infra-red spectrometer data, a new electrical computer, which is also suitable for other applications involving linear simultancous equations, has been announced by Consolidated Engineering Corp., 620 North Lake Ave., Pasadena 4. Calif. The new instrument is based upon the "Gauss-Seidel" or "Classical Iterative" method, employing highly stable circuits and rugged components. It provides a means for the rapid and accurate solution of any number of simultaneous equations up to and including 12.



#### Portable Mass Spectrometer

This view shows a portable mass spectrometer This view shows a portable mass spectrometer tuned to helium gas for leak detection, built by Westinghouse Electric Corp., Pittsburgh, Pa., for detecting leaks in equipment used for the atomic bomb project. The sensitivity, using helium as a probe gas, is so great as to detect one part in several hundred thousand. In testing a vacuum system the mass spectrometer is attached to it and the pumps are started to evacuate the air. Then a thin jet of helium gas is sprayed against each suspected location or over the entire system. Since there is normally no appreciable amount of helium in the atmosphere, a reading im-mediately indicates a leak.

In use, the instrument provides a series of increasingly accurate approximations, each step consisting merely in adjusting a circuit to a balance or null condition, with the instrument itself "remembering" the previous approximation as long as necessary. Convergence to an accurate solution is assured for most practical problems by the proper arrangement of the data set into the computer. It is claimed that this new instrument reduces computation time over mechanical calculators to one-fifth to onetenth. the inherent accuracy being great enough for most engineering applications. Errors introduced by the computer in analyzing are negligible on mass spectrometer or infra-red data. Easy to operate, the instru-ment requires only a short training period for those with average manual dexterity and a mathematical background limited to arithmetic.

The computer operates on 115-volt, 50-60-cycle current, is unaffected by normal line voltage fluctuations and draws only 100 watts. Its size is  $25 \times 33 \times 19$  in. weighing 200 lb. The weight of the power supply is 35 lb.

#### SWIVEL PIPE COUPLING

TRANSMISSION of fluids under high pressure through a pipe which swivels or rotates through a full 360 deg. is possible with the new All-Flex ball-bearing swivel pipe coup-ling. This development of Suyder Sales Corp., 5225 Wilshire Blvd., Los-Angeles 36. Calif., employs a combination of multiple synthetic packings and metallic seals which is said to assure absolute freedom from leakage at both high and low pres-sures. A double row of ball bearings, plus metal-backed packings, is said to give lowest possible resistance to rotation, permitting case of operation at all pressures. Available sizes range from  $\frac{1}{2}$  to 1 in. normal tube size, with a variety of threaded and elbow connections to meet particular needs. The coupling is designed to operate at an average speed of rotation not over 250 r.p.m., and
at pressures from 0 to 3,000 lb. per sq.in. Operating temperatures normally range from 0 to 150 deg. F.

#### GAS TURBINE

THE GAS TURBINE unit shown in an accompanying view is an experimental unit built by Allis-Chalmers Mfg. Co., and in-stalled at the U. S. Naval Engineering Experiment Station at Annapolis. Designed and built for eventual operation with hot gas at a temperature of 1.500 deg. F., this 3,500-hp. unit is being tested in a series of successively increasing temperature runs. It has now been operated successfully at a gas temperature of 1,350 deg. F. and will eventually, it is anticipated, reach the design temperature of 1,500 deg. F. This is the first large multi-stage gas turbine unit for continuous power generation at high efficiency ever operated successfully at such a high temperature. Although designed as a Navy project, the basic elements of this turbine have characteristics similar to those re-quired for land use. The unit embodies innovations in cooling to permit high-temperature operation. Two turbines operate in parallel, one supplying the power required to drive the compressor, the second furnishing the power needed to drive the driven machine or dynamometer.

#### APRON CONVEYOR

SEVERAL widths, with centers ranging from a minimum of 4 ft. 7 in. to a maximum of 9 ft. 1 in., varied by 18-in. increments, are available in a new line of completely self-contained, factory-assembled, heavy-duty apron conveyors announced by Chain Belt Co., Milwaukee, Wis. Feeders of this type are used extensively under bins and hoppers for heavy lump material. At a normal speed of 10 ft. per min., handling 100-lb. material, capacities of standard units will run up to 80 tons per hr. Because the heavy steel chain belt rides directly on large diameter traction rollers, it is claimed that the new heavy-duty feeder offers longer chain life and reduced power consumption.

#### AUTOMATIC LUBRICATOR

MANUFACTURING rights on the Gun-Fil lubricator have been acquired by the Gray Co., Minneapolis 13, Minn. Designed in four sizes, with lubricant capacities ranging from 1 to 8 oz., these pressure-filled lubricators automatically dispense oil or grease in a measured uniform flow to a moving bear-

High temperature experimental gas turbine unit



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

ing-and stop feeding lubricant when a bearing becomes motionless. It is claimed that the precise amount of lubricant needed for each individual bearing is thus provided. Six interchangeable valves are available with distinctive colored caps for identification. These exert varying degrees of control of feed on greases of different densities.

#### **OPERATION RECORDER**

FOR PROCESS timing-and time study work the Ess Instrument Co., Bergenfield, N. J., has introduced an operation recorder that provides a continuous record of "time on" and "time off" of multiple operations. The instrument can be supplied with a singleacting pen, a two-position double-acting pen, or a three-position pen, while as many as six single- or double-acting pens can be combined on a single chart. Double-acting pens are now being used in this company's "Normality Indicators" which are used to record the operation of a variety of kinds of indicator. When operation is normal a circle is traced. If the process goes too far in one direction the pen moves outward and remains there until "normal" is resumed, when the pen returns to the center point. If the process goes too far in the other direction, the pen moves to the other side of "normal" and remains there as long as the condition persists. As many as six of these three-position "Normality" pens can be placed on a single chart to give a complete picture of the "normality" of six processes simultaneously.

#### **DISCHARGE CHECK VALVE**

To cive positive protection against back surge in discharge lines carrying steam, sludge, waste water or other waste liquids in gravity flow installations, the J. A. Zurn Mfg. Co., Erie, Pa., has announced a new discharge check valve. This valve is equip-

#### Heavy-duty apron conveyor



Gun-filled lubricator

101

ped with a swing check flap suspended from a full-floating pin fulcrum to insure positive contact between the ground face of the flap and the flap seat. The valve may be operated with or without a manual control or with an extension shaft or flexible cable from an access box. Operating pressure is 150 lb., and valves are available in 180deg., 105-deg., and 90-deg. bodies of cast bronze, steel, semi-steel, cast iron or alloyed metals.

#### GAS MEASURING INSTRUMENTS

DAVIS EMERGENCY EQUIPMENT Co., 45 Halleck St., Newark 4, N. J., is extending its line of gas detection and gas analysis instruments to include new types of safety equipment for the detection and analysis of combustible gas or vapor in air, for measuring gas or vapor air mixtures, and for detecting and analyzing for any one gas, whether or not combined with other gases. These instruments, of the thermal conductivity type, will be available with direct reading meters or circular chart or strip chart recorders, and may incorporate control equipment.

#### PRESSURE SWITCH

FOR THE handling of liquids or gases that will not corrode brass, three new pressure switches for either pressure up to 200 lb., or vacuum, are now available from the Areotec Co., White Plains, N. Y. The switches are rated at 10 amp., 110 volts a.c., and are produced in three designs, one

#### Four-pen operation recorder



Discharge check valve



having an externally adjustable range with a fixed differential, another arranged for manual resetting from the outside, and the third with an adjustable differential. Several contact arrangements can be secured with the first two types and normally open contacts with the third.

#### EQUIPMENT BRIEFS

HANDLING of materials in narrow aisles and in close quarters is the function of the new Handy steel all-welded truck announced by the Schmidgall Mfg. Co., 307 Cass St., Peoria 2, Ill. Designed for handling barrels, kegs, and sacked materials, as well as boxes or crates, the truck has a single handle to permit the handling of bulky and heavy loads with one hand. Its capacity is 500 lb. It is equipped with bronze-bearinged wheels and molded rubber tires.

A NEW LINE of streamlined pressure gages in modernized design is being offered by the United States Gauge Division, American Machine & Metals, Inc., 233 Broadway, New York 5, N. Y. The working parts have been improved after years of tests, so that it is claimed that longer life under adverse conditions is assured.

INFROVEMENTS have been announced by the Alden Speare's Sons Co., 156 Sixth St., Cambridge, Mass., in the Safety Siphon originally developed in late 1942. The improved model fits 6- and 6½-gal. carboys (as well as larger ones), whereas the old siphon would not. Furthermore, the flow valve has been redesigned to incorporate an indicator of the "on" and "off" positions. The siphon is produced from an inert plastic and is designed to be easily and quickly primed by a built-in pump. The entire contents of the carboy may be discharged by the siphon by manipulation of the flow control valve which may be adjusted from a tiny trickle to a fast, steady flow.

TO PRODUCE a fog for fire fighting, a new fire control nozzle for fixed installations has been announced by the Blaw-Knox Sprinkler Division, Pittsburgh, Pa. Named the Aquatomic fog nozzle, the device is said to be particularly adapted to protection of tanks containing flammable liquids, either in tank farms or housed in buildings. The fog is produced by forcing water through three clear spiral passages and a central passage in the head of the nozzle. The fog pattern is said to be maintained even at greatly reduced water pressure, while air currents are claimed not to affect its action.

SHADOWCOUNT is the name of a new photoelectric counter, capable of high counting speed, that is manufactured by the Autotron Co., Danville, Ill. The maximum counting speed is 1,000 per min. In most cases the instrument is installed in the production line, and when possible it is so placed that objects, as they are made or processed, can fall directly or by way of a chute, into a guide tube at the top of the instrument.

KNOWN as the Hi-Temp furnace, a new small electric furnace with automatic con-

trol for continuous operating temperatures up to 2,200 deg. F. has been announced by the K. H. Huppert Co., 6830 Cottage Grove Ave., Chicago 37, III. Available in both floor and table models, these furnaces are furnished complete with automatic temperature control, for operation on 110-volt a.c. current at a current consumption rate of 2 kw.

FOR PLANTS that permit smoking in safe areas, Standard Industrial Products Co., 1710 Main St., Peoria, Ill., has developed the Sipco Safe Smoker, which consists of a small metal canister that in use is partially filled with water. It is fitted with a hinged cover having a hole for the introduction of ashes and smokers' debris and can be attached to the wall, or to a machine, or provided with a stand. Large signs calling attention to the receptacle are available.

CALCULATIONS needed in the design of heating systems are handled automatically by a circular slide-rule like device introduced by Heat-O-Meter, 424 West 42nd St., New York 18, N. Y. The device performs the calculations required in figuring radiation for steam and hot water systems. It also contains information on sizes of mains, returns, risers, radiator sizes and capacities, and other needed data.

#### FLEXIBLE COUPLING

SERIES A is the designation of a new gear-type flexible coupling announced by the Coupling Division of John Waldron Corp., New Brunswick, N. J. It enables a smaller sized coupling, requiring less space, to be used. The coupling has been designed for a much larger maximum bore, hence permitting the use of smaller size couplings than would ordinarily be required. With a smaller coupling first cost and maintenance are less. Basic construction features of this company's carlier line of couplings have been retained. The coupling is made entirely of steel, to close manufacturing tolerances, and is dustproof, oil-tight, and inclosed as a single, rigid unit.

#### **GRAVITY CONVEYOR**

THREE widths of 12, 18 and 24 in. are available in the new line of "packaged" gravity roller conveyors now being marketed by Lyon Metal Products, Inc., Aurora, Ill. These conveyors are adapted to the handling of cartons, packages, boxes, crates and other

#### Compact series A coupling



articles, and are built in straight sections 10 ft. long, and in 90-deg. curved sections. Trestles are also produced in widths suitable for the various conveyor widths. A variety of arrangements can be built up by using straight runs and curves in different combinations. The conveyors have a clean, finished appearance, and because the rollers are set slightly above the level of the tops of the side rails, packages larger than the width of the conveyors, regardless of width, will handle loads up to 200 lb.

#### CARBON DIOXIDE ENGINE

DESIGNED to provide broad protection coverage at comparatively small cost, a new model wheeled portable fire extinguishing unit, having a capacity of 750 lb. of liquid carbon dioxide, is now being produced by Cardox Corp., 307 North Michigan Ave., Chicago 1, Ill., under the name of Cardox Transitank. Owing to the fact that a single nozzle can supply 300 lb. of carbon dioxide per minute, a single operator shielded behind the cooling screen afforded by this mass discharge can extinguish a relatively large fire in a matter of seconds, according to the manufacturer. Liquid carbon dioxide is stored in a refrigerated and insulated pressure vessel at approximately 0 deg. F., and 300 lb. per sq. in. When released, this liquid carbon dioxide is said to yield 47 percent "snow." The unit is readily portable and is available both in a self-powered model driven by a gasoline engine, and in models equipped with rubber-tired wheels or casters for towing or hand-propulsion to the point of fire.

Curved roller conveyor section



Portable 750-lb. carbon dioxide extinguisher





WEIGHT CONTROL A Valuable Tool of Process Industries

REPORT ON .....

Weighing is an indispensable tool of industry. Today, more than ever before, engineered weight control systems perform many essential functions. An integral factor of both process and cost control systems, weighing has passed far beyond the traditional limits of merely measuring incoming raw materials and finished products to play an increasingly important part in plant operations. Modern plants and processes are now designed to utilize modern automatic weighing equipment available for a wide variety of purposes. This report, by Douglas M. Considine,\* chemical engineer, Philadelphia, Pa., describes the principal mechanisms and outlines many important functions and applications of weighing in the process industries.

WEIGHING is an operation too often taken for granted in descriptions of the chemical process industries. Frequently, consideration of scales and weighing is confined to the routine receipt of raw materials and the shipment of final products. Although weight control at these points is important it must be emphasized, that, to many chemical processes, weighing, as a form of process control, is possibly the most critical operation. This is especially true of processes where the yield and quality of the final products depend upon the exact proportioning of the raw ingredients or reactants.

Many advances in the engineering of scales and weighing systems have been made during the past few years. As a result of these advances, weighing, in many cases, has become almost completely automatic. The time and labor required for weighing have been reduced substantially and the chances for human error have been practically eliminated. Weighing at one time was necessarily a batch operation. Today, the automatic scale makes possible a complete integration of weighing with other operations in a process. Engineering of the weighing system and of the materials handling system, often with elaborate mechanical and electrical interlocking, commonly is handled as a cooperative effort between the scale and the materials handling equipment manufacturers.

#### PROCESS AND COST CONTROL

Weighing in the process industries is of principal importance to process control, and cost control. In process control, the major applications of scales are in (1) continuous feeding, (2) continuous proportioning, (3) batching, and (4) product testing.

In cost control, scales and fluid flow meters are the accountant's principal means for collecting data regarding the flow of materials through the plant. In this regard, weighing is important to (1) materials receiving, (2) inventory control, (3) interdepartmental transfers, (4) production scheduling, (5) wage payments, (6) packaging, and (7) shipping. A steady flow of starting reactants or raw ingredients is a major requisite for continuous processing. Pumps and flow meters of various types successfully handle the feeding of most liquids. Continuous weigh feeders are commonly used where solid materials are concerned. The latter feeders are used widely, for example, in charging crushers, grinders, roasters, dryers, furnaces, ovens, and the like.

Essentially, continuous weigh feeders function to maintain a continuous flow of material at a predetermined weight-per-minute or weight-per-hour rate. These machines are available with capacities ranging from a few pounds per hour up to several tons per hour and are capable of handling powdered materials of fine mesh as well as larger, lumpy materials.

#### CONTINUOUS WEIGH-FEEDING

Weigh feeders take numerous forms, but generally they can be classified into two groups, namely: the pivoted belt, and the loss-in-weight hopper.

Pivoted belt feeders comprise a feed hopper, an endless traveling belt mounted

<sup>\*</sup> Mr. Considine is the author of a comprehensive book on industrial weighing and weight control, upon which this report is largely based. The book is to be published soon by the Reinhold Publishing Corp.



Fig. 3-Two dust-tight weigh feeders for proportioning limestone to shale

on a pivoted frame, an adjustable weight which counterbalances the load on the belt, and a means for continuously and automatically adjusting the feed of material to the belt.

#### PIVOTED BELT FEEDERS

Materials generally flow to the feeder from a hopper. If the feeding operation is to be substantially constant, it is obvious that the over-all rate of flow of material to the feeder must equal the overall rate of flow from the feeder. Otherwise, the feeder will become completely exhausted in a time, or material will build up unduly so that it will interfere with the feeder operation. The secret of continuous weigh feeding is to cause a smooth, relatively constant flow of material to the weight-sensitive element of the feeder, the latter mechanism functioning to make continuous and smooth adjustments in this rate of feed, all to the end purpose that material will flow from the feeder smoothly and at a constant rate.

Control of material flow to the feeder is accomplished in either of two general ways, namely: (1) by means of a restriction, such as a gate placed in the passage between the feed hopper and the belt, or (2) by controlling the amplitude of vibrations in a vibrating deck placed between the feed hopper and the belt. Control in either case can be accomplished electrically or mechanically.

A unit in which the rate of flow of material to the belt is controlled by changing the position of a gate over the outlet of the feed hopper is shown diagrammatically in Fig. 1. Note that the feed gate is linked mechanically to the pivoted belt frame so that a downward tilt of the belt, resulting from the load running too heavy, will automatically cause partial closing of the feed gate. The reverse action occurs when the load runs light. Thus, the feeder automatically compensates for changes in the feed material to maintain an overall constant weight rate of feed.

A unit in which an electrically controlled vibrating deck is employed to charge the pivoted belt is illustrated schematically in Fig. 2. When properly adjusted to the desired feeding rate, the scale beam is level and neither the over- nor the under-contact is made. When the belt tilts downward, indicating that the flow of material is excessive, the over-contact at the end of the scale beam makes, which actuates a rheostat, decreasing the amplitude of vibrations in the deck and hence throttling the flow of matrial to the unit. When the belt tilts upward, indicating a deficiency in the flow of material, the under-contact makes, which increases the amplitude of vibrations,

resulting in an increased flow of material.

The units are available with two types of adjustments for changing the rate of feed, namely: (1) a constant speed belt with adjustable counterpoise, or (2) a variable speed belt with constant counterpoise. The first arrangement is most commonly used, since it is the simplest and least expensive. The adjustment can easily be made by the operator. The second arrangement is employed where adjustments must be made from a remote point and usually is used where the proportioning of several ingredients is required.

Pivoted belt feeders are available with numerous accessory devices and refinements, including: (1) counters which totalize the flow, (2) recorders which provide permanent records of the flow rate, (3) no-load cut-offs which automatically stop the feeder and sound an alarm should the material supply become exhausted, (4) flush control (Syntron), which automatically corrects for sudden flushing of materials from the feed hopper, and (5) attachments for proportioning liquids with solid materials.

The loss-in-weight type feeder is based upon the rate of weight loss of a hopper or tank rather than upon the instantaneous weight of a moving conveyor belt. In essence, the feeder comprises a hopper or tank suspended from scale levers, a means for throttling the flow of material from the hopper or tank, and a scale beam with electrically driven counterpoise which fixes the rate of flow from the unit. The hopper must be recharged periodically.

#### LOSS-IN-WEIGHT FEEDERS

As the counterpoise slowly travels along the beam, it tends to unbalance the beam at the rate at which feeding is desired. The scale and beam can be brought back to balance only by causing material to flow from the hopper or tank, resulting in a loss of weight. Various means are used to translate the scale beam unbalance into movement of the hopper gate or tank valve. In one system, this unbalance is detected by the flapper mechanism or free-vane of a pneu-



Fig. 1-Hardinge weigh feeder with mechanically interlocked gate type feed

matic control instrument, resulting in corrective action by means of a valve positioner and diaphragm control valve, where liquids are handled; or a gate-positioning power cylinder, where solid materials are handled.

The capacity of this type of feeder is limited only by the scale lever system which supports the hopper or tank. As with the pivoted belt type feeder, numerous refinements and accessories are available.

#### WEIGH-FEEDERS ARE NOT SCALES

It is important to note that the devices just described are termed weigh feeders and not scales. There is an important distinction between these two terms in that weigh feeders are not recognized by weights and measures officials as scales and, there-fore, can not be sealed. Feeders utilize the weight of a flowing material to make adjustments in feeding so that a relatively constant flow-on a weight basis-is obtained. Note, however, that these feeders do not weigh first and then feed, but feed first and then check and adjust that feed through weighing. Although many of these feeders cause a substantially constant flow over a given period, with the over- and underweight increments of feed averaging out, it can not be stated that the flowing material has been truly weighed and, hence, feeders can not be classified as scales proper. For feeding critical processes, weigh feeders may be checked periodically by collecting a stream of material over a timed period and weighing the collected material on an accurate scale.

#### CONTINUOUS PROPORTIONING

The weigh feeders just described are commonly used for continuously proportioning two or more ingredients, solids, or liquids, to a process.

Proportioning Solid Materials—In cement manufacture, for example, it is desirable to weigh-proportion limestone and shale in an early stage of the process, and later to weighproportion gypsum and clinker. Pivoted belt feeders are adapted to these applications.



Fig. 4-Loss-in-weight continuous feeder proportioning Ethyl fluid to gasoline

Limestone and shale generally are proportioned ahead of the grinder so that advantage of the mixing action during grinding can be taken. In addition to weigh-proportioning these ingredients, the efficiency of the grinder must be considered. Two main theories have been advanced regarding crusher and grinder efficiency, namely: (1) Kick's law which assumes that the energy required for crushing materials is proportional to the logarithm of the ratio between the initial and final diameters, and (2) Rittinger's law which is based on the assumption that the energy required for crushing is proportional to the surface sheared. It is obvious, therefore, that simply feeding a crusher or grinder at a constant weightper-time, or volume-per-time rate will not assure operation of the machine at maximum efficiency.

Some efforts have been made to measure the amperage of the current drawn by the driving motors of the grinder and to control this amperage to maintain constant grinding efficiency by adjusting the rate of feed to the grinder. Obviously, controlling the feed at a constant weight rate will substantially aid in smoothing out a grinder control system. Weigh feeding for this application has three major advantages, namely: (1) provides an accurate basis for proportioning the ingredients, (2) aids in maintaining the grinder at constant efficiency despite variations which may occur, and (3) the totalizers or recorders on the feeder supply valuable production and cost accounting data.

#### DUST TIGHT CONSTRUCTION

Two continuous weigh feeders of dusttight construction, one for feeding limestone and the other for feeding shale, arc illustrated in Fig. 3. Both feeders discharge to a common grinder which is controlled on the basis of amperage required. The weighbelts of the feeders are driven by Selsyn motors which are interlocked with the grinding circuit, such that their speed is reduced if the amperage required by the grinder goes up, and is increased if the amperage goes down. The units are adjusted, of course, to maintain a constant weight proportion of limestone to shale regardless of the belt speeds.

Proportioning Liquid Materials—Blending tetraethyl liquid with gasoline is an example where the loss-in-weight type feeder finds application. In the installation illustrated in Fig. 4, an Ethyl fluid storage tank of 8,500-gal. capacity is mounted on a 60ton built-in scale. The unleaded gasoline, on its way from storage to the Ethyl blending unit, passes through a venturi tube which, in connection with a differential type flow meter, measures the flow of gasoline. Changes in this flow are transmitted as electrical impulses to the counterpoise driving motor on the scale beam, which





CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

drives the poise at a slower or faster rate as required. Unbalance of the scale beam is detected by a pneumatic control instrument which throttles the amount of Ethyl fluid passing through a diaphragm control valve. Thus, correct proportioning is constantly maintained regardless of a changing gasoline flow.

The unit also incorporates a system of safety devices and audible alarm signals, which sound in case of eductor pump failure, air pressure failure, vacuum failure, and high or low scale beam. In connection with the latter alarms, it is to be noted that the scale beam is level when correctly operating, thus the reason for high and low alarms.

#### AUTOMATIC WEIGH-BATCHING

Automatic batching scales are used widely in batch and semi-continuous processes to automatically weigh out a single batch or a series of batches of materials. Processes requiring systems of this type include the batching of ingredients for rubber, glass, alloy steels, explosives, etc. By interlocking several automatic hopper scales, a system capable of batching several ingredients, completely automatic in timing and operation, can be engineered.

An automatic hopper scale consists essentially of: (1) a storage space, usually in the form of a hopper or bunker, for supplying material to the scale, (2) a means for feeding material to the scale, (3) an automatic device to start and stop materials running into the scale, with provision for dribbling the last amounts of feed into the weigh hopper, (4) a weigh hopper, suspended from the scale lever system, (5) a device for continuously counterbalancing and indicating the load in the weigh hopper, and (6) a means for discharging material from the weigh hopper to the process. The counterbalancing mechanism often takes the form of a double-pendulum which is common in conventional dial type scales.

Fig. 5—Batching scale on a portable gathering car for rubber compounding



The principal methods for feeding materials to the weigh hopper include the gate feed, screw feed, conveyor belt feed, and vibrating feed. The latter type is best suited to close control, especially where materials which tend to arch and flush are handled, and therefore, is in common usage.

#### TREND TO AUTOMATIC

Early efforts for correct proportioning of raw materials in batch processes often consisted of the foreman directing a workman to fill a large box or hopper to a crudely marked level with the desired ingredients. Materials used in smaller quantities were measured by equally inexact methods. As the needs for better yields and higher product quality became greater, the large box or hopper was mounted on a scale platform and an immediate improvement in the uniformity of proportions was obtained. Batch proportioning by this latter method required that supply bins be closely grouped around a centrally located weigh hopper.

Several of the obvious inconveniences of the above arrangement were relieved by rearranging the supply bins, locating them in a line, one beside the other, and over a batch gathering tunnel. With this arrangement, a portable gathering car, as illustrated in Fig. 5, equipped with a scale, could operate below the bins, collecting the materials one at a time. Aside from the improvement in batch handling conditions, the major change was that the earlier fixed weigh hopper and scale were converted to a portable unit, acting as a scale and as a truck. There were two serious disadvantages to this arrangement, namely: (1) smaller quantities of more critical materials were weighed on a scale designed for the much larger quantities, resulting in inaccuracies, and (2) use of the scale as a truck with attendant rough handling in a generally dusty and abrasive atmosphere, quickly tended to destroy the original sensitivity of the scale.

The above objections were overcome by installing a dial scale of the proper capacity and sensitivity under each supply bin, with no scale on the traveling batch car. Weighing accuracy was improved and scale maintenance was reduced. With reliance on the accuracy of manual weighing as required by this system, however, great care was required in hiring reliable operators. It was often found, for example, that the operator omitted some ingredient from the batch, or weighed two portions of some other raw material. Frequently, these errors did not show up until later in the process, sometimes several hours after weighing. In any event, the errors usually were discovered too late to make the required corrections. These stages in the development of automatic batching are cited because even today, there are many plants which still employ such antiquated batching systems. Two major improvements remained to be made: (1)



Fig. 6 — Mercury-magnetic contact manufactured by the Toledo Scale Co.

elimination of the human error in weighing, and (2) speeding up of the batching operation.

#### MODERN BATCHING SYSTEMS

As indicated above, the accuracy and sensitivity of the conventional dial type scale are quite satisfactory for batching operations. Many modern automatic batching systems, therefore, use scales of this type, equipped with automatic controls to render them and the weighing operations which they perform almost totally automatic. The two general types of electrical controls used are the mercury-magnetic cut-off, and the photo-electric cut-off. Since these controls can be adapted to nearly any standard dial scale they provide an extremely wide selection of scales for automatic batching operations.

Both types of cut-offs allow the scale to make or break one or more contacts when the desired quantity of material has been weighed on or off the scale. These electrical contacts may be used to start or stop a conveyor, a vibrating feeder, a pump, to open or close a valve, and frequently to perform other process operations, such as opening or closing a furnace door, or starting or stopping a mixer.

Mercury-Magnetic Cut-Off—With this arrangement a mercury-magnetic contact, illustrated in Fig. 6, is used. This contact comprises a small vacuum tube in which is contained a drop of mercury and a flexible wire, the end of which contacts the mercury when in a closed position. On the flexible wire is mounted a magnet armature, which draws the wire out of the mercury when subjected to magnetic attraction, causing the electrical contact to be broken. The contact tube is mounted on an adjustable bracket located at the lower section of the scale dial housing diametrically opposite the zero position on the dial and very close to the plane of dial indicator travel. A small permanent magnet is attached to the scale indicator by a small arm and when the indicator is in the zero position, the magnet attracts the armature on the flexible wire in the vacuum tube, causing contact to be broken.

In operation, with no load on the scale, a poise on the beam is set to the desired weight, whereupon the dial indicator revolves in a clockwise direction from the zero graduation and comes to rest at a position on the dial equivalent to the poise setting. The load is then applied to the scale whereupon the indicator revolves back toward zero in a counterclockwise direction and cutoff takes place when the indicator reaches the zero graduation.

Where feeding rates to the scale are quite rapid and where there is little time to accumulate material on the scale, a double cutoff is employed. This arrangement simply consists of one contact mounted in the zero position and second contact mounted several dial graduations away from zero. In this manner, the zero contact causes a final cutoff of the feed, but the other contact causes a dribble feed, thus eliminating the chance of overweight in the batch.

Photo-electric Cut-Off-In this arrange-ment, as shown in Fig. 7, an interceptor is incorporated on the scale dial indicator shaft and revolves about the dial just as the indicator revolves. A photo-electric cell is mounted on the scale head so that the light-sensitive portion directly faces a section of the dial. When the interceptor passes between this section and the photoelectric cell, an electrical contact is made or broken, as required by the process. Dribble feed is accomplished by incorporating a slit in the interceptor so that two contacts are made by the photo-electric cell, the dribble contact being made a few graduations before the zero position is reached. The position of the interceptor is adjusted by

Fig. 7—Photo-electric cut-off used in dial type automatic batching scale



means of a center knob, accessible from outside the scale dial.

Where it is desired to automatically control the feeding of the scale as well as the discharging operation, two photo-electric cells are mounted on the head and two interceptors are used.

It is important to note that both the mercury-magnetic and photo-electric cutoffs enable the scale to actually weigh material out of the hopper, insuring delivery of the correct amount of material to the process. This arrangement is to be contrasted with equipment in which the material is accurately weighed into the hopper, but where the discharge of material from the hopper is not a weighing operation. Thus, complete delivery of the weighed material to the process may not always take place. With the latter arrangement, it is quite possible for a pocket of material to be weighed time after time, causing each batch to be short by that amount. Where materials are actually weighed out of the



Fig. 8—Toledo's central control panel for automatic weigh-batching system

hopper, a small amount of material often is purposely allowed to remain in the hopper after each batch as an aid to overcoming flushing conditions.

#### CENTRALIZED SYSTEMS

With automatic batching systems, a single operator controls the entire batching operation as well as the movement of the batch, from a central control panel of the type illustrated in Fig. 8. This includes the movement of materials from the time they leave the supply bins to their delivery to the process. In this way, complete responsibility for accurately proportioned batches is centralized in a single skilled operator. The centralized automatic batching system decreases both the time and labor required for batching, increases the overall accuracy of batching, and makes possible the elimination of dusty conditions and chances for contaminating the batch.

The following systems are described to illustrate the wide possibilities obtainable with automatic weigh-batching systems.

The only way to defeat the effects of inhomogeneity in glass production is to provide thorough uniformity of materials handling from hour to hour and from day to



Fig. 9—Automatic suspension hopper scale used in glass batching systems

day. If the various ingredients are permitted to vary even over a narrow range, one day the glass may be filled with batch stones, while the next day it may be filled with seeds and blisters, and perhaps the next day lumpy and cordy glass may be the result. It has been pointed out that the predominant day-to-day fluctuations in glass production are principally dependent on the batch house and its associated weighing equipment.

#### **GLASS BATCHING**

Consider a plant with a capacity of 200 tons of glass per day, batching on an 8hour shift. This represents approximately 90 batches of 5,000 lb. each every 8 hours, or an average of over 11 batches per hour. An automatic batching system should be designed, therefore, to produce at least 12 such batches per hour.

Five major ingredients go into the preparation of the glass, in approxately the following proportions: Sand, 1,500 lb.; soda ash, 550 lb.; dolomite, 500 lb.; feldspar, 140 lb.; cullet, 2,310 lb., totaling 5,000 lb.

The following automatic dial type suspension hopper scales, of the type illustrated in Fig. 9, will handle the above ingredients. For weighing sand, one 2,000-lb. scale with 2-lb. graduations; for weighing soda-ash and dolomite, two 750-lb. scales with 1-lb. graduations; for weighing feldspar, one 250-lb. scale with  $\frac{1}{4}$ -lb. graduations; for weighing cullet, one 3,000-lb. scale with 5-lb. graduations.

The ingredients are stored in silos arranged in a line. Materials feed through the scales to a conveyor type gathering belt, which delivers them to a skip hoist, the latter elevating them to a mixer. The mixer is discharged by an operator into batch cans on a monorail. The weigh hoppers are fed and discharged by means of vibrating feeders. The entire batching system is controlled from a central panel. Electrical interlocks are provided to insure the following conditions:



Fig. 11—Scale with large dial and graphic recorder used to proportion Monooil ingredients for TNT production

1. Before the scales will weigh out a batch, the previous batch must be discharged.

2. Before the scales will discharge: (a) all scales must weigh out the desired load, (b) the conveyor belt must be running, and (c) the skip must be in the loading position and must have ascended since the last time the scales discharged.

3. Before the skip will ascend: (a) definite time interval must elapse after the discharge of the last scale, and (b) the mixer must be in the mixing position and must have discharged since the last movement of the skip.

4. Before the mixer will discharge: (a) the batch must be mixed for a definite time, and (b) a batch can must be in position and the previously filled can must be moved.

#### RUBBER BATCHING

One modern rubber batching installation comprises a total of eight scales and is capable of automatically serving two Banbury mixers. The scales employed include two 500-lb. platform scales with  $\frac{1}{2}$ -lb. graduations for weighing rubber; two 25-lb. bench scales with 1-oz. graduations for weighing pigments; one 50-lb. suspended hopper scale with 1-oz. graduations for weighing carbon.

Weighing rubber on the platform scales is one of the few manual operations required by the system. Pigments are fed to the scales by means of vibrating feeders. Three conveyors are required, namely: two rubber conveyors, each of which serves a Banbury mixer, and one reversing pigment conveyor, which serves both mixers. Each pigment chute empties into a vibrating feeder and each chute is equipped with a bin level indicator, a vibrator to insure constant flow, and a star feeder or bin check valve to prevent flushing of the materials. Once the scales are adjusted for a series of batches, operation of the system proceeds as follows:

(1) Rubber is placed on the platform scale manually according to compounding pointers, until the total desired weight is satisfied and indicated by a tolerance signal light on the scale. The rubber conveyor will now start when called upon by the Banbury operator.

(2) The Banbury operator presses a start button which sets the rubber conveyor into motion, providing: (a) the Banbury has been previously discharged, (b) the Banbury ram is up, and (c) the Banbury gate is closed. The starting of the conveyor is electrically interlocked with the above functions.

(3) The rubber conveyor runs for a given intervals of time, as determined by a timer, which is set at the time the system is installed. Thus, the rubber is discharged into the Banbury.

(4) The pigment conveyor starts, providing all pigment scales have received the loads for which they are set. The direction in which the pigment conveyor moves is dependent upon the control station from which the starting impulse is received. At the end of a given interval, as determined by another timer, the pigment conveyor stops.

(5) After each pigment scale is discharged, it is automatically refilled, ready for the next batch, providing an automatic counter, set for a given number of batches, does not lock out the system.

In industries, such as the manufacture of drugs and pharmaceuticals, batching is the basis of the entire operation. Although batching efficiency, which is a direct result of automatic batching systems, is desired, time savings are sacrified in favor of extreme accuracy and precision. For most industrial products, the automatic systems are entirely satisfactory. In drug manufacture, however, it is mandatory that each weighing be supervised by one or more persons, who generally are registered pharmacists.

#### MANUAL BATCHING

Throughout the processing of pharmaceuticals, weight is a major criterion of the control division. The weight of a final batch of material, such as a batch consisting of thousands of tablets, must tally-within extremely close tolerances-the total weight of the various ingredients called for by the formula. To maintain the weight balance under complete control, weighings are made after each major operation and at each point of inter-transfer within the plant. The importance of the final weight balance can best be illustrated by the fact that a large batch of a final product, valued in thousands of dollars, can not be released to the market until any and all deviations from the weight balance are fully investigated and explained to the satisfaction of the control division. Naturally, the management of a pharmaceutical plant desires to keep such investigations to a minimum and has found that frequent step-by-step weighings during the course of manufacture are the best insurance against discrepancies.

For ease in handling quantity and cost calculations, the standard formulas are usually expressed in lbs. and decimal fractions thereof. Most manufacturers consider it good practice to express formulas in one basic unit and never to express part of the formula in lbs. and the remainder in oz. or other units. The convenience and lower

Fig. 12-Moving sheet can be weighed on this Toledo checking scale





Process vessel, mounted on scale, used in manufacture of penicillin

possibility of errors with this system are obvious.

At one time, pharmaceutical manufacturers used volumetric measurements to some extent in the handling of liquids, but modern trends have practically eliminated this practice. Handling of liquids on a weight basis eliminates the use of volumetric units in formulas and has led to a general increased accuracy in compounding and a greater simplicity in handling calculations.

The industry long ago displaced beam type scales in favor of automatic dial scales and the present trend is toward the use of automatic printing scales, which produce neat, clearly printed weight records. Duplicate and sometimes triplicate records of each weighing are required in the drug industry. The value of printing scales for such rigid accounting is immediately evident. These scales accommodate printed forms of various sizes and shapes so that the accounting and control departments can design a form most suitable for their filing systems.

#### GRAPHIC RECORDING

The preparation of mono-oil for TNT requires accurate proportioning of toulene, sulphuric acid, and nitric acid. These materials are proportioned from overhead suspended weigh tanks, as partially illustrated in Fig. 11. The scales are equipped with mercury-magnetic cut-offs which stop the pumps when the desired weight of material has been withdrawn from the tanks. Note the extra large indicating dials and also the graphic recorder located atop the scale dial housing. These recorders provide permanent records showing the time of weighing and the actual weight of each ingredient. The records are invaluable to the production superintendent when checking operations, especially during the night shift, and also when checking the causes of production difficulties.

Automatic scales may also weigh a continuously moving sheet of material and thus provide a means of checking material den-

sity, thickness, gage, etc. If the weight is not within desired tolerances, electric signal contacts are made to warn the operator of an unsatisfactory condition.

The scale illustrated in Fig. 12 consists of: (1) three rollers, supported by a rigid frame and lying in the same horizontal plane, the middle roller being the live or weigh roller, (2) scale levers supporting the weigh roller, (3) a scale beam with movable poise for adjusting the scale, (4) an over-under indicating head, and (5) electrical contacts which operate warning signal lights or alarms.

#### CONTINUOUS CHECKING SCALES

In operation, the moving sheet of flexible material passes over the three rollers. The weight of the material between the two outside idler rollers is divided among the three rollers as follows: 2 of the total weight is supported by each of the idler rollers and  $\frac{1}{2}$  is supported by the weigh roller. Thus, if four yd. of material lie between the two outside rollers, the weight of two yd. is supported by the middle roller. Since the middle roller is connected directly to the scale levers, it is the weight of the two middle yd. of material that is indicated by the scale. This condition is true, of course, regardless of whether the material is moving or at rest.

The load represented by the desired weight of the material being weighed is counterbalanced by an appropriate pendulum mechanism connected to the scale levers and equipped with a pointer which moves over a chart and automatically indicates any trends from the predetermined correct weight. The pointer indicates zero only when material of the desired weight is passing over the middle roller. Movement of the indicator is sufficiently great to permit convenient, accurate reading at a distance of from 20 to 30 ft. Where the scale is installed in a relatively dark location, or where the operator's station is a considerable distance from the scale, an illuminated magnifying lens attachment is obtainable.

Tube and tread uniformity in the rubber tire industry are often controlled by means of these scales. This application is illustrated in Fig. 13. Several variables affect the final extruded product, including the operating temperature and pressure of the tuber, speed of the conveyor, adjustments of the die, etc. Weight per running foot of the extruded product is one reliable index of proper extruder or tuber operation. A continuous indication of the weight enables the operator to maintain the equipment in proper adjustment. Automatic temperature controls on the tuber, of course, tend to iron out variations and permit adjustments to be made more quickly.

Scales of this type are used widely in the sheeting of plastic materials and in the rubber and plastic coating of fabrics and paper.

When specifying a scale for weighing and feeding bulk solid materials, the following physical characteristics of the materials should be considered. Then, the weighing and feeding equipment should be evaluated in light of its ability to successfully cope with these characteristics.

#### MATERIALS HANDLING

Arching—Many materials commonly handled in processing, such as lampblack, activated carbon, zinc oxide, titanium oxide, fine soda-ash, and hydrated lime, tend to arch when placed in hoppers.

Arching is best overcome by keeping the individual solid particles continually in motion. This condition can be accomplished by rigidly fixing an electric vibrator to the side of the hopper. These devices operate at a frequency of 3,600 vibrations per minute and with an approximate amplitude of in.

In addition to preventing arching, bin vibrators eliminate air pockets and voids in the hopper that may form when the hopper is filled and also tend to assure a greater

Fig. 13—Built-in scale for continuous weighing tire tubing from the tuber





Liquid components of synthetic rubber are weighed in this installation

homogeneity of the material discharging from the hopper gate. Very few materials are crushed or pulverized so well that all particles are of equal size. In the absence of hopper vibration, the smaller particles and fines tend to segregate and roughly collect in a center cone, while the larger particles roll to the side. Consequently, when the hopper is discharged, the fines will drop out first, while the larger particles will be discharged later. A properly vibrated hopper many help to distribute particles uniformly throughout the hopper. Although an auto-matic weigh feeder will recognize these changes in particle weights as the material is discharged from the hopper, it is logical that performance of the feeding operation will be improved by ironing out variables of this sort.

Flushing-Closely related to arching is the tendency of materials to flush. This

#### Weigh-batching into tank cars



condition is caused by the sudden breaking of an arch or otherwise clogged state. Materials may flow from a hopper satisfactorily even though there may be partial clogging or arching. However, when this condition is relieved suddenly, the material literally gushes forth and floods the feeder or scale.

In many cases, flushing may be prevented by a bin vibrator which eliminates tendencies to clog. This is especially true in connection with light, fluffy materials which flow freely and which are difficult to hold back under any circumstances.

#### USEFUL DEVICES

Sectional check valves, which permit only a small portion of material to be discharged from a hopper at any given time, are frequently used to alleviate a flushing condition. The rotary bin check valve (Jeffrey-Mfg. Co.) illustrated in Fig. 10 comprises a conical hopper which is flanged for direct fastening to the bin bottom. An agitator which rotates on a vertical rotor shaft prevents arching within this conical hopper and with most materials its effect is transmitted for some distance into the storage bin, especially if the bin is also conical. The driven agitator cuts the bottom of the column of material preventing formation of an arch and hence permits the material to flow into the opening. From this opening, the material is swept horizontally 180 degrees by an eight-bladed rotor and is dropped into the valve discharge chute. In practice, a vibrating feeder, usually equipped with a vibrating hopper, is located beneath the discharge chute and a motor control in the chute stops and starts the valve to keep a constant supply of material ahead in the feeder.

Some supply hoppers are equipped with air pipes which run along three sides of the lower part of the bin. An occasional puff of air through these lines aids in causing sluggish materials to flow smoothly. Air is applied only when needed, since a continuous flow of air into the bin would cause excessive dusting and loss of material.

Moisture Content-The percentage of moisture in a material to be weighed is important from two standpoints, namely: (1) the presence of moisture affects the texture of the material and, therefore, its handling qualities, since moist materials tend to cling together and usually require vibration to render them free flowing, and (2) materials with varying moisture content often are used in processing operations. In the latter case, it must be stressed that the feeder recognizes only weight and, if part of the weight of the material is due to moisture, less useable material may be fed to a process than is desired. Where extremely critical, frequent moisture determinations should be made and the feeding rate adjusted accordingly.

Density and Uniformity-This condition is a major factor in determining the capacity, belt or hopper size, and accuracy of a scale or feeder. It is immediately evident that a smaller hopper or feeding belt can be used for handling a given quantity of relatively dense material than would be required for a much lighter material. Some idea of the variation in the density of materials com monly handled in scales and feeders can be gathered from the accompanying table. When selecting a feeder or scale, the engineer always should be specific as regards the material density.

Where relatively impure substances are being fed to a process, the variation in percentages of the components in the substance must be considered carefully. If there is a variation of 10 percent in the content of critical material in the feed, the weighing accuracy on that critical material should not exceed 10 percent. The accuracy of the feeder or scale cannot make up for variations in quality of the raw material.

Dust and Toxic Characteristics—Most weigh feeders are available with totally enclosed hoods, designed especially for dusty and toxic materials. Unless specified, however, this equipment normally will not be supplied by the scale manufacturer.

Temperature—Materials can be handled in many types of weigh feeders up to temperatures of 2,000 deg. F. Hot substances, of course, affect the materials of construction used and, therefore, the average operating and limiting temperatures to be encountered should be specified.

#### COST CONTROL

As with the control of other major variables, such as temperature, pressure, pH, etc., affecting chemical processes, weight control properly applied is a tool for decreasing costs, increasing production, and improving product quality.

The cost control department of a plant

#### Fig. 10- Rotary bin check valve



#### **Density of Various Materials**

|   | Dens                         | ity                                    |                      |
|---|------------------------------|--|----------------------|
| Material L  | b. per                       | Cu.                                    | Ft.                  |
| Cork, ground<br>Charcoal, ground<br>Wheat, middlings<br>Cocoa shells  | · 4                          | to<br>10<br>20<br>30                   | 5                    |
| Cinders, ashes, and clinker<br>Salt, coarse<br>Sulphur, ground (200 mesh).<br>Soda ash, dense<br>Calcium, earbide, loose<br>Coment portland | . 45<br>. 50<br>. 60<br>. 77 | 40<br>to<br>to<br>to<br>to<br>to<br>to | 52<br>55<br>62<br>80 |
| Fluorspar, ground (100 mesh<br>Sand, wet<br>Iron ore  | ) 90<br>. 105<br>. 125       | to<br>to<br>to                         | $100 \\ 110 \\ 150$  |

is responsible for keeping costs down and for making certain that full value is received for all expenditures, including those for materials, labor, and a host of overhead factors. First of all, it is necessary that every lb. and oz. of raw materials paid for are actually received at the plant. Secondly, it is necessary that each lb. of material received is converted to useable finished products and that, where waste occurs, such waste be accounted for. The sources and extent of waste must be determined so that steps can be taken to improve efficiency. Scales and flow meters are the major tools for collecting cost data regarding the flow of materials through a plant.

#### RECEIVING

Where an organization spends thousands of dollars annually to support a cost control department, it is absolutely essential that this department use only accredited data. Certified receiving weights make up a part of these data and are one basis upon which plant efficiency is determined. Therefore, great care should be exercised in selecting scales for the receiving department. Several scales with overlapping ranges should be selected so that the percentage of accuracy in weighing is consistent. A high standard of weighing to one part in one-thousand parts is a good standard to adopt.

Blind acceptance of railroad or shippers' weights by the receiving department of a plant is considered poor practice because of various factors. (1) Ever present possibility of unintentional errors on the part of the railroad or shipper. (2) The condition of the railroad's or shipper's scales may not be up to par. Adjustments or repairs may be required, or the accuracy of these scales may not be in keeping with the high standards maintained by the plant receiving the material. (3) Losses through pilferage, leakage, etc. may occur between the point of shipment and the point of receipt. (4) Departments questioned of production inefficiency may claim shortages in starting ingredients as the cause of such inefficiency and, without accurate receiving weights, no proof can be offered against such claims.

Cost of weighing all materials received may be considered prohibitive by management. In such cases, a percentage of all shipments should be checked and the remainder of a shipment judged on the basis of the sample selected. A knowledge of the past performance and frequency of errors made by the railroad or shipper will aid in determining the percentage for sampling.

Accounting of high cost raw materials is extremely important. The importance of accurate accounting of relatively low cost materials, however, cannot be overemphasized. On a percentage basis, there is a definite fallacy in the idea that accounting of cheap materials is not so important as the accounting of more expensive items. This is true because, generally, the lower cost materials are usually used in much larger quantities.

#### USE ACCURATE SCALES

For example, assume that 20 percent of a manufacturer's material costs are for material A, costing \$0.05 per lb.; and that 2 percent of his material costs are for material B, costing \$1.00 per lb. Assume that these materials are used in the following daily quantities:

10,000 lbs. of A at \$0.05 per lb. = \$500.00 50 lbs. of B at 1.00 per lb. = 50.00

Now assume that material A is accounted for to an accuracy of 2 percent, meaning that a daily shortage of  $0.02 \times 10,000$ , or 200 lbs., with a value of \$10, will be tolerated. However, realizing the high cost of material B, management requires that this material be weighed to an accuracy of  $\frac{1}{2}$  percent. There will be a tolerable daily shortage of this material of  $0.005 \times 50$ , or 0.25 lbs., with a value of \$0.25.

Obviously, when weighing in materials, the total value received must be considered primarily, rather than the unit price. It does not make sense to use cheap scales to weigh cheap materials.

The scales in the receiving department vary, of course, with the quantity and nature of materials received. A pharmaceutical manufacturer, for example, may require:



Battery of large weigh-tanks for solvents used in the chemical industry

(1) an analytical balance, with a capacity of 200 g. to weigh extremely small recepits of special concentrates or intermediates, (2) a bench scale with a capacity up to 200 lbs. for weighing canisters, small cartons and packages, (3) a floor scale with a capacity up to 6,500 lbs. for weighing bags, barrels, and drums, (4) a built-in scale with a capacity up to 21,500 lbs. for weighing baled drugs, (5) a railroad track scale with a capacity up to 200 tons for weighing tank cars of alcohol, solvents and other bulk materials, and (6) an automatic hopper scale for receiving coal.

Speed and convenience of weighing are very important in the receiving department. By selecting scales which reduce the time and labor required for weighing, the costs per weighing are reduced, enabling the receiving department to substantially increase the number of items checked daily. Automatic dial scales with large indicating dials should be selected to provide a maximum

Scales used in manufacture of cosmetics



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



Fig. 14—Totalizing conveyor scale employed in weighing bulk tobacco

in reading accuracy and convenience. Beam scales are slow and no longer considered consistent with modern accounting practice, unless equipped with attachments for immediately indicating the weight. The manipulation of poises and the mental calculations required to operate a conventional beam scale are frequent sources of error and impatience on the part of the operator. In many cases, a dial scale with a printing attachment will prove economical because of the increase in weighing efficiency resulting. These scales produce accurate printed records and the time required to make such a record is no greater than that required to simply read the dial manually.

Time also can be saved by incorporating the receiving scale in a continuous conveyor line. Bench scales suitable for weighing in bags, boxes, cartons, and the like are particularly adaptable to roller conveyor lines. A set of rollers is mounted directly on the scale platform so that no lifting is required to place the container on the scale.

Where bulk materials, such as lime, crushed stone, wood chips, tobacco, and the like, are received, a totalizing conveyor



Fig. 15—Even-arm scale used for checking cartons of drug products

scale of the type illustrated in Fig. 14, can be installed directly in a conveyor line. The material is weighed continuously without slowing up the receiving operation. Automatic hopper scales generally are used for weighing coal, although totalizing conveyor scales are also adapted to this application.

#### PACKAGING

Weight control is important in packaging operations, (1) to meet legal requirements insofar as the weight of material in the package must equal or exceed that marked on the package, (2) to insure customer satisfaction and trust, since these are soon. lost when inaccuracies occur, and (3) to prevent shipment of materials in excess of that required, since it is easy to package profits unless close control over this operation is exercised.

A small even-arm scale, as illustrated in Fig. 15, often is used in packing and checking filled packages. A package of the correct weight is placed on one pan and the packages to be checked are placed on the other pan. An over-under indicating chart

Fig. 20-Floor scale with recorder for weighing chlorine drums



indicates how much the package deviates from the standard. Scales of this type have been equipped with automatic electrical signals so that blind operators can perform this operation.

An automatic scale with six separate weigh hoppers and d is c h arge s pouts for p a c k a g ing small quanties is illus. trated in Fig. 16. This unit is fully automatic and continuous, requiring no manual positioning of the containers under the filling spouts. Completely automatic operation is effected by accurately coordinating the action of the conveyor with the scale. The machine illustrated is capable of delivering one-half, one, and two lb. quantities and is suitable for filling cartons, jars, or tins. The machine has a capacity of sixty containers per min. with very close weight tolerances. The conveyor carries a vibrating settler to insure proper packing of the materials. Another weigh packer capable of delivering single drafts, varying from 2 oz. to 20 lb., at a rate from 5 to 10 per min. is illustrated in Fig. 17. This unit incorporates a photo-electric cut-off and vibrating feed.

Automatic scales have been greatly responsible for the reduction of packing costs and the increase of packing speed in the chemical industrics.

Weighing of carbide is illustrated in Fig. 18. The material is fed from a suspension type weigh hopper through a slanting chute by means of a vibrating feeder. The scales are equipped with mercury-magnetic cut-offs so that only the desired amount of material for each drum is fed to the weigh hopper for each cycle. Note that the drums are placed on shaking platforms to insure thorough packing of the material. The operator controls the flow of material through a clam shell type valve so that the material will not overflow the drum before it is properly shaken down. The operator calls for a fresh draft of material when an empty drum is set in place, merely by depressing a push button.

Weighing and bagging of tetrasodium pyrophosphate is shown in Fig. 19. The material is fed from the supply hopper located over the scale. One operator, watching the pointer on the scale dial, controls the manuel valve at the bottom of the hopper. Once filled to the proper weight, the bag is quickly transferred to the other operator who sews it.

#### PROCESS ACCOUNTING

Scales are used frequently for directly checking and recording the consumption of materials by a process. In bleaching, sewage and water treatment, for example, the consumption of chlorine is checked in this manner. In many cases, a chlorinator is used to feed the chlorine to the process. One convenient and accurate check on the operation of the chlorinator comprises weighing the chlorine drums. These weights should be checked several times daily and preferably a continuous record maintained. In addition to checking the operation of the chlorinator and providing valuable cost accounting information, these weight records indicate to the operator when the cylinders must be replaced.

Generally, the chlorine cylinders are

placed on large floor scales although in small plants, portable platform scales may be employed. In Fig. 20 is illustrated a floor scale for weighing large cylinders of chlorine. Note the continuous recording instrument placed atop the scale head.

Space does not permit full coverage of the use of scales in cost accounting. Suffice it to say that many of the process industries depend largely upon scales for controlling inventories, scheduling production, paying wages, shipping final products, etc.

#### IMPORTANCE TO ACCOUNTING

Scales which produce automatically printed weight records practically eliminate the human element as a source of weighing errors. The development of automatic dial scales eliminated the need for manual manipulation of poises and the necessary mental calculations on the part of the operator. Even with the standard automatic dial scale, however, the operator is required to record the readings. Manually recorded weight records are subject to (1) carelessness and indifference on the part of the operator, and (2) dishonesty.

Carelessness and indifference are apt to become prevalent where units of approximately the same weight, such as encountered in receiving and shipping operations, are weighed consistently day in and day out. The factor of dishonesty may be encountered wherever the scale operator can gain directly through short- or over-weights, or indirectly by cooperating with other individuals, dividing the gains from dishonest weights. For example, where materials are delivered to a plant, the operator, may feasibly cooperate with the vendor by reporting more materials received than are actually delivered; or where wage payments are based upon the weight of material produced, the scale operator may cooperate with the wage earner by indicating more materials produced than are actually made. While in most cases, it may be assumed

Fig. 16—Hoepner multiple unit weigh-packer available from Consolidated Packaging Machinery Corp.



that the scale operator is honest, progressive manufacturers prefer printed weight records and thus eliminate all doubts regarding this factor. At the same time, printed weight records protect the operator from being falsely accused of dishonesty.

In addition to these factors, printing scales possess the following advantages: (1) neat, legible, uniform records are produced for use by the accounting department, (2) reliance is placed in printed weight tickets by seller, manufacturer, and buyer alike, (3) weighing time is reduced, since the operator need not take pencil and paper in hand. Where labor and management are both vitally concerned with a given weight, as for example, the weight of material mined, produced, etc., acceptance of an accurate automatic printing scale has frequently eliminated the need for two operators at the scale to check and recheck weighings. Some labor management contracts specify that scales of this type be used for measuring production and that wages be paid on the basis of printed weight records.

In selecting a scale, it is first necessary to determine the capacity, size, and style most suited for the job. Once these factors are established, the field of available scales should be judged from the standpoint of excellence in design and construction. The rates of depreciation and obsolescence of scales are usually less than those for most other items of process equipment and, therefore, scale selection should not be made on a basis of small difference in first cost.

#### SELECTING SCALES

Capacity—Automatic dial scales generally are graduated from zero to the total dial capacity, in 1,000 graduations, or approximately that number depending upon the most convenient subdivisions to use for the range involved. For example, a scale with a dial capacity of 1,000 lbs. will have 1-lb. graduations. With this arrangement, at full







#### Fig. 18-Multiple scale (suspended hopper) installation for packing carbide

capacity, the scale will weigh to one part in one-thousand parts, although the scale actually can be read accurately to the halfgraduation, meaning that it will weigh to one part in two-thousand parts.

It is important to note that maximum accuracy percentagewise, is obtained at the top of the dial capacity. For example, a 1,000 lb. load on a 1,000 lb. capacity scale will be weighed with an accuracy of 1 part in 1,000. An 800-lb. load on the same scale will be weighed with an accuracy of 1 part in 800. In other words, no matter what load is on the scale, the scale will weigh to the closest lb., or by reading half graduations, to the closest  $\frac{1}{2}$  lb. Obviously, then, for a load of 400 lbs., a 1,000 lb. capacity

### Fig. 19—Weigh-packing tetrasodium pyrophosphate in bags for shipment



CHEMICAL & METALLURGICAL ENGINEERING · APRIL 1946 ·



Dust-tight pivoted belt feeder used in potash production

scale will not provide the accuracy afforded by a scale with a 500-lb. capacity. On a 1,000 lb. capacity scale, a 400 lb. load will be weighed to one part in 400, while on a 500 lb. capacity scale, the load will be weighed to one part in 800. Thus, it is seen that the capacity of a scale should be selected with reference to the average load to be weighed on it.

Where a variety of items is to be weighed, some thought should be given as to whether one scale will do the job, or whether two or more scales will be required. The items to be weighed during an average day should be tabulated and analyzed and a decision made based on these data.

Size-In connection with floor, built-in, truck, and railroad track scales, the following factors should be considered when selecting the platform size: (1) What is the base size of the average container or vehicle to be weighed? (2) what is the base size of the largest container or vehicle to be weighed? (3) How many containers will be weighed at any one time? (4) What floor space is conveniently available for installation of the scale.

Style-Some factors which should be considered in selecting the style of a scale include: (1) If a streamlined accounting system is desired, specify a printing scale. (2) If the scale dial is to be read from a considerable distance, specify a large, illuminated dial. (3) If it will be convenient to read the scale dial from either of two directions, front and back, specify double indication. (4) If a permanent record of weighings is required, specify graphic recording. (5) If materials must be weighed continuously, specify: (a) totalizing . conveyor scale, or (b) an automatic hopper scale.

(6) If a totalizing conveyor scale or automatic hopper scale is desired, specify totalizing counters so that maximum usage of the scale as an accounting machine will be obtained.

#### LOCATION

The importance of proper installation to scale operation can not be overemphasized. A mediocre scale, properly installed and maintained, will give better results than a good scale poorly installed and given no maintenance. But mediocre results can not be tolerated in modern processing where profits are intimately tied in with weighing accuracy. Proper installation is an investment in weighing accuracy.

Selection of a proper location for a portable scale will be governed principally by the factor of convenience. Often the most convenient location can be determined only through experience. These scales readily lend themselves to moving, portability being one of the major factors in their design. Often it is more convenient to take the scale to the load rather than vice versa. Where scales are moved frequently, several small spaces should be set aside in the plant specifically for storage of the scale when not in use. These spaces should be sufficiently out of the path of vehicles and traffic to prevent possible damage to the scale.

Much more careful consideration must be devoted to selecting a site for a permanently installed scale. The problem should be given the same consideration as would be given to the installation of a large machine tool or piece of process equipment. These scales become a part of the produc-

tion line of the plant and should be positioned so that the weighing operation will be in proper sequence with the other processing operations. Decisions as to the location of the scale should not be the sole responsibility of the scale mechanic, but should be the result of a careful study by the production planning department.

From purely the standpoint of scale operation, the following factors should be considered:

(1) Locate the scale where it will be easily accessible, but not directly in the path of vehicles which do not require weighing. The scale should bear only the traffic which is brought to it for weighing.

(2) Select a location where air currents will not bear on the platform, causing inaccurate readings. This factor is especially important where large platforms are involved and where a scale is located between two floors of a plant. A breeze of five miles per hour velocity exerts a pressure of 0.12 pounds per square foot. If directed at a truck scale platform (40 feet by 10 feet), with an area of 400 square feet, the breeze will exert a pressure of 48 pounds. Such a pressure causes a false reading. If a naturally sheltered location can not be found, a shelter to protect the scale from drafts should be constructed.

(3) Select a floor or road area where the approaches to the scale platform will be level for several feet. While inclines to and from the scale platform are acceptable, the immediate approaches should be level and smooth to avoid bumping each time a vehicle is driven on or off the scale. Care in this respect will eliminate unnecessary horizontal and vertical impacts and hence will reduce the maintenance required.

(4) Except in special cases, a railroad track scale should not be located where the number of cars to be weighed does not exceed 60 percent of the total number of

(5) Locate the scale dial so that it will be easy to read. In dark locations, provide illumination to aid reading.

#### REFERENCES

Benton, W. A., Weighing in the Chemical Industries, J. of S. C. I., Aug. 26, 1927, pp.

Industries, J. of S. C. I., Aug. 20, Aug., pp. 764-7. Ghering, L. G., Refined Method of Con-trol of Cordiness and Workability of Glass During Production, J. of Am. Cer. Soc., Dec. 1944, pp. 373-87. Johnson, S. H., Weighing in Bulk, Indus-trial Management, Dec. 27, 1923, pp. 366-70. Measurement and Control of Process Variables, Chem. & Met. Eng., May 1943, pp. 115-6.

Varlables, Chem. & Met. Eng., May 1943, pp. 115-6.
Pooley, F. H., Some Notes on Weighing and Weighing Machines, J. of S. C. I., Nov. 29, 1929, pp. 1152-6.
Smith, R. W., Testing of Weighing Equip-ment, Nat. Bur. of Stds. Handbook H37, Jan. 31, 1945.

Reprints of this report are available at 25 cents per copy. Address the Editorial Department, Chem. & Met., 330 West 42nd St., New York 18, N. Y.



## "Proof of the pudding ...."

FOR your money's worth in gas processes, deal with the organization that offers tangible evidence of wide, practical experience in the field.

This Girbotol plant is one of many engineered and constructed by Girdler since originating the GIRBOTOL PROCESS for the effective, economical removal of hydrogen sulphide from natural gas.

And the GIRBOTOL PROCESS is one of many gas processes which Girdler designs and builds—processes for gas manufacture, purification, separation, and dehydration—processes involving hydrogen sulphide, carbon monoxide, carbon dioxide, inert and controlled atmospheres, natural gas,

CHEMICAL

ENGINEERS

CONSTRUCTORS

refinery gases, liquid hydrocarbons, hydrogen, nitrogen.

. . . .

For further proof, and for direct evidence of what this wealth of experience means to you, write today giving an outline of your specific problem in gas processing. Get Girdler engineers specialists in gas processing—on the job and be sure you are getting men best qualified for the work.

#### WE DON'T GUESS ABOUT GAS

#### The GIRDLER CORPORATION

Gas Processes Division, Dept. CM-4, Louisville 1, Ky. New York Office ... 150 Broadway, New York 7, N.Y. 1 Over a million gallons per day of Delaware River water are demineralized by the cation-anion exchange process in this gravity flow plant; the top of the vacuum degasifier column is shown at right

> A . Chem & Met PICTURED FLOWSHEET



# SYNTHETIC BEAD CATALYST-

**PNODUCTION** of synthetic bead catalyst by the Socony Vacuum Oil Co., Inc., Paulsboro, N. J., did much to prevent the wartime aviation gasoline program from bogging down at a most critical time. Guided only by laboratory data, and without benefit of pilot plant experience, this plant was built and operating within six months after ground was broken.

Basic raw materials include sodium silicate, sulphuric acid, aluminum trihydrate, and demineralized water. Fluid chemicals are received by barge and pumped to storage tanks, while dry chemicals are received by rail. River water is purified to remove various catalyst poisons.

Manufacturing the bead catalyst consists of several steps: (1) Preparing the raw materials into the two gel forming solutions; (2) continuously blending the two solutions in correct proportions to form separate drops of gel, each of which becomes a bead after further treatment; (3) wet heat-treating, base exchanging with aluminum sulphate, and washing the raw beads; (4) drying the processed wet beads; (5) final drying, followed by tempering the dried beads at elevated temperatures; (6) screening, bulk storage, packaging and shipping.

Gel forming solutions consist of acid-alum and sodium silicate. Aluminum sulphate is prepared from aluminum trihydrate and sulphuric acid then diluted with water to form the base exchange solution. Sulphuric acid is added to this to obtain the acid-alum solution used in gelation. Sodium silicate solution is prepared by diluting "N" brand silicate of soda with treated water. The two forming solu tions are metered to the mixing head on each forming tower. Here they are mixed to form a liquid hydrogel which emerges from the nozzle and distributes evenly over a fluted cone dividing into a large number of individual streams. These streams flow directly into a layer of oil, where they break into droplets forming beads.

Freshly formed beads are sluiced from the bottom of the forming towers into a flume leading to the wet processing tanks. Here the processing takes place in three stages, namely, hot water treating, base exchanging and final washing. Hot water treatment sets the structure and controls the density of the finished beads. Base exchanging removes the zeolitic sodium present in the raw beads, replacing it with aluminum. Final washing removes sodium sulphate and other soluble salts. Hot water treating takes place in a closed system while washing and base exchanging consist of a multistage, countercurrent operation.

Completely processed beads are sluiced to the dryers where the beads are dewatered and dried to 10 percent moisture. Then they pass to the tempering kiln where fina. drying takes place and where they are held for a soaking period at high temperature to relieve the stresses caused by the drying operation. This imparts ruggedness and good wearing quality to the finished catalyst. Tempered beads are then transferred to the screen house atop the storage silos where the fines are screened out. After storage the beads are weigh-packaged into moistureproof, multiw. It bags for shipment. For a more detailed recent of the complete process turn to pages 94 to 98.

CHEMICAL & METALLURGICAL ENGINEERING

April, 1946 PAGES 138 TO 141

# All Drip and Drain Piping ... from the Complete Crane Line



Drip lines should be erected with the same care that's given to main steam lines. They're part of each other; steam efficiency depends equally on both. Thus, for boiler piping especially, the *complete* Crane line is preferred because of these exclusive advantages:

#### ONE STANDARD OF QUALITY ONE RESPONSIBILITY ONE SOURCE OF SUPPLY

All the valves and fittings, in brass, iron, or steel—the pipe, fabricated piping and accessories you need to install a boiler—one order to your local Crane Branch or Wholesaler covers everything. One responsibility for all materials—Crane—simplifies and speeds the job. Crane uniform quality assures the uniform dependability you want in all boiler lines.

Whether your needs be usual or unusual, Crane supplies them from the world's greatest selection. And what Crane can do to give you better power piping, it can also do for all piping systems in your plant.

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill. Branches and Wholesalers Serving All Industrial Areas

TOURBINE

(Right) AT THE HEAD OF THE CLASS for steam services — Crane 300-pound Alloy Steel Wedge Gate Valves. Supplied with Exelloy to No. 49 Nickel Alloy seating for steam, water, gas or air up to 850° F. maximum; with Stellite

FOR EVERY PIPING SYSTEM

maximum; with Stellite to Stellite, for steam up to 1000° F.; and with Exelloy to Exelloy, for oil and oil vapor up to 1100° F. Screwed, flanged, or welding ends. Your Crane Catalog gives complete specifications.

EVERYTHING FROM ....

VALVES • FITTINGS PIPE • PLUMBING HEATING • PUMPS CRAN





ing; alum tanks are lead lined while all are equipped with eductor mixers process liquors; many corroded parts were replaced with Lucite smaller streams which form beads while falling through the oil

2 Tile-insulated storage tanks keep dilute aqueous solutions from freez- 4 Corrosion resistant pumps handle the forming solutions and



6 Resin coated plaster of paris cones divide liquid hydrogel into



3 Under certain conditions this steam jet unit is used to refrigerate the forming solutions; piping hookup permits unit to be bypassed



5 Electronic rotameter controllers maintain the flow of forming solutions within 0.5 percent



7 Operating floor above wet processing tanks; approximately 125 tons of lead pipe and equipment are used to prepare and handle processing fluids







8 Wax coated steel flumes transfer beads; rubber hoses are raised or lowered to stop or start flow, eliminating many valves



10 Heat treating in kiln relieves internal stresses to improve bead quality



11 Fines and broken beads, less than 5 percent of total production, are screened out





fines; note skip hoist, at upper right



13 Beads are filled, weighed into multiwall, moistureproof bags and loaded into box cars



1 Ov water excha of the



CENTRIFUGES

construction of an and the plant of the organization of the organization of the plant data wanted by the organization of the plant data with the organization of the plant of the organization of the organiza

## FOR CAUSTIC OR ACID IREATMENT OF OILS PRIOR TO CENTRIFUGING

FLOW DIAGRAM COMMERCIAL

Continuous AUTOMATIC PROPORTIONING WILL WORK FOR Uou

TREET.O.CONTROL

The *principle* of continuous, automatic proportioning is *working* in this %Proportioneers% flow responsive system for treatment of oils. Automatic, accurate and flexible in application, this Treet-O-Control system is *working* with spectacular success.

MALWASH

Look to %Proportioneers, Inc.% for continuous, automatic treating and blending equipment and for engineering service to develop production line-processing.

Ask for Bulletin 1700

6 PROPORTIONEERS. INC. %

WRITE TO %PROPORTIONEERS, INC.% 29 CODDING ST., PROVIDENCE 1, RHODE ISLAND • APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

Ě

# All Drip and Drain Piping ... from the Complete Crane Line



Drip lines should be erected with the same care that's given to main steam lines. They're part of each other; steam efficiency depends equally on both. Thus, for boiler piping especially, the *complete* Crane line is preferred because of these exclusive advantages:

#### ONE STANDARD OF QUALITY ONE RESPONSIBILITY ONE SOURCE OF SUPPLY

All the valves and fittings, in brass, iron, or steel—the pipe, fabricated piping and accessories you need to install a boiler—one order to your local Crane Branch or Wholesaler covers everything. One responsibility for all materials—Crane—simplifies and speeds the job. Crane uniform quality assures the uniform dependability you want in all boiler lines.

Whether your needs be usual or unusual, Crane supplies them from the world's greatest selection. And what Crane can do to give you better power piping, it can also do for all piping systems in your plant.

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill. Branches and Wholesalers Serving All Industrial Areas

> (Right) AT THE HEAD OF THE CLASS for steam services — Crane 300-pound Alloy Steel Wedge Gate Valves. Supplied with Exelloy to No. 49 Nickel Alloy seating for steam, water, gas or air up to 850° F. maximum; with Stellite

FOR EVERY PIPING SYSTEM

maximum; with Stellite to Stellite, for steam up to 1000° F.; and with Exelloy to Exelloy, for oil and oil vapor up to 1100° F. Screwed, flanged, orwelding ends. Your Crane Catalog gives complete specifications.

TOURBINE

EVERYTHING FROM ...

VALVES • FITTINGS PIPE • PLUMBING HEATING • PUMPS CRAN







## RAYMOND BOWL MILL

"Get the most from the coal with the Raymond Bowl Mill" . . . this is today's direct-firing unit that is proving its right to replace fuel oil, natural gas and centralized powdered coal systems, due to its extra operating economies which pay for the installation.

- 1. Uniform pulverization . . . at light or heavy load . . . on any grade or moisture coal.
- 2. Proper drying of the coal in-the-mill while grinding . . . automatic rejection of foreign materials.
- 3. Panel board control, which permits one operator to tend several mills. Lubrication and adjustments may be made while running.
- 4. Quiet, vibrationless, dustless operation . . . month after month without shutdowns.

To maintain peak production, use the Bowl Mill for direct-firing rotary kilns and industrial furnaces.

#### RAYMOND PULVERIZER DIVISION

OFFICES IN PRINCIPAL CITIES

COMBUSTION ENGINEERING COMPANY, INC. 1311 North Branch St. Chicago 22, Illinois

Canada: Combustion Engineering Corp., Ltd., Montreal



# NEW PRODUCTS AND MATERIALS-

R. W. PORTER, Assistant Editor

#### TEFLON

DEVELOPED during the war by E. I. du Pont de Nemours & Co., Wilmington, Del., a new plastic material, tetrafluoroethylene resin, under the brand name of Teflon was used exclusively for military purposes. Teflon is characterized by high strength and resistance properties since it retains its strength and form at higher temperatures than any other known organic material. It resists the action of such reagents as aqua regia chlorosulfonic acid, acetyl chloride, boron trifluoride, hot sulphuric acid, hot nitric acid and boiling solutions of sodium hydroxide.

Its high heat resistance is shown by the fact that when subjected to a temperature of 572 deg. F. for three months, it showed no degradation. It retained all its useful properties at that temperature. It is not adversely affected by temperatures as low as -75 deg. F. Applications of this new plastic will include uses where high resistance to solvents and corrosive agents is required, where heat endurance is of importance and where high frequency electrical insulation is needed. It has been used in jet engines, being the only plastic that will stand up under such high temperatures. It is expected to find wide use in gasket material for high temperatures, tubing and piping for chemical plants, distillation equipment for acids, etc.

Teffon's dielectric qualities make it desirable for conduits which are subject to attack by corrosive materials and also may be used as the basis for coaxial cables, conducting high frequency current for radio, radar and television.

#### Various articles of Teflon



#### CRYSTALLINE SODIUM PENICILLIN

COMMERCIAL production of sodium penicillin in crystalline form has been announced by the Commercial Solvents Corp., 17 East 42nd Street, New York, N. Y. Special crystallization in the final production stage of the penicillin salt has made possible the production of the crystalline product, which has high potency and is heat stable. Refrigeration during storage and shipping is thus eliminated. The potency of the crystalline drug is of the order of 1,400 to 1,500 units per mg. and will be available in single vials of 100,000, 200,000 or 500,000 units. It is white in color and under a microscope the crystals are visible.

Because of the increased purity, dosages as high as 200,000 units have been possible as against dosages of 50,000 to 60,000 units with the former amorphous preparation. Within a few weeks this company's plant will be making crystalline penicillin exclusively.

#### ORGANIC PEROXIDE

An undesirable impurity in petroleum consisting of organic peroxide may now be extracted from petroleum in pure form ac-cording to the Union Oil Company of California, Wilmington, Calif. The new petroleum peroxide marketed under the brand name of Uniperox has a close rela-tion to hydrogen peroxide since it can be regarded as an hydrogen peroxide in which one of the hydrogen atoms has been re-placed by a hydrocarbon radical. Uniperox is a clear liquid, slightly soluble in water but completely miscible with most organic solvents, petroleum products and resin monomers. The oxygen content of different grades various between 7.5 and 12 percent. It can be kept over a year without appreciable decomposition. Uniperox is a good polymerization catalyst in the manufacture of vinyl type plastics, polystyrene, acrylates, GR-S rubber and for the curing of such special resin monomers as Bakelite BRS 16631, Plaskon 911, Laminac 4122-R, Thalid X-530 and Paraplex P-10. Its activity and ready miscibility with resin monomers makes it suitable in the manufacture of low pressure laminates and castings. Another application of Uniperox is its use as an ignition and combustion accelerator for diesel fuels. The addition of 0.5 percent of Uniperox to low grade fuel not only raises Uniperox to low grade rule not only raises the cetane number but improves cold-start-ing. This accelerating effect on combus-tion is explained by the decomposition of Uniperox into chemically active radicals which set off a rapid chain reaction leading to ignition and combustion. The material is also expected to find use as a germicide, fungicide and insecticide.

#### CONTENTS

| Teflon                          | 145 |
|---------------------------------|-----|
| Crystalline Sodium Penicillin   | 145 |
| Organic Peroxide                | 145 |
| Weatherproof Glue               | 145 |
| Tetraphenyl Tin                 | 145 |
| Acrosol Insecticide             | 146 |
| Injection Molding Powder        | 146 |
| Synthetic Hormones              | 146 |
| Leather Cleaner                 | 146 |
| Wetting Agent                   | 146 |
| Alkyd Resins                    | 146 |
| Paraffin Hydrocarbon            | 146 |
| Waterproof Fabric               | 148 |
| Anion Exchange Resin            | 148 |
| Aluminum Foil Laminate          | 150 |
| Shock Resistant Colored Plastic | 150 |
| Foam Plastic                    | 150 |
| Textile Chemical                | 152 |
| Coating Stripper                | 152 |
| Plastic Strip Coating           | 152 |
|                                 |     |

#### WEATHERPROOF GLUE

FORMED by combining the byproduct materials, soybean meal and corn gluten, with a special preparation of water soluble phenolic resin, a new type weatherproof and waterproof glue has been recently announced. It is claimed to be 30 percent cheaper and to have superior binding strength and was developed by the U. S. Department of Agriculture, Northern Regional Research Laboratory, Peoria, III. In all tests, the glue stood up under outdoor weather conditions longer than the pieces of plywood which it bonded. It has been successfully tested on a commercial basis for making plywood. Plywood made with this glue passed the 3-hr. boiling test with surplus strength, and in addition the glue line was not attacked by mold. Known as Norelite, this glue is expected to find wide use in the plywood industry when soybean meal and corn gluten become more plentiful.

#### TETRAPHENYL TIN

SAMPLES of a new chemical compound developed by the Hooker Electrochemical Company, Niagara Falls, N. Y. are now available. Tetraphenyl tin, whose formula is ( $C_9H_8$ )<sub>4</sub>Sn, is an almost odorless, white to light tan, crystalline, free-flowing powder with good thermal stability. Its melting point is 220 deg. C. and its boiling point is 424 deg. C. Decomposition at the boiling point occurs very slowly. It is soluble in ethyl alcohol, insoluble in water. Among suggested uses and applications are as an HCl scavenger for use with stabilizers in chlorinated compounds, as a preservative for mineral oils and as a reagent in chemical synthesis. Some of the properties are given in the accompanying table.

#### Properties of Tetraphenyl Tin

| Pressonation                  | (T)                   |
|-------------------------------|-----------------------|
| Synonym.,                     | l etraphenyl stannane |
| rormula                       | (CaHa) Sn             |
| Molecular weight              | 427.1                 |
| Chlorine content (tynically). |                       |
| nnm                           | 20 to 30              |
| Acidity as HCl (tymiaellar)   | 20 10 00              |
| borcont                       | 0.000                 |
| percence                      | 0.002                 |
| Melting point, deg. C         | 228 deg. ± 1.5        |
| Boiling point, deg. C.        | 424                   |
| Flash point, deg. C.          | 232                   |
| Fire point deg C              | 280                   |
| Dansitat at many town         | 203                   |
| Density at room temp., g.     |                       |
| per co                        | 1.5                   |
| lb. per ou. ft                | 32                    |
| Vapor pressure at 25 deg. C., |                       |
| mm                            | 1 - 10-1              |
|                               | 1 1 10 -              |
|                               |                       |

| ility  |   |
|--------|---|
| Temp.  | G per 100 G.  |
| Deg. C | Solvent   |
| 32     | 0.18  |
| 36     | 0.22  |
| 19     | 0.83  |
| 87     | 1.37  |
| 47     | 0.36  |
| 52     | 0.49  |
| 19     | 0.26  |
| 34     | 0.40  |
| 24     | 0.11  |
| 33     | 0.14  |
| 25     | 0.02  |
| 28     | 0.75  |
| 36     | 0.99  |
| 39     | 0.08  |
| 50     | 0.11  |
|        | insoluble   |
|        | illity<br>Temp.<br>Deg. C<br>32<br>36<br>19<br>87<br>47<br>52<br>19<br>34<br>24<br>34<br>24<br>34<br>25<br>28<br>36<br>39<br>50<br> |

#### **AEROSOL INSECTICIDE**

RECENTLY announced by the Virginia Smelting Co., West Norfolk, Va., a new aerosol insecticide under the brand name of Lethalaire which employs Freon-12 as a dispersing propellent is now available. Active ingredients of this insecticide comprise pyrethrum extract, DDT, methyl aromatic petroleum derivatives and Xylol. It is commercially available in 5- and 30-lb. cylinders with or without the applicator. A special automatic diffuser for permanent installation in rooms is also available.

#### INJECTION MOLDING POWDER

DEVELOPED for use at temperatures above the heat distortion point of unmodified styrene compounds or of Plexiglas, a thermoplastis injection molding powder is now avail-able in limited quantities from the Rohm & Haas Co., Washington Square, Philadelphia 5, Pa. Known as Plexene M., this new powder is claimed to be superior to ordinary polystyrene in weathering properties and in resistance to chemicals as well as having improved machining qualities. Moldings made of this new material do not show the tendency to the crazing characteristics of many unmodified styrene compounds. Plexene M has a heat distortion temperature (192 deg. F.) considerably higher than that of Plexiglas R (167 deg. F.) and stan-dard polystyrene compounds. Residual strengths are lessened by its good flow characteristics; maximum service temperatures of 194 deg. F. should be satisfactory for Plexene M molding except where extreme dimensional stability is necessary. Moldings show low shrinkage.

Strength characteristics are improved over Plexiglas as well as polystyrene molding powders. Six months exposure and 200 hours of accelerated aging had little affect on the shape, dimensions and color of typical standard samples. Plexene M is odorless and tasteless and practically unaffected by acid, alkalies and dilute alcohol and is resistant to gasoline and commercial inks. It is attacked, however, by organic solvents such as acetone and ethylene dichloride. It has a power factor lower than that of Plexiglas but not as low as unmodified polystyrene. Plexene M is light amber in color and translucent and opaque colors ranging from ivory to black are available. Full scale production is expected in late 1946.

#### SYNTHETIC HORMONES

CONSISTING of indolebutyric acid and beta naphthoxyacetic acid diluted with distilled water, a synthetic hormone known as Indol is marketed through the Cleveland Hothouse Vegetable Growers Cooperative As-sociation, Cleveland, Ohio. Used to improve the yield of winter-grown tomatoes, grown in hothouses, this chemical mixture is applied to the first blooms on the tomato plants. A single drop of this mixture on a tomato bloom practically insures a "set" of fruit improving the size and shortening the time necessary for ripening. It is claimed that use of this synthetic hormone will increase the spring crop yield by as much as 15 to 25 percent. It is available in 8-oz. bottles, the contents of one bottle being sufficient for one gallon when diluted with distilled water. This is enough to treat 9,000 plants, the average stand on an acre of ground. It sells for \$16 per 8-oz. bottle and is only avail-able in limited quantities. It is effective only on plants grown under glass and on the first three clusters of blooms only. No advantage is gained by using the chemical on field-grown plants.

#### LEATHER CLEANER

ALL KINDS of leather articles may now be effectively cleaned and toned by use of Leather Lather, a new colorless liquid compound developed by the Link Laboratories, 1015 McGee Street, Kansas City 6, Mo. This cleaning agent contains no wax or petroleum derivative and therefore leaves no grease or oil on the surface of the cleaned object. It is claimed to remove stains from leather articles, to restore original color and softness without rubbing or scrubbing. The active ingredient is a polymerization agent which combines with the dirt and soil to effectively clean such leathers as suede and other fine leather articles. It is available in 4- and 16-oz. bottles and in one-gallon jugs. It will be available through chemical, drug and hardware jobbers.

#### WETTING AGENT

A SULPHATED synthetic ester possessing wetting, softening and rewetting properties has been introduced by the Hart Products Corp., 1440 Broadway, New York, N. Y. Known as Hartex Duofol L this product is a concentrated liquid miscible with water in all proportions, even when cold, whose clear solutions and high surface actions are not affected by hard water, salt, alkali or weak acid. It is claimed to be an outstand-

ing wetting agent at elevated temperatures and is recommended for use in vat or pad dyeing and for other dyeing operations to give greater uniformity of shade. It is said to be effective in producing controlled shrinkage in sanforizing and in obtaining higher slasher speed and greater loom efficiency in rayon warp sizing. Added to print-ing paste Duofol L improves penetration and gives better fastness to soaping. The wetting back property imparted to fabrics by this material renders the fabric highly absorbent. In addition, it acts as a softening agent, making the product doubly useful in sanforizing operations. It is claimed that concentrations as low as 0.04 percent (about 1 oz. per 100 gal. of solution) have proved most satisfactory for most applications.

#### ALKYD RESINS

DEVELOPED to replace Aroplaz 1306, a new alkyd type resin, Aroplaz 1314 has been announced by the U. S. Industrial Chemi-cals, Inc., 60 East 42nd Street, New York 17, N. Y. Aroplaz 1314 contains 12 percent less oil on the solvent-free basis than the resin it replaces, yet exhibits approximately the same qualities. It is suggested for use in architectural and industrial coatings and may be applied by brushing, dip-ping or spraying. It is a hard resin modified, phthalic-free, oxidizing alkyd-type resin of medium oil length. It air dries to hard tack-free finishes overnight and bakes hard in 2 to 1 hr. at 250 deg. F. Finishes prepared with this resin have moderately good flexibility and good resistance to water and alkali. It is pale in color and coatings made from Aroplaz 1314 exhibit high color-re-tentive properties. White enamels made with this new resin approach the whiteness of enamels based on phthalic-alkyd resins. In gloss and gloss retention it is as good in both clear and pigmented films as many similar products. Finishes prepared with Aroplaz 1314, however, have only moderately good exterior durability.

#### PARAFFIN HYDROCARBON

DISCOVERED by the Houdry Process Corp., 225 South 15th St., Philadelphia, Pa., a new paraffin hydrocarbon with the empirical formula  $C_{15}H_{34}$  has been recently announced. Given the name of Houdrane, this new hydrocarbon is a highly branched hexadecane having about as many carbon atoms in its branches as it has in the main chain. Its structure is not definitely established, but its properties are different than any of the other known possible isomeric hexadecanes. Up until now the best known hexadecane is the normal hydrocarbon or cetane. Houdrane shows appreciable differences in its properties from cetane and it is noted that whereas cetane solidifies at +18.1 deg.

1 AL

白田

# **PFAUDLER OFFERS** A Valuable New Heat Exchanger Manual!

# HELPS YOU SAVE TIME

and the TRAFF

Here is a Manual that will help you to figure practically any heat exchanger problem with a great saving in time. The data it contains represents the experience of Pfaudler Engineers who have both designed and used heat exchangers in the Chemical Process Industries. Some of the information does not appear in any text book, represents a real contribution to the technology of the subject. All of the material is arranged to give you quickly the facts needed to figure your heat exchanger requirements.

This Manual is available to you without obligation but we do ask you to indicate your title and to identify company affiliation. Use the coupon below or write us. As supply is limited, don't delay!

THE PFAUDLER CO., Rochester 4, N. Y. Branch Offices: 330 West 42nd St., New York 18, N.Y.; 111 W. Washington St., Chicago 2, Ill.; 1325 Howard St., San Francisco 3, Calif.; 455 Paul Brown Bldg., St. Louis 1, Mo.; 7310 Woodward Ave., Detroit 2, Mich.; 1318-1st Nat'l Bank Bldg., Cincin-nati 2, O.; 1041 Commercial Trs. Bldg., Philadelphia 2, Pa.; 751 Little Bldg., Boston 16, Mass.; Box 982, Chattanooga 1, Tenn.; Enamelled Metal Products Corp., Ltd. Artillery House, Artillery Row London SW. 1, Enalard London, S.W. 1, England.



Please send me a copy of your new Heat Exchanger Manual 837. 87 East Ave., Rochester 4, N. Y. THE PFAUDLER CO. Name Company-

Address-

State

#### CITY. PFAUDLER CO., ROCHESTER 4, THE NEW YORK ENGINEERS AND FABRICATORS OF CORROSION RESISTANT PROCESS EQUIPMENT

Partial list of contents:

Thermal design examples

Praudler

THE PFAUDLER CO. . RO

HEAT EXCHANGE

and CONDENSER

manual no. 837

Temperature correction curves

Heat transfer film coefficients

Physical properties for miscellaneous compounds

Installation, operation and maintenance practices

Advantages and limitations of various types of heat exchangers.



Avoid damage to crushers, grinders, pulverizers and machinery, possible costly shutdowns, injuries to employees by installing Stearns (air-cooled for more power) Magnetic Pulleys. Your best low expense, effective and automatic insurance against the tramp iron nuisance. In all sizes to serve as head pulleys in your conveying system.



Completely self-contained Magnetic Pulley type Separator with belt, tail pulley, frame —or with two magnetic pulleys, depending upon your capacity and separation desired.



# STEARNS MAGNETIC MANUFACTURING COMPANY

629 So. 28 St. Milwaukee 4, Wis.

C., Houdrane remains liquid to a much lower temperature and solidifies to a glass at about -78 deg. C. A comparison of the physical properties of these two paraffins is given in the accompanying table.

| Comparison of  | the      | Propertie   | es of Cetane                                   |
|--|----------|---|--|
| an   | d H      | oudrane   |  |
| (Formula = Cisl  | Hat; 1   | Iol. Weight                                       | = 226.44)                                      |
| Properties<br>Melting pt., deg. C.                                     |          | Cetane<br>+18.1                                   | Houdrane<br>glass @ -78                        |
| Boiling pt., deg. C.<br>At 760 mm.<br>100 mm.<br>50 mm.<br>10 mm.      |          | 287.5<br>208.5<br>188.5<br>147                    | 250.7<br>172<br>150<br>107.5                   |
| D 0/4 deg.<br>D 20/4 deg.<br>dD/dt<br>nD/20 deg.<br>dn/dt              |          | solid<br>0.7750<br>-0.00069<br>1.4352<br>-0.00044 | 0.7985<br>0.7854<br>-0.00065<br>1.4399         |
| Dispersion<br>Sp. dispersion   |          | 76<br>99  | $\begin{array}{c} 76 \\ 100 \pm 2 \end{array}$ |
| Sp. ref. L.L.<br>n - d/2   |          | 0.3368<br>1.0477                                  | 0.3355<br>1.0472                               |
| Kinematic 0 deg<br>viscosity 20 deg<br>in 35 deg<br>centistokes 55 deg | CCCC     | 4.43<br>3.15<br>2.22                              | 8.65<br>4.95<br>3.46<br>2.42                   |
| Absolute<br>Liviscoeity] 20 deg.<br>i in 0 deg.<br>centiposes          | C.<br>C. | 3.43  | 3.90<br>10.83                                  |

#### WATERPROOF FABRIC

DEVELOPED by the Chemical Products Division, of the Goodyear Tire & Rubber Co., Akron, Ohio, a new fabric is said to be mothproof, waterproof, scar-proof and scuff-proof. It is woven from a new thread made from Pliofilm which has heretofore been produced in the form of sheets or film. A Pliofilm fiber is now produced which can be twisted into a thread and then woven into a fabric. The thread can be made in a variety of weights to make possible a wide variety of finished fabrics. The Pliofilm thread made from rubber and hydrogen chloride, forms a tough, elastic, flexible film that is readily sealed and is waterproof. It can be produced in any color and by providing threads of various colors a number of patterns may be obtainable. It is expected that wide applications of this new fabric will find use in making slipcovers for automobiles, airplanes, etc., as well as for luggage, brief cases and on any applications where waterproof and durability are important. Pliofilm fabric will not be placed on the market until natural rubber is again freely available.

#### ANION EXCHANGE RESIN

AN IMPROVED acid adsorbent or ion exchange resin claimed to have wide usefulness in the fields of water conditioning and in numerous applications calling for the removal or recovery of acid has been announced by Resinous Products & Chemical Co., Philadelphia, Pa. Known as Amberlite IR-4B, and closely related to Amberlite IR-4B, and closely related to Amberlite IR-4, its operational characteristics are said to be superior. The new exchanger exhibits an increased rate of exchange, thus permitting higher flow rates during operation. Also it can be regenerated at higher rates than those recommended for Amberlite IR-4 and for certain applications can be regenerated by strong alkalies such as caustic soda. Other advantages include absence from objectionable color-throwing, lower rinse requirements and reduced pack-

# ortho-Nitrobiphenyl plasticizer

| PHYSICAL AND CHEMICAL PROPERTIES<br>(From Typical Analyses) |                                       |  |  |  |
|---|---------------------------------------|--|--|--|
| MOLECULAR WEIGHT  | 199.20                                |  |  |  |
| MELTING POINT   | APPROX. 35°C.<br>(Supercools Readily) |  |  |  |
| BOILING POINT AT 10 MM.                                     | APPROX. 172°C.                        |  |  |  |
| BOILING POINT AT 760 MM.                                    | APPROX. 330°C,                        |  |  |  |
| REFRACTIVE INDEX AT 25°C.*                                  | APPROX. 1.613                         |  |  |  |
| SPECIFIC GRAVITY AT 40° 15.5°C.                             | APPROX. 1.189                         |  |  |  |
| VISCOSITY AT 25°C.*   | 38 CENTIPOISES                        |  |  |  |
| VISCOSITY AT 45°C.  | 12 CENTIPOISES                        |  |  |  |
| WEIGHT/GALLON   | APPROX. 9.9 LBS.                      |  |  |  |
| FLASH POINT   | 143°C. (289.5°F.)                     |  |  |  |
| FIRE POINT  | 179°C. (354.5°F.)                     |  |  |  |

\*Obtained on supercooled material.

SOLUBILITY: Practically insoluble in water (either hot or cold). Readily soluble in-

Benzene Ethyl Alcohol **Methyl Alcohol** Ether Acetone **Methyl Ethyl Ketone** TOXICITY: For information, write for technical bulletin O-D-700.

**Ethyl Acetate Amyl Acetate** Ortho-Dichlorobenzene Carbon Tetrachloride Perchlorethylene **Glacial Acetic Acid** 

**Mineral Spirits** Pine Oil Turpentine **Linseed** Oil Soya Bean Oil Corn Oil



# 1 available

## 2 low cost

## **3** general purpose

Due to its wide range of compatibility, Monsanto ortho-Nitrobiphenyl finds many uses in most types of lacquer and plastic compositions. It can be used alone, or with other plasticizers-and is applicable to the entire range of synthetic resins, from the cellulose esters and ethers through the vinyls and vinyl copolymers. It is compatible with alkyds and some synthetic rubbers.

The low cost of ortho-Nitrobiphenyl-6 cents a pound, in carload lots—is additionally in favor of this all-round plasticizer. It is suggested that you consider its use as:

- (1) A camphor substitute in cellulose nitrate compositions
- (2) A plasticizer in thermoplastic molding compositions
- (3) A plasticizer in lacquer-type coatings to improve water, acid and alkali resistance
- (4) A stabilizer with some plasticizing action in varnishes

Other uses may present themselves when you study the table of physical and chemical properties included here. For example, ortho-Nitrobiphenyl may impart fungicidal properties to the compositions of which it becomes a part.

Samples and technical information will be sent promptly on request. Contact the nearest Monsanto Office, forward the coupon to: MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri. District Offices: New York, Chicago, Boston, Detroit, Charlotte, Birmingham, Cincinnati, Los Angeles, San Francisco, Seattle, Montreal, Toronto.

| Monsanto Cr<br>Organic Chem<br>1700 South Se | IEMICAL COMPANY<br>icals Division<br>cond Street, St. Louis 4, Missouri |
|--|---|
| Please sen                                   | nd, without cost or obligation, samples<br>Vitrobiphenyl, technical.    |
|  |   |
| Name   | and the second second   |
| Name<br>Company                              |   |
| Name<br>Company<br>Street                    |   |

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



ш



LUBRIPLATE Lubricants actually condition bearing surfaces and stop progressive wear. They prevent rust and corrosion and resist steam, hot water, many acids and other adverse conditions. LUBRI-PLATE is in a class by itself. Use it and make one bearing outlive two. Write or phone for facts and figures.

DEALERS FROM COAST TO COAST

#### YOU CAN INCREASE LIFE EXPECTANCY OF ANTI-FRICTION BEARINGS

While manufacturers and users of all types of machinery base operating cost figures on a definite period of time, over which they can safely predict that their equipment will operate, they fully realize the economy that will result from increasing the "life expectancy" of bearings. Ball and Roller Bearings represent a sizable investment. In order to secure a paying return on the investment, considerable care must be exercised in installation and in lubrication. Manufacturers and users of anti-friction bearings have been able to increase the life expectancy of their bearings by the use of LUBRIPLATE Lubricants. There is a reason for this phenomena. Through long and careful research, the manufacturers of LUBRIPLATE have been able to combine all those desirable qualities that are vital to the continuous operation of anti-friction bearings.

LUBRIPLATE Lubricants stay put when applied. They don't drip away nor are they dissipated at high temperatures. LUBRIPLATE maintains an extra protective lubricating film on bearing surfaces at all times and prevents them from scoring. Since LUBRIPLATE sheds water, it provides that necessary protection against the destructive forces of rust and corrosion. A comparatively small amount of LUBRIPLATE does the job-making it economical as well as long lasting. A durable LUBRIPLATE "film" keeps metal surfaces apart, no matter how heavy the load nor how high the speed, and reduces heat and friction, the exponents of wear, to a minimum. Bearings thus retain their newness longer.

Specially developed to meet the operating requirements of antifriction bearings, BALL BEAR-ING LUBRIPLATE provides cool and quiet performance for grease type bearings operating at speeds up to 5000 R.P.M. and temperatures to 300°F. For conditions other than above, consult the LUBRIPLATE recommendation chart. Write for a copy of the "LUBRIPLATE SÉRVICE HANDBOOK" containing valuable information on the subject of lubrication of anti-friction and other bearings. Ady.

ing. It has outstanding resistance to the leaching action of water and solvents and has a wide range of usefulness in deacidification processes where absence of contaminants in treated product is essential. It resists the aggressive action of formaldehyde and formic acid as well as a variety of chemical reagents and solvents. It is available in commercial quantities. Amberlite IR-4B has the following physical characteristics:

| Properties of Amberlit  | e IR-4B                  |
|-------------------------|--------------------------|
| Density, lb. per cu. ft | . 32 to 36<br>. 40 to 50 |
| Screen grading; mesh    | . 20 to 50               |
| Effective Size; mm      | . 0.4 to 0.0             |
| Solubility              | . Insoluble in all       |
| Calas                   | common solvents          |
|                         | · AATTANCA               |

#### ALUMINUM FOIL LAMINATE

A SYNTHETIC thermoplastic resin emulsion adhesive designed for foil lamination has been developed by Paisley Products, Inc., 1770 Canalport Avenue, Chicago 16, Ill. Recommended primarily for roll applicator machines the new adhesive is claimed to bond all grades of aluminum foil to cellophane, acetate, glassine, and various grades of paper and board. It is white in color with a mild odor, weighing 9.70 lb. per gal. It has a viscosity of 400-500 centipoises with a pH of 4 to 4.5. It is soluble in water. This new material produces a flexible, transparent film which is odorless, non-toxic and waterproof. Suggested applications include the manufacture of moisture- and vapor-proof packages, waterproof aluminum foil labels, and other similar uses.

#### SHOCK RESISTANT COLORED PLASTIC

A RANGE of standard colors is now available in the rag-filled melamine-formaldehyde molding material manufactured by the American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y. Known as Melmac 3020 it is claimed to be the first thermosetting, shock resistant plastic available in color. Originally designed to combine strength with electrical and chemical resistant properties, this compound supplied in black is acceptable for many industrial applications. Now that it is available in color, it may be used for the many applications requiring color. Melmac 3020 is now available in commercial quantities. It is suggested for use in washing machine agitators, vacuum cleaner housings, sirup dispensers, shock-resistant food trays, refrigerator dip trays and many other commonly used consumer items.

#### FOAM PLASTIC

ANOTHER addition to the ranks of lightweight plastics is now available in experimental quantities from the E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Designated as CCA, cellular cellulose acetate is suggested for use in the manufacture of airplane floor panels, tail assemblies and wing structures, and in refrigerators, luggage and sections of prefabricated houses. CCA is lighter than cork and combines insulation against heat and cold with highstructural strength when bonded between two sheets of metal, wood or plastic. Thermal insulation properties are approximately



VIBRATION, misalignment or connecting moving parts frequently creates a problem in economically conveying steam, oil, water and other liquids or gases. If such a problem confronts you, try this solution ... install connections of American Flexible Metal Hose or Tubing.

Available in brass, bronze, aluminum, steel and other metals, in sizes 1/8" to 12" I.D., American Metal Hose is manufactured from strip in four spirally wound types. American Seamless Flexible Metal Tubing, flexible as garden hose and as leakproof as the seamless bronze tube from which it is made, is standard in sizes  $\frac{1}{8}''$  to 4" I.D.

Either of these "American" products can be fabricated completely with end fittings to your specifications. You can thus obtain just the type of flexible connection that will best serve your needs.

For detailed information, write for Publication SS-50. In connection with exceptional problems, consult our Technical Department.

merican Metal

THE AMERICAN BRASS COMPANY-American Metal Hose Banch-General Offices: Waterbury 88, Conn. Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.

CHEMICAL & METALLURGICAL ENGINEERING . APRIL 1946 .



Wherever corrosion, excessive vibration, and heat are factors—alert production men choose REX-FLEX stainless steel Flexible Metal Tubing. For it effectively resists corrosion... has the extreme temperatures of stainless steel ... the extra flexibility to withstand prolonged vibration ... and is formable for use for virtually any application.

In scores of general and heavy industry jobs —REX-FLEX is minimizing flexible metal tubing connection failures, delivering topnotch performance. Find out what it can do for you. Write today for full information.



ш

REX-FLEX . . . has all the outstanding corrosion-resistant qualities of 18-8 Austenitic Stainless Steel . . . safely handles many types of corrosive liquids and gases. In addition, it's pressure-tight . . . so there's no dangerous, wasteful leakage.



REX-FLEX ... is easier to install, for it is manually bendable in multiple planes. Flanges and fittings are seam welded to form uni-metal assembly. This eliminates the hazards of solder . . insures uniform strength and pressure-tightness throughout.



REX-FLEX . . . is available in 5 wall formations, unbraided or braided. Sizes range from 5/16" to 6" I.D. (incl.). The C.M.H. line of stainless steel units also includes REX-FLEX Inner Lined Exhaust Members and C.M.H. Bellows.



CHICAGO METAL HOSE CORPORATION MAYWOOD, ILLINOIS

Plants: Maywood and Elgin, Ill.

the same as those of cork, balsa wood and other insulating materials. This material is uniform in shape and is not brittle nor will it crack or break down under vibration. CCA is now made in strips  $3\frac{1}{2}$  in. wide by  $\frac{5}{8}$  in thick and of any desired length. Strips may be readily glued together with thermosetting adhesives to form thick sections, and may be bonded with ease to metal, wood or other plastics. It is readily tooled with any woodworking machinery. It is anticipated that it will be made in four ranges of density: 4 to 5 lb. per cu. ft., 6 to 7 lb., 7 to 8 lb. and 8 to 9 lb. Commercial production of this new material in a wide variety of sizes is expected to begin late in the summer of 1946.

#### TEXTILE CHEMICAL

Mew chemical treatment for textiles has been announced by the B. F. Goodrich Co., Akron, Ohio and the Treesdale Laboratories, Pittsburgh, Pa. Known as Permaproof, it is said to render any sort of fabric mildewproof, waterproof and flameproof without having any tenderizing effect on the base fabric. It is applied by dipping, spraying or painting and adds a minimum of weight to the fabric with no effect on color patterns. Suggested applications include tents, awnings, draperies, slipcovers, auto upholstery, etc.

#### COATING STRIPPER

KNOWN as cold wire stripper No. 416, recently developed by the Ellanar Chemical Co., 308 W. Randolph Street, Chicago 6, Ill., this product is used to strip wire covered with such coatings as Formex, Formvar, and enamel. Application of this product causes plastic coatings to break loose in a short time cutting expenses and in many cases avoiding danger to employees from wire brushes, knives, abrasive cloth, or gas flame, etc. It does not injure the wire.

#### PLASTIC STRIP COATING

DEVELOPED by the Naugatuck Chemical Division of the United States Rubber Company, Rockefeller Center, New York, a new plastic coating under the brand name of Kotol is tough, moisture-proof and resistant to salt water. It was developed originally for the Army Air Forces to protect planes on the decks of freighters and hangars during shipment overseas and should find many ing shipment overseas and should hid many peacetime applications. It has low moisture vapor transmission, good elongation and toughness, having a tensile strength of 900 lb. per sq. in. Kotol has a wide temperature range with flexibility at -40 deg. and good aging characteristics at 180 deg. F. It may be applied by spraying or dipping and it be applied by spraying or dipping, and it is then dried, either by air or vapor at 250 deg. F. Since the material has high resistance to acid and alkaline plating solutions at high temperatures, it is expected to be valuable as a rack coating and stop-off lacquer in the electroplating industry. With this application the coating, which may be stripped off, saves valuable metal by protecting the parts on coating racks and by masking parts of objects where electroplating is not desired. It is expected to find peacetime applications in shipment of machine parts, bottle sealing caps, and other similar services.

# of Alcoa Aluminum....

#### CONDENSER TUBES OF ALCOA ALUMINUM LOW IN FIRST COST-HIGHLY CORROSION-RESISTANT

Tubes

Concerser

ALCOA now offers you Alclad Aluminum tubing for condenser tubes.

With aluminum's naturally excellent heat conductivity, you are assured of high operating efficiency.

In many processes, Aluminum condenser tubes are preferable because aluminum does not discolor the product, alter its taste or otherwise cause contamination.

Now in Alcoa Alclad Aluminum you have two aluminum alloys combined in a single tube, providing cathodic protection which lengthens its life.

Condenser tubes of Alcoa Aluminum usually cost no more, often less, than other tubes. Why not try them in one installation to prove their added worth? Call on our sales office or write ALUMINUM COMPANY OF AMERICA, 2151 Gulf Bldg., Pittsburgh 19, Pa.



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

# Ryerson Stocks Equally Handy



Steel of all kinds at your finger tips, almost as convenient as the seasonings on a well stocked shelf! The right kind, the exact amount, in easy reach.

That in substance is Ryerson Steel-Service, supplied by eleven strategically located Ryerson plants. The exact steel you want, cut or otherwise prepared just the way you want it, delivered promptly, "right from the shelf."

Even now, with stocks short in many sizes, you can more often find the steel you need at Ryerson. And stocks are improving daily. Moreover, Ryerson technical men are available to work with you on any problem of selection or fabrication.

Ryerson stocks normally include more than 10,000 sizes, shapes and kinds of steel, all described in the current Ryerson Stock List and Data Book. Copies have been distributed, but if you do not have one we will be pleased to send it to you.

No matter what kind of steel you need, contact Ryerson *first*—your best source for prompt steel delivery.

#### PRINCIPAL PRODUCTS .

Bars hot and cold rolled alloy steel reinfarcing Structurais Plates— Inland 4-Way Floor Plate Sheets

Strip Steel Mechanical Tubing Boiler Tubes and Fittings Allegheny Stainless sheets, plates, shapes, bars, tubing, etc. Tool Steel Wire, Chain Bolts, Rivets Babbitt Solder Welding Rod Metal Working Tools and Machinery, etc.

#### JOSEPH T. RYERSON & SON, INC.

Steel-Service Plants at: Chicago • Milwaukee • Cleveland • Cincinnati • St. Louis • Detroit Philadelphia • Pittsburgh • Buffalo • Boston • New York

# **RYERSON STEEL**

P.P.Y.

The law of

F

#### ATOMIC BOMB SCIENTISTS GIVEN MEDAL FOR MERIT

IN recognition of their work in connection with the development of the atomic bomb, the War Department has awarded Medals for Merit to a number of scientists who took a leading part in the successful completion of that project. The first presentations were made on March 4 in the office of the Secretary of War with the Hon. Robert P. Patterson, Secretary of War, bestowing the awards. The recipients were Dr. J. Robert Oppenheimer, California Institute of Technology, Pasadena, who was director of the Atomic Bomb Project Laboratory in New Mexico; Dr. Arthur H. Compton, chancellor of Washington University, St. Louis; Frank R. Creedon, Washington; Dr. John Ray Dunning, Columbia University; Percival C. Keith, Hydrocarbon Research, Inc., New York; Dr. Charles A. Thomas, vice president, Monsanto Chemical Co., St. Louis; Dr. Eugene P. Wigner, Princeton University; and Roger Williams, vice president, E. I. du Pont de Nemours & Co., Wilmington. The citations, signed by President Truman, were read by Col. Hugh M. Exton, aide to the Secretary of War.

On March 13, in the Pentagon Building, Major General Leslie R. Groves, commanding general Atomic Bomb Project, Manhattan Engineer District, made similar awards to Dr. Richard C. Tolman, dean of the Graduate School, California Institute of Technology, Pasadena, and to Dr. Robert F. Bacher, professor of physics, Cornell University.

On March 20, at the University of Chicago, Major General Groves officiated at a ceremony which gave Medal for Merit awards to Dr. Harold C. Urey for his work as director of laboratories at Columbia University; Dr. Enrico Fermi, self-exiled Italian physicist and now a staff member of the Institute of Nuclear Studies, University of Chicago; Dr. Cyril S. Smith, University of Chicago, who was co-chief of the Division of Chemistry and Metallurgy at the Los Alamos Laboratory; Dr. Samuel K. Allison, director of the Institute of Nuclear Studies, University of Chicago; and Dr. Robert S. Stone, University of California.

#### PLASTICS RESEARCH PROGRAM SET UP AT PRINCETON

A TWO-YEAR contract calling for the expenditure of \$100,000 for fundamental research in high polymer chemistry and engineering research in plastics has been awarded Princeton University by the United States Army Signal Corps. The work will be carried out principally by advanced students under the direction of a plastics committee representing the departments of chemistry, physics, chemical, electrical and mechanical engineering.

In addition to the Princeton committee, there has been established an advisory committee from industry whose members are: G. K. Scribner, Boonton Molding Co., chairman; R. J. Moore, Bakelite Corp.; A. E. Pitcher, E. I. du Pont de Nemours & Co.; W. S. Landes, Celanese Celluloid Corp.; E. B. Babcock, Firestone Tire & Rubber Co.; R. Hopkinson, United States Rubber Co.; N. A. Shepard, American Cyanamid Co.; W. J. B. Stokes, II, Joseph Stokes Rubber Co.; R. M. Burns, Bell Telephone Laboratories; R. V. Beshgetoor, Radio Corp. of America; W. H. Milton, Jr., General Electric Co.; E. A. Stillman, Watson-Stillman Co.; A. W. Fritzsche, General Industries Co.; F. H. Shaw, Shaw Insulator Co.; H. F. MacMillin, Arthur D. Little, Inc., and F. N. Williams, Monsanto Chemical Co.

The Army has proposed eight research projects from which several will be selected for active research. They will permit a substantial research staff working under the direction of Louis F. Rahm, associate professor of mechanical engineering. A plastics committee of the university, under the chairmanship of Professor Rahm, consists of Hugh Scott Taylor, dean of the graduate school; Kenneth H. Condit, dean of engineering; Joseph E. Elgin, chairman of the department of chemical engineering; Henry DeWolf Smyth, chairman of the department of physics and Clodius H. Willis, chairman of the department of electrical engineering.

#### NEW PRODUCTS EXPOSITION INDEFINITELY POSTPONED

THE Products of Tomorrow Exposition which had been scheduled to open at the Chicago Coliseum on April 27 has been indefinitely postponed. Marcus W. Hinson, general manager of the exposition, reports that the national production outlook seems so clouded that the majority of manufacturers who originally planned to display their postwar products now consider it inadvisable to participate until they are more certain of their future capacity for delivery.

#### SHARES OF AMERICAN POTASH SOLD WITH RESTRICTIONS

ONLY one bid was received on March 27 by the Alien Property Custodian for the 478,194 shares of the American Potash & Chemical Corp. which were seized during the war under authority of the Trading With the Enemy Act. The successful bidder was a group made up of Kuhn, Loeb & Co., Glore, Forgan & Co., and Lehman Bros. The price offered and accepted was \$32.29 a share and the buyers also agreed to assume the expenses incurred incidental to the sale. Offerings to the public will be made through a large number of investment companies scattered throughout the country.

The remaining 48,664 shares of the company have been classified as class A shares and the seized shares designated as class B shares. Both classifications carry the same voting rights and divided participation but the class B shares are to be sold with restrictions which prevent their resale to their original owners or to certain companies or competing owners of potash deposits.

#### NEW COMPANY WILL BUILD SULPHURIC ACID PLANT

PRODUCTION of sulphuric acid is expected to begin before the end of this year in a plant which is under construction in Indianapolis, Ind. The plant will be adjacent to the Union Stock Yards and will furnish acid to the fertilizer companies in that vicinity. It will be owned and operated by the Marion Mfg. Corp. which was recently organized. Officers of the corporation are John E. Powell, president; R. D. Martenet, vice president; George H. Kingsbury, secretary; and Howard F. Kimball, treasurer. Cost of the plant and equipment will approximate \$500,000 and production of acid is expected to reach an annual total of 50,000 tons.

Mr. Powell also is president of the Smith Agricultural Chemical Co.; Mr. Mertenet is executive vice president of E. Rauh & Sons Fertilizer Co.; Mr. Kimball is vice president of the Smith Agricultural Chemical Co.; and Mr. Kingsbury is president of Kingsbury & Co.

#### WESTINGHOUSE CENTENNIAL FORUM IN PITTSBURGH

A SCIENCE and engineering forum honoring the centennial of the birth of George Westinghouse will be held in Pittsburgh on May 16-18. The opening session, titled "Science and Civilization" and presided over by Dr. Robert E. Doherty, president of Carnegie Institute of Technology, will include Dr. Isaiah Bowman, internationally prominent geographer and president of the Johns Hopkins University, and George W. Merck, president of Merck & Co., and special consultant to the War Department. Dr. Archibald V. Hill, foreign secretary of the Royal Society, will represent England, Four aspects of "The Future of Atomic

Four aspects of "The Future of Atomic Energy" will be discussed the initial day of the Forum in a group headed by Dr. Karl T. Compton, president of the Massachusetts Institute of Technology. The group will delve into the biological, chemical, explosive and power possibilities of this new form of energy. A Nobel Prize winner from Columbia University, Dr. I. I. Rabi, will act as chairman at a dinner that evening at which Dr. Vannevar Bush will speak on "Planning in Science."

#### NEW ADMINISTRATIVE STAFF AT FRANKLIN INSTITUTE

APPOINTMENT of a new administrative staff to head the Franklin Institute laboratories for industrial research was announced recently by Dr. Henry Butler Allen, secretary and director of the Institute. Lt. Col. Charles H. Greenall, formerly director of



# The Time is Approaching When You Can Again Get a PEERLESS!

• Like thousands of others, you've probably put a new water pump at the top of your *must* list of improvements. "Will I be able to get a Peerless?" you ask. The answer is sounding more cheerful every day. Yes, you will, in the not too distant future. The big Peerless back-log of orders is being worked on 24 hours a day. The situation improves daily. But don't wait to place your order until your need becomes desperate. Consult with the nearest Peerless Distributor now and get your order on file. We'll do everything within our power to deliver your needed pump as soon as we can. Certain types can be delivered sooner than other models—so check with Peerless now.



research at Frankford Arsenal, has been made executive director of the laboratories, assisting Dr. Allen who will continue in over-all charge of the research work. Acting as senior consultants to Dr. Allen are Dr. Rupen Eksergian and Dr. W. F. G. Swann. Dr. Swann is a director of the Bartol Research Foundation of the Franklin Institute.

During the war the Institute laboratories were greatly expanded. They are still engaged on projects for the armed forces, but soon will be expanded to cover a peacetime program of industrial research in the physical sciences.

#### MODELS OF OIL REFINERIES PRESENTED TO RUTGERS

As a contribution to the plans which Rutgers University is making for the expansion of its courses in chemical engineering, the Standard Oil Co. of New Jersey last month presented the university with an atmospheric pipe still model, a catalytic cracking plant model, and a pentane plant model. The models, which are valued at approximately \$16,000, were presented by M. J. Rathbone, president of Standard Oil and himself a chemical engineer, who in his address said "These models have served us well, not only during the design and construction days of the plant equipment which they typify, but they have also been of great assistance to us in the training of our operating personnel. They are, in effect, a three

#### CONVENTION CALENDAR

- American Tung Oil Association, annual meeting, San Carlos Hotel, Pensacola, Fla., April 26-27.
- American Ceramic Society, 48th annual meeting, Hotel Statler, Buffalo, N. Y.. April 28-May 1.
- American Drug Manufacturers Association, annual meeting, Cavalier Hotel, Virginia Beach, Va., May 6-9.
- National Association of Corrosion Enginneers, annual meeting, President Hotel, Kansas City, Mo., May 7-9.
- American Association of Cereal Chemists, annual meeting, General Brock Hotel, Niagara Falls, Ont., Canada, May 13-16.
- American Oil Chemists' Society, annual meeting, Roosevelt Hotel, New Orleans, La., May 15-17.
- National Foreign Trade Week, sponsored by Chamber of Commerce of the United States, Washington, D. C., May 19-25.
- Metal Powder Association, spring meeting, Waldorf-Astoria Hotel, New York, N. Y., June 13.
- Society for the Promotion of Engineering Education, 53rd annual meeting, Jefferson Hotel, St. Louis Mo., June 20-23.

American Chemical Society, 110th meeting, Chicago, Ill., September 9-13.

- Fourth National Chemical Exposition, Chicago, III., September 10-14.
- The Electrochemical Society, Inc., fall meeting, Hotel Royal York. Toronto, Canada, October 16-19.



GATX 1946

FOR REN

#### 37,000 Specialized Tank Cars – 207 Types – For Swift, Sure, Economical Transportation of Liquids in Bulk

GATX tank cars-207 types from 4,000 to 12,500 gallon capacities-haul an almost infinite variety of liquids: from propane to port wine to pine tar.

Strategically located offices, plants and repair shops throughout the nation give General American the unique ability to provide shippers precisely the kind of tank cars they want, *when* they want them, *where* they want them.

These tank cars are for rent. So, if the cargo is bulk liquid and the problem safe, fast, economical transportationcount on General American.

Take your tank car problems to our nearest office



GENERAL AMERICAN TRANSPORTATION 2-11

CORN C

GASOLIN

FUEL OIL

LUBRICATING ON

CIUCOS

0

6

**The second** 

HURIAT





Sectional view of Williams over-running hammermill with heavy liners and grinding plate for limestone and other hard material. Particular attention is directed to the grinding plate adjustment which assures uniform close contact of hammers and grinding plate at all times. Also note the metal trap which provides an outlet for the escape of tramp iron.

Williams Hammer Grinder direct connected to motor, all mounted on heavy cast base. This type of drive is economical to operate and easy to install.

#### ANIMAL...MINERAL VEGETABLE MATTER

Reduces

#### Capacity from 50 pounds to 300 tons per hour

• Williams is the world's largest organization of crushing, grinding and shredding specialists and have developed standard machines for the reduction of practically every material whether animal, mineral or vegetable. Capacities range from 50 pounds to 300 tons per hour permitting selection of exactly the proper size for your work. Whether you wish to grind chemicals to 400 mesh, crush 4 feet cubes of rock or shred steel turnings, you can profit by Williams' experience.



dimensional picture of the completed plant. We constructed them before undertaking actual plant construction, chiefly to study the relation of each part of the unit with other parts, from the standpoint of facilitating maintenance in the completed unit. They provided us a useful means of visualizing and reviewing clearances for expediting repair work and metal inspection. They also were invaluable in studying the all important matters of safety. They assisted greatly in the pre-training of operators."

#### REPORT ON ATOMIC ENERGY STRESSES BENEFICIAL USE

EXISTENCE of "two great fields" of beneficial use of atomic energy is stressed in the "Report on the International Control of Atomic Energy" released on March 28 by the State Department in Washington. Much importance is attached to the fact that U 235 and plutonium can be denatured from the standpoint of explosiveness and at the same time be successfully used in peaceful applications. The report was prepared for the Sec-

The report was prepared for the Secretary of State's committee on atomic energy by a board of consultants consisting of David Lilienthal (chairman), TVA; Chester I. Barnard, president of New Jersey Bell Telephone Co.; J. R. Oppenheimer, California Institute of Technology; Charles Allen Thomas, vice president and technical director of Monsanto Chemical Co.; and Harry A. Winne, vice president of General Electric Co.

tric Co. Voicing their conviction that the peacctime applications of atomic energy are so enormous that the manufacture of fissionable materials must continue despite military potentialities and under international management, the consultants give much weight to the views expressed in an unpublished report by a group of scientists and engineers to the Secretary of War. This group describes the "two great fields" as "the development of atomic energy as a controlled source of power" and "the application of radiations and radioactivities to the growth of the sciences and the practical arts." The group says that "It is probable that the exploitation of atomic energy as a tool for research will outweigh the benefits to be derived from the availability of a new source of power."

of power." "It should be understood," continues the report of this group, "that work specifically focused on atomic power need not and should not interfere with making available to biology, medicine, chemistry and physics the radiations and activities characteristic of this field...We should not be astonished if the greatest benefit of this program were in fact to lie in therapy for some of the neoplastic diseases, such as cancer, or in the increased understanding of biological systems or of the realities of the physical world, which will in turn open up new fields of human endeavor." With respect to power applications the group says, "We see characteristic limitations and advantages in atomic power which make us regard it in great measure as a supplement to existing sources, and an incentive to new developments, rather than as a competitor, let us say, to coal or to petroleum products."

The State Department's consultants urge the ownership and management by an international agency of "all intrinsically dangerous



# THEY CALL 'EM JEEPS BECAUSE THEY'RE SMALL, BUT POWERFUL, AND GO ANYWHERE

For a small, tough, hard-working turbine that will go anywhere and do all you expect of it . . . get a Coppus "Blue Ribbon" Steam Turbine.

Coppus Steam Turbines come in six frame sizes from 150 HP down to fractional—so you can match more closely your job requirements. Each smaller size is priced correspondingly less, so by selecting "horsepower" instead of "elephant power" you save on investment and installation cost.

Many well-known manufacturers install Coppus "Blue Ribbon" Steam Turbines on original equipment. They know Coppus quality will protect the reputation of their own products. The Coppus Turbine is also being used

> Write for Bulletin 135-9. Coppus Engineering Corporation, 454 Park Avenue, Worcester 2, Mass. Sales offices in THOMAS' REGISTER. Other Coppus "Blue Ribbon" Products in SWEET'S, CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG.

on many U.S. Destroyer Escorts, all Casablanca class aircraft carriers and 90% of all Landing Ship Docks.

Like all Coppus "Blue Ribbon" products (blowers, ventilators, gas burners, etc.), the Coppus Steam Turbine is a precision-made product, with accuracy controlled by Johansson size blocks. Every turbine is dynamometer-tested before shipment.

More than 85% of all orders since 1937 have been repeat orders.




Davis No. 97 TH two-step Solenoid Valve. For proportioning or throttiling of liquid flow. Extremely accurate.

## *make it Automatic* with Davis Industrial Type SOLENOID VALVES

• Freedom from manual control and from fear of disastrous failures is yours when you specify Davis Solenoid Valves. These valves are available for steam, gases and liquids in sizes from  $1\frac{1}{2}$ " to 12" and pressure to 1500 lbs. Any device capable of making or breaking an electrical circuit will operate Davis valves. Available with either normally closed or

> Below—No. 380—a 3 or 4-way pilot valve widely used on air or liquid actuated power cylinders.



solenoid boxes and two step action when extreme accuracy is required.

open valves, explosion proof

Wherever an automatic valve will improve your piping system, be sure to write Davis engineers for recommendations. You'll be certain that Davis will furnish the right valve for the job. Informative literature available.



Above—No. 93-H with solenoid operated pilot valve and hydraulically actuated main valve built for use on a 400 lb. pressure water main.



operations in the nuclear field, with individual nations and their citizens free to conduct, under license and a minimum of inspection, all non-dangerous, or safe, operations." Dangerous operations are classified as: (1) Prospecting, mine ownership or other control, mining and refining of uranium and, to a lesser extent, thorium, (2) enrichment of the isotope 235 by any methods now known, (3) operation of reactors for making plutonium and of separation plants for extracting it, (4) research and development in atomic explosives. The field of "safe" operations includes construction and operation of non-dangerous power-producing piles.

#### WESTVACO UNITES TECHNICAL SALES ACTIVITIES

ALL sales department technical affairs of the Westvaco Chlorine Products Corp., including market development and technical service, have been grouped into the technical sales division of which William T. Nichols has been appointed technical sales



William T. Nichols

director to coordinate and expand sales activities. Mr. Nichols has been engaged as technical assistant to the executive vice president and prior to that was in charge of research and product development at the corporation's plant in South Charleston.

research and product development at the corporation's plant in South Charleston. K. W. Bayha will supervise market de velopment work in the New York office and J. M. Smith will continue in charge of technical service. J. M. Payne will head technical consulting service for the middle west with headquarters in the Chicago office and A. George Stern will act in a similar capacity for the Pacific Coast with headquarters at the plant in Newark, Calif.

#### COMPANIES HOLD MEETINGS OF RESEARCH STAFFS

It is customary for chemical companies to hold annual conventions for their sales force in order to keep the men in touch with general policy and the direction of company policy. Recently the Wyandotte Chemicals Corp. held a formal one-day meeting in the Book Cadillac Hotel, Detroit, for the members of its research department. This meeting represented an innovation inasmuch as it was conducted along the lines usually reserved for a sales meeting. Dr. T. H. Vaughn, director of research for the company, opened the meeting and explained to



The recent installation of two Vulcan Rotary Kilns each 8' and 9'-6" in diameter by 199 ft. in length—at Cementos El Melon, Calera, Chile (shown above) has increased the total capacity to 10,000 barrels per day; making it the largest cement plant in South America and one of the largest in the world. Four other Vulcan kilns of the same size and type were also installed recently at another large South American cement plant —Sociedad Cemento Juan Soldado—owned and operated by the same interests, at La Serena, Chile.

To the best of our knowledge and belief more Vulcan Rotary Kilns are operating successfully in modern cement plants throughout the world today than any other kind—undeniable evidence of their correct design and sturdy, dependable, construction.

For nearly half a century Vulcan Rotary Kilns, Calciners, Retorts, Dryers and Coolers have been widely used, also, for the manufacture of high-grade chemical lime, dehydration of bauxite, nodulizing and desulphurizing of ores, alteration of barytes, calcination of lithopone, processing of pigments, recovery of lime from paper-mill sludge, soda ash from black liquor, coke and other by-products from petroleum sludge, etc. As a natural consequence of this long and varied experience our engineers have acquired a vast fund of practical operating data—much of which cannot be duplicated elsewhere and all of which is available for solving the problems of prospective purchasers. Correspondence is cordially invited and constructive suggestions will be furnished, whenever possible, without charge or obligation.



Vulcan Rotary Kilns in process of installation at Sociedad Cemento Juan Soldado, La Serena, Chile.

## Main Office and Works WILKES-BARRE, PA., New York Office 50 Church

Rotary Kilns, Coolers and Dryers Rotary Retorts, Calciners, Etc. H Improved Vertical Lime Kilns Automatic Quick-Lime Hydrators

Toothed, Double-Roll Crushers High-Speed Hammer-Type Pulverizers Ball, Rod and Tube Mills Shaking-Chute and Chain Conveyors Heavy-Duty Electric Hoists Self-Contained Electric Hoists Scraper-Loading Hoists Cast-Steel Sheaves and Gears

Steam Locomotives Diesel and Gasoline Locomotives Diesel-Electric Locomotives Electric Locomotives and Larrys



## HARDINGE COUNTER-CURRENT CLASSIFIERS AND HARDINGE CONICAL BALL MILLS

Hardinge Counter-Current Classifiers in closed circuit with Hardinge Conical Ball Mills make an excellent compact layout for a chemical plant. The classifier, with its one moving part, doesn't wear out. Average life of classifier lining is 10 years on hard siliceous materials. Control of oversize fineness by counter-current action of the classifier insures maximum overall production from the complete grinding circuit—thus increasing mesh tons per horsepower in a system where maintenance is practically nil.

HARDINGE COMPANY, INCORPORATED · YORK, PENN. NEW YORK 17-122 E. 42nd St. · 205 W Wecker Drive-CHICAGO & SAN FRANCISCO 5-501 Howard St · 200 Bay St.-TORONTO 1

WANT CLASSIFYING DATA? • ASK FOR BULLETINS 17B, 31D, 39A

the 62 chemists and engineers in attendance that it was an experiment in a new method of bringing into focus for them the department's part in the over-all program of the corporation. He added that because the research personnel are housed in a dozen different buildings scattered over three plants, it was difficult for them to exchange ideas except in small groups and on specific problems.

Of a somewhat similar character was the recent meeting held at Skytop Lodge, Skytop, Pa., for 150 chemists, physicists and chemical engineers of General Aniline & Film Corp. The three-day meeting was devoted to discussions on new developments in the various research fields in which the company is engaged. It brought together research and technological workers from the company's plants in Grasselli, Rensselaer, Binghamton, Johnson City, and the Central Research Laboratory in Easton.

#### LIMITATIONS ON GERMANY'S CHEMICAL INDUSTRIES

ACREEMENT on severe limitations on German's chemical industries, including complete elimination of certain industries, is announced from Berlin by the Allied Control Council. State Department officials in Washington declare that the terms, which are subject to periodic revision, bear out in general the principles proclaimed by the United States as to how German industry should be controlled. Officials also believe the terms are consonant with the broad Potsdam objectives of rendering Germany harmless in the future and at the same time laying the basis for maximum reparations which are consistent with a minimum standard of living for Germany at present. The following information on the German chemical industrics and related enterprises comes from the State Department in Washington.

Slated for complete elimination are German production facilities for: synthetic ammonia, synthetic rubber, primary aluminum, primary magnesium, beryllium, vanadium produced from Thomas slags, radioactive materials, hydrogen peroxide above 50 percent concentration, and chemicals and gases specifically for war purposes. Production facilities for synthetic oils, synthetic ammonia and synthetic rubber will be temporarily retained in operation to meet German domestic needs until necessary imports are available and can be paid for. Thereafter, the facilities will be removed.

To allow for German home requirements, 40 percent of the 1936 basic chemicals production capacity, in addition to presently retained capacity for synthetic ammonia, will be retained. Basic chemicals include: nitrogen, phosphates, sulphuric acid, alkalis, chlorine and calcium carbide. Seventy percent of the 1936 production capacity will be retained for other chemicals. Pharmaceuticals are set at the rate of 332 million reichmarks (1936 value) annually. The annual capacity for dyestuffs and synthetic textiles will be 36,000 tons and 185,000 tons respectively. No levels are established for the following classes of products: flat glass, bottle and domestic glass, ceramics and potash. Likewise, no limits are set for building materials, except that cement production capacity is limited to 8 million tons per year.

limited to 8 million tons per year. In the metal industry the steel capacity is fixed at 5.8 million tons annually. The fol-

## THE PLASTICS LOOK TO .... BLAW-KNOX

BLAW-KNOX has grown up with the Plastics Industries, collaborated closely with the leading plastics scientists and manufacturers, and is now building the most modern and complete equipment and plants needed in the production of commercial resins – phenoiic, urea, melamine, cellulose acetate, alkyd, and vinyl.

## INDUSTRIES



BLAW-KNOX DIVISION of BLAW-KNOX COMPANY 2090 FARMERS BANK BLDG., PITTSBURGH 22, PA. New York • Chicago • Philadelphia • Birmingham • Washington

BLAW-KNOX

PROCESS EQUIPMENT

lowing consumption rates (annual tons) of non-ferrous metals from all sources are established: copper, 140,000; zinc, 135,000; lead, 120,000; tin, 8,000; nickel, 1,750. The German economy in 1949 is estimated to require 50,000 tons of rubber (imported), 2,129,000 tons of pulp, and 665,000 tons of fiber for textiles.

Looking at the general German industrial picture, the manufacture of oceanic ships and all types of aircraft is banned. Electric power capacity to the extent of 9,000,000 kw. is retained, this figure including all hydroelectric plants. Coal production is to be maximized, the potash production is to be at some point above the 1938 level. Machine tool manufacturing capacity is retained at only 11.4 percent of the 1938 figure.

The control plan is based on the assumption of a German population of 66.5 mil-lions and contemplates that Germany will be administered as an economic whole.

#### DU PONT DROPS MILITARY EXPLOSIVES DIVISION

SINCE virtually all military explosives production of E. I. du Pont de Nemours & Co. has been completed, the military explosives division will be known as the nitrocellulose and sporting powder division, with F. W. Bradway as manager. J. M. Skilling, who was manager of the military explosives di-vision, will be director of production of the new division. In other changes, P. J. Kim-ball, who was general superintendent of the department, becomes manager of the ex-plosives division. F. R. Wilson, formerly division manager, becomes director of pro-duction; T. R. Carlson who was director of production becomes production manager of the high explosives section, and H. C. Peinert becomes production manager of the black powder section.

#### PERFECT SHIPPING 'CAMPAIGN **OF ADVISORY BOARDS**

For the last 10 years the Shippers Advisory Boards have set aside the month of April as a period when they try to focus the attention of all shippers upon all the factors affecting the movement of goods and to in-stigate thought and study to see what new progress can be made in perfecting distribu-tion methods. The Perfect Shipping Campaign started this month is concentrated on the better marking of packages. J. E. Bryan, general chairman of the national management committee has sent out a poster and a leaflet in which he calls for teamwork on the part of all shippers in an effort to raise the standard of shipping practices.

#### NEW FORMALDEHYDE PAMPHLET **OUTLINES SAFE HANDLING**

CONTROL of hazards resulting from the industrial use of formaldehyde is outlined in the third of a series of pamphlets issued by the Division of Labor Standards, entitled "Controlling Chemical Hazards." Formalde-hyde vapors, as the pamphlet points out, irritate eyes, mucous membranes and the skin. The characteristic symptoms are explained in the publication. It outlines the characteristics of formaldehyde, permissible and hazardous concentrations, safety and first aid precautions. Copies may be ob-tained from the Division of Labor Stand-

Lever locking ring drum No. 55188 Lever locking ring pail No. 514X Swivel-spout por-pail No. 584R Bond seal pail No. 564 Lug covered pail No. 584 12345 NLAND STEEL CONTAINER CO. Container Specialists 6532 S. MENARD AVE., CHICAGO 38, ILLINOIS e New Orleans Plants at: Jersey City

undisputable

R SAFE PACKAGING

INIAND

SIFF

CONTAINERS

Made in a wide variety of cover

styles and openings suitable for

easy filling and safe airtight

packaging of products.

5

NO LEAKAGE NO SPOILAGE NO CONTAMINATION





# SIZE REDUCTION

There are many different types of size reduction machines. But, there is only ONE type which will perform your size reduction jobs BEST.

Let Sprout-Waldron's eighty years of experience in solving all kinds of size reduction problems work for you . . . bring your problem to Sprout-Waldron and get the benefits of wide experience with Attrition or Disc Mills, Knife Cutters, Roller Mills, Burr Stone Mills, Cone and Sawtooth Crushers. Remember, Sprout-Waldron's earnest desire is to recommend only the best machine for your application.

Consultants first--then manufacturers--and finally salesmen.

## **SPROUT-WALDRON & COMPANY**

MUNCY

Manufacturing Engineers PENNSYLVANIA





**T**HE reduction of mechanical and processing costs has never been as important as now—in fact, it's the order of the day for every plant in the chemical field.

That's why the long service features built into Trentweld stainless steel tubing is of positive interest to engineers, particularly where there is a high temperature or corrosive pressure application. In this field, Trent experience is as wide as it is deep. Trent engineers are familiar with the many types of

Chicago 11, Ill.

Sales Office: 664 Michigan Ave.

stainless alloys, know the properties and characteristics that recommend each one for a specific application.

Please feel free to get the full story, particularly in terms of your own design requirements. Trent has the specialized machinery and engineering knowledge to handle any tubing problem from <sup>1</sup>/<sub>8</sub>" diameter to 18" diameter. Write for technical data bulletin, or even better, address Dept. 10 for spe-

TRENTWELD

Mill at

East Troy, Wisconsin

cific information on your particular problems.

2

ards so long as the limited free supply exists. Larger orders may be secured from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. at 10 cents per copy.

#### AMERICAN PATENTS OFFERED FOR DOMESTIC LICENSES

TWELVE patents owned by Walter Kidde & Co., Inc., Belleville, N. J. and Hercules Powder Co., Wilmington, Del., have been dedicated to the United States public and will be listed on the Register of Patents Available for Licensing which is maintained by the Patent Office. The Kidde patents include one designed to improve the means of storing explosives or dangerous fluids, one giving a method for producing inert gases, and a third giving a method for protecting combustibles, particularly applicable to tankers transporting oil, petroleum or gasoline.

The Hercules patents relate to improvements in varnishes and lacquers and the production of a rosin base ester-drying oil composition to replace tung oil.

#### PYRENE MFG. CO. RENAMES LINE OF EXTINGUISHERS

ALMOST 40 years ago when the Pyrene Mfg. Co., Newark, N. J., started in business by introducing a vaporizing liquid type of extinguisher for the new hazards of electricity and flammable liquids, it coined the trade name Pyrene. As other types of extinguishing compounds and equipment were added, they were given new coined names. Now the company has dropped these assorted trade names and renamed each of its products using the Pyrene name in conjunction with the type of unit. An exception is made in the case of exports where the difficulties peculiar to foreign markets make it advisable to retain the old names for the time being.

## CONSTRUCTION PLANNED ON NEW PHOSPHATE PLANT

PLANS for immediate construction of a new phosphate mine and plant have been set up by the International Minerals & Chemical Corp. The plant is expected to have an annual capacity of one million tons and is scheduled to begin operation July 1, 1947. The plant will be built on the 2,000-acre phosphate property recently purchased near Bartow, Fla. The mine is considered by metallurgists to be one of the richest phosphate deposits in the country and its production will double International's phosphate output. The development will be called the Noralyn mine. The project will contain a number of metallurgical innovations developed by the company's research division.

#### MID-AMERICA EXPOSITION WILL BE IN CLEVELAND

MID-AMERICA EXPOSITION, an industrial exposition is scheduled for Cleveland, Ohio from May 23 through June 2. Public Hall and all exhibition halls will be turned into a show window where a display of postwar commercial and home products will be spotlighted. The purpose of the exposition is to focus national and international attention on the region's industries, craft skills, engineering resources, research facilities, adver-

## , and what this means to the refiner

OVER 80 RUBBER UNITS

including two of the coun-try's largest, are lined with

B&W Insulating Firebrick

he above statistical information can be interpreted by the refiner to his distinct profit.

B&W Insulating Firebrick were not chosen by the builders of these furnace units, by chance, but by experience-the experience of the country's most expert and informed buyers of refractories.

These manufacturers know refractories. They realize the significance of temperature ratings, brick weight, hot-load strength and similar technical data. That is why they chose B&W Insulating Firebrick for 80 units which they built to produce synthetic rubber from petroleum. Their judgment is well worth following when you order refractory replacements. By doing so, you can be sure you will get insulating firebrick that fill all the requirements of insulating firebrick-low heat conductivity, low heatstorage capacity, rapid cooling when fires are shut off, and long life under direct exposure to furnace gases—with consequent fuel saving and minimized maintenance of furnace linings.

R-222

Water-Tube Boilers, for Stationary Power Plants, for Marine Service . . . Water-Cooled Furnaces . . . Superheaters . . . Economizers . . . Air Heaters . . . Pulverized-Coal Equipment . . . Chain-Grate Stokers . . . Oil. Gas and Multifuel Burners . . . Seamless and Welded Tubes and Pipe . . . Refractories . . . Process Equipment.





THE ERTEL





#### PRE-FILTRATION TO GERMPROOF AND ULTRA-FILTRATION

The Ertel "Utility" Filter is the only unit specially designed for use with any and all types of filtering mediums:

- 1. Ertel Neutral Asbestos Filter Sheets
- 2. Filter Cloth and Filter Aid 3. Filter Paper
- 4. Filter Cloth

Available in sizes holding from 10 to 100 filtering surfaces. Has no rubber gaskets or washers. The Ertel single hand wheel effects a simple complete closure. Equipped with pump, motor and pressure control. Engineering consultation without obligation.



#### ENGINEERING CORP. KINGSTON NEW YORK

NEW YORK CITY SALES OFFICE & SHOWROOM 40 WEST 48th STREET, NEW YORK 19, N. Y.

| LIOUID<br>RANDLING<br>LOUIPMENT      | MAIL COUPON<br>FOR CATALOG                         |
|--------------------------------------|--|
| ERTEL ENGINEERING                    | ERTEL ENGINEERING<br>Corporation<br>KINGSTON N. Y. |
| Please send you<br>dling Equipment'' | r Catalog-12 "Liquid Han-                          |
| Name                                 |  |
| 1<br>Company                         |  |
| Street                               |  |
| City                                 | State  |

tising, selling and distribution facilities. It is expected to draw approximately a quarter of a million people this year, and will have no geographical fences. Generally, however, the exhibitors are being invited from a region staked out by Detroit, Cincinnati, Pittsburgh and Buffalo, with Cleveland as the "capital." The show is not confined to any particular industry or group but will represent every type of industry in the region. The aim of the sponsors is to reach the scope of the prewar annual fairs at Toronto, Canada; Manchester, England; and Leipzig, Germany.

#### FLINTKOTE WILL BUILD NEW RESEARCH LABORATORY

CONSTRUCTION of a new research laboratory at Morristown, N. J., costing about \$1,000,000 for plant and equipment has been announced by The Flintkote Co. This is part of a research, expansion, and modernization program representing a contemplated outlay of \$10,000,000 of which \$6,000,000 had been authorized by the end of last year. In addition to sections set aside to carry out research on the present products of the company, the new laboratory will be equip-ped with pilot plants for the development of new products.

#### METAL POWDER ASSOCIATION WILL MEET IN NEW YORK

THE Metal Powder Association will hold its annual spring meeting at the Waldorf-Astoria Hotel, New York, June 13. The program will include a day of technical and educational papers by leaders in powder

metallurgy. Details of the program are being arranged by Robert G. Kenly, New Jersey Zinc Sales Co., who is chairman of the program committee, and Paul E. Weingart, American Metal Co., Ltd., vice chairman of the committee.

#### FINAL ABSTRACTS AVAILABLE **ON VESTED PATENTS**

THE second and final supplement to the abstracts of vested chemical patents is avail-able, says the Alien Property Custodian. Abstracts of about 800 patents and patent applications are contained in the second supplement. Abstracts are grouped into 31 fields including chemicals, drugs, foods, unit processes, ceramics, plastics, pulp and paper, rubber and petroleum. Copies of the two supplements may be purchased from the Office of Alien Property Custodian, Chicago, Ill. The set of original abstracts, covering about 8,000 patents in the chemical field, is obtainable at \$25.

#### **U. S. RUBBER TO ESTABLISH** PLANT IN SOUTH AFRICA

According to an announcement by L. C. Boos, president and general manager of the United States Rubber Export Co., Ltd., the company has completed plans for the establishment at Port Elizabeth, South Africa, of a plant for the production of rubber tires and a varied line of rubber products. Equipment already has been ordered and installation and operations are expected to begin by the first of next year. Investment in the project will amount to approximately \$5,000,000 and up to 1,000 people

EQUIP IT TO **"GROW GRACEFULLY" ON KEWAUNEE'S** "UNIT ASSEMBLY PLAN" Experiment M YOUR LABORATORY NOT with IT! You take the "experiment" out of laboratory planning when you install Kewaunee Laboratory Furniture, Cabinets and Casework. Simply select the Kewaunee units you need-all match exactly and are interchangeable, permitting your laboratory to "grow gracefully" as your facilities expand. Each piece made of finest materials . . . all table and working surfaces of Kewaunee's patented KemROCK for defiant resistance to acids, alkalies, abrasion and shock. Modernize efficientlythe Kewaunee way. For details-WRITE: INDUSTRIAL DIVISION

5018 S. Center St., Adrian, Michigan-Representatives in Principal Cities

ABORATORY

euaunee M

C. G. Campbell, President

FURNITURE O DEXPERTS

Smooth and

Ontrolled OVERLAY THICKNESS

Free from Porosity

At last you can have all the advantages of Colmonoy hard-facing overlays-extreme resistance to corrosion and abrasion—without the disadvantages of heavy, welded overlays that require costly machining to finish to size and check for pin holes.

You can apply Colmonoy No. 6 in thicknesses from .020" to .040". The unretouched photograph at the right shows how smooth the application is. You eliminate porosity, save machining and secure overlays that have a Rockwell C hardness of 55-60 and areater corrosion resistance than stainless steel.

You can make the application and secure the same final results in either of two ways:

#### COLMONOY POWDER WELD PROCESS

Uses powdered Colmonoy and the Powder Weld Torch.

COLMONOY SPRAY WELD PROCESS Uses 1/8" plastic bonded rod of Colmonoy in your ordinary flame spray metallizing gun.

> Write for full information and stepby-step instructions for application.



#### Did you ever see a Hard-facing job so smooth?

This thermocouple tube overlay requires no machining after applying, either to bring to size or discover holes. It will outlast stainless steel. Laboratory tests show that in sulphuric acid tanks, for instance, its corrosion is only 5% that of stainless steel, at all concentrations. It tests from 55 to 60, Rockwell C.





will be employed and trained by a staff of specialists from the domestic organization until native workers become qualified to take over. Since 1919 the South African territory has been served through the United States Export Co. of which Bland Scott, a South African, is managing director. The new plant is intended not only to satisfy South African requirements but also to export its products to Rhodesia and Central Africa.

#### READERS' VIEWS and COMMENTS

#### GIVE US MORE

To the Editor of Chem. & Met .:

Sir: — By means of this letter I wish to compliment you on the excellence of the articles which have appeared in Chemical & Metallurgical Engineering regarding engineering aspects of atomic bomb production, and to hope that further articles of the same type will follow. I refer, of course, to J. F. Hogerton's article in the December issue on the gas

I refer, of course, to J. F. Hogerton's article in the December issue on the gas diffusion process, and to Col. Fox's very brief article in the same issue on the thermal diffusion plant. It seems to me that this latter plant, employing a process that has been very little mentioned, and whose mechanics are almost unknown to the ordinary engineer, deserves more extensive treatment. I also refer to the excellent article by P. C. Keith in your February issue. As an official of one of the firms supply-

As an official of one of the firms supplying equipment extensively, to this project, I appreciate keenly the secrecy limitations and the difficulty of telling a story which will be useful and interesting, and at the same time will not disclose any military secrets. However, the above authors, particularly Keith, have all solved this difficult problem. Without disclosing any secret information, they have managed to do three things: First, they have helped to give us a better picture of the tremendous complexities involved in this work and of the amazing wartime achievement, of which every engineer can be proud. Second, they have given a somewhat clearer and more complete picture of the process details of at least certain phases of this program. These details are naturally of interest to every engineer and scientist, in view of the fact that the successful use of atomic energy is undoubtedly the greatest scientific achievement of all times. Third, they have given hints of new techniques, new methods and new equipment, which will be useful in other fields. These have been hinted at elsewhere, but with not enough definiteness so that an engineer outside of the project could tell whether or not these things were actually useful to him. These articles have started the necessary job of informing other engineers of new techniques and new equipment, so that these war-born developments can be put to practical use in other fields besides this specialized one.

The prime purpose of this letter is to urge that such articles be continued and that they cover other phases of the atomic bomb project. More information is needed, for example, on the thermal diffusion plant, and there should be an article or series of articles on the electromagnetic separation plant. Of course, it goes without saying



**FLEXIBLE...** High-temperature vapor heating proceeds independently of lowtemperature liquid-phase heating in this processing system. Pressure in the vessels heated at  $600^{\circ}$  F is only 28 lb. gage, much less in the low-temperature system. Both systems are heated by a single vaporizer.

Dowtherm is the heating agent. The vaporizer is the compact "D" type tubular unit arranged for either oil or gas firing. The entire system is designed, constructed and installed by Foster Wheeler.

**Bulletin ID-46-3** describes Dowtherm process heating for a variety of services. Request a copy from any Foster Wheeler branch office, or address—

FOSTER WHEELER CORPORATION 165 Broadway · New York 6, N. Y.





## Standard can give you any one or all three..

DECAUSE Standard builds power and gravity conveyors in light average—or heavy duty types for either stationary or portable use, as well as a wide range of special types, you can install Standard equipment as you need it.

For "spot" handling of packages at receiving or shipping departments a section of wheel or roller conveyor will save time and eliminate excess manual handling. For stacking and piling merchandise in warehouse or storage rooms a Standard Handibelt or Handipiler portable conveyor will speed the work and utilize hard-toget-at ceiling space. For complete "linking" of all operations from receiving through manufacturing to shipping a system of Standard power or gravity conveyors (in belt, roller,







slat, push-bar, or chain types) cuts handling time, manpower, and costs

Whatever you need-whatever your

plans in conveying equipment check with Standard and gain the benefit of a 40 year background in convey-

Write for useful reference book "Conveyors by Standard" Catalog No. CM-46

STANDARD CONVEYOR CO.

General Offices: North St. Paul 9, Minn.

to the minimum.

ing and conveyors.



ROLLER - BELT - SLAT - PUSHBAR CONVEYORS - PORTABLE CONVEYORS AND PILERS - SPIRAL CHUTES - PNEUMATIC TUBE SYSTEMS that there should be a whole series on the Hanford Engineer Works and its unique problems of remote control, disposal of dangerous radioactive byproducts, etc. In view of what you have already done, I feel certain that even in the face of rigid secrecy limitations articles can be prepared and properly cleared by the Manhattan District which will be interesting, informative and useful to process engineers everywhere. Keep up the good work.

R. J. KRYTER, Treasurer The Esterline-Angus Co., Inc. Indianapolis 6, Ind.

#### MANGANESE ARTICLE CRITICIZED

To the Editor of Chem. & Met.

Sir:—I have read carefully the article in your March 1946 issue entitled "Electro-Process Developed to Produce Metallic Manganese." There is a statement made in the article that "the process (at the Electro Manganese Corp. at Knoxville, Tenn.) is the same as that developed by the Bureau of Mines." There is a further statement that "small scale production by this method (i.e., the Bureau of Mines) was begun in 1939."

These statements are decidedly misleading, particularly inasmuch as the first plant of the Electro Manganese Corp. was designed by personnel of the Bureau of Mines for 5,000 lb. a day and produced 100 lb. a day and was an operating failure. From that point on, the Electro Manganese developments were such as to result in a considerable number of patents which cover various stages of the Electro Manganese Corp. processes and make the procedures of that company a distinct entity. Apparently the only thing that the two processes have in common is that they are both based on manganese ores and employ electrowinning and electrolytic operations. This hardly makes them the same.

Certain steps in the flowsheet illustrated on page 107 bear considerable resemblance to the scope of issued Electro Manganese Corp. patents.

Something of the order of ten million pounds of electrolytic manganese have been produced and adequate production costs have been kept as records. Plants were projected for much larger capacities up to 50 tons a day. The article in the March Chem. & Met. indicates that electrolytic manganese might be considered to have a future cost. on the basis of Bureau of Mines estimates, of the order of electrolytic zinc. These figures are so far away from the actual production cost in continuously operated commercial plants that they can be considered to be definitely misleading. They apparently have resulted from the projection of short-term operation of experimental units. This type of reasoning in the metallurgical and electrochemical industries has many times in the past been shown to be full of pitfalls.

A number of years of operation of electrolytic manganese processes as developed by the specifically different operations of the Electro Manganese Corp. in contrast to those of the Bureau of Mines, does not appear to justify the optimism expressed in the article.

C. L. MANTELL

Consulting Engineer Electro Manganese Corp.

# Dodge # Timken THE COMBINATION FOR POWER ECONOMY

Dodge-Timken Type "B" Pillow Block.

The photographs show one of the latest developments in Dodge-Timken Pillow Blocks. This is the type "E", designed to provide Dodge-Timken efficiency at the lowest possible cost.

Are you paying for power you are not using? Now is the time to find out. Check up on your transmission equipment and replace the power wasters with modern

Timken Bearing Equipped power savers. The Timken Roller Bearing Company, Canton 6, Ohio.

TAPERED ROLLER BEARINGS

Cross sectional view of Dodge-Timken Type "E" Pillow Block.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



Headquarters for the San Francisco convention of the American Institute of Chemical Engineers during August 25-28 will be in the Palace Hotel (large rectangular building with inner court, lower right). In the background are the Bay Bridge, Berkeley, Oakland, Alameda and Mt.Diablo

#### PACIFIC PROCESS INDUSTRIES TRENDS · EVENTS · DEVELOPMENTS

JOHN R. CALLAHAM, Pacific Coast Editor, San Francisco, Calif.

#### AICHE TO CONVENE IN SAN FRANCISCO

PLANS for the first convention of the American Institute of Chemical Engineers in the West since 1924 are now materializing. The date has been set at August 25-28 and the convention headquarters will be at the Palace Hotel, San Francisco. Theme of the meeting will be "New Chemical Industries of the West," while one symposium on chemicals from petroleum has been definitely scheduled. There will also probably be a round-table symposium on "Chemical Engineering Education in the West." Vacation attractions of the West are being stressed, and moves are now well under way to provide regional "vacation consultation" services for those persons desiring further information on any particular locality. C. R. Nelson of Shell Development Corp., San Francisco, is general chairman in charge of the program, while George C. Gester, Jr., of California Research Corp., Richmond, has charge of arranging plant visits.

#### SHELL DEVELOPMENT ANNOUNCES MAJOR EXPANSION

ALREADY one of the two largest research and development organizations of the United States in the field of petroleum processing, Shell Development Co. has recently announced plans to expand its Emeryville, Calif., research laboratories by a capital expenditure of more than \$3,500,000. Construction of the new facilities, involving erection of three major new buildings and extensive remodeling of present units, will begin this spring and continue over a twoyear period, according to A. E. Lacomblé, president of Shell Development Co.

Architectural plans now approved show the largest of the new buildings as an eightstory structure with basement, designed primarily to house the research laboratories. It will be of steel and concrete construction. The second major building will in reality be a five-story addition to the present administration building in Emeryville. Its completion will necessitate modernizing existing facilities to harmonize with the new construction and will double the space now available for office and staff workers. The third structure is designed for heavy equipment. It will reach four stories with a basement and will house the large-scale laboratory facilities and service shops. In addition to the new buildings, Shell Development's expansion program calls for a substantial expenditure to remodel present facilities, construct small experimental plant buildings and provide new furnishings and equipment.

vide new furnishings and equipment. Established in 1928 with a staff of 35, Shell Development Co. has done much pioneering research on improvements in petroleum manufacturing processes and products as well as in the development of a chemical industry based on petroleum hydrocarbon raw materials. By 1939 the Emeryville staff had grown to 600 and by the end of the war this figure had increased to approximately 1,000 of which 350 were chemists, chemical engineers and other technical personnel. The Emeryville laboratories, now the largest research organization in the West, will employ 1,200 persons in 18 functional departments when the present 25 percent increase in staff is completed, it was reported by W. J. Hund, manager and associate research director of the laboratories.

#### GENERAL CHEMICAL BUYS SULPHURIC PLANT

PURCHASE of the \$552,000 sulphuric acid plant at Richmond, Calif., by General Chemical Co., wartime operator of the unit, has now been definitely settled, according to reports. The company has been operating the plant under a temporary lease. All manufacturing facilities, consisting of the conventional type of equipment, are built in the open and the only building is a one-story administration unit of 2,000 sq.ft. The plant has a design capacity of 65,000 tons annually of acid from sulphur shipped by barge from the Gulf Coast. It occupies a 10-acre site near the Richmond refinery of Standard Oil of California and was built under government sponsorship primarily to supply sulphuric acid to petroleum refineries. Other sulphuric acid plants owned and operated by General Chemical Co. in California are located at Nichols on San Francisco Bay and at El Segundo, near Los Angeles.

#### SODA ASH PRODUCTION SETS NEW RECORD

SODA ASH production on the Pacific Coast is still insufficient to meet consumption needs, according to reports during mid-March, and this chemical has been particularly tight in the area. Western production and sales for 1945, altogether from four natural producers in California, was at the record figure of 182,100 tons, according to preliminary figures from the U. S. Department of Commerce, as compared to the

This proposed building will house the research laboratories of Shell Development Co. in Emeryville, Calif. It is one of three major structures included in a \$3,500,000 expansion program being undertaken by Shell's research organization







The new CME Continuous Centrifuge sets new standards in centrifugal filtration. It extracts solids from liquids and separates immiscible liquids of unequal specific gravity at lower cost than with any other type equipment. There are no filter elements to renew or service.

Operation is continuous, uninterrupted, and automatic. The unit is entirely self-contained and requires little floor space.

CME Continuous Centrifuges are available in a variety of sizes and models to meet different requirements. Granular, amorphous, and crystalline materials such as caustic recoveries, salts from brine solutions, sugars, coal, scrap rubber, ground cork, cut sponge, and pulps are separated and washed at from 2 to 15 tons per hour. For separating fines or mixed sizes fractionated to particle size or specific gravity, for refining or degritting clays or



non-metallics, and for treating slimes, crystalline and fibrous matter, metal salts, fish reductions, and fine chemicals models of 1 to 6 tons per hour capacity are available.

CME Continuous Centrifuges are designed and built by pioneers in this modern, efficient, low cost type of filtration. Our engineering analysis of your problem will not obligate you. Send for full details.

CENTRIFUGAL MECHANICAL EQUIPMENT, Inc., N. J. Specialists in centrifugal separation

#### 95 River Street, Hoboken, N. J.



VALVES...

for Your Liquid Level Gages . . . for Your JERGUSON GAGES



THE words "& Valve" in our company name were not included just to make the name longer and more imposing. They cover an important division of our business . . . the design and manufacture of valves for gages for all liquid level indicating requirements.

Ever since we began to make gages years ago, we realized that the valves were as important as the gages themselves. We have put just as much engineering thought and manufacturing skill into our valves as into our gages.

Jerguson Valves are the ones to buy . . . for any liquid level gage installation. Always order them when ordering your Jerguson Gages. You can obtain any type valve desired: plain, automatic-closing, quick-closing, jacketed, offset.

We make gages and valves of any metal required to meet specific corrosive conditions. Valves are furnished with any type and size of connections required.

## JERGUSON GAGE & VALVE CO.

**88 Fellsway** 

Somerville 45, Mass.

Manufacturers of Gages, Valves, Drain Valves, Thermometer and Thermocouple Wells, Sight Glasses

Representatives in the Following Cities

Charlotte, N. C. Chester 1, Penna, Chicago 2, 111, Cleveland 14, Ohio Cincinnati, Ohio Detroit 4, Mich. Houston 1, Texas Kansas City, Mo. Los Angeles 6, Calif. Marshalitown, Iowa Memphis 3, Tenn. Minneapolis, Minn. New York 17, N. Y. Pittsburgh, Penna. Portland 8, Oregon San Francisco 10, Calif.

Seattle 9, Wash. St. Louis 11, Mo. Tulsa 12, Okla, Wilmington, Del. Mexico, D. F. Montreal 13, P.Q. Canada 1944 output of 179,600 tons and the 1943 figure of 165,700 tons. The 1945 California output represents about 4 percent of the total United States production of this chemical.

For a number of years, California production of soda ash has been insufficient to supply West Coast requirements. Although no official figures on consumption are available, private estimates on the deficiency within recent years range from 30,000-45,000 tons annually. Reason for this situation has been in the large wartime expansion of consuming industries, of which glass manufacture is the largest, with substantial amounts going into soaps and detergents, petroleum and sugar refining, paper, ceramics and non-ferrous metallurgy. Glass and soap, in particular, are still undergoing expansions, with a number of new plants announced or under construction. Prior to 1943, one producer of caustic soda by the lime-soda process in southern California represented one of the larger independent chemical users of soda ash; there is no bicarbonate production in the West.

Western output of soda ash is normally by four California producers of the natural product: American Potash & Chemical Co., Trona; Natural Soda Products Co., Keeler; Columbia Chemical Div. of Pittsburgh Plate Glass Co., Bartlett; West End Chemical Co., West End. The last of these firms has recently made known a considerable expansion program in soda ash production facilities.

#### NEW OXYGEN PROCESS SHOWS PROMISE

IN REVEALING a chemical method of preparing pure oxygen from the air, Dr. Melvin Calvin, associate professor of chemistry on the Berkeley campus of the University of Califorina, stated that the new process was first used in the South Pacific in preparing oxygen needed for welding and other repairing which had to be completed away from regular repair bases. Conceived by Dr. Calvin and associates while working on means of indicating oxygen changes in submarines, the initial findings were submitted to the National Defense Research Committee which sponsored additional research at the University of California in Berkeley and Los Angeles, California Institute of Technology, Massachusetts Institute of Technology and Iowa State College. The new method was first announced by Dr. Calvin before a meeting of the California Section of the

American Chemical Society in March. The process, which has been considerably improved since its conception in 1940, uses a simple tubular heat exchanger filled with crystalline granules of a new chemical compound, the cobaltous chelate formed from 3-fluorosalicyl-aldehyde and ethylene diamine. Low-pressure air is blown through the material, which absorbs up to 4.3 percent by weight of oxygen per cycle, and turns from red to black. Water cooling around the tubes is necessary for maximum absorption. When the air flow is stopped and the tubes heated with hot water or steam, the chelate liberates the absorbed oxygen as an extremely high-purity gas which can be pumped to regular storage tanks. Although there is a slow decrease in productivity with use, the cycle could probably be repeated over 2,000 times before regener. For IMPROVED EFFICIENCY AND SAFETY

In COMBUSTION AND OTHER PROCEES CONTROL



M.S.A. Gas Instruments are engineered and built to highest precision standards for the control of gaseous atmospheres in hear treating, fabric coating, film casting, petroleum refining, hydrogenation, inert gas generation, solvent extraction, gas production and distribution, power plant operation and other exacting industrial applications. Each instrument is specifically calibrated for the gas or vapor to be analyzed, and each installation is individually engineered for a specific use. Available as continuous indicators, recorders, controllers, or as simple alarms for operating warning signals whenever predetermined concentrations of a gas are exceeded. • Rapid in response. • Minimum maintenance required.

## OXYGEN INDICATOR

For those applications where maximum sensitivity 15 desired, analyzers can be provided with a full scale range of 0 to 0.5% oxygen, and for other uses instruments can be made available in the following standard scale ranges: 0 to 5.0%, 0 to 10% and 0 to 25% oxygen. Based on the use of new electrolytic detector cell, such analyzers are capable of the specific measurement of oxygen in mixed gases such as products of combustion, hydrogen, and hydrocarbons.





## COMBUSTIBLE GAS ANALYZER

For measuring combustible content of atmospheres related to process control and plant safety. Available in ranges capable of detecting a few hundredths of a percent up to and including 100% combustibles. Widely used for maintaining efficiency of solvent recovery systems, fabric coating machines and film casting operations as well as for controlling composition of inert atmospheres, detecting leakage of flammable products from processing equipment and for many other uses. Entire assemblies can be made explosion proof.

FURTHER DETAILS AND DEMONSTRATIONS GLADLY PROVIDED ON REQUEST



**Titeflex helps cut** maintenance costs

in the

**Chemical Industry** 

SAFELY HANDLES VARIOUS TYPES

OF LIQUIDS AND GASES

RESISTS CORROSION

PRESSURE-TIGHT

STANDS THE GAFF OF VIBRATION

If you are having problems in the conveying of corrosive liquids or gases under heat, vibration and pressures pass them on to Titeflex Application Engineers who will welcome the opportunity to discuss these problems with you. Throughout the chemical industry the application of Titeflex has materially helped cut costly maintenance in the handling of corrosives. This experience is available to you. Titeflex, Inc., 523 Frelinghuysen Ave., Newark, N. J.



ation of the chelate by recrystallization becomes necessary.

Greatest promise of the new method is believed to be for generating oxygen for in termittent or small-scale use in welding and other operations at locations remote from industrial oxygen producing plants and in instances where the cost of shipping, han dling and storing cylinders would be exces-sive. Other advantages of the process for such purposes are stated as (1) simplicity of equipment and operation; (2) flexibility in size, since an economic unit can be made as large or as small as desirable; (3) low power requirements, since the air need not be compressed to more than 20 lb. gage; (4) the fact that ordinary industrial waste heat, waste steam or 100 deg. water can be used

for liberating the oxygen. Determining factor in the economics of the Calvin process will most likely be the cost of the chelate chemical. Although never yet produced on a large scale, it is understood that there is interest in the possibilities of synthesizing the chemical industrially.

#### WESTERN CHEMICAL GROUPS SHOW HEALTHY GROWTH

REFLECTING the increased growth and stimulation of the chemical and process in-dustries of the West, membership in the American Institute of Chemical Engineers and the American Chemical Society has increased considerably, recent compilations show. With both organizations, member-ship in the West as a region has increased more than the national average, with Wash-ington, Oregon, California, Utah, Colorado and New Mexico in the lead. Detailed figures are shown in the accompanying table.

#### Western Chemical Membership Growth\*

|             | Amer.<br>1940 | Chem.<br>1946 | Soc. | Amer. Inst.<br>1940 | Chem.<br>1946 | Eng. |
|-------------|---------------|---------------|------|---------------------|---------------|------|
| Wash.       | 194           | 366           | 89   | 18                  | 60            | 975  |
| Ore.        | 110           | 192           | 75   | 3                   | 12            | 300  |
| Calif.      | 1,322         | 2.834         | 114  | 45                  | 286           | 528  |
| Mont.       | 61            | 57            | _    | 1                   | 200           | 000  |
| Idaho       | 28            | 24            |      | 1                   | 50            |      |
| Nev.        | 17            | 42            | 147  | Cont. 1             | 2             | -    |
| Utah        | 43            | 96            | 123  | i                   | Ř             |      |
| Ariz.       | - 21          | 34            | 62   | i                   |               |      |
| Wyo.        | 20            | 38            | 90   | 10/100              | -             |      |
| Colo.       | 157           | 212           | 35   | 10                  | 30            | 200  |
| N. M.       | 26            | 92            | 254  | 1                   | ß             | 200  |
| - 10.00     |               |               | _    |                     | 0             |      |
| Total       | 1,999         | 3.987         | 100  | 83                  | 107           | 201  |
| Total U. S. | 21 023        | 40 550        | 02   | 2 141               | 301           | 391  |

• Figures for the American Chemical Society are for Dec. 31 of the years previous to those indicated; those for the American Institute of Chemical Engineers are for Jan. 1 of the years indicated indicated

#### ALCOA MOVES STIR INTEREST IN OREGON BAUXITES

PLANS for shipping high-grade Alaska limestone into the Portland, Ore., area and at the same time developing recently discovered high-aluminum iron ores in northwestern Oregon have been announced by Aluminum Co. of America. Alcoa itself is a potential future consumer of the limestone, states C. S. Thayer, works manager of the firm's privately-owned Vancouver, Wash., plant, while at the same time availability of the material will solve the problem of highgrade lime for other existing and potential industries of the area.

Alcoa Mining Co. is reported to have spent around \$500,000 in exploratory work on the ferruginous bauxite ores of Washing-



# DrierS... that can take it!

O COMBAT the corrosive and abrasive action of wet salt, Lukens Monel-Clad Steel is the ideal choice of material for the wet end of the large drier above. The even more economical Lukens Nickel-Clad Steel is used for the dry end where the action is less severe. By preventing metal pick-up and protecting the product from contaminating byproducts of corrosion, product purity is assured. Lukens Monel-Clad and Nickel-Clad Steels have for many years been standard materials of construction for salt handling equipment, where, in addition to protection of product purity, for production economy continuous operation is essential.

Lukens Clad Steels — Nickel-Clad, Inconel-Clad and Monel-Clad — are also recommended for large drying and dehydrating equipment handling other chemicals and pharmaceuticals.

Consisting of a layer of nickel, Inconel, or Monel permanently and homogeneously bonded to a heavier backing plate of steel, Lukens Clad Steels offer protection against metallic contamination and prevention from corrosion for equipment requiring plate thicknesses, at savings in material cost up to 60% over the cost of solid nickel, Inconel, or Monel. Bulletin 255, "Lukens Clad Steels" gives complete information and additional applications. Your copy on request.

LUKENS STEEL COMPANY • 315 LUKENS BUILDING • COATESVILLE, PA.





REDUCING MATERIAL COST OF LARGE CORROSION-RESISTANT EQUIPMENT

Drier for pharmaceuticals, constructed of 20% Lukens Nickel-Clad Steel by Struthers Wells, Warren and Titusville, Pa. The pan is 5' 9" in diameter, 1/2" thick, with carbon steel jacket.



Drier for chemicals, 2' 6" in diameter, 10' 0" long, fabricated by Henderson Barwick Company, Limited, Montreal, Canada, of 20% Lukens Nickel-Clad Steel.



Rotary vacuum drier for agricultural chemicals, with inner shell fabricated of 20% Lukens Nickel-Clad Steel by Struthers Wells, Warren and Titusville, Pa.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



## NITROGEN GENERATORS INERT GAS PRODUCERS

Capacity range from 1000 CFH. to 100,000 CFH.

Standard and special designs to meet the most unusual, difficult and specific requirements.

#### **Exclusive Features**

- Product gases of highest quality
- Operating range down to 20% capacity

Manufacturing Co.

BALTIMORE 2, MD.

- Utmost safety features
- Full automatic control

Ask for Bulletin No. F 901.4 containing complete information



ton County, Ore. More than 16,000 chemical analyses from drill cores indicated that the deposits, estimated at over 3,500,000 long tons, contain about 25-35 percent Fe, usually more than 30 percent alumina, and about 6.0-6.5 percent each of silica and titanium. While this laterite is lower in alumina than the Arkansas bauxites used during the war for producing alumina, the high iron oxide content will make possible the production of marketable iron through a process being developed by Alcoa, company engineers predict.

The firm has not indicated the nature of the process under development, but in Thayer's statement was a guarded forecast of a plant that will produce both alumina and pig iron; at present there is no largescale production of alumina in the Northwest. It has been suggested that a modification of the Pederson process, which has been used in Norway on similar ores, might be used economically. In this process the ore is mixed with lime and coke in an elecore is mixed with lime and coke in an electric furnace and the molten pig iron drawn off, leaving a calcium aluminate slag which is treated with hot soda ash solution containing some caustic soda to liberate aluminum hydrate.

#### MAJOR SODA ASH EXPANSION UNDER WAY AT WEST END

IN ORDER to help supply the sharply increasing demands for soda ash on the Pacific Coast, West End Chemical Co., Oakland, Calif., has undertaken an expansion of its Searles Lake plant that will increase the firm's capacity for producing natural soda ash by about 67-75 percent. The expansion involves additional housing and plant improvements to cost approximately \$750,000. The plant changes, now under way, will include installation of a battery of stainless steel heat exchangers, a compressor to increase plant refrigeration by 200 tons daily, a new boiler frigeration by 200 tons daily, a new boiler for and 20 brine carbonating towers. It is hoped that the new facilities will be in operation by early fall. West End Chemical Co. is one of the two large soda ash producers in the West.

In the West End process, limestone is calcined with coke to produce a byproduct lime and  $CO_2$ . The gas is used for carbonating brine from the lake wells under such conditions that sodium bicarbonate is precipitated. The filtered, carbonated brine is mixed with raw brine, thereby converting the more acid borates to tetraborate, which is processed to produce both anhydrous and crystallized decahydrate borax. The bicarbonate is calcined to produce dense ash, with the CO<sub>2</sub> recycling back to the carbonating towers.

#### INSECT CONTROL WARFARE MUST BE INTENSIFIED

ONLY eternal vigilance can now prevent epidemics of new insects and insect-borne diseases in California from foreign sources, according to Dr. Dwight Pierce, entomologist, at the recent California conference of pest control operators. Six different species of mosquitoes were recently found in a shipment of tires from New Guinea, and airplanes from Saipan have been found to carry mites. Returning cavalry horses can introduce sleeping sickness, and a South American disease which affects the human





Close-up of finger-tip "trigger" control. The claim is a strong one, we know. It is based on this premise: The trigger power tube cleaner can be called best only if it will clean your heat exchanger tubes quicker, more thoroughly and with greater economy than any other outside suspension cleaner. And we can back up that claim, because the Wilson Trigger Power tube cleaner does just that! It is the only tube cleaner with which it is economically practical to remove deposits from completely plugged tubes without damage to the tube walls. The reasons for such performance? Here they are — all exclusive with Wilson:

Wilson Trigger Power has higher torque at any speed than any other tube cleaner. This cuts down-time radically which means production dollars saved. The unusually fast action of Wilson Trigger Power (up to 3500 rpm working speed) permits the use of standard Wilson accessories, such as: expanding brush, expanding cleaner, etc. Wilson Trigger Power permits a choice of any scavenging agent...; even coal oil can be used where it is economically available.

The Vibromatic Attachment, which delivers 1900 pulsations or "tops" per minute, enables the cutter bit to get a "bite" on the deposit even when cleaning tubes completely plugged with fiint-hard carbon or rock-like deposits.

You can use the Wilson Trigger Power even on sagged tubes. The hollow shafting has sufficient "give" to follow the contour of the sag without damaging tube walls.

The Wilson Trigger Power provides the operator with instantaneous, finger-tip control of speed and power.

These features are your assurance that you will get the kind of tube cleaning you want — the kind you need for full economy and long tube life.

Wilson Trigger Power tube cleaners are now available from stock. Or, if it is additional information you seek, write for our bulletin today. Address department A.

#### THOMAS C. WILSON, INC.

21-11 44th Avenue, Long Island City 1, N.Y.,

## WILSON TUBE CLEANERS

2

3

4

5

6

TW703



None of the efficiency losses of a variable-speed AC motor.

- No expensive DC installations.
  - No hydraulic or electric drive couplings.
    - JUST A SIMPLE BY-PASS VALVE that recirculates the unwanted pulp back through the pump.

## MORRIS Straightflo Pump

when equipped with a separate by-pass line

From high to low volume . . . both at a low head . . . and all with the high efficiency and low cost of a standard constant-speed induction motor! Requiring no expensive D.C. installations, and no hydraulic or electric drive couplings! That's what this MORRIS Straightflo Pump gives you when you add a separate by pass line, and a simple by pass valve that re-circulate the unwanted pulp back through the suction end of the pump, cutting the delivery to any volume you want.

It is so simple, so economical and so practical that you'll wonder you didn't think of it yourself. Avoids all the cost and efficiency losses of a woundrotor, variable-speed A.C. motor. Does away with all troublesome complications. Just a simple valve to adjust to the volume you want. Just a standard constant speed motor—and no increase in power consumption as the delivered volume is increased.

#### **Engineered to Specific Needs**



Either Vertical Straightflo (see diagram or horizontal type (Illustrated above) may be adapted to this installation. Morris Straightfio (axial flow) Pumps are built to the specific requirements of the job, designed to give optimum performance under all the conditions encountered. Suction and discharge elbows can be furnished in almost any position desired.

Write for bulletin No. 167.



heart can be transmitted by giant bedbugs found on foreign pack rats.

New insecticides to combat these and similar pestilences were listed by Dr. A. M. Boyce of the University of California. DDD, a United States modification of DDT, offers promise since it is much less toxic to hu-mans than DDT. The British-developed insecticide 666 or benzene hexachloride is one of the most promising of the new organic insecticides. A chlorinated hydrocarbon called Velsicol 1068, whose organic structure is still uncertain, is reported to be 3-4 times as deadly to houseflies and twice as poisonous to potato beetle larvae as DDT. Dr. Boyce told of two new poisons for killing rats which, with termites and moths, are the most costly pests in California: Antu or alpha-naphthyl thiourea and "1080" or sodium fluoracetate. Antu kills by drawing body liquids into the rats' lungs, causing death in the same manner as drowning. The fluoracetate is so poisonous to warm-blooded animals that its distribution will be severely restricted

#### CARBONIC GAS AND DRY ICE PLANT UNDER WAY

CARBONIC gas and dry ice will be produced in a new \$750,000 Berkeley, Calif., plant on which foundation work was recently begun by Pure Carbonic. Inc. The plant, which will be erected adjoining the firm's present factory, will provide six times the production capacity of existing facilities. It will house factory, offices and garage for a fleet of trucks to operate a distribution system covering all of northern California and part of Nevada. The plant is expected to be completed next fall.

#### STANDARD OF CALIFORNIA LEASES RFC REFINERY

A PORTION of the government-owned 100octane refinery near Bakersfield, Calif., will be leased by Standard Oil of California, San Francisco. Designed for production of 3,000 bbl. per day of 100-octane gasoline, the plant consists of a reforming unit, gas concentration unit, isomerization facilities, HF alkylation unit and isopentane splitter. Approxinately one-third of the facilities will be operated by Standard and the remainder will be maintained by the company for the Reconstruction Finance Corp.

Formerly operated by Mohawk Petroleum Corp., the plant has been declared surplus by RFC. Standard's lease is for a minimum of two years, subject to cancellation by either party on one year's notice.

#### TWO NEW GLASS CONTAINER PLANTS ANNOUNCED

Two new plants for producing glass containers are now under construction in California, according to recent reports. The first is that of Hazel-Atlas Glass Co., which purchased 17 acres of land in Pomona on 5 acres of which the new plant will be built. This unit will manufacture glass containers primarily for food purposes. Investment is reported at \$1,250,000 and 300 people will be employed. J. R. Carnahan in San Francisco is in charge of the firm's western activities, which includes a manufacturing plant at Oakland, Calif.

In addition, Ball Bros. of Muncie, Ind., has acquired 30 acres of land in El Monte

## INSTINCTIVE BALANCE to the rescue

If you're way out on a limb when a bee attacks, you need more than ordinary balance. It's a situation that requires extra action, fast. Nothing less than the spontaneous effect of instinctive balance can save you from a nasty fall.

In much the same way, upsets in critical industrial processes are kept in check by HYPER-RESET – a remarkable function of Foxboro's Stabilog Control. Sensitive not merely to the amount, but also to the rate of disturbance, HYPER-RESET Stabilog Controllers apply

#### HERE'S HOW MUCH DIFFERENCE HYPER-RESET MAKES



CAPACITY

corresponding corrective actions simultaneously. The result is recovery from disturbances in as little as one-fourth the usual time, with the degree of upset held to new minimums.

The longer, more involved curve shows recovery time in a typical process before the development of HYPER-RESET. The shorter, simpler curve shows how rapidly and smoothly the HYPER-RESET function stabilizes the same process. Usual recovery time is cut by as much as 75%.

Such improved process control may be just the additional edge you need in today's competitive market. Write now for full information on Foxboro's Stabilog Control with HYPER-RESET. The Foxboro Company, 16 Neponset Avenue, Foxboro, Mass., U. S. A. Branches in principal cities.

#### Why HYPER-RESET Requires Only Adjustment

An exclusive practical advantage of the HYPER-RESET Stabilog Controller is its simplicity of manipulation. The patented HYPER-RESET feature provides simultaneous setting of both the reset and rate-sensing functions.

A definite pressure drop across the derivative resistance for every rate of change in the measuring system produces an extra increment of correction.

Only one adjustment is necessary because each reset adjustment valve connects the derivative resistance to a different capacity in the network. (See diagram at left.) Since the proportioning system is automatically self-balancing, the use of a derivative resistance requires a greater quantity of air to maintain equilibrium. In producing this greater flow, a different pressure drop is established by each adjustment. Hence, the effective value of the fixed derivative resistance is really dependent upon the capacity in series with it – and requires no independent adjustment.

11





## Simplified Master Taper Attachment Fits All Types of Lathes Instantly!

Now! A "universal" taper attachment that fits all lathes, old or new, big or small—that can be attached or removed in *minutes!* This taper attachment is not bulky or cumbersome. It bolts easily to the bed, in the back of any lathe.

The Master performs accurate taper turning, boring and threading with the ease of any straight line tool operation. It precisely duplicates any tapered part. Is usable in any position. Does not interfere with straight turning. The bar is precisely machined and fitted. There is no vibration. Taper graduations are in inches at one end; degrees at the other. The Master is available now, in two sizes; two feet and four feet in length.

Available today also, is delicious Wrigley's Spearmint Gum. This is one treat you can enjoy even when your hands are busy. And the pleasant chewing helps to keep you alert and wide-awake, even through a monotonous job.

Chewing Wrigley's Spearmint satisfies a fellow. In addition, it helps keep your mouth moist and fresh—so you feel better. And feeling better, you naturally work better. By making gum available to all, scores of plants and factories report increased morale and efficiency that really pays off.

You can get complete information from the Keene Electrical Machinery Co. 549 W. Washington Blvd., Chicago 6, Ill.



Model 710 Master Taper Attachment



AA-65

on which to erect a factory to produce fruit jars and other glass containers. The first unit of this plant will have an estimated cost of \$1,000,000 but provisions will be made for expansions at a later date. Hugh Crawford will be Pacific Coast manager, according to reports.

The new plant of Glass Containers, Inc., subsidiary of Fibreboard Products, Inc., at Antioch is about ready for capacity operations. This firm also operates a glass container plant near Los Angeles. Owens-Illinois Pacific Coast Co. has recently indicated an expansion at its glass plant in Los Angeles and possibly also at its plant in Oakland, Calif. Northwestern Glass Co., Seattle, only glass producer in the Northwest, has installed an electric furnace of new design. All these moves emphasize the growing importance of the West as a consumer of glass, particularly of glass containers for food and beverages, and of soda ash, silica sand, salt cake and other raw materials used in glass manufacture.

#### ZEOLITE MANUFACTURED BY LARGEST SOFTENING PLANT

For the past six months the largest water softening and filtration plant in the United States has been manufacturing its own requirements of synthetic zeolite. The plant, that of the Metropolitan Water District of Southern California near La Verne, Calif., was placed in operation during mid-1941. In the early part of 1945, since the war had made zeolite practically impossible to obtain, District engineers proceeded to build a plant from machines and operating equipment made in the machine shop at the softening plant.

Raw materials used in the process are sodium aluminate and sodium silicate solutions made up in 250-gal. batches. When the batches are prepared, each solution is run into its reservoir tank on a mixing gantry on rails which straddles the drying area; this consists of 14 panels, each having an area of 400 sq. ft. When the gantry is above the panel selected for that particular batch, the two solutions are dropped simultaneously from the reservoirs into the 600gal. mixing tank mounted on the frame of the gantry and provided with a high-speed stirrer. After being mixed for 30 seconds, the solution is drained into the drying area where it remains until properly cured. Harvesting the dried zeolite is done by means of a suction lift. It is collected in cloth sleeves within the vacuum chamber. After screening, the gel is ready for use in the softening process. Cost of production by the District is claimed to be about half the price of the zeolite available for purchase.

#### SPOKANE MAGNESIUM PLANT MAY OPERATE AGAIN

PLANS for getting Spokane's governmentowned Mead magnesium plant back into production are getting under way, it was recently revealed. The plant, designed to produce annually 24,000 tons of ferrosilicon and 24,000 tons of magnesium by the ferrosilicon process, was operated a short time during the war for this purpose by Electro-Metallurgical Co. At the end of the war, this firm was just beginning to operate the plant for the production of metallic sodium and metallic calcium was





## **Research Chemicals** ALKANE SULFONIC ACIDS



## A new Series — Interesting in both the Organic and Inorganic Fields

Available only in research quantities-potentially available commercially.

#### THE ALKANE SULFONIC ACIDS

Are strong, stable acids, non-reactive with paraffinic and aromatic hydrocarbons. Are effective but milder catalysts than sulfuric acid in typical reactions. Form many interesting organic derivatives. Form metal salts characterized by high water solubility, including those of lead and barium.

|  | Nothere<br>Selfonte Acid | Efficient<br>Soffwarig Keid | Wined Allone<br>Sultania Antida |
|--|--------------------------|-----------------------------|---------------------------------|
| Molecular Weight                       | 96                       | 110                         | 110-120                         |
| pH of 1% Solution                      | 1,05                     | 5.70                        | 1.15                            |
| Solubility of Lond Soft (Long-security | 59.2                     | 67.3                        |                                 |
| Color                                  | Yellow                   | Eight Amber                 | Amber                           |

Available in ½ and 1 pound packages, prices on request. Methane and ethane sulfonic acids are in limited supplymixed acids available in larger quantities.

AVAILABLE COMMERCIALLY Aliphatic Hydrocarbons High Boiling Aromatics Petroleum Sulfonates Rubber Plasticizers Polybutenes For further information send for Bulletin No. 11 and for price list.

STANDARD OIL COMPANY (INDIANA) CHEMICAL PRODUCTS DEPARTMENT 910 SO. MICHIGAN AVENUE, CHICAGO 80, ILLINOIS

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



It reduces particles to sub-microdimensions by grinding, and

Effects perfect dispersion of such particles into fluid or plastic materials.

An examination of the turbine design shows why it is possible for a single machine to perform these two distinct operations. Liquid is broken up into



minute globules by high velocity impact at top of turbine. Suspended material is mechanically sheared by the rotor and stator teeth, and hydraulically sheared by the final smooth surfaces of rotor and stator.

Eppenbach Mills are available in laboratory and production sizes. Capacities range from  $\frac{1}{2}$  to 3600 gallons per hour or higher.

Write for complete details. Ask for a copy of Catalog No. 401.

EPPENBACH, INC. 45-10 VERNON BOULEVARD LONG ISLAND CITY 1, N. Y.



reported to be under consideration, but the unit is now being maintained only on a standby basis with a working force of about 40 employees.

Electro-Metallurgical Co. has indicated to the War Assets Corp. its desire to open negotiations for operation of the plant, according to reports, but engineers familiar with the light metals industry doubt that magnesium will ever be produced in the unit. Meanwhile, government engineers have made a complete study of possibilities for producing cyanamide, fertilizer and ferrochrome in the plant.

#### ELECTROLYTIC IRON PLANT TO BE BUILT IN TACOMA

SELECTION of Tacoma as location for the Tacoma Powdered Metals Co., Inc., a newly formed organization which will produce powdered iron from scrap steel by an electrolytic process, was announced during mid-March. Construction work on a plant will start as soon as labor and materials become available; initial plant installation is expected to cost approximately \$500,000 and to require 50-75 employees. Officers of the new organization, Frank Eichelberger as president and Jacob Schoder of Chicago as vice president, are nationally known metallurgists and engineers.

The Eichelberger process, said to be different from that employed at any other powdered metals plant, consists essentially in dissolving the scrap steel in hydrochloric acid and electrolytic deposition of pure iron on the cathode of the cells. After further physical treatment, the deposit is washed, dried, screened and sealed in airtight containers to prevent rust. The product will be shipped east where the only plants now equipped to use powdered iron are located. Factors which decided the company to locate in Tacoma included low-cost electric power, ample supplies of hydrochloric acid, a supply of hydrogen now largely discharged as waste by two chemical plants, and quantities of scrap steel which for many years has been cheaper on the Pacific coast than in the east.

Powdered iron, a comparatively new development greatly advanced during the war, is regarded by many engineers as one of the most promising materials in the field of powder metallurgy for the molding of small, high-precision machine parts. With the new improvements in techniques of precision molding and heat treating, powdered iron will probably be used on an increasing scale for production of automobile and other small machine parts otherwise requiring expensive tooling operations.

#### IDAHO SUPERPHOSPHATE OUTPUT STILL EXPANDING

ADDITIONAL production facilities that will raise the output of normal superphosphate fertilizer at Simplot Fertilizer Co., Pocatello, Idaho, to the neighborhood of 200,000 tons annually are now being planned, according to officials of the firm. New equipment will include a second Sturtevant acidulating den and another bagging unit. As nitrogenous materials become more available, the firm plans to supply more ammoniated and complete fertilizer.

Although built and first operated during 1944, the Simplot superphosphate plant was



## St. REGIS PACKAGING SYSTEMS prove their worth ... in SALT

This fourth case history, in a series of MULTI-WALL success stories, relates the experiences of one of the leading American salt refining companies. The multiple problems of caking, contamination, and absorption of odor were solved and economy in packaging was effected after consultation with St. Regis field engineers. As a result, this large salt refinery has been a satisfied user of Multiwall Paper Bags and St. Regis Valve Bag Packers for over ten years.

**PROTECTION:** The multiple layers of kraft paper combined with a moisture proof sheet prevent penetration of water and atmospheric moisture and keep the salt clean and free from caking. No longer is there any problem of lint and dirt in the salt. **REDUCED CONTAINER COSTS:** A 46 per cent saving in bag cost has been made by using Multiwall Paper Bags instead of fabric bags.

**INCREASED PRODUCTION:** An increase of 18 per cent per hour in packaging output, with the same crew, was made possible through use of Multiwall Paper Bags and St. Regis Valve Bag Packers.

**EASIER HANDLING:** Small portable conveyors running from each of the valve bag filling machines deliver the 100-lb. bags to a large master conveyor on which they ride to the shipping room.

**CONSUMER PREFERENCE:** Customers express satisfaction with the Multiwall Bag because it protects the product in transit and while stored and eliminates the danger of the salt absorbing odors from other commodities.

> Left: Operators filling 100-1b. Multiwall paper bags using St. Regis Valve Bag Packers. Machine deposits filled bags on small portable conveyors.

> Below: From small conveyors illustrated on left filled bags are delivered to this master conveyor which delivers the 100-lb. bags to the shipping room.





NEW YORK 17: 230 Park Ave. BALTIMORE 2: 2601 O'Sullivan Bldg.

(Sales Subsidiary of St. Regis Paper Company) CHICAGO 1: 230 No. Michigan Ave. dg. SAN FRANCISCO 4: 1 Montgamery St.

## Mail this coupon for the complete story

 Birmingham
 Boston
 Cleveland
 Dallas
 Denver

 Detroit
 Franklin, Va.
 Los Angeles
 Nazareth, Pa.

 New Orleans
 No. Kansas City, Mo.
 Ocala, Fla.
 Seattle
 Toledo

 IN CANADA: St. Regis Paper Co.
 (Can.)
 Ltd., Montreal, Vancouver.

*Without obligation*, please send me full details regarding "Case History" No. 4, outlined above.

NAME

COMPANY\_

ADDRESS\_

# IMPORTANT



## FOR THE MAN IN CHARGE OF **PRESSURE GAGES**

This is the first technical catalog written on pressure gages. It explains the theory of operation and gives all the technical details of modern gage construction. It tells how the Helicoid movement works—an exclusive feature of Helicoid Pressure Gages. If you use any quantity of pressure gages in your operations, the man in charge of your gages should have a copy of the new Helicoid Gage catalog.

HELICOID GAGE DIVISION AMERICAN CHAIN & CABLE Bridgeport 2, Connecticut aggregate for building blocks that are extremely light yet show strengths up to 2,000 lb. per sq.in. Many industrial uses for the calcined rock have been suggested.

A recent and improved type of kiln just now starting operations is expected to reduce processing costs of the material still further and to eliminate the old-type rotary kiln previously used. The present burner can produce about eight cars daily of expanded rock; a second unit is now being added. Developer of the process is P. G. Means, who is also president of Fluttrok.

#### IDAHO GROUP PLANS CHEMURGY ADVANCES

THE STRIDES Idaho has made in the science of chemurgy were detailed at the recent annual meeting of the Idaho committee of the National Farm Chemurgic Council. Discussion of potato starch manufacture was highlighted, as it represents Idaho's first attempt at industrialization and utilization of cull potatoes, normally a waste product. Idaho has four of these white potato starch plants, all established since 1941, which have been supplying more than 50 percent of such starch consumed in the United States. These plants, built at Twin Falls, Blackfoot and St. Anthony, were made of "junk parts," and it was reduced by installation of new equipment and reduction of processing time.

reduction of processing time. A \$100,000 research program has been organized and the Idaho Research Council, headed by Dr. L. C. Cady, acting dean of Idaho, Moscow, is now conducting work on noxious weed killers, use of gums and resins for secondary trees, benefication of phosphate rock and soil stabilization. A new process for purification of sugar beet juice to make sirup and an operation whereby amino acids may be obtained from beet waste were reported to be under development by Amalgamated Sugar Co. Idaho growers produced 220,000,000 lb. of sugar from beets in 1945. It was pointed out that residue pulp from the manufacture of starch can be used for livestock feed or converted into glucose, sirup or alcohol.

livestock feed or converted into glucose, sirup or alcohol. Windsor J. Lloyd, Nampa, was reelected chairman of the Idaho committee, with George Crookham, Caldwell, as vice chairman and R. E. Gale, Boise, as secretary.

#### NORTHWEST MACNESITE LEADS REFRACTORY PRODUCTION

WITH several mines and a calcining plant at Chewelah, Wash., Northwest Magnesite Co. continues to be the largest domestic producer of refractory magnesia, according to a recent report of the U. S. Tariff Commission. After pilot plant experiments in 1939, selective flotation equipment for beneficiating ore and new calcining facilities were installed at the Chewelah plant at a cost of over a million dollars, more than doubling the company's capacity to produce refractory magnesia. Of the total output at this plant, maintenance grades have recently accounted for 80-90 percent. The company also acquired the right to use the Britishcontrolled Chesny process for production of refractory magnesia from sea-water and dolomite and its new plant at Cape May, N. J., has an annual capacity of about 35,000 short tons by this method. Northwest's production

ACCO

л

P

m

th

dr Sm

Sp

ab

ac

Dn:

17

60

15

# FOR 'PRECISION-ENGINEERED' PROCESS PLANTS & EQUIPMENT LOOK TO I \* P \* E

## LOOK FOR THIS GREEN STRIPE

- The I\*P\*E Seal of Warranty on equipment

#### Built-to last

Built—of warranted materials fitted to your needs Built—to precise I\*P\*E standards Built—to advanced engineering and design specifications Built—to do more with less outage

## LOOK FOR

ENGINEERING. 1\*P\*E equipment-both complete plants and individual units-incorporates sound engineering. Result: equipment created functionally to fit your own manufacturing process ... simplified plant layout ... and in many instances, a better product. 1\*P\*E's broad engineering experience has resulted in major improvements in standard equipment used by the process industries. Our technological skills often incorporate both engineering and design improvements, particularly when special process equipment is "tailored" to your particular manufacturing process.



DESIGN. I\*P\*E process equipment represents advanced design improvements and features. I\*P\*E designing boards go to work, stripping equipment down to fundamentals, adding only those design improvements that offer greater efficiency. Such functional simplicity pays off in lower maintenance cost, less trouble shooting, longer equipment life and less outage!

### If <u>Production</u> Is Holding Up Your Orders — Remember I\*P\*E Delivers Equipment On Time

IF YOU ARE flooded with post war orders . . . if even full time production finds you unable to keep up with your orders, consider this: have I\*P\*E analyze your production process—make suggestions that will help you step up output through the addition of new process equipment.

MANY NATIONAL MANUFACTURERS have been able to increase production within a short period of time by calling in 1\*P\*E as "process equipment counsel," for each 1\*P\*E installation recommended is handled as a specific problem closely related to your product, rate of production, and physical condition encountered...and delivery of the equipment is made ON TIME! 1\*P\*E has been the first to design certain types of chemical processing equipment that have become the standard for the industry. We have "tackled" and solved engineering problems attempted by few other manufacturers.

I\*P\*E's STAFF is at your disposal without obligation ... why not write, phone or wire today?

#### Look to I\*P\*E for

Agitators Agitator Drives Agitator Drives Autoclaves Chemical Process Equipment Condensers Continuous Processing Units Dissolvers Dowtherm Kettles Electric Kettles Electric Kettles Electric Kettles Electric Kettles Electric Kettles Aborbers Grease Mixers Heat Exchangers Heat Exchangers Heat Exchangers Heat Exchangers Heat Exchangers Mitrators Paste Mixers Scap Crutchers Sche Entering Agitators Special Machinery Special Machinery Special Valves Stills Synthetic Resin Plants Turbine Agitated Units Vacuum Kettles & Mixing Equipment



## SPRAY TROUBLE? CONSULT NOZZLE HEADQUARTERS



Are all of your processes using Spray Nozzles as efficient as you think they could be? Do the Sprays produce even distribution? Break up the liquid into as fine particles as you would like? Resist the corrosion or wear conditions satisfactorily?

Send Monarch an outline of your spray problem—if your liquid can be sprayed with direct pressure at all—Monarch can furnish the nozzles.

#### **NOZZLES FOR:**

- OIL ATOMIZING
- HUMIDIFYING
- AIR WASHING
- DESUPERHEATING
- SPRAY PONDS
- MILK POWDERING
- EGG DRYING
- ACID CHAMBERS
- CONCRETE CURING

WRITE—While you think of it!

MONARCH MFG. WKS., INC. 2730 E. WESTMORELAND ST. PHILADELPHIA 34, PA. of refractory magnesia from all materials in 1944 amounted to approximately 65 percent of the total domestic production as compared to about 90 percent for the immediate prewar period. Its wartime investments account for nearly half the total new investments in the entire industry.

About 75 percent of the crude magnesite produced in the United States in the prewar period came from Washington, and Northwest has continued to control the production of crude magnesite and deadburned magnesia in that state. Very little magnesite is transported; the bulk is calcined at or near the mine.

California magnesite deposits, second in importance to those of Washington, were rapidly being exhausted during the war but Nevada, with vast deposits, has recently become an important source. Westvaco Chlorine Products Corp., Newark, Calif., continued to be the only producer of periclase-grade magnesia from one mine in the state. This firm's relatively small production of other refractory magnesia comes from two sources—sea-water bitterns and crude magnesite. The most significant change in the industry during the war has probably been the opening by Permanente Metals Corp. of a sea-water magnesia plant at Moss Landing, Calif., and the recent erection nearby of a plant by Permanente Cement Co. to produce refractory brick. This plant is reported to have a capacity of 100 tons daily of high-purity periclase brick.

#### PRIVATE INDUSTRY TAKES OVER RFC PLANTS

INDUSTRIAL plants constructed and financed by government agencies for wartime operations are now being sold or leased to private corporations and individuals. Recent information released by the War Assets Corp. on sales and leases for the eleven western states is tabulated below. (See Chem. & Met., Jan. 1946, pp. 188, for a complete listing of such plants.)

#### Sales and Leases of RFC Industrial Plants and Sites

|                          | M IT III            | Original        | Rated Capacity.   | Plant Cost | F Sales<br>Price | Purchaser or<br>Lesses |
|--------------------------|---------------------|-----------------|---|------------|------------------|------------------------|
| War Operator             | Plant Location      | Produce         | Toma  |            | 401 000          | n. m.                  |
| Coast Carbons Inc.       | Tacoma, Wash.       | Wood charcos    | 450/mo.   | \$121,230  | \$24,000         | Malak desays Theme of  |
| Molybdenum Com of        | Empire, Colo.       | Molybdenum      |   | 351,503    | 851,503          | Molybaenam Corp. of    |
| Amorian                  | Perbud over         | concentrate     |   |            |                  | America                |
| Westman Ollening         | Manash Calif        | Coloined        | 100/da.   | 287,354    | 72,000           | Westvaco Chiorine      |
| Weitvaco Chiorine        | Hewalk, Calu.       | magnosia        |   |            |                  | Products Corp.         |
| Producta Corp.           | W. J. Wash          | Magnesia        |   |            |                  | Hardesty Chemical Co.  |
| Baste Magnearum, Inc.    | Henderson, Nev.     | MERICEUM        |   |            |                  |                        |
| (portion)                | ** 1                | Countin and a   | A COMPANY OF  | 8 478.788  |                  | Stauffer Chemical Co:  |
| Bane Magnesium, Inc.     | Henderson, Nev.     | Caustie sous,   | and the second se | 0,110.100  |                  |                        |
| (portion)                |                     | chiome          | a 000 /   | FED 000    |                  | T-dependent Insula-    |
| Pacific Carbide & Alloys | Tacoma, Wash.       | Calcium carbide | 1,000/mo.   | 002,000    |                  | tions Ine              |
| Ca                       |                     |                 |   |            |                  | Cloba Avisona Jahan    |
| Pine Ton Ashestos Muca   | Globe, Aris.        | Asbertos        |   | 60,440     |                  | GIODE ATINOLI ABOOP    |
| The reprint of the       |                     |                 |   |            |                  | tos Co.                |
| Bohn Aluminum &          | Los Angeles, Calif. | Aluminum        |   | 8,205,148  |                  | Harvey Maddine Co.,    |
| Rease Com                |                     | shapes          |   |            |                  | inc.                   |
| Drass Corp               |                     |                 |   |            |                  |                        |
|                          |                     | a manhables a   | mmmettel for 1  | 00.00      |                  |                        |





Place valves correctly

in the line

## JENKINS 3-POINT FORMULA - 3

Choose JENKINS VALVES

for lifetime economy

# The right road to lower valve costs.

When you follow the Jenkins 3-Point Formula, you can be sure you're headed for new savings in valve expense.

First comes careful selection of pattern and metal. While many types may be used in a given service, ordinarily there is only one type best suited to withstand the service conditions and require least maintenance.

Next comes correct installation. Both where and how a valve is installed can limit or extend its service life, according to the valve "know-how" applied. Write for Booklet No. 944 on installation.

Third, by choosing Jenkins Valves, you not only get valves made with *extra* endurance that means *extra* economy. You also get the experienced advice of top-rated valve specialists, Jenkins Engineers, whenever you need it, on any question of selection or placement.

Base your valve buying on the 3-Point Formula, and make sure of the extra value that means lowest cost in the long run.



### Jenkins Fig. 117-A Bronze Lift Check Valve

Made with a renewable composition disc, Fig. 117-A is dependable choice for drop-tight closure, economical maintenance, and, long, trouble-free service. The disc can be replaced quickly and easily without removing the valve from the line. For pressures up to 150 lbs. steam, 200 lbs. O.W.G.

ONE OF OVER 600 EXTRA VALUE VALVES MADE BY JENKINS VALVE SPECIALISTS

LOOK FOR THIS FAMOUS DIAMOND MARK



#### THEY S-T-R-E-T-C-H IN EVERY DIRECTION

BIG NEWS for users of liners. Chase C. & P. Liners are crinkled for vertical elasticity and pleated for horizontal elasticity. It's the protective feature which provides plenty of flexibility in all directions! Result: no more broken liners nor costly damage to contents due to liner failure or breakage.

Write today. Let us tell you more about Chase Crinkled and Pleated Liners—it's the better liner that actually costs no more!



## NEWSFROM ABROAD

#### URGENT HOME DEMANDS LIMIT BRITISH EXPORTS BUT FOREIGN TRADE IN CHEMICALS IS RISING

#### Special Correspondence

**B**RITAIN'S EXPORT drive is about to grow into a production drive covering the whole field of industrial activity. The export trade still ranks as priority No. 1, but in some sectors a new rival for the country's output of industrial products is claiming even higher priority grading. With the end of the winter the building season has started, and soon huge quantities of various materials will be absorbed into new houses to replace those destroyed during the war. Further, a spread of home demand for

Further, a spread of home demand for consumers' goods can no longer be checked by appeals for austerity and economy alone. The time has come for a revision of wartime policies for curbing consumption, but the country's resources are not equal to the three-fold task of expanding exports (to pay for imported food and raw materials), of producing more consumers' goods (to offer the worker a reward for hard effort), and of building more houses, plants and machines (to make up for wartime losses and omissions) at the same time.

To do justice to all three tasks, a large over-all increase in production and, since manpower is limited, in productivity is needed. It is sought on the road of cooperation between government, industry and workers and may well be obtained in this way. It is clear, however, that with the country's economic resources of plant, power, labor and raw materials strictly limited careful planning will be needed to achieve maximum results. In the chemical industries, more particularly, constant adjustment of supply and demand, continuous attention to the distribution of deficiency commodities among competing buyers, and utter economy in the use of fuel and labor will be required. It is true that chemical manufacturers have so far escaped interference by government departments. No chemical trades, with the exception of the coke-oven and coal-tar industries, are scheduled for nationalization. The de-control of chemical materials has proceeded at a satisfactory pace. None of the Working Parties appointed to investigate shortcomings in business methods have to deal with any chemical production. By their successful part in the export drive, British chemical manufacturers have indeed proved their efficiency and enterprise to the satisfaction of the authorities.

The country-wide production drive, however, will create entirely new problems. It will, in the first place, necessitate a reorientation of export policy. Some classes of goods will have to be virtually withdrawn from the export market, while shipments of

Samples Now Available for Research and Development

Aromatic Acids FROM Coal

A mixture of solid, water soluble, polycarboxylic acids prepared by controlled oxidation of bituminous coal.

**INDICATED USES:** 

Resins • Plasticizers • Surface Active Agents Reactions Requiring Polyfunctional Molecules

Technical Information and Samples on Request.

MELLITIC ASSOCIATES (Coal Research Laboratory) CARNEGIE INSTITUTE OF TECHNOLOGY Pittsburgh 13, Pennsylvania



## **DESIGNS and FABRICATES**

### **Processing Equipment that Performs as Specified**

General American uses the coordinated efforts of its research laboratories, pilot plants, chemical engineers and fabrication experts to build equipment that will perform according to specifications.

Experienced process engineers design the equipment to meet precise product requirements. Metallurgists select the materials, carbon steels, stainless steels, clad steels, silicon bronze, Monel, alloys, aluminum, Hastelloy, etc.

Units are precision built from the materials selected to suit the particular process

requirements, resist corrosion or prevent product contamination. The result is more efficient equipment for producing higher quality products with lower operating costs.





That is Missouri's position. In FRONT RANK among the nation's most advantageous industrial locations . . . in the very CENTER of things opportunitywise.

Missouri produces over three hundred thousand tons of lead and zinc annually. Iron ore is found in huge quantities. Leads U. S. in barite production. Bauxite and other elements are readily accessible in this region.

In addition Missouri can claim: Over 950 new corporations last year. New modern State Constitution. Low taxes. Unlimited water supply. Wealth of raw material and abundance of firm power. Vast pools of skilled native-born friendly labor. Rich diversified consumer market. Hub of all inland transportation. Extensive cultural and educational facilities. 350 alert communities eager and able to offer every cooperation.

Specialized, confidential service to industrialists. Write direct: Missouri State Department of Resources and Development, Dept. 707, Jefferson City, Missouri.

THE STATE OF MISSOURI

THE HEART OF AMERICA

others will be encouraged by all means. The paint trade, for instance, has raw materials for export orders only to the value of £540,-000 in January-March, while foreign orders on the books of paint manufacturers early in January totalled £3,000,000. The discrepancy was largely due to shortages of drying oils and pigments. In future, domestic building is likely to

In future, domestic building is likely to reduce further the amount of paints available for exports. In the cosmetics trade, on the other hand, the government hopes to stimulate exports by increasing raw material supplies for the home market. Manufacturers of toilet preparations and perfumery were told that additional home trade quotas would be given to them proportionate to the value of their exports in 1946, on condition that the industry's total exports would rise by 60 percent between the first and fourth quarters of this year. Thus cosmetics makers will pay directly by bigger exports for the cost of foreign raw materials for their home market output.

Chemical exports as a whole continue their upward trend. They are now running at about three times the prewar value. Their volume has doubled as compared with 1938. This expansion is largely due to the re-opening of old markets which had to be neglected during the war. It was made easier by the exhaustion of stocks in overseas importing countries and by the absence of competition from continental Europe. The principal buyers of British chemicals are still India, Australia and other Empire markets, Egypt and Argentina, while in Europe France and Spain are so far the only important buyers of British chemicals.

The United States is still among the leading buyers, but a decline in British chemical shipments to the States has occurred since the wartime peak period. If, as expected, shipments abroad of inorganic chemicals, dyestuffs, drugs and cosmetics continue to increase while those of paints, fertilizers and coal-tar products are kept in check by a proportionately bigger and more urgent home demand, the direction of Britain's export trade in chemical and allied products is unlikely to be affected to any marked extent.

#### FERTILIZER EXPANSION

British fertilizer consumption has undergone a heavy expansion during the war, and there is every prospect that it will continue to advance. The increase, though easily explained by the need for more home-produced food and the prosperity of farmers, is indeed striking. Despite wartime difficulties of shipping, the consumption of phosphate rock for fertilizers rose from 26,300 long tons a month in 1935 to about 60,000 tons in 1945. The consumption of superphosphates increased accordingly from a monthly rate of 42,800 tons in 1935 to over 80,000 tons in 1945, while that of basic slag advanced from 24,000 tons monthly in 1937 to more than 45,000 tons last year.

The supply position for potash has not improved to the same extent; less than half the potential demand can be covered at the present rate of importation. Similarly, the consumption of some types of nitrogenous fertilizers would have been higher had bigger supplies been available. There has been a substantial advance in the use of synthetic nitrogen compounds, but there is no doubt that British agriculture could usefully absorb

AI

## ENGINEERING PROGRESS REPORT # 2 LJUNGSTROM AIR PREHEATER

## Economics of Fuel Saving by Lower Exit-Gas Temperatures

Mounting fuel costs stress the importance of savings made by lowering exit-gas temperatures, and thus increasing heat recovery. Problems arising from lower exit-gas temperatures are being given intensive study. Progress report one covered control of deposits. Encouraging progress is being made toward the reduction of corrosion. At the present time, while it is not possible to eliminate corrosion, it can be held down to a low rate. This leaves the entire subject of lower exit-gas temperatures on a strict dollars-and-cents basis. With the mass blower in use, increased draft loss caused by the deposits plugging up the heater is no longer a factor. An exclusive feature of the Ljungstrom air preheater provides for rapid and inexpensive replacement of the ele-

ments at the cold end.

## THE AIR PREHEATER CORPORATION

Executive Offices: 60 East 42nd Street, New York 17, N.Y. . Plant: Wellsville, N.Y.


• Listed here are a few of the refined chemicals from coal tar that are now commercially available through Reilly research and development. Most of the products listed have not before been offered in quantity. Many of them have promise of usefulness to industry and to the nation.

These products, all of which are available in 90% or higher purity, have a wide range of applications, including: Pharmaceuticals, insecticides, fungicides, antiseptics, rubber chemicals, additives to gasoline and lubricants, photographic compounds, dyestuffs, plastics, printing inks, and in the synthesis of organic chemicals.

Further information on any of these products gladly furnished on request.

And earbourd

ACENAPHTHENE ANTHRACENE CHRYSENE DIMETHYLNAPHTHALENES FLUORANTHENE FLUORENE METHYLNAPHTHALENES 2-METHYLNAPHTHALENE NAPHTHALENE PHENANTHRENE PYRENE

Acid

M-CRESOL O-CRESOL P-CRESOL M-ETHYLPHENOL P-ETHYLPHENOL 1,3,5-METHYLETHYLPHENOL PHENOL 1,2,4-XYLENOL 1,3,4-XYLENOL 1,3,5-XYLENOL 1,4,2-XYLENOL 2-AMINO-3-METHYLPYRIDINE 2-AMINO-4-METHYLPYRIDINE 2-AMINO-5-METHYLPYRIDINE 2-AMINO-6-METHYLPYRIDINE 2-AMINOPYRIDINE 2-AMYLPYRIDINE 4-AMYLPYRIDINE 2-ETHANOLPYRIDINE 4-ETHANOLPYRIDINE 2-HEXYLPYRIDINE ISOQUINOLINE LEPIDINE 2.6-LUTIDINE **3-METHYLISOQUINOLINE** 2-(5-NONYL)PYRIDINE 4-(5-NONYL)PYRIDINE ALPHA PICOLINE **BETA PICOLINE** GAMMA PICOLINE 2-PROPANOLPYRIDINE **4-PROPANOLPYRIDINE** PYRIDINE QUINALDINE QUINOLINE 2-VINYLPYRIDINE

Send for 56 page booklet (second edition) and supplementary printing describing the complete Reilly line of coal tar chemicals, acids, oils, bases and intermediates.

# Reilly Tar & Chemical Corporation

Merchants Bank Building • Indianapolis 4, Indiana 500 Fifth Ave., N. Y. 18 • 2513 S. Damen Ave., Chicago 8, Ill. more home-produced as well as, of course, imported natural nitrates. It is difficult to predict how this will affect the external commerce in chemical fertilizers, but as the shipping position has eased and more Chile saltpeter and other products can be imported, an attempt will certainly be made to ship larger tonnages of the fertilizers of which Britain is a surplus producer.

#### CREMICAL EXPORT QUOTAS

If, as a government spokesman stated, the heavy industries are to export one quarter of their total production, the chemical trades will probably have to shoulder an even bigger export quota, and to fulfill this the younger branches of the chemical industry will have to make a bigger contribution than they do today. There is no lack of projects for new factories and plant extensions in the plastics and artificial fibers industry, but the bigger firms are hampered by the lack of construction materials and complain about delays in official handling of applications for building licenses and other permits.

Smaller firms with less ambitious projects may find it easier to obtain official sanction for their plant projects and do not meet insuperable difficulties in procuring labor and materials for new production schemes, but big companies seem to experience serious delays. A good illustration of their predicament is provided by some figures in the latest annual accounts of Courtaulds, the big rayon producer. This company sets aside £457,000 for deferred repairs and renewals which were due in 1945, since the amount actually spent on such work, viz. £102,000, was in respect of repairs and renewals which should have been carried out in previous years. The difference between the actual expenditure and what is considered necessary gives an idea of the arrears accumulated during the war.

Manufacturers of chemical plants and apparatus will also have to divide their attention between home market and export orders. The delegation of Indian chemical manufacturers which toured Great Britain and the United States returned with the impression that "American manufacturers of plant and machinery are in no way better in the matter of deliveries than firms in the United Kingdom," but this is cold comfort for British chemical firms wishing to buy new plants. They are forced to make do with the apparatus and machinery they have got.

The conversion of existing wartime plant to different peacetime uses has been developed to a fine art. Firms wishing to set up new works are helped by the disposal of armament factories and development of "industrial estates." One of the latter, near Glasgow in Scotland, will house four smaller factories for Chemicals, drugs and pharmacenticals.

Recent allocations of government factories to private firms include several to be used for making plastics, laboratory chemicals, and other fine chemicals in different parts of the country. In addition, several plastics makers have made separate arrangements for new factories to facilitate the extension of their production range.

Quite a number of such small and medium-sized production projects have become known during the past few months, so that perhaps the first tentative conclusions can be drawn concerning the trend reflected

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING



The importance of specialized shop facilities for pipe fabrication is demonstrated convincingly by this Grinnell-developed extruding machine.

The accurately extruded nozzles permit easier pipe erection in the field by making each weld a plain circumferential butt weld. The smooth contours, accurate positioning of the nozzle and the uniform wall thickness are possible only because of this type of shop equipment designed for the job. Make use of Grinnell's engineering, metallurgical research and pipe fabrication facilities when specifications call for shop fabricated piping.

GRINNELL COMPANY, INC. Executive Offices, Providence, R. I. Pipe Fabrication Plants: Providence, R. I. Atlanta, Ga. Warren, Ohio



WHENEVER PIPING IS INVOLVED

heeps rust out-keeps heat in

#### **B-H NO. 1 INSULATING CEMENT**

A special rust inhibitor, in this insulating cement, keeps metal surfaces free from corrosion. No rust can form—even when

the cement is allowed to dry out slowly on cold equipment.

The basis of B-H No. 1 Cement is nodulated *black* Rockwool. Although applied with water, the nodules remain unchanged—insuring full insulating efficiency. This cement withstands temperatures up to 1800° F. under the most humid conditions.

It can be stocked without breakage or loss, is easily applied even by an unskilled laborer, and is fully reclaimable when used at temperatures not exceeding 1200° F.

In every way B-H No. 1 Insulating Cement is ideal for maintenance work, especially for valves, fittings and irregular surfaces, large or small, and as a finish over blanket and block insulations.

The coupon below will bring you full information and a practical sample of B-H No. 1 Cement.



Baldwin-Hill Co., 568 Klagg Ave., Trenton 2, N. J. Send information on products checked below:

Free sample of B-H No. 1 Cement No. 100 Pipe Covering-effective up to 1200° F. (for long runs overhead, underground, Diesel exhausts) Mono-Block—the one-block insulation for all temperatures up to 1700° F. Black Rockwool Blankets (felted between various types of metal fabrics)

|         | nead, underground, Diesel exhausts) | between various types of metal fabrice) |
|---------|-------------------------------------|---|
| NAME    |                                     | POSITION                                |
| FIRM    |                                     |   |
| ADDRESS |                                     |   |
| VIII    | 204                                 | E STATE                                 |

by these new factory schemes. The new plants are dispersed over the whole country, thus avoiding the mistake committed in the past of industrial congestion in a few areas with consequent transport and labor troubles. There is no evidence of a trend towards specialization; on the contrary, in such new fields as plastics the leading manufacturers are obviously endeavoring to spread their activities both horizontal and vertically.

Another feature of new production schemes is the participation of U. S. companies in some new ventures. A recent development in this field is the formation of British Geon Ltd., a new £500,000 capital company, which is "to adopt an agreement between the Distillers Co. (biggest producer of industrial alcohol in the British Isles) and B. F. Goodrich Chemical Co. of Cleveland, Ohio," to make resins and plastics. It would not be surprising if the next few months would bring more examples of such international cooperation in new industrial ventures.

#### TECHNICAL UNIVERSITY OPENS IN SAO PAULO, BRAZIL

OPENING last February of the department of industrial chemistry as the first unit of the School of Engineering at Sao Paulo, marks an innovation in Brazilian technical education since it enables students to take a university course in engineering, chemistry, and related fields immediately after having completed five years of elementary and five years of secondary school. Organized by the Rev. Roberto Saboia de Medeiros, S. J. who visited the United States in 1944 and enlisted the support of prominent industrialists, the university is administered and financed by the Foundation of Applied Sciences, a Jesuit organization.

#### NEW RAYON PRODUCTION PLANNED FOR CANADA

WHILE apparently still in its preliminary stages, a project looking toward new production of rayon yarn and staple in Canada is said to be under consideration. The report credits a combination of United States and Canadian interests as originators of the project but the United States interests are not identified either as individuals or as representatives of any rayon company. Members of the firm now operating the Dionne Spinning Mills Co. at St. George de Beauce, are mentioned as the interested Canadian parties. The unofficial report is that a new company will be formed to produce rayon in the building which has been used as a government arsenal at St. Malo, close to Quebec.

#### PATENT SITUATION AFFECTS DEVELOPMENTS IN CHINA

REPORTS from McGraw-Hill World News Bureau state that foreign technicians foresee reluctance on the part of their corporations to risk introducing manufacturing processes in China on an all-out basis unless the Chinese government enacts a law for protection of patent rights. American firms in Manchuria, whose patents came under laws instituted by the Jap puppet regime, stand to lose out now that the area has been regained by China unless the government continues the legal protection. A similar situation is

MEMO: TO PLANT OPERATORS use Bicarbingler, for Jaster, simpler, for Jaster,

mk step 1

the "BICARB" way

the ACID way

Add "Bicarb" caustic completely converted — hot wash safe. step 2

NONE

Add soda ash reaction alkaline—

then wash (hot

wash may now be

safely used).

Addacid—reaction then acid — cold wash.

#### TIME WITH "BICARB"

#### TIME WITH ACID



THE MATHIESON ALKALI WORKS (INC.) 60 East 42nd Street, New York 17, N.Y.

Bicarbonate of Sada . . . Caustic Sada . . . Sada Ash . . . Liquid Chlorine . . . Chlarine Dioxide . . . Ammonia, Anhydrous & Aqua . . . HTH Products . . . Fused Alkali Products . . . Synthetic Salt Cake . . . Dry Ice . . . Carbonic Gas . . . Sodium Chlorite Products . . . Sodium Methylate



#### A MATHIESON DEVELOPMENT

Faster, simpler, safer than acid, bicarbonate of soda effectively removes caustic by changing it into sodium carbonate or soda ash.

Originated and commercially developed by Mathieson Research, this process offers certain definite advantages:

- acid resistant equipment not required.
- hot wash safe.
- production speeded by elimination of additional steps necessitated by acid process.
- careful chemical control unnecessary.
- no health or other hazards involved

These advantages, plus new ones stemming from intensive research, may hold important meaning for you—may bring to light possibilities you haven't thought of.

While complete details for the utilization of this process have been evolved specifically for textiles, Mathieson Research is prepared to carry out further assignments in other fields.

For best results, consult our Technical Staff in regard to adapting this new Mathieson development to your particular operations. Write for further information.



15 to 900 psi Control and shut-off of volume and pressure for air, gas, steam, liquids and semi-solids



# TORQUE IS EQUALIZED in Quick Operating



Three-Way Valves

All R-S Butterfly Valves are precision engineered, metallurgically and mechanically, and this is the chief reason why the Three-Way Valves have met widespread approval and acceptance.

Designed for mixing and quick interchange service, these valves are adapted to pressures from 15 to 900 psi and for elevated or sub-zero temperatures. In manual op-

eration, four to six revolutions of the hand wheel fully open or close the valve vane. Adjustable linkage is usually provided so that the mixture can be changed at will.

With a pressure drop across the valve, the vane tends to close itself. The torque on the closed right-hand vane (see illustrations) is opposite to that on the open left-hand vane so that the torque is equalized and no excessive load is placed on the prime mover whether the operation is manual or automatic.

Available in sizes from four to sixty inches. Write for details and Catalog No. 14-B.





faced in Korea and Formosa. Well-known American trade marks which lost protection in Jap-controlled territories during the war include Permutit, Nichrome, Monel, Carborundum Alundum, and Pentode.

#### ITALIAN PAPER INDUSTRY OPERATES AT LOW RATE

SURVEYS of the paper industry in Italy have brought out that damage to the plants during the war years was not very heavy and it is estimated that from 80 to 85 percent of paper-making capacity has been left intact. However, the industry has been slow in getting back to normal operations and only a small part of the available capacity is being operated. Recent reports place total production at from 20 to 25 percent of normal.

#### RUSSIA HAS NEW METHOD FOR PROCESSING OZOKERITE

PRESS reports from Soviet Russia say ozokerite is now processed in a new plant at Tadzhikistan. Mechanized processing permits the extraction of 75 to 80 percent of the material compared with 20 percent obtained by methods in former use. In Russia this mineral wax is used in treating hides and skins, as a solvent in the manufacture of synthetic rubber, and in dyes and medical preparations.

#### INDIA HAS SCARCITY OF DYES WITH PRICES HIGH

PRIOR to the late war, India obtained the major part of its coal-tar dyes from Germany. From 1940 on, Germany has dropped as an exporter and while the United Kingdom, the United States, and Switzerland have increased their shipments, the total supply has been inadequate for all Indian requirements. Prices have been on an upward trend and have more than doubled the prewar levels. India produces dyes only on a small scale. Attempts to build up dye production have not met with much success but an effort is being made to develop a home output of about one-half the country's needs. However it will take a long time to train the highly skilled workers required.

#### DDT WILL BE MANUFACTURED BY JAPANESE COMPANY

PERMISSION has been given by American military authorities for the manufacture of DDT in Japan. The basic ingredient for DDT will be imported from the United States and it will be mixed with talc obtained from the mines at Sarusawamura, in East Iwai County, Iwate Prefecture. The Japan Steatite Industrial Co. (Nihon Kasseki Kogyo Kaisha) will pioneer in the undertaking.

#### CHEMICAL SUPPLIES IMPROVE IN MARKETS OF URUGUAY

MORE plentiful supplies of chemicals placed the chemical and chemical-consuming industries in Uruguay in a more favorable position to start the present year. Imports of sulphur and arsenic were large in the final quarter of 1945 and stocks of anhydrous ammonia also were increased through imports. Dyes continue to be scarce but arrivals eased the situation somewhat. Acetic acid and acetone were other chemicals re-

# FOR THE PLASTICS INDUSTRY

As the plastics industry grew, Stauffer chemicals kept pace—day to day, year to year—supplying increasing quantities for an increasing industry that seemed to know no bounds. Now, today, the plastics industry stands on the threshold of a new era in production and Stauffer stands with it—ready to keep that pace with dependable chemicals.

#### STAUFFER PRODUCTS

\*Aluminum Sulphate Borax Boric Acid Carbon Bisulphide Carbon Tetrachloride Caustic Soda Chlorine Citric Acid \*Copperas Cream of Tartar Muriatic Acid Nitric Acid Silicon Tetrachloride Sodium Hydrosulphide Stripper, Textile

Sulphuric Acid Sulphur Chloride \*Superphosphate Tartar Emetic Tartaric Acid Titanium Tetrachloride

Sulphur

(\* Items marked with star are sold on West Coast only.)

#### STAUFFER CHEMICAL COMPANY

420 Lexington Avenue, New York I7, N. Y. 221 N. LaSalle Street, Chicago I, Illinois 424 Ohio Bldg., Akron 8, O.--Apopka, Fla. 555 South Flower St., Los Angeles 13, Cal. 636 California Street, San Francisco 8, Cal. North Portland, Oregon—Houston 2, Texas



#### No. 94 Healthguard Respirator

Efficiently filters out lead, silica and nuisance dusts, through throwaway paper filters. Speaking diaphragm permits normal conversation. Pliable, sealtight rubber with broad easy-resting facial contact for comfort; adjustable head-bands. Bureau of Mines Approval, No. 2116.

• For protection from dust or fumes ... prescribe CESCO Respirators for your workers.

Your prescription is supported by two important advantages: First, CESCO Respirators permit free breathing, at the same time giving workers full protection from dust and fume dangers. Second, CESCO Respirators are worn with minimum interference with normal comfort—every possible comfort feature is incorporated into CESCO products.

This combination—assured safety and maximum comfort—makes CESCO Respirators especially popular with wearers. That's why your best buy is CESCO.

#### No. 95

Fume Respirator Cartridge-type respirator for protection from light gas and vapor concentrations. Rubber face cushion shapes to varying facial contours, provides air-tight seal, comfortable fit.



No. 80 Dust Respirator Lightweight disphragm-type dust protector; contains large, quickly-changed filter pads. Made of molded rubber, with replaceable, soft cloth facelet.

CHICAGO EYE SHIELD CO.



#### GERMAN CHEMICAL INDUSTRIES

#### BERYLLIUM METAL

BERYLLIUM is made on a small scale in Rheinfelden in a cell with a nickel anode and iron cathode. The current used is 500-1,000 amp. The ore is sintered with CaO and extracted with  $H_2SO_4$ . The A1 and Fe are removed as alums. Be(OH)<sub>2</sub> is precipitated with NH<sub>4</sub>OH and converted to BeO by calcining. It is briquetted with carbon and then chlorinated. The chloride is electrolyzed in a fused bath with KCl. Be separates in crystallized form and is then melted in vacuum. The Be is used to make 1-2 percent copper alloys.

Digest from "Deutche Gold und Silber Scheide Anstalt, Degussa, Frankfort/Maln" OPB Report No. 181 by L. M. White,

#### **ISO-PARAFFIN SYNTHESIS**

WARTIME research by the Kaiser Wilhelm Institute fur Kohlenforschung on the Fischer-Tropsch synthesis has been primarily directed along the line of iso-paraffin synthesis.

Operating conditions for the synthesis of iso-paraffin have been found to lie in the range of 300 atm. pressure and 420 to 450 deg. C. For pressures under 300 atm. the yield falls off rather sharply, although a very slow reaction will take place at 30 atm. or over. Higher pressures than 300 atm. give increasingly greater percentages of oxygenated products, until at 1,000 atm. the principal product is dimethyl ether. Similarly, lower operating temperatures give slower reaction rates, more unsaturated compounds, a very high percentage of alcohols, and less carbon formation on the catalyst. For temperatures slightly greater than 450 deg. C., the products become principally naphthenic, and carbon deposition becomes excessive. Instantaneous reaction rates, however, are increased.

It has been found that the best synthesis gas has a  $CO:H_2$  ration of 1.2 volumes of CO to 1 of  $H_2$ . Increasing the hydrogen increases methane formation; decreasing the hydrogen lowers the over-all yield.

Best catalyst found for this synthesis has been an alumina-thoria co-precipitated one, although ZnO-Al<sub>2</sub>O<sub>3</sub> appears to be nearly as good and much cheaper. Using either of these materials it was found necessary to burn off the carbon deposits about every two weeks of steady operation. This was accomplished with air at the temperature of the synthesis. Catalysts so treated have been used continuously for over 6 mo. without appreciable decline in activity. Their heat sensitivity is also quite good, as they have been held for prolonged periods at 800 deg. C. without damage.

Heat evolution during synthesis is approximately the same as with the normal synthesis, i.e. one-fifth of the heat of combustion of the products. Since it is possible to work in a 20 to 30 deg. C. temperature range, this lessens the problem of very close temperature control normally encountered in this process. Another advantage is found in the fact that sulphur does not seem to



accurate reproductions of x-ray diffraction patterns showing application to specific industrial problems.

in the party of the second second in the

#### this helpful guide



Picker Bulletin No. 1245 is available without cost or obligation. Simply ask for it (on your letterhead, plcase, to either of the addresses below).

PICKER X-RAY CORPORATION 300 Fourth Avenue, New York 10, N. Y. WAITE MANUFACTURING DIVISION 17325 Euclid Avenue, Cleveland 12, Ohio



#### can bring you up-to-date on uses of x-ray diffraction . . .

You've heard of the remarkable contributions to any diffraction has made to many urgent wartime problems (in the development of synthetic rubbers, use of steel in shell cases, improvements in plastics, among others).
Its applications are so diverse that in many plants today x-ray diffraction has become an indispensable routine tool for rapid physical and chemical determinations, research in product improvement and design, studies in waste reduction.
This Picker Bulletin No. 1245, just published, discusses many phases of application, types of apparatus, techniques employed.
It will be helpful in the evaluation of the method in your own problems. Send for it today.



descriptions of construction and use of various types of diffraction cameras, tube and target characteristics, etc.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



appreciate in a DESPATCH Laboratory Oven. Fast, accurate heat recovery in 2 to 8 minutes after loading a cold charge!

As the graph suggests, the nearlyvertical heat recovery curve of a Despatch oven eliminates unnecessary delay between tests, lets you start "timing" new loads sooner. Result: you can easily run through more tests per day . . . obtain needed data faster . . . and definitely improve

your laboratory work schedule.

See your local dealer or write direct to DESPATCH OVEN CO., 617-B 8th St. S.E., Minneapolis, Minn.



482 TERRACE

BUFFALO 2, N. Y.

be nearly as deleterious as in former syntheses, although the upper allowable limit has not yet been determined.

Gas velocities have been fairly accurately studied, and it was determined that 20 c.c. of a 2 to 4 mm. catalyst were necessary for each 10 l. of synthesis gas per hr. Any increase above this velocity gave sharp decreases in yield and also tended to form increasing amounts to alcohols.

Product yields, in g. per cu. m., are as follows from a ZnO-Al\_Q a catalyst using a CO:H<sub>2</sub> ratio of 1, at 300 atm. and 450 deg. C.:

Total yield of  $C_3$  and higher..... 120-130  $C_4^a$  (90% isobutane)...... 50- 80  $C_5^a$  and higher (over 97% iso).... 30- 60

A comparison of the 2 catalysts shows that for a thoria-alumina catalyst (1:4 by weight) the best yields of all are obtained. Higher gas velocities can be used, and there is little tendency to form alcohols. However, there is a greater tendency to form carbon on the catalyst, meaning shorter burn-off times.

The development of the Fischer-Tropsch process as a producer of iso-paraffins, and thus a source of high quality aviation and automotive fuels, opens the way for it to become the most versatile of all synthetic fuel processes. It would then be capable of producing products which range all the way from high quality diesel fuels and lubricants to excellent aviation gasoline.

Digest from "Wartime Research on Synthetic Fuels; Kaiser Wilhelm Institut fur Kohlnforschung" OPB Report No. 289 by D. R. Dewey.

#### H<sub>2</sub>O<sub>2</sub> PRODUCTION THROUGH 2-ETHYL ANTHRAQUINONE

CONVENTIONAL methods of hydrogen peroxide production are all electrochemical reactions involving the oxidation of solutions of sulphuric acid or ammonium sulphate. It has been known that reactions involving the oxidation of easily oxidizable organic materials and the extraction of the resulting peroxide with water could be used. The process described here had been operated successfully at Ludwigshaven for several months before it was bombed out. The plant had a daily production of one metric ton of  $H_sO_a$  calculated on 100 percent  $H_aO_a$  basis. The chemistry of the process was:



In the unit the total working solution was 15 cu. m. of which one-quarter is in the reductor, one-quarter in the oxidizer, and one-half in the other vessels. The total time for circulation is 2 hr. The main difficulty is the first reaction. This is carried out by passing hydrogen through the quinone in a solution of 50 percent thiophene free benzene and 50 percent cyclohexanol in the presence of Raney nickel. It is preferable to use higher aliphatic alcohols  $(C_7 - C_{11})$  if possible. The process is carried out in nine steps, as follows:

Precontactor—Converts remaining  $H_2O_2$ (0.1N) with hydroquinone. One-tenth of the total hydroquinone is circulated through



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

#### METERING YOU CAN BANK ON...with R-C





R-C Positive Displacement Maters accurately measure from 5% to 150% of their normal ratings.



Extreme simplicity of R-C Rotary Positive Dis-placement principle enables you to account economically for every cubic foot of gas metered through these units.

• You get accurate measurement of gas or liquid with Roots-Connersville Positive Displacement Meters.

Accuracy is assured by the simple, correct design of the meter, with its absence of small parts, impossibility of tampering and complete freedom from adjustments.

This simplicity naturally leads to low cost per cubic foot of measuring capacity and extremely low maintenance cost. Thus, R-C metering gives you dual-ability not obtainable in any other meters.

> **ROOTS-CONNERSVILLE BLOWER CORPORATION** One of the Dresser Industries 604 Illinois Avenue, Connersville, Indiana

#### ROTARY POSITIVE METERS GAS

ROTARY POSITIVE AND CENTRIFUGAL BLOWERS - EXHAUSTERS - BOOSTERS LIQUID AND VACUUM PUMPS - METERS - INERT GAS GENERATORS

the precontactor. This is an excess, but free peroxide poisons the nickel catalyst. The precontactor was made of aluminum and contains 1 cu. m. of catalyst, a porous clay carrier containing metallic nickel and silver.

Reducer-The first reaction is carried out in this aluminum equipment at room temperature and 1-2 atm. pressure. A stoichiomet-ric amount of H<sub>2</sub> is added for the product removed. Only one-half of the total quinone is reduced to hydroquinone in the reduction step. This is done purposefully because the combined presence of hydroquinone and quinone causes formations of quinhydrone which increases the solubility of the hydroquinone in the solution.

After Filter—A bag type filter is used, and cloths rarely need changing. Cooler—A water cooler is used and, roughly, one-half of the heat of the over-all

reaction is removed. Oxidizer—Aluminum cannot be used wherever peroxide and hydroquinone solution are copresent because of corrosion. The oxidizer is of enameled iron and the heat pick-up is 7-8 deg. C. from roughly 30 to 37 deg. C. The entire mixing is done by dispersing the gas through a porous plate. Nitrogen is present and is recycled to eliminate loss of benzene vapor in the nitrogen effluent. Oxygen is added to the cycle. The oxidation is essentially complete and no hy-droquinone is present in the exit. However, a slow hydrogenation of hydroquinone takes place in the reducer and tetra hydroquinone is formed. This is more difficultly oxidized, and therefore a new solution works somewhat better than an old solution.

Water Wash-Iron free water enters at the top of the reactor countercurrent to benzere solution. Twenty percent  $H_sO_s$  solution is drawn off the bottom. The product can be stabilized and sold or further concentrated. The quinone solution is taken off the top. It contains 0.1-0.3 percent water and 0.01N-H<sub>2</sub>O<sub>2</sub>. The water is removed by sending through 33 percent K<sub>2</sub>CO<sub>3</sub> solution. This solution is maintained at strength by addition of 50 percent  $K_0CO_3$  solution. The wash tower contains Raschig rings.

Aftercooler-Approximately one-half the total heat of reaction is taken off here. Absorption Filters—These contain 1 cu.

m. of activated alumina for removal of organic impurities.

Step 9—The product taken out the bot-tom of the wash tower contains 20 percent  $H_2O_a$  at a pH of approximately 6.0 plus im-purities consisting of benzene, some alcohols and traces of water soluble acids. This solution is stabilized with 20 mg. Na.SnOa per liter and 30 mg. per l. NH, NO3 is added to inhibit aluminum corrosion

Digest from "Hydrogen Peroxide Pro-duction Through 2-Ethyl Anthraquinone," OPB Report No. 395, by W. G. Gormley.

#### ALL-BASIC MARTIN FURNACES

IT WILL be of considerable interest to both steel-makers and the manufacturers of refractory bricks to know that the problems of constructing furnaces with super-structure entirely of basic material has apparently been solved in Germany during the war. The three Martin furnaces in Volklingen are constructed in this material and have apparently been giving very satisfactory operation. The bricks used included both magnesite and chrome-magnesite, and that in

APRIL 1946
 CHEMICAL & METALLURGICAL ENGINEERING

# Choose the Hooker Chlorinating Agent that Best Fits Your Process...

Whatever method or type of reaction you want to use to introduce chlorine into organic and inorganic compounds you can select the one best suited to your operations from Hooker Chlorinating Agents. Seven Hooker chemicals listed below are available for chlorinating. Their application is so widespread that we can only touch briefly here on a few of their uses in organic synthesis.

CHLORINE, Cl2, readily enters into addition\_and substitution reactions with many types of organic compounds. With aromatic hydrocarbons chlorine is widely used for the chlorination of both side chains and nucleus of the compound by the use of the proper catalyst. Chlorine is also widely used in reactions with actic acid, nitro compounds, sulfonic acids, esters and ethers. Hooker Liquid Chlorine made in the Hooker "S" cell conforms to the high standards of the industry.

HYDROGEN CHLORIDE, HCl, the anhydrous gas is used to form alkyl chlorides through reaction with alcochlorides through reaction with alco-hols, ethers and unsaturated hydro-carbons. It reacts with organic acid an-hydrides to form acid chlorides. Hydro-gen Chloride may combine with vinyl chloride, ethylene, and rubber to form many important compounds. Hooker Hydrogen Chloride is supplied in an sourcous solution as muriatic acid or it aqueous solution as muriatic acid or it may be synthesized from hydrogen and chlorine under licensing arrangements with us.

SULFURYL CHLORIDE, SO<sub>2</sub>Cl<sub>2</sub>, is commonly used to form organic acid chlorides. It may be used to produce chlor derivatives of phenols and in the presence of certain catalysts to produce chlor derivatives of hydrocarbons or the sulfonyl chlorides of hydrocarbons.

THIONYL CHLORIDE, SOCI<sub>2</sub>, available in a high degree of purity is a popular chlorinating agent because byproducts of its reactions are sulfur dioxide and hydrogen chloride, gases readily removed by heating. It reacts with organic acids to form either acid chlorides or anhydrides depending upon ratio of acid to Thionyl Chloride. SULFUR DICHLORIDE,

SCl<sub>2</sub>, is used as chlorinating agent and in these reactions may be considered the equivalent of chlorine dissolved in sulfur. monochloride. It reacts with sodium salts of organic acids to pro-duce acid anhydrides.

SULFUR MONOCHLORIDE, S2Cl2, and SULFUR DICHLORIDE, SCl2, are used in metallurgy to chlorid-SCl<sub>2</sub>, are used in metallurgy to chlorid-ize sulfide ores. They react with un-saturated hydrocarbons introducing sulfur or chlorine, or both in the mole-cule. Unsaturated fatty acids are treated with these chlorides to produce cutting oil bases. They also find extensive use in the meanfacture of due intermediates the manufacture of dye intermediates, rubber substitutes, military gases, in-secticides, and pharmaceuticals. Phenolic resins can be made through the use of these chlorides. The sulfur chlorides which have a ready source of chlorine are ideal chlorinating agents with the added advantages of low cost, ease of handling and storage.

PHOSGENE (Carbonyl Chloride), COCl<sub>2</sub>, is the acid chloride of carbonic acid. With alcohols it forms either chlorformates or carbonates. With amines it forms chloramides, substituted ureas or isocyanates. It enters into many Friedel-Crafts syntheses with aromatics to produce acid chlorides or aryl ketones. It may also act as an agent for direct chlorination. With metallic ox-ides and sulfides, it gives anhydrous chlorides. Reacting with organic acids it has been used to make acid chlorides and anhydrides. HOOKER

#### **HOOKER RESEARCH** Presents TETRAPHENYL TIN (C6H5)4 Sn

This new Hooker Chemical is an almost odorless, This new Hooker Chemical is an almost odorless, white to light tan, crystalline, free flowing powder with excellent thermal stability. Melting point is 928°±1.5°C and Boiling point 424°C. Decom-position in glass at boiling point occurs very slowly. It is soluble in ethyl alcohol, insoluble in water. Among its suggested uses and applications are as an HCl scavenger for use with stabilizers in chlorinated compounds. chlorinated compounds, as a preservative for mineral oils and as a reagent in chemical synthesis. Hooker Technical Date Sheet 733 containing additional physical and chemical data is available. Samples will also be furnished to those interested when requested on business letterhead.



BULLETIN No. 328A, a technical discussion on Hooker Chlorinating Agents, gives more information on these chlorinating agents and is available upon request. Our technical staff is also at your service in helping to solve problems involving the introduction of chlorine into organic chemicals or in the application of any of the many Hooker chemicals.

#### HOOKER ELECTROCHEMICAL COMPANY

5 Forty-Seventh St., Niagara Falls, N. Y.

New York, N. Y.

Tacoma, Wash. . Wilmington, Calif.

**Caustic** Soda Paradichlorbenzene Chlorine

Sodium Sulfhydrate

**Muriatic** Acid

Sodium Sulfide

CHEMICALS

8354

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



#### Here's the Reason for Norblo's **Low-Cost Fume and Dust Collection**

Norblo Automatic Bag Type fume or dust collection provides high efficiency with low operating and maintenance cost, for nearly all require-ments in the smelting, rock products and dust-producing processes in the chemical industries. Norblo design is ardized on multiples of a basic, stand-ardized compartment. Bag cleaning is cyclic and periodic, taking only a few seconds for each compartment. Thus in continuous, heavy duty opera-tion full calculated capacity of Norblo equipment is always available and investment for equipment of any de-

sired capacity at a minimum. Advanced design insures against obsolescence and complete fabrication in Norblo shops insures long life and low maintenance. Write for new detailed folder for use in your own calculations and planning.



elbows of the ducting prematurely, are removed; resulting in longer life for ducting and collectors. Settling out of heavy materials in the duct lines is eliminated.

Send for Bulletin 246.

Schneible Velocitrap. Dry solids, air-borne at high velocity are ejected by centrifugal force from specially designed ports in the unit, becoming trapped in CLAUDE B. SCHNEIBLE CO. 2827 Twenty-fifth St. Detroit 16, Mich.



spite of the heavy duty imposed upon the furnaces in the manufacture of high-class steels, the furnaces gave a life up to 1,400 charges between repairs.

This performance is far in excess of any recorded in this country, and having regard to the high temperature of the flame and stringent operating conditions, the practice at these works should be made the subject of investigation by a special team made up of representatives of both steel-makers and brick-makers.

Digest from "Rochling'sche Eisen und Stahlwerke G.m.b.H." OPB Report No. 847 by T. P. Colclough.

#### WHAT SHOULD BE DONE WITH GERMAN RESEARCH

GERMAN research and development on items for military application should be ab-solutely debarred. Laboratories now in existence which have served a war purpose primarily should be dismantled or adapted to peacetime projects. Likewise, all present German development projects whose application is chiefly to war, in whatever form, should be stopped and no new ones started. Severe penalties should be imposed for evasion or attempted evasion of these regulations.

Research directed toward normal and peacetime activities in pure and applied science should be allowed to expand to a level commensurate with German recovery. The following inspection system should be employed:

1. Registration and licensing of all re-search laboratories and the personnel therein; control of visas for travel abroad.

2. Disclosure of the budgets and other financial information of all German scientific research agencies, including government institutes and industrial laboratories. Also control of government funds appropriated for research and engineering.

3. Penalties for not making all new knowledge available to the Allied Control Commission and sending to this body copies of published material relating to scientific findings.

And since laboratory research results are ineffective and of very little value if the operations are not developed through the pilot plant or engineering stage, the Committee recommends the following rigid controls:

4. Permission for pilot plant construction or new engineering undertakings generally, including field trials of new devices and the testing of preproduction models, must be received from the Allied Control Commission.

5. Permission for production of any new items or of previously manufactured items by new processes must be received from the Allied Control Commission.

6. Control of production of those peacetime items which might also serve as supplies or munitions of war.

7. Official reporting to the Control Commission by scientists and technologists visiting Germany and non-governmental business from other countries of any suspicious activities.

A Technological Bureau included in the Commission of Occupation should undertake the execution of the above recommendations. This Bureau should have broad authority with regard to the supervision and control of German technological activities



a hopper.



# *leats* without carbon or sludge

### SUNISO REFRIGERATION OIL ...

Eliminates Former Shutdown of 4 Compressors, Keeps Cooling System Operating

Trouble with sludge and carbon always forming in the compressors that was the problem that confronted a large ice plant. Just when the plant was busiest it was necessary to shut down compressors for carbon removal and adjustments.

**Then** came the switch to Suniso Oils! Trouble from sludge and carbon stopped — not just temporarily — but for more than four years of operation.

**Compressor valves** haven't been replaced or refaced in that time. Operations now continue for ten months at a time without any mechanical interruption.

**To keep your plant on stream**, to keep production at a high rate and maintenance costs low, rely on Sun. Call the Sun man near you for engineering service, for refrigeration oils, lubricating oils, Diesel oils, compressor oils, processing aids, greases, micro-crystalline waxes, and other important products for modern chemical processing.

> SUN OIL COMPANY • Philadelphia 3, Pa. Sponsors of the Sunaco News-Voice of the Air - Lawell Thomas



# THE SUPERIOR CATALYST FOR EDIBLE OIL and FAT HYDROGENATION-SELECTOL A

**SELECTOL A** is a highly active and selective catalyst for the hydrogenation of refined edible oils and fats. Tests have shown that it has about 50% greater activity than other catalysts (activity determined by hydrogenating oils with equal amounts of the catalyst and measuring the iodine value change in a fixed period of time).

No. of the local division of the local divis

**SELECTOL A** is especially effective for low temperature hydrogenation of fats and oils where the highest degree of selective hydrogenation is desired.

For your conclusive confirmation of the superiority of **SELECTOL A** catalyst, we shall be pleased to send you — at no cost – a generous sample for testing in your laboratory.

Drew consultants are available at any time to discuss your particular catalyst problem — and see that you are supplied with the catalyst best suited for your individual needs. Just fill out the handy coupon—our representative will call promptly.

SELECTOL A is packed in removable-top metal drums—500 lbs. net weight—and contains 17 to 19% active metal content suspended in semi-liquid edible oil.

> SELECTOL A is now being used by some of the largest oil processors in America.

E. F. DREW & CO., Inc. (Catalytic Chemicals Division) Main Office: 15 E. 26th Street, New York 10, N. Y. Factory and Laboratories – Boonton, New Jersey

| 1. 18 C. 2. 4 2   |  |
|---|--|
| STOL A<br>ponion prod-<br>ELECTOL A-is<br>the hydragen-<br>inedible oils. | E. F. DREW & CO., Inc.<br>15 E. 26th Street, New York 10, N.Y.<br>Please send sample of SELICTOL A |
|   |  |

and should be in charge of an outstanding scientist or engineer who has membership in the highest ranking Council of the Commission of Occupation.

The questions which arise in connection with the disposition of German scientists and of German scientific research are so important that the Committee urges the immediate appointment of an interallied scientific group to study and recommend the proper course of action. If this is not done at once, the process of dissipation now at work will soon carry the situation beyond the possibility of a wise solution.

Summary of conclusions from "The Treatment of German Scientific Research and Engineering from the Standpoint of International Security," TIDC Project 3.

#### PHLEGMATIZED P.E.T.N.

PHLECMATIZING of P.E.T.N. was accomplished in the washing house. Two of the washers provided equipment for phlegmatization. In the original process phlegmatizing was carried out continuously by adding wax to the precipitator, however, with poor grade of labor encountered as time went on and the intricate and sensitive control necessary for such an operation, it was decided to make this part of the process a batch process and use extra washers as phlegmatizers.

The operation was conducted in batches of 500 kg. The kettles were used intermittently, one filling while one was empty. The kettles were jacketed and equipped with a straight blade stirrer operating at 140 r.p.m. The process was conducted by filling the kettle to the top of the stirrer blade with hot water at 70 deg. C., and then heating by direct steam injected to 95 deg. C. Then moist recrystallized P.E.T.N. in 500 kg. batches was added, a laboratory moisture determination being made on each batch to determine the necessary wax to add to produce a 5, 10 or 15 percent addition as desired for the particular grade necessary. Montan wax was used. It was charged into the melting kettle having a steam jacket. All pipes from the melting kettle to the filter and to the measuring tank were steam jacketed as was also the filter and measuring tank. The molten wax was colored a deep reddish pink by adding 0.5 percent of Sudan red B dye to the melter. This is to color the P.E.T.N. to distinguish it from other materials and to give a visual check on how well the job is being carried out. After adding the necessary amount of the wax to correspond to a dry weight basis of wax desired, the mixture was stirred for about 10 to 15 min., and the mass cooled to a temperature of 80 deg. C. Then the kettle was slowly emptied through a bottom barrel and a rubber discharge tube. At the same time cold water was squirted into the receiving nutch to cool down the mass of crystals to 35 deg. C. The water also served to eliminate any tendency for the coated crystals to stick or cluster. After a good suction, the moist crystals were transferred to bags and taken to the dry houses where the 500 kg. batch was treated as a unit and a control sample sent to the laboratory for physical, chemical and explosive quality tests.

Digest from "Manufacture of Phlegmatized P.E.T.N. at Fabrik Zur Verwertung Chemischer Enzungnisse G.m.b.H. Wolfratshausen," OPB Report No. 320 by A. A. Swanson.

RES

uct of S

used in

ation a



The Men that Know "HOW" and "WHY"

#### PUT OUT MORE PRODUCTION ... WITH LESS WASTE !

#### At your Service... ALLEGHENY LUDLUM'S FILM LIBRARY

Instructional films on tool and stainless steels—some in full color, all with sound-available for free showings on request. NEW—"Manufacture of Dies" 16 mm, 400 ft. in length, requiring about 15 minutes to show,—in sound and full color.

FOR DETAILS and BOOKINGS ADDRESS DEPT. CM-40 THE special high-alloy steels take more knowing than ordinary materials, that's sure. But they also give you more—so much more that their uses have taken one of the steepest upward climbs of any class of materials in recent years.

Electric furnace steels are on the march. Our principal special steel products—corrosion and heat-resisting alloys, tool and die steels, electrical, valve and nitriding steels. are products which offer you the greatest future promise.

As pioneers and originators in these fields, we have the data your engineers and designers need, and the working information for your shopmen to handle special steels well and speedily. Let us help you.



W&D 9332 F

# DOW INDUSTRIAL CRIEMICALS

# Aniline Oil-one of over 500 Dow Chemicals Serving American Industry

NUT SHITTLE CONFICTION

TERM

Dow is a major source of many of the "heavy duty" chemicals that play so essential a part in the nation's manufacturing operations. Users in many fields depend on the uniform product quality and careful attention to delivery that have formed an integral part of Dow's service for so many years. Dow Aniline Oil, supplied in L.C.L., drum carload, and tank car lots, is an important member of the great family of Dow-Industrial Chemicals.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • Si. Louis Houston • San Francisco • Los Angeles • Seattle Caustic Soda • Glycols Chlorides • Epsom Salt Phenol • Sodium Sulphide Carbon Tetrachloride and more than 75 others.



# CORROSION FORUM-

EDMOND C. FETTER, Assistant Editor

MODERN & MATERIALS • MODERN & METALS

#### **Corrosion** Testing in a Chemical Plant

S. W. SHEPARD Chief Metallurgist Calco Chemical Div. American Cyanamid Co. Bound Brook, N. J.

**I** would be very nice and most convenient if a list of materials of construction could be compiled from which the most economical material for handling a given corrosive condition could be taken. Unfortunately, there are so many variables that influence corrosion rates that it is a hazardous procedure to make a selection from most of the lists of metals for handling the various acids, alkalis and recognized corrosives. It is almost as hazardous to select from previous plant usage—either your own or someone else's unless you can be reasonably sure that all of the factors which govern corrosion are the same. We do not wish to belittle the value of such lists or previous plant experience. On the contrary we would like to encourage the publication of more information. At the same time it is well to emphasize the importance of conducting individual corrosion tests for each specific problem.

#### CORROSION TESTING

In order to get the specific corrosion information we need for designing new equipment or for improving old equipment we run corrosion tests in existing equipment, or under conditions as near plant conditions as possible. This information is kept on the Corrosion Test Piece Record. On this record we try to secure all the data that is pertinent to the test being run. Some of this corrosion testing is conducted in the research laboratories in their glass equipment. In general, when we are particularly interested in the effect of the metal on the quality and yield of the product, we use double the surface-volume ratio anticipated in the plant tool. We have had excellent correlation between the results obtained in laboratory flasks and in the metal pick-up in the plant. By working very closely with the research department, we have found that it is possible to cut down considerably on corrosion in selecting the agents used to minimize corrosion. It is much easier to make changes in a new process at this time than it is after the process has become more fully developed. Similar corrosion tests are carried through in the pilot or semi-plant operations, and finally in the producing plants themselves.

We do not know of any good substitute for getting our own information under our specific operating conditions. However there are some general principals that can be followed. There are factors that have an important influence on corrosion wherever they occur and they should always be considered whenever a selection is being made or a test conducted. The balance of this article will be occupied with an analysis of these factors; in considering them, their interdependence must not be lost sight of.

#### TEMPERATURE

In general, an increase in temperature in creases corrosion rates in line with the ordinary limits of reaction velocity, say double to four times the rate for a rise of 50 deg. F. However, in some cases corrosion rate may be lowered by an increase in temperature through decreasing the solubility of gases in the liquid. For instance, the corrosion rate in water, acids, and the like may be much lower at 100 deg. C. than it is at 80 deg. C. because of the decreased solubility of oxygen in the liquid. Reduction of temperature to the point where the metal is below the dew-

point of the air with which it is in contact will also lead to a tremendous increase in corrosion rate. This is especially important in the design of dryers handling materials that may contain volatile corrosives like HCl; at the place where the dew-point is reached corrosion will be severc.

At times a rise in temperature can increase corrosion rates much faster than the ordinary limits of reaction velocity would indicate. This may be due to the decomposition of films that were inhibiting corrosion at lower temperatures or because of local overheating or hot spots.

The temperature that is most important to consider, and which is most likely to be neg-



Close-up of results of corrosion fatigue cracking in a hydraulic cylinder

lected, is the temperature of the metal at the surface in contact with the corroding medium. This may be illustrated by corrosion tests that were conducted for a direct fired muriatic retort. The temperature of the molten salt cake in the retort was 320

|  |  | CORROSION TEST PIECE RECORD Sheet No.  |
|--|--|--|
|  | (When fil  | Lled out return to Netallurgical Laboratory)   |
| Chamint  |  | Construction material  |
| Ingineer   |  | Corroding product  |
| Telephone  |  | Sampla No  |
| r.o.   |  | Туре   |
| Division   |  | DimensionsI  |
| A COLUMN TWO IS NOT  |  | Surface condition Treatment  |
| Meight issue   | be   |  |
| Weight retur   | bea  | MDD x Factor - IPY (Inches penetration per year.   |
| Weight loss_   |  | E Uniform corrosion @ 305 days   |
|  |  | per year/24 hours/day.)  |
|  |  | Concentration cell attack  |
| Date install   | bed  | Date removed   |
|  |  | CONDUCTOR OF PERCENDE  |
|  |  | CONDITIONS OF ELPOSORE   |
|  |  | Oriented and C.T.No.   |
| Product  | Process  | Uperation 0.1100.  |
| Corresion a  | amples Hung in   | tool, completely immersed, percentage immersion  |
| Continuous :   | immersion  | Cycle 11 Internittent  |
| Fastened to  | stirrer  | Speed of stirrer bistance itom acts  |
| las there I  | ree access of (  | corresive media to whole surface the bit, what percent   |
| sgitation p  | roduced by mean  | ne oil Stirter, screper, air, steam, reaction, tumoring  |
|  |  |  |
| Amount agit  | ations home  | June stiger outside alle fine af mention Hours   |
| Amount agit  | atches   | Hours stirrer ran Time of reaction Hours   |
| Amount sgit<br>Number of b<br>Total bours  | exposure   | Hours stirrer ran Time of reaction Hours<br>Type of equipment in which test was conducted  |
| Amount agit<br>Number of b<br>Total hours<br>Temperature   | atches<br>exposure<br>: Lowest   | Hours stirrer ran Time of reaction Hours<br>Type of equipment in which test was conducted<br>Average Highest   |
| Amount agit<br>Number of b<br>Total bours<br>Temperature<br>Oxidising o  | atches<br>exposure<br>: Lowest<br>r reducing nate  | Hours stirrer ran Time of reaction Hours<br>Type of equipment in which test was conducted<br>Average Highest<br>ure of corrosive media.  |
| Amount agit<br>Number of b<br>Total hours<br>Temperature<br>Oxidizing o<br>Aeration: 1   | exposure   | Hours stirrer ran Time of reaction Hours<br>Type of equipment in which test was conducted<br>Average Highest<br>ure of corrosive media<br>Considerable Abrasion: NoneSomeConsiderable  |
| Amount agit<br>Number of b<br>Total hours<br>Temperature<br>Oxidising o<br>Aeration: 1<br>Effect on p  | atches<br>exposure<br>: Lowest<br>r reducing nat:<br>None Some<br>roduct: Disco  | Built Consideration     Built Consideration       Hours stirrer ran     Time of reaction       Type of equipment in which test was conducted       Average     Highest       ure of corrosive media     Considerable       Considerable     Abrasion: None     Some       Considerable     Vield     Some  |
| Amount agit<br>Number of b<br>Total hours<br>Temperature<br>Oxidising o<br>Aeration: 1<br>Effect on p<br>Volume of r   | atches   | Hours stirrer renTime of reaction Hours<br>Type of equipment in which test was conducted<br>AverageHighest<br>ure of corrosive media<br>ConsiderableAbrasion: NoneSomeConsiderable<br>lorationTiald<br>n testYolume of reactant mass in plant  |
| Amount agit<br>Number of b<br>Total hours<br>Temperature<br>Oxidising o<br>Acration: 1<br>Effect on p<br>Volume of r<br>Area of exp  | atches   | Bours stirrer ran Time of reaction Hours       Hours         Type of equipment in which test was conducted          Average Highest          urre of corrosive media          Considerable Abrasion: None       SomeConsiderable         loration Yield       Yolume of reactant mass in plant   |
| Amount agit<br>Number of b<br>Total hours<br>Temperature<br>Oxidising of<br>Aeration: 1<br>Effect on p<br>Volume of r<br>Area of exp<br>Ratio of vo  | atches<br>exposure<br>: Lowest<br>r reducing nat<br>NoneSome<br>roduct: Disco<br>eactant mass hi<br>osed surface of<br>lume under tes  | Burs stirrer ran Time of reaction Hours       Hours  |
| Amount sgit<br>Number of b<br>Total hours<br>Temperature<br>Oxidizing o<br>Aeration: 1<br>Effect on p<br>Volume of r<br>Area of exp<br>Ratio of vo<br>Ratio of vo                              | exposure<br>exposure<br>: Lowest<br>r reducing nat<br>None Some<br>roduct: Disco<br>eactant mass i<br>osed surface o<br>lume under tes<br>lume under plas  | Hours stirrer ran Time of reaction Hours<br>Type of equipment in which test was conducted<br>Average Highest<br>ure of corrosive media<br>Considerable Abrasion: NoneSomeConsiderable<br>Iteld<br>n test Volume of reactant mass in plant<br>f plant tool in square inches<br>t conditions to area of exposed tool surfaca   |
| Amount agit<br>Number of b<br>Total bours<br>Temperature<br>Oxidising o<br>Aeration: 1<br>Effect on p<br>Volume of r<br>Area of exp<br>Ratio of vo<br>Ratio of vo                              | atchesexposure:<br>Lowest:<br>reducting matt<br>NoneSome<br>roduct: Disco-<br>sectant mass in<br>osed surface o<br>lume under tes<br>lume under plat   | Bight       Consistence       Time of reaction       Hours         Type of equipment in which test was conducted       Highest       Highest         ure of correlive media       Highest       Highest         considerable       Abrasion: None_Some_Considerable       Ioration         loration       Yield       Tield         n test       Volume of reactant mass in plant       Iorations to area of test piece         nt conditions to area of exposed tool surfaca       Conscientation       Cases (Introduce or wet)  |
| Amount sgit<br>Number of b<br>Total hours<br>Temperature<br>Oxidising o<br>Aeration: 1<br>Effect on p<br>Volume of r<br>Area of exp<br>Ratio of vo<br>Ratio of vo<br>Chemicals:                | atches   | Ballad       Constant of reaction       Hours         Type of equipment in which test was conducted       Average       Highest         Type of course media       Considerable       Abrasion: NoneSomeConsiderable         Considerable       Abrasion: NoneSomeConsiderable         Ioration       Tiald       Tield reactant mass in plant         of plant tool in square inches  |
| Amount sgit<br>Number of b<br>Total hours<br>Temperature<br>Oxidizing o<br>Aerations i<br>Effect on p<br>Volume of r<br>Volume of r<br>Area of exp<br>Ratio of vo<br>Ratio of vo<br>Chemicals; | atches   | Hours stirrer ran Time of reaction Hours<br>Type of equipment in which test was conducted<br>Average Highest<br>ure of corrosive media<br>Considerable Abrasions NoneSomeConsiderable<br>Itald Itald<br>n test Volume of reactant mass in plant<br>f plant tool in square inches<br>t conditions to area of texpised tool surfaca<br>Concentration Gases (Anhydrous or wet)<br>Concentration Gases (Anhydrous or wet)<br>Concentration Gases (Anhydrous or wet)  |
| Amount soft<br>Number of b<br>Total hours<br>Temperature<br>Oxidising o<br>Arration: 1<br>Effect on p<br>Volume of r<br>Area of exp<br>Ratio of vo<br>Ratio of vo<br>Chemicals:                | actors actors<br>exposure<br>: Lowest<br>: Lowest<br>reducting matt<br>None Some<br>reduct: Disco<br>eactant mass in<br>osed surface o<br>lume under tes<br>lume under tes<br>lume under plat<br>Acids<br>Salts  | Balant       Constant of Table and the set was conducted         Type of equipment in which test was conducted       Hours         Type of equipment in which test was conducted       Highest         ure of correlive media       Considerable         Loration       Yeld         Intest       Volume of reactant mass in plant         f plant tool in square inches       Int conditions to area of test place         nt conditions to area of exposed tool surfaca       Concentration         Concentration       Gases (Anhydrous or wet)         Concentration       Reports (Anhydrous or wet)         Concentration       Reports (Anhydrous or wet) |
| Amount sgit<br>Number of b<br>Total hours<br>Temperature<br>Oxidising o<br>Arrations 1<br>Effect on p<br>Volume of r<br>Nates of exp<br>Ratio of vo<br>Ratio of vo<br>Chemicals:               | atches   | Hours stirrer ranTime of reactionHours         Type of equipment in which test was conducted         Average       Highest         ure of corrosive media       Considerable        Considerable       Abrasion: NoneSomeConsiderable        Considerable       Abrasion: NoneSomeConsiderable        Considerable       Abrasion: NoneSomeConsiderable        Considerable       Abrasion: NoneSomeConsiderable         f plant tool in square inches       t conditions to area of test piece         nt conditions to area of exposed tool surfsca  |
| Amount sgit<br>Number of b<br>Total bours<br>Temperature<br>Oxidising of<br>Astaing of<br>Astain of the<br>Chemicals:  | atches   | Burs stirrer ran Time of reaction Hours         Type of equipment in which test was conducted         Average       Highest         Lorstion   |
| Amount agit<br>Number of b<br>Total hours<br>Temperature<br>Doridising o<br>Maraioni 1<br>Effect on p<br>Volume of r<br>Area of axp<br>Ratio of vo<br>Ratio of vo<br>Chemicals:                | atches_<br>exposure_<br>r Lowest<br>r reducing mat<br>NoneSome<br>coduct: Disco-<br>eactant mass in<br>osed surface on<br>lume under tes<br>lume under tes<br>lume under tes<br>lume under tes<br>lume under tes<br>lume under tes<br>sets<br>forganic<br>sheet write bi | Burgs stirrer ran Time of reaction Hours         Type of equipment in which test was conducted         Average       Highest   |





PUMP PROVING GROUND WORKS FOR YOU AT ROPER

Here on a dynamometer test block, a Roper 75 g.p.m. pump is put through its paces. With modern test facilities performance is accurately measured,

results predetermined ... a painstaking procedure followed at Roper. Prior to shipment, each Roper is given a rigid, horsepower and capacity test. And the



SHAPES?

WE MAKE 'EM.

BUT GOOD!



test standards set up to meet requirements are recorded on the "test-ticket" you receive with each pump. It's your insurance against faulty performance and costly time losses. For

formance and costly time losses. For standard as well as for special engineered units, the pump proving ground works for you at Roper.

SEND FOR CATALOG TODAY Sizes, 34 to 300 g.p.m., pressures to 1000 p.s.s. GEO. D. ROPER CORP. 144 Blackhawk Park Ave. ROCKFORD, ILLINOIS

SHAPES by Andover Kent embody unusual features: depth of draw, difficult radii, square corners . . . fea-



Iures impossible to achieve in post-forming operations. Thus a single "A K" shape economically replaces the usual complicated assembly of two or more parts formed from ordinary rod, sheet or tube stock. Come to Andover Kent — the folks who moke shopes exclusively!

SPECIALISTS. In SHAPES Isminated from resins and fabrias (glass, synihetic or colton) to exacting meeds of America's leading industrial engineers. Tell us your shaps requirements. We probably can submit samples similar to your needs. Write to Andover Kent, New Brunzwick, N. J. — TODAY 1

YOUR BEST SOURCE FOR

Andover Ke

Laminated Shapes UNBREAKABLE · LIGHT · NON-ABSORBENT deg. C. When this temperature was increased the corrosion rate of cast iron under test conditions was decreased slightly, probably due to loss of HCl, but when the molten salt cake temparature was held at 320 deg. C. and the temperature of the cast iron in contact with it was increased, the corrosion rate went up as shown in the table below.

| 35.1.7 | monen  | COLLOSIO    | 1                 |             |
|--------|--------|-------------|-------------------|-------------|
| metal  | Salt   | Rate,       | Estimated Life of |             |
| Wall   | Cake   | Cast        | HCI Retort        |             |
| Temp   | .Temp. | Iron        | (Wall             | 9 in Thiak  |
| Der.C  | Dog    | In /V.      | TE In Thick,      |             |
|        |        | A11.4/ 1,1. | 1.0               | in. Lost)   |
| 320    | 000    | 0.0000      |                   |             |
| 020    | 020    | 0.0833      | 18yr.             |             |
| 350    | 320    | 0,2         | 7yr.              | 6mo.        |
| 400    | 320    | 1.0         | Ivr               | 6mo         |
| 450    | 320    | 3.7         |                   | Amo Octano  |
| 500    | 220    | 11.5        |                   | 4mo. Zodays |
| EFO    | 020    | 11.0        |                   | 1mo. 17days |
| DDU    | 320    | 27.0        |                   | 18dave      |

From this it may be seen that the life of a muriatic retort may be about 18 years if the temperature of the metal does not exceed the temperature of the molten salt cake, but may be only 18 days if this temperature differential is increased 230 deg. F. This situation is quite dramatic and it is easy to see that it is quite important not to have large temperature differentials on direct fired vessels if a low corrosion rate is desired. If the corrosion rate can be about doubled for a 20 deg. C. differential between the temperature shown in the mass of liquid being heated and the temperature of the metal through which the heat is being conducted at its point of contact with the corrosive, it is important to consider whether or not a high differential can be avoided. We may ask ourselves the following questions in regard to heating:

- 1. Is it necessary to use such high pressure steam?
- 2. Is it justifiable to decrease the life of the equipment in order to bring the temperature of the charge up rapidly?
- 3. Is the temperature distribution as uniform as economically feasible?

#### PRESSURE

Pressure has but a secondary influence on corrosion. It may increase corrosion by increasing the solubility of corrosive gases. Pressure differentials may influence corrosion by a cavitation effect. And pressure may have some bearing on fatigue failure, chafing, and some of the effects such as decarburization and hydrogen embrittlement that takes place in high pressure processes.

#### AERATION

The effect of dissolved oxygen may be of predominating importance, particularly in dilute solutions of the non-oxidizing acids. For instance, the corrosion rate of mild steel is about 0.03 in. penetration per yr. in 6-percent sulphuric acid at room temperature without air present and about 0.4 in. per yr. under the same conditions saturated with air.

In strongly oxidizing acids or with metals that depend on oxide coatings for corrosion protection, oxygen does not increase corrosion appreciably and in some cases decreases it. For instance, the corrosion rate of aluminum in 30-percent nitric acid is about 0.1 in. penetration per yr. without air and 0.08 in. per yr. with air.

When aeration is not uniform, corrosion

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

#### How to maintain your





If joints have opened, frost is forming. When refrigeration is off, remove and dry out the covering; then reapply it. If necessary, apply new covering.



If, because of an accident, the mastic finish of the cork covering is chipped or broken, repair it at once with Armstrong's Seam Filler.

If wires break or loosen, they should be replaced at once. Check every foot of your low-temperature line twice a year to discover such wires.



At least once a year give the entire surface of the insulated lines a good coat of Armstrong's Cork Covering Paint to reseal the surface.

Neglect of cold line insulation is costly, because it wastes refrigeration and eventually requires major replacements. Armstrong's Contract Service, with its trained engineers and skilled workmen, is well equipped to survey your installation, tell you just how efficiently they are now operating, recommend what repairs should be made, and do the work for you if you so desire. For full information, write to Armstrong Cork Company, Building Materials Division, 4603 Concord St., Lancaster, Pa.



#### ARMSTRONG'S INDUSTRIAL INSULATION **Complete Contract Service** For All Temperatures To 2600° Fahrenheit

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



#### Install an Ansul SO<sub>2</sub> System and get these Proved Advantages

FINGER-TIP CONTROL-Easy, positive, finger-tip control providing extreme accuracy for reaction or adjustment of pH.

GREATER ECONOMY-Small investment in equipment, materially reduced operating and maintenance costs, and freeing of valuable floor space:

HIGHER PURITY-Elimination of impurities inherent in burner gases (Ansul Liquid SO<sub>2</sub> is 99.9+% [by weight] PURE).

GREATER SOLUBILITY-Solubility in water is 4 to 5 times greater than SO<sub>2</sub> from burner gas.



INDUSTRIAL CHEMICALS DIVISION, MARINETTE, WIS.

Eastern Office: 60 E. 42nd St., New York City





Stress corrosion cracks in a Type 347 stainless vessel. Cracking of this sort can be eliminated by using inhibitors and by reducing imposed stresses

tends to take place in the area where oxygen has the least access. This results in pitting and concentration cell attack. Although uniform corrosion rates might be low, if the pitting attack is rapid, such a metal is not as desirable as a metal with a higher uniform corrosion rate but is not susceptible to pitting attack under the existing conditions.

The presence of oxygen or other oxidizing agent may provide a passivating effect. This is particularly true with aluminum or stainless steel. It is more likely to occur with certain acids and oxidizing agents than others. For example, the corrosion rate of 18-8 stainless steel was 0.08 in. penetration per yr. (uniform corrosion in 3 percent sulphuric acid) without air, and 0.0002 in. per yr. with air.

For each installation we should answer these questions in regard to aeration:

- 1. Can the cover be made airtight?
- 2. How can the equipment be best protected between batches?
- 3. Can we use a protective neutral atmosphere economically?
- 4. Does air, dissolved or otherwise, have free access to the whole surface?
- 5. Are we injuring the equipment by using air to move the materials?
- 6. Does the stirring action draw air into the charge?
- 7. Would it pay to exhaust all air from the system?
- 8. In stainless or aluminum equipment operating under reducing conditions, are we providing sufficient air, oxidizers, or occasional passivation?
- 9. Can inhibitors be use that will counteract the effect of dissolved oxygen?
- 10. Can the liquid-vapor interface (wind and water line) be changed periodically?

#### AGITATION

Increase in the motion of the corroding solution accelerates corrosion by removing inhibiting films, by bringing more oxygen to the surface of the metal, and where concentrations are low, by bringing more corrosive to the surface of the metal. Turbulent flow

# ... your New Equipment should be made from

# Stainless Steel

The Encyclopedia says, "Stainless Steel-various types of steel or iron alloys capable of resisting atmospheric corrosion or attack by chemicals, acids and organic solution. These steels consist of steel or iron alloys in which chromium is the chief alloying element."

We say, "Stainless Steel is all that, and furthermore, it is easily fabricated by standard metal working practices, and has excellent physical and mechanical properties after fabrication."

#### Stainless in every form is easy to get from INDUSTRIAL STEELS, INC.

A complete stock of all types and forms of stainless steel is as near as your telephone. INDUSTRIAL STEELS, INC. maintains America's largest warehouse stock of stainless steel hardware, sanitary fittings, shapes, and other parts. Your order can be filled completely and promptly through one telephone call. You pay no premium for this service—for all stock is listed at mill prices.

#### For Stainless . . .

BARS · VALVES · PLATES · FITTINGS SHEET · WIRE · HARDWARE · WELDING ELECTRODES

#### Call INDUSTRIAL STEELS, INC.

Engineers, Purchasing Agents, and Designers-Ask to have your name put on the mailing list for the weekly stock list published by INDUSTRIAL STEELS, INC. Lists all types and forms available for immediate delivery.

# INDUSTRIAL STEELS,

255 BENT STREET Cambridge 41, Massachusetts TROwbridge 7000 Teletype: Cambridge 547



#### **Everything in STAINLESS**

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



Available in 5 and 13-gallon carboys I.C.C. 1-A and 61/2-gallon carboys, I.C.C. 1-D.



increases corrosion markedly. Cavitation results in rapid failure.

During the first batch made in a new 1,000-gal. autoclave operating at 900 psi., the bottom of the draft tube was severely corroded as shown in the accompanying photograph. During the first batch the im-peller was 21 in, in diameter and was running at 310 rpm. (peripheral velocity, 2,040 in. per min.). The result was that the draft tube was in some places completely eaten out in one run. By cutting down the diameter of the impeller to 19 in. and reducing the speed to 218 rpm. (1,300 in. per min.), corrosion of the end of the draft tube was



Draft tube of an autoclave that was severely corroded by excessive agitation

practically eliminated. There was no noticeable attack after three batches, other con-ditions being identical. The corrosion rate as measured in the draft tube during the first batch was approximately 12 in. penetration per yr. After having made 300 batches there was no noticeable corrosion on the draft tube, impeller, or sides of the autoclave.

Here are some questions to ask in con-nection with agitation:

- 1. Are our stirrers, agitators, impellers, and other moving parts operating as slowly as advisable?
- 2. Is the agitator drawing air into the charge?3. Could the pipelines be larger so that velocities could be reduced?
- 4. Can turbulence be eliminated?
- 5. Can cavitation be prevented by a change in pump characteristics, suction head, temperature, viscosity or speed of impeller?
- 6. Can a material more resistant to abrasion be utilized?
- 7. Can abrasive particles be eliminated?
- 8. Can removable wear plates be installed?
- 9. Would a stirrer of different design reduce corrosion rate?
- 10. Are baffles necessary?
- 11. Is agitation uniform?

#### GALVANIC PITTING

Dissimilar metals in contact is a common cause of localized attack. In general, the greater the distance between two metals in the galvanic series, the more rapidly corrosion of the less noble metal takes place. The galvanic or electrochemical series shows the tendency toward galvanic action. But actual electrolytic attack depends on several factors.

The circuit must be complete through

# the WG-9 another Sullivan modern, heavy duty compresso



• The Sullivan WG-9 air compressor is ideally suited for plants with moderate volume requirements or for specialized. uses in large plants particularly where limited floor space is available. It is a doubleacting, heavy-duty, single-stage compressor that will stay on the job twenty-four hours a day with the very minimum of maintenance.

Long, trouble-free operation is assured by:

- (1) Cylinder liners replaceable ON THE JOB
- (2) Full force-feed lubrication to all working parts
- (3) Sullivan patented, long-life, **DUAL-cushion** valves
- (4) Anti-friction main bearings.

Because of its smooth-running characteristics and the small floor area required, the WG-9 needs only a simple, block-type foundation which can be quickly, easily and cheaply installed right where the air is needed. Available in eleven sizes with displacements from 153 to 822 C.F.M. at pressures from 30 to 150 pounds. Send for Bulletin A-43 for complete details. Sullivan Machinery Co., Michigan City, Indiana. In Canada: Canadian Sullivan Machinery Co., Ltd., Dundas, Ontario.

\$



OFFICES Birmingham - Boston - Butte - Chicago - Claremont - Dallas - Denver Duluth - El Paso - Huntington - Knozville - Los Angeles - Middlesboro New York - Philadelphia - Pitisburgh - Portland - Soit Lake City - Seattle San Francisco - Spokane - St. Louis - Washington, D. C.

PRODUCTS Stationary and Portable Air Compressors, Pneumatic Casting Grips, Foundation Breakers, Portable Hoists, Rock Drills.



The handling of hot liquids-particularly when of a corrosive nature, or carrying abrasive contents-is the supreme test of any pump. And in this service, as in so many others, LAWRENCE CENTRIFUGALS are showing a performance marked by high economy, low maintenance, ireedom from shut-downs, and long life. Throughout the process industries, they are successfully handling hot acids (including hot sulphuric), hot alkalies, hot sludges and slurries, hot syrups, and hot mixtures carrying abrasive or librous materials. Usually, such installations are special problems in which engineering skill and experience are invaluable. Let us work with you. Write for Bulletin 203-3.



Right: Lawrence Ver-tical for han-dling volatile Liquids.

LAWRENCE MACHINE & PUMP CORP. 369 Market Street LAWRENCE, MASS.



#### REMOTE INDICATION OF RATE OF FLOW

For practically all liquids-tar, molasses, crude oil, grease, paint, varnish, syrups, etc., etc.—for measuring, indicating, totalizing flow of water and chemicals in continuous manufacturing processes and numer-

ous other uses. Its remote indicating feature is new-get the complete story.

SEND FOR BULLETIN 46-766



Left: — a Lawrence Hor-izontal, steam-Jacketed for handling vis-cous mate-irals.

conducting metals and solution. Distilled water and any organic compounds are rather poor conductors and tend to suppress attack of this nature. Joints in the metal may be insulated by rubber, fiber, wood or other insulating materials to prevent galvanic attack.

Formation of hydrogen ions or a cathodic surface and insoluble protective films may slow or stop galvanic attack by polarization. Attack may be accelerated by removal of the hydrogen with oxygen, an oxidizer, and by formation of molecular hydrogen. In general, the larger the ratio of cathodic area to anodic area the faster the corrosion of the anodic area takes place.

Cathodic protection may be obtained by the sacrifice of some less noble material or through the use of an impressed current. As mentioned previously, concentration or solution cell attack may be developed by differential aeration through galvanic corrosion or by the same metal in different electrolytes. The amount of corrosion depends upon the supply of corroding agent to the cathodic area. Most of the corrosion occurs at the anodic area which thus becomes pitted.

Corrosion of the surface of the metal lowers its fatigue resistance. Fatigue stresses accelerate corrosive action. Corrosion simultaneous with fatigue stresses leads to rapid

failure by corrosion fatigue cracks. The following questions should be answered in regard to localized corrosion:

- 1. Is there a galvanic couple set up between two different metals, and, if so, could it be corrected by insulation or an imposed e.m.f.?
- 2. Are any rivets, bolts, thermometer wells, etc., that have fairly small surface areas anodic to the main vessel?
- 3. Is the corrosion subject to cathodic or anodic control by means of an inhibitor?
- 4. Could depolarization be prevented by climination of oxygen or oxidizers?
- 5. Have irregularities in the surface or in the tool design been contributing to the concentration cell attack?
- 6. Have dirt or corrosion products been allowed to accumulate?
- 7. Do severe vibration, bending, or torsion stresses co-exist with corrosion?
- 8. Have sharp notches, threads, or fillets been eliminated as well as possible?
- 9. Have nickel or steel vessels used to handle alkalis been stress-relieved?

#### CORROSION INHIBITORS

There are many organic and inorganic compounds that act as inhibitors of corrosion. Many of the organic materials encountered in the chemical industry do tend to inhibit corrosion. Of these compounds, the amines, the ketones, and some of the sulphur containing compounds such as mercaptans, are corrosion inhibitors.

Any organic base or positively charged colloid will act as an inhibitor of corrosion. However, it must be soluble or peptized in dilute acid.

A good many compounds or materials used in their manufacture are good corrosion inhibitors. Are we taking full advantage of them?

- 1. Are we sweeping them off with too vigorous stirring?
- 2. Are we heating the vessel walls above their effective temperatures?
- 3. Do we add them at the most effective time, or are we putting the acids in first

MICHIGAN CITY, INDIANA, U.S.A

## WHY THE FE STRING DISCHARGE IMPROVES FILTRATION AT LOWER COSTS

FEINC CONTINUOUS FILTRATION

- The dewatered cake is *lifted* from the revolving filter drum by strings on the FE Continuous Vacuum Filter. There are no scrapers to shorten the life of the filter cloth — no wire windings to impede filter cloth changes — no extra equipment for compressed air "blow back."
- Since there is no severe mechanical strain or wear, lighter filter cloths can be used. These more nearly approach ideal filtering, permitting the cakes rather than the cloth to serve as the filter media. Cloths can be changed on an FE filter with far less "down time."
- Filter cake leaves the FE filter drum in a continuous sheet of uniform thickness, as shown in the photos at right. Ideal where a uniform rate of feed is required for smooth flow of material to continuous drying or processing equipment.
- Extremely thin filter cakes—as thin as 1/16 in. with some materials and filter cakes from difficult slimes can be handled successfully on FE filters. Cake thicknesses as high as 12 in. and above can also be handled with some materials.

FE Continuous Vacuum Filters are available in plain designs for simple filtration work, and with any combination of the FE washing, dewatering, and cake-handling features for a wide variety of food, chemical, mining, sewage and other applications. Write for bulletins.



SALES OFFICES & PLANT: 858 SUMMER AVENUE • NEWARK 4, N. J. In Canada: The Northern Foundry & Machine Co., Ltd., Sault Ste. Marie, Ont.







#### SPECIAL APPLICATIONS

#### Typical Materials Successfully Handled

Alumina Hydrate Cement Clay D D T Iron Oxide Lactic Acid Lithopone Magnesium Hydroxide Paper and Pulp Penicillin

2

Phthallic Anhydride Sewage Silica Gel Soybean Protein Starch: Carn, Potato, Rice, Wheat Sugar Muds Sulfa Drugs Titanium Hydrate White Lead Zinc Stearate

## YOU DON'T HAVE ANY **CLOGGED FEED TROUBLE**

### Save crushing money as you reduce wet, sticky materials

When you reduce wet or sticky materials, get the advantage of the DIXIE Moving Breaker Plate which never clogs. It positively eliminates all trouble and loss of time heretofore experienced. The various parts of the DIXIE are constructed to withstand hard and continuous wear and assure uninterrupted service under any conditions. It is simple and easy to operate—the few adjustments necessary can be made quickly by an inexperienced operator. The DIXIE handles a wide variety of materials and, because of its various adjustments, crushes to a minimum of fines or pulverizes to a maximum. Made in 14 sizes.

Let us reduce a sample of your materials and give you our suggestions as to the proper type of Hammermill best suited to your requirements. Send for our 32-page booklet which gives interesting descriptions, applications, etc.

#### DIXIE MACHINERY MFG. CO.

4172 Goodfellow Ave.

St. Louis, Missouri



 no delays in production

• greater output with same or less power

 uniform product every day

Iower drying costs

HAMMERMILLS for **CRUSHING**---PULVERIZING **GRINDING - - - SHREDDING**  and the organic inhibitors in after the harm has been done?

4. When corrosive mother liquors are to be recycled in a process that involves an organic inhibitor, could we add it to facilitate storage?

#### **CORROSION NEWS BRIEFS**

AT THE annual meeting of the American At the annual meeting of the American Coordinating Committee on Corrosion on February 26 in Pittsburgh the following officers were elected: chairman, S. Logan Kerr, S. Logan Kerr and Co., Inc., Phila-delphia; vice-chairman, George W. Seagren, Mellon Institute of Industrial Research, Pittsburgh: secretary treasurer Hugh I Mc. Pittsburgh; secretary-treasurer, Hugh J. Mc-Donald, Illinois Institute of Technology, Chicago.

E. I. DU PONT DE NEMOURS & Co. has announced "Teflon," a fluorine-containing plastic that the company has been making in pilot plant quantities since 1943. Teflon is made by polymerizing gaseous tetrafluoroe-thylene to yield a solid, granular polymer which can be extruded or compression molded. Its prominent characteristics are heat resistance, chemical resistance, and electrical properties.

As to chemical resistance, Du Pont says it withstands the attack of all materials except molten alkali metals; it can be boiled in aqua regia, hydrofluoric acid, or fuming nitric acid with no change in weight or properties; it resists the attack of organic materials and strong alkalis. Since Teffon can be used throughout the temperature range, -100 deg. F. to 480 deg. F., it should find immediate use as a gasket and packing material and as tubing for chemical process work. Samples of Teffon are availa-ble for evaluation.

NATIONAL ASSOCIATION OF CORROSION ENCINEERS will hold its annual meeting and exposition in Kansas City, Mo., May 7-9. All meetings and the manufacturers' exhibi-tion will be held in the Municipal Auditorium. The program is as follows:

Tuesday, May 7, 9 a.m.

Registration and opening of exhibits.

Tuesday, May 7, 2 p.m.

- Tuesday, May 7, 2 p.m.
  General assembly:
  "Opening Address," R. A. Brannon, Humble Pipe Line Co., president NACE.
  "Romantic Views of Corrosion," S. J. Rosch, Anaconda Wire and Cable Co.
  "Economic Considerations of Corrosion Prob-lems," F. A. Rohrman, Kansas State College.
  General business meeting, 4 p.m., members only.

Tuesday, May 7, 7:30 p.m.

Buffet supper, President Hotel: "Challenge of the Atomic Bomb," H. B. Hass, Purdue Univ.

Wednesday, May 8, 9 a.m.

Wednesday, May B, 9 a.m.
Electrical and communication symposium:
"Cathodic Protection and Applications of Selenium Rectifiers," W. F. Bonner, Federal Telephone and Radio Corp.
"Corrosion In and Around Generating Stations," J. A. Keeth, Kansas City Power and Light Co.
"Attenuation of Drainage Effects on Long Uniform Structures," Robert Pope, Bell Telephone Laboratories.

torm Structures," Kobert Pope, Ben Telephone Laboratories. "Corrosion Experience on Underground Lead Cables," J. M. Standring, American Telephone and Telegraph Co. "Construction and Ratings of Copper Oxide Rectifiers," L. W. Burton, General Electric Co.

Rectifiers, E. W. Burlen, General Licence Co.
"Cathodic Protection Rectifiers," W. L. Roush and E. J. Wood, Westinghouse Electric Corp. Water industry symposium:
"Cathodic Protection as a Corrosion Control Method Applied to Steel Surfaces Submerged in Water," L. P. Sudrabin, Electro Rust-Proofing Corp.
"Corrosion in the Water Industry," H. A. Price,





Pipe and Fittings, flanged or threaded of solid hard rubber. Also hard or soft rubber lined pipe and fittings, flanged.



Pumps, single and double acting, centrifugal and rotary gear, rendered immune to chemical attack with hard rubber protection.

Losses caused by corrosion can be kept to a minimum by the proper application of Ace Hard Rubber in the handling of corrosive solutions. With Ace Hard Rubber you can protect valuable solutions from contamination and avoid damage to the finished product, besides protecting valuable equipment. This is invaluable insurance for your circulating, storage and processing operations.

We have had almost 75 years of experience in anti-corrosion service ... experience that is ready to go to work for you. Our research and labora-tory staffs will be glad to consult with you, natually with no obligation.

American Hard Rubber Company General Sales Office: 11 Mercer St., New York 13, N. Y. Branch Sales Offices: 111 W. Washington St., Chicago 2, Ill. Akron 4, Ohio

#### SEND FOR YOUR FREE COPY OF THIS 64 PAGE CATALOG

Containing information about Ace Rubber Protection. An invaluable handbook for the plant executive.

Ace Hard Hard and Soft Rubber Lined Tanks, Pipe and Fittings All-Hard Rubber Pipe, Fittings and Utensils Hard Rubber Pumps in a Wide Range of Sizes and Capacities Made-to-Specification Equipment-Hard Rubber and Hard Rubber Lined

ubh



### IMINATED ...2 classifying screens 2 mills 7 motors and conveyors

THIS impressive list of equipment was replaced in the plant of one manufacturer with the installation of a MIKRO-PULVERIZER. In addition, cleaning time was reduced from 6 hours down to 30 minutes.

Such savings among MIKRO users are not unusual. These and similar advantages all stem from a design especially suited and guaranteed for



NO. 2TH MIKRO-PULVERIZER

each individual application-from a report and recommendation made only after careful test and check of the user's material in our laboratory and test grinding department—the services of which are available without cost or obligation.

Submitting a production test sample of your material for test grinding may provide the answer you are seeking. Write today for your copy of our Con-fidential Test Grinding Data Sheet.





- Los Angeles Dept. of Water and Power. "Designing Water Pipe for Long Life and High Carrying Capacity," G. H. Garrett, Thompson Pipe and Steel Co. "Corrosion in Cooling Water Systems and Serv-ice Lines," F. T. Redman, Hall Laboratories, Inc.
- Inc
- Inc. Corrosion Problems as Applied to the Interior Water Distribution Systems," M. P. Hatcher and H. W. Poston, Kansas City Dept. of Water.

Wednesday, May 8, 2 p.m.

- Wednesday, May 8, 2 p.m.
  Gas industry symposium:
  "The Installation and Protection of Underground Gas Distribution Systems with Pipeline En-amels," P. D. Mellon, Canadian Western Natural Gas, Light, Heat and Power Co., Ltd.
  "Magnesium Anodes for the Cathodic Protection of Underground Structures," H. A. Robinson, Dow Chemical Co.
  "Use of Fibrous Glass in Underground Pipe Protection," J. A. Grand and S. M. Peek. Owens-Corning Fiberglas Corp.
  "Results Obtained from Five Years of Cathodic Protection on 24-Inch Gas Line Rapidly De-teriorating from Bacterial Corrosion," W. E. Huddleston, Cities Service Gas Co.
  "Carosion by Aqueous Solutions in Absence of Oxygen," N. E. Berry, Servel Corp.
  "Condenser Tubes of Aluminum Alloys," R. B. Mears, Aluminum Company of America.
  "Pereability and Corrosion in Protective Coating and Corrosion in Protective Coating and Corrosion in Protective Coating and Corrosion in Cotentica.
  "Permeability and Corrosion in Protective Coat-ings," D. F. Siddall, United States Stoneware Co.

- "Application of Carbon and Graphite to Resist Corrosion," C. E. Ford, National Carbon Co.

Wednesday, May 8, 7 n.m.

Banouet, President Hotel: Speaker, H. Roe Bartle, Scout Executive Council. Boy Scouts of America.

Thursday, May 9, 9 a.m.

- General industry symposium: "Effect of Paint on Galvanic Corrosion," G. W. Seagren, Mellon Institute of Industrial Research.

- Seauren, Mellon Institute of Industrial Research.
  "Disadvantages of Dissimilar Metals in Equipment," T. G. Hieronymus, Kansas City Power and Light Co.
  "Maintenance of Oil Field Equipment," D. R. Hiskey, Dearborn Chemical Co.
  "Corrosion Ratings for Metals and Alloys," H. D. Holler, Westinghouse Electric Corp.
  "Designing to Prevent Corrosion," R. H. Brown and R. B. Mears, Aluminum Co. of America. Oil industry symposium:
  "Resistance of Some Nickel-Containing Alloys to Corrosion by West Texas Crudes," B. B. Morton, International Nickel Co.
  "Down the Hole Treatment of Condensate Wells," T. S. Bacon, Lone Star Producing Co.
  "Laboratory Studies for Determination of Organic Acids as Related to Internal Corrosion of High Pressure Condensate Wells," M. T. Griffin and E. C. Greco, Union Producing Co.
  "Metallurgical Phases of High Pressure Condensate for Condense," Metallurgical Phases of High Pressure Co.

- rosion Problems," M. E. Holmberg, Phillips Petroleum Co. "Use of Sodium Chromate for Control of Cor-rosion in Gas Condensate Wells," C. K. Eilerts, H. A. Carlson, R. V. Smith, F. G. Archer, V. L. Barr, Bureau of Mines. "Results of Some Studies of the Condensate Well Problem," W. F. Rogers and Harry Waldrin-Gulf Oil Corp. "Down the Hole Treatments of Condensate Wells," Paul Menaul, Stanolind Oil and Gas Co.
- Co.
- "Prevention of Condensate Well Corrosion by Chemical Treatment in the Erath Field," W. D. Yale, Texas Co.

Thursday, May 9, 2 p.m.

- Corrosion activities of technical societies: "American Coordinating Committee on Cor-rosion," G. H. Young, "American Foundrymen's Association," J. T. Nackenzia

- rosion," G. H. Young.
  "American Foundrymen's Association," J. T. Mackenzie.
  "American Society of Mechanical Engineers," S. Logan Kerr.
  "American Society of Refrigerating Engineers," R. S. Taylor.
  "The Electrochemical Society," R. B. Mears.
  "American Institute of Chemical Engineers," R. B. Mears.
  "Society of Automotive Engineers," E. H. Dix.
  "American Society for Testing Materials," C. S. Cole.
- "American Society for Testing Materials," C. S. Cole. "National District Heating Association," R. M. McQuitty. "Technical Association of the Pulp and Paper Industry," J. A. Lee. "American Petroleum Institute, Production Di-vision," H. H. Anderson. "American Water Works Association," H. L. Nelson. "American Chemical Society." F. N. Speller
- "American Chemical Society," F. N. Speller. "National Research Council," F. N. Speller.

# Applied of the Times Reduce Installation Costs And Space Requirements





#### for the-line Motor

... Across-the-Line Motor Starting Equipment by using the ROWAN Type 780-KBF Oil Immersed Combination Motor Starter

No special care is required for motor and control leads during installation.

Unit consists of sealed-off terminal compartment, disconnect switch, Rowan Air Seal Fuses, magnetic contactor and magnetic overload relays.

Overload relays are combination of inverse time element and instantaneous operation. Individually calibrated for 110% to 175% operation. Enclosure is mechanically interlocked to prevent lowering of tank when switch is in "ON" position or closing of switch when tank is lowered.

Rowan Air Seal Fuses . . . a proven short circuit protection . . . is a standard feature. Wherever atmosphere is contaminated with corrosive elements, semi-hazardous and hazardous vapors and dust . . . Rowan Oil Immersed Control has proved its dependability and complete safety. Users all over the country testify to its outstanding performance.

Write for complete information on the Rowan 780-KBF and other Rowan Oil Immersed Control Equipment.

|       | MAX. HORSEPOWER<br>25 OR 60 CYCLES |            | MAX.<br>AMP. |
|-------|------------------------------------|------------|--------------|
| FRAME |                                    |            |              |
|       | 220 V.                             | 440-550 V. | FUSE         |
| 50    | 5                                  | 71/2       | 30           |
| 100-B | 10                                 | 15         | 60           |
| 100-C | 15                                 | 25         | 100          |
| 150-В |                                    | 50         | 100          |
| 150-C | 25                                 | 50         | 200          |
| 300-В | 50                                 | 100        | 200          |
| 300-C | 75                                 | 100        | 400          |



The Rowan Controller Company has specialized in Oil Immersed Controls for nearly half a century.

# ACME SPRAY DRYERS



The unit illustrated was designed for experimental spray drying for the U. S. Department of Agriculture. It has met and passed every test to which it was critically subjected! In addition to many food products, spray dryers are today being successfully used for the drying of chemical products such as soap, tannin solution, urea formaldehyde, insecticide, lithophone, phenol resins, pigments, etc.

# DIFFICULT DRYING PROBLEMS...

Another instance where that Acme "Fresh Viewpoint" has led to marked improvement, is in the field of spray drying, where heretofore there was a complete lack of fundamental and design data. In many difficult drying problems, such as converting liquids containing solids into dry powder, the Acme Spray Dryer has proved efficient. On thermoplastic products, dry cool air is admitted to the spray dryer to create a cool zone in the hopper. Details of this feature and performance data on any type of drying equipment available on request,



FROM THE LOG OF EXPERIENCE-

DAN GUTLEBEN, Engineer

PROPAGANDA without special knowledge may lead to embarrassment. Our new steam plant in '32 had been designed for burning high-volatile gas-coal screenings which contained more B.t.u. per dollar than any other fuel on our market. Incidentally, equipment was also provided for burning oil. A fuel oil salesman, representing one of the mammoth refineries, dropped in to urge the replacement of our 400-ton daily coal consumption with oil. Oil, he argued, offered greater economy and he admitted no qualifying conditions. Just before the salesman's arrival, the current issue of Power was delivered to the chronicler's desk and one of the feature articles described a great new steam plant at the New Jersey oil refinery of his company. This plant was designed by the oil company's engineers, well-known for their experience and good judgment. It was equipped with stokers and was burning coall

TOM STEARNS, Columbia '81, one of the founders of Stearns-Roger Mfg. Co. of Denver, occasionally hobnobs with his friend "Murray" on the Columbia campus in New York. Although he is 21 years past the conventional 65-yr. limit, he reports to his office regularly. He says that when a man stops peddling he falls like a bicycle.

LABORERS from the tropical sugar fields of Jamaica were imported in the spring of '45 to take the place of sugar refinery workers of superior mechanical ability who had assumed the white man's burden in the shipyards at superior pay. About 120 "head" were assigned to our plant under government agreement that we house and subsist them. The steward at the rooming house dispatched them to work at 7 A.M. supplied with a generous lunch of super sandwiches. Most of the lunch was consumed enroute to the works and by noon these ravenous men of the jungle preempted the cafeteria. Each started modestly with a quart of milk and ended with three sectors of assorted pie pyramided sandwich fashion in order to gain the delight of three flavors at one bite. The boys considered their 90-day Ameri-

The boys considered their 90-day American contract as a grand holiday at full pay. They could not submit to discipline. They had been represented as experienced raw sugar mill operators. When the foreman could find them and had time enough to stand by, they dropped dischargers into two of the centrifugals at top speed. By the grace of providence, the trajectory of the flying parts followed an open path but the day's profit for the plant was shot. One of the boys assigned to the dock made so bold as to caress a fellow worker of Aunt Jemima pattern. She bit a chunk out of his breast that sent him to the hospital. We paid the full American wage less the taxes. The Jamaican government took 25 percent of their pay to save for return to them when need arises later. The earnings were small as the men seldom appeared on the job more than three days a week.

CHEMIST BACHLER, researcher in Oxnard, Calif., in '02 was the first to suggest the application of the zeolite (ion exchange) water softening device to the purification of sugar juice. One pound of salt restrains four pounds of sugar from crystallizing. Bachler came to the land of milk and honey from Austria. In 1914 he took a busman's holiday in Cuba. By the time he boarded the steamer for return to America, the war had struck and the presence of the British secret service men on the deck reminded him that he was an enemy alien, having allowed procrastination and a heavy schedule of work to delay the acquisition of his final American citizenship papers. When chemis-try won't, hokus pokus will! So Bachler reported illness and went to bed. The inspector respected the pale face and the closed eyes and passed him by. He had an American name anyway!

SUGAR MARKETING in paper bags did not originate in Savannah but it was resurrected there. In 1865 John Arbuckle, in his effort to overcome the wastefulness of mar-keting coffee in its green state, started the development of equipment by which the beans were roasted while suspended in superheated air. This imparted a superior flavor, and to retain this flavor he packed the beans while warm in tight paper bags. His competitors called them "little bags of peanuts." However the packages and the aroma pleased the housewives and the Arbuckle business grew. When Pioneer John Arbuckle filled coffee bags by hand and sold them to the housewives he was the forerunner in the creation of the demand for packaged food products. The semi-automatic packaging machine developed by his mechanical wizard, Smyser, was the granddaddy of automatic packaging equipment. It stimulated the growth of the traffic in coffee and, eventually, sugar into the great Arbuckle establishment. The Arbuckle coffee business grew so large that the export duty levied by Brazil furnished an occasional battleship for the South Ameri-can country. The exchange of "Arbuckle" package signatures for premiums expedited the erection of the monumental Brooklyn postoffice. The premium department is said to have furnished more wedding rings than any other institution.

The success of coffee packaging suggested marketing sugar in two and five pound paper bags. Arbuckle's purchase of sugar in bulk for re-sale in packages grew so large that the refinery that supplied it sought to share in the traffic and attempted to negotiate for the purchase of Arbuckle packers. When this was declined, the refinery cut off Arbuckle's supply of sugar. To retaliate, Arbuckle built his refinery in Brooklyn which got into production in 1898. The old packaging machines, without improvements since 1925 but under the maintenance of Smyser's desciple, Frank Cocks, were suffered to remain for sentimental reasons, in spite of their obsolescence, till the Arbuckle refinery was dissolved in 1941.

INTELLIGENCE as to the customer's business serves a salesman in good stead and avoids loss of time. A cub power salesman, by way of acquiring experience, was sent into our field to propagandize the value of large electric display signs. His purpose was of course to increase the demand for his company's product. His subject was of no interest to us but he was admitted out of respect due to his House. He had committed his rote to memory and it was a long one. There was not a pause long enough to permit edging in an interruption. Finally, when he had reached the end of his great effort and paused to observe the effect, we told him that our power plant was generating byproduct power cheaper than his own!

PREJUDICE does not determine the most advantageous material to use for containers of various products under varying conditions. However in the case of refined sugar at the Savannah Refinery, Benny Oxnard (now V.P. of Great Western Sugar Co.) sensed the superior quality of paper over woven fabrics. He argued that paper had the advantage of freedom from lint and the sugar can be completely reclaimed without dust. The up-standing quality of paper favored an automatic machine not available to flabby woven fabrics. Besides, its use promised to permit a reduction of one twentieth of a cent per pound of sugar. President Ben Sprague suddenly announced that his company was prepared to deliver all of the standard packages, from two pounds up, in paper. His refinery is located off the beaten path and therefore less subject to visitation by the "sugar tramps." Accordingly his installation developed quietly under the handiwork of Benny Oxnard without benefit of the usual kibitzing by the gang. Anyhow in 1936 when Ben Sprague

Anyhow in 1936 when Ben Sprague sprung the announcement on the trade there followed a stampede for paper bags and equipment. The customer is highly sensitive to price and the nickle reduction per hundredweight that Ben named swung the business. Ben's arguments as to the sanitary advantages were interesting but a few families of microbes, more or less, had a lesser



Illustrated are the radically dif-

for ant Klein Ideal Filter Leafs with

discharge tubes that practically eliminate the danger of clogging

Established 1909



#### The Stainless Steel KLEIN IDEAL DIATOMACEOUS EARTH FILTERS AND SLURRY FEEDERS

Many important and exclusive improvements and radical innovations have been incorporated in the precision-built Klein Ideal Diatomaceous Earth Filters and Feeders. Constructed of stainless-steel they

utilize a new exclusive filter principle that will bring you a new high in maximum efficiency, minimum maintenance and product uniformity.

> WRITE TODAY for full information and the latest Klein Bulletin.



6

(0)

influence with the great American housewife than the price. The southern consumers had hitherto favored cotton planters but now veered to arboriculturalists who extracted their livelihood out of the quickgrowing trees of the tropical swamps.

On the other hand for the special purpose of parachutting sugar behind the lines of the African expedition we filled a War Department order for 260,000 hundredpound packages using double cotton bags. The famous wood-stave sugar barrel passed out with 1945. It lost caste economically, politically and sanitarily along with the cracker barrel and the red hot, pot-bellied stove. Its prerogative as a prop to political decisions has been transferred to more modern devices on the banks of the picturesque Patomac.

ROLLINS had two interests, boiling sugar and playing poker, and although he was master at both, poker was the more engaging. It is favorite avocation left little time for sleep. As he whiled away the night shift in the old "bar-room chair" in front of the Rocky Ford pans, he clutched a large bolt in his hand. When he nodded, the bolt dropped to the floor and brought him to consciousness.

A MACHINIST ("war baby") in the great Enterprise Diesel Engine Works of San Francisco quit flat right after the Japs had thrown in the towel. His enthusiasm for the aristocrat of jobs faded with the ending of the draft. He explained that he had nothing further to learn and was accordingly reconverting to his old job behind the wheel of a truck.

WHEN THE FIRST WAR flarcd up, luxuries had to be put aside. However, the LeConte Memorial Society requested us to complete a museum to commemorate the haunts of the famous geologist who had spent many years in exploration in Yosemite. We interned on this job one Wilhelm Harm, an ex-Prussian soldier who was a skillful stone mason. With two helpers, an air-drilling outfit and a generous quantity of dynamite, he proceeded to mine the granite, rough hew it and lay it into the walls. He was to carry on with little supervision from headquarters but was to apply his skill with vigor and faithfulness and otherwise to keep his mouth shut. He did a creditable job. Wilhelm had a picture of himself as an infantryman in the "Wacht Am Rhein" which exemplified the efficiency of the Prussian military system. The picture consisted of a photograph of his helmeted head mounted on a print of a glorified soldier. The part that differentiated one soldier from another was custom made but the rest submitted to mass production.

THE SINEWS of a reinforced concrete bridge are steel bars hidden within, and when the drawings are gone and the oldest inhabitant has forgotten what bars were used, there is no way of ascertaining how much load the bridge can sustain. And so a nameplate on such a structure should be made of imperishable bronze etched with the data that the engineer needs. In lieu of the usual plate that disfigures many bridges with names of politicians who will be charitably forgotten in an election or two, we

# For Motor Protection That Keeps Machines Running

The four types of Century motors shown here are designed to resist the dangers of hazardous atmospheres as described below. As a result they keep machines operating, keep shutdowns to a minimum on such equipment as — pumps, blowers, cooling towers, processing machinery, dye house equipment, textile finishing machinery, dryers, and bleaching equipment.

Form J — open rated, general purpose motor - meets the needs for most installations where operating conditions are relatively clean and dry. The top half of the motor frame is closed to keep out falling solids or dripping liquids.

Splashproof motor — gives the necessary protection where plants must be washed down — keeps water out of the motor even when a hose is applied directly on the frame. It also provides protection against rain, snow, sleet, and ice for outdoor installations.

Totally Enclosed Fan Cooled motors - protect against dust, dirt, grit, abrasives, mist, or fog that would destroy the vital operating parts of the motor. The inner frame protecting the motor is sealed to keep out harmful matter.

**Explosion Proof motors** — protect against atmospheres charged with explosive dusts or gases. See specifications for specific kinds of explosive hazards.

For complete information on these and many other motor types to best meet your operating conditions, call in a Century

engineer today. Century motors are built in sizes from 1/20 to 600horsepower.



Centu

**Use 1 of These 4** Century Motor Types

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 • ·

CENTURY ELECTRIC COMPANY

1806 Pine Street + St. Louis, 5 Mo.



# YOU CAN'T POUR LOST SYRUP ON A PANCAKE!

Between the tree and the table there are many places where syrup is lost . . . leaky valves and pumps for instance. The losses of liquids or gases escaping past improper packing is enough...but the *lost production* due to needless shut-downs for the replacement of faulty packing is downright costly! That's why particular care should be exercised in the selection of the *right* packing for every application.

#### USE THE RIGHT PACKING!

PALMETTO makes the right packing for every one of your applications . . . the right quality for most economical maintenance... . the right design for most effective sealing—with least wear to rods, shafts and stems.

Write today for bulletins which show what packings to use where.



GREENE, TWEED & CO. Bronx Blvd. at 238th St., New York 66, N. Y. Plants at New York, N. Y. and North Wales, Pa. GT-1528



once installed a bronze plate, 8x10 in. engraved by Shreve & Company, the famous jewelers of San Francisco. Into this bronze were etched the load diagram, the position and size of reinforcing bars and some general statistics. A nameplate should justify the space it occupies by providing permanent storage of essential information.

STEPHEN T. MATHER, who as an official of the Pacific Coast Borax Co., had devised the famous "20-mule-team" slogan, was director of National Park Service. During one of his visits to Yosemite, he ordered the preparation of plans for a luxurious Rangers' Club. Then he instructed us to build it and render the bills to him. He paid for it by personal checks and thus endeared himself to a faithful crew of public servants.

THE NAVY DEPARTMENT saw fit to give us contracts for four weather stations along the West Coast. The nearest to home was on Farallon Island. This island is a vertical jut of rock about 20 miles outside of the Golden Gate. There is no dock to which a ship can be moored. It was necessary to anchor the boat and deliver the materials by cableway. Sometimes the sea was so rough as to require the boat to return to San Francisco without discharging its cargo. We, learned some fine points of law there.

The rock was manned by a detachment of U. S. Marines whose sole off-duty occupation was playing poker. During the long stormy evenings our crew joined in this activity and of course lost their money. The foreman carried an expense account from which he made withdrawals for petty cash expenditures and occasional advances against payroll. While he was sitting in with his crew and getting his trimming, one of the carpenters requested an advance and promptly lost it. At the month-end, when the carpenter went home, the wife berated him because he delivered no cash, and besides, he was in debt to the foreman's drawing account. She presented her complaint to a special court where employer employee disagreements were adjusted. The judge ruled that the sums that the foreman advanced to the carpenter while they were occupied in a game of chance could not ap-ply against wages! The judge's philosophy was not clear but his pronouncement from a practical point of view sounded reasonable. At any rate it maintained worker moral by insuring domestic tranquility.

OUR FIRST JOB at Mare Island Navy Yard (about 1910) was a four-story steel vault to house the valuable drawings of the hull department. After our details had been approved and delivered to the shop, a draftsman discovered that the government had specified the steel doors too small to admit the furniture! The appropriation for the contract was fixed. When the Public Works officer told us of the oversight, we relieved his mind by telling him that we could readily increase the size of the doors to fit the furniture. We hadn't done much work on them and so the cost of the change did not amount to much-but the officer did not know this! When the brickwork got underway, we requested the use of a Yard air hoist which was among the surplus

# tor AL



HOT » » In chemical plants all over the country, WILFLEY Acid Pumps have established notable records for cost-saving handling of acids, hot liquids, corrosives and mild abrasives. This is the pump that delivers dependable 24-hour a-day production in both intermittent and continuous operations. Individual engineering assures proper application on every job. 10- to 2,000-G.P.M. capacities; 15- to 150-ft. heads and higher. It's the pump to buy when you want low costs. Write or wire for further details.

CORRU

HOT LIQUIDS . CORRO

ACIDS . HOT I

CORROSIVES

HOT LIQUIDS .

JIDS .

ROSIVES

DUIDS

A. R. WILFLEY & SONS, INC. Denver, Colorado, U. S. A. NEW YORK OFFICE: 1775 BROADWAY, NEW YORK CITY, N.Y.


## THROW WATER ON MOLTEN MAGNESIUM



Burning magnesium metal doused with water may cause a violent conflagration. Other fire extinguishing methods may be equally impotent. But there is an effective way to control a magnesium fire. Pyrene G1 Powder has been specially developed and prepared to extinguish fires in burning metals such as magnesium, sodium and potassium. Easily applied with either a shovel or muchine.

# OF USE IMPROPER EXTINGUISHER

Pyrene Foam made at the nozzle of Pyrene Playpipe smothers fire in burning liquids. One man does the job with a hip-pack of air foam and just hydrant or salt water. Fast, safe, certain and most economical.



THROW

WATER ON ELECTRICAL FIRE

Use a Pyrene Vaporizing Liquid extinguisher — a one-quart pump type to a one-gallon pressure type — depending upon size of fire. It's safe because it's a non-conductor.

## STANDARDIZE ON PYRENE PROTECTION

Control of fire in all its phases has been Pyrene's business for almost 40 years. There are specific Pyrene Fire Extinguishers for different classes of fires. A Pyrene jobber will be glad to help you determine your fire hazards and advise best methods for protection from them.



equipment that was available to contractors at a standard schedule of rental. A few days later the hoist was set up on the job and connected to the Yard compressed air system. There was a memorandum on the shop superintendent's desk instructing him to provide this service without levying the customary fee.

In front of the job there was a quartermile row of old Civil War cannons projecting out of the sea wall to serve as bollards for mooring ships. Two of these had become spattered with lime from our mortar pile, and so when clean-up time arrived, our painter covered these with a fresh coat of paint. When he observed the relative disparagement in the appearance of the rest, he painted the whole row. While the chronicler was watching the painter cover the last post, Admiral Tappan happened along on his daily inspection tour. He called and said "Gutleben, you boys seem to have the disposition to treat the government very squarely." A little later we were building an extension to the Mare Island Hospital. Excavation in those days was per-formed by mules and scrapers and the Vallejo Ferry daily transported our twelve teams across the straits at a dollar a team. The Admiral noticed this and asked why we did not use the empty government stable at the foot of Telegraph Hill and thereby avoid the daily ferry charge. We were thus continually swapping and there were never any arguments. Those Navy Yard engineers were mighty square men to cooperate with. We gave the government more than was due and at the same time the returns were up to expectations.

THE MARE ISLAND STATION was located on top of Telegraph Hill. To provide water for operators' quarters, we erected an elevated tank which was supplied from an automatic pump located at the foot of the hill. When the level in the tank dropped, a float started the pump which continued to deliver water until the tank was full. The main supply line from the bottom of the tank led to the cellar of the quarters building and from there, was distributed through the building.

One Saturday afternoon, before the job was completely finished, the marines moved in and stored in the cellar a large stock of supplies, including spinach, carrots, eggs, a week's rations of bread and bulk beans. When everything was moved in, the leathernecks were tired and went to bed-all but one! He climbed up the tank tower and opened the valve in the supply line which the plumber had closed because a 2½-in. clbow in the cellar had failed and he had not had time to get a new one. When the leatherneck got into his room, the water pressure was too low to provide for his bath and he retired in ill humor.

When the boys awoke on the morrow, they beheld two streaks of assorted green vegetables and beans extending all the way down the hill with a little streamlet of water in the middle. The flood from the tank had pushed next week's rations out through the trap door on the low side of the yard and in the absence of an impulse from the float control, the pump continued dutifully to perform until reveille brought the mess sergeant into action.

## Pritchard GAS ENGINEERING

### For the Chemical Industries

HYDROGEN SULPHIDE CARBON MONOXIDE CARBON DIOXIDE REFINERY GASES HYDROCARBONS HYDROGEN NITROGEN OXYGEN

Gas and liquid dehydration, separation and purification; equipment and counsel for the profitable utilization of by-product gases, distillery gases, reformed natural gases, etc.

# **Pritchard's Broader Experience Pays Profits**

in the Design, Engineering and Construction of Facilities for the Production or Processing of Natural, Manufactured or By-Product Gases

> Pritchard engineers' thorough understanding of this field is based on the actual creation, from plans to production, of many plants and process units. Augmenting and actively contributing to Pritchard's comprehensive acumen in gas engineering is the experience of other Pritchard Divisions serving the petroleum, chemical, power and refrigeration industries. Your inquiry concerning any aspect of Pritchard service will receive prompt response without obligation.

> CHEMICAL DIVISION . FIDELITY BLDG. . KANSAS CITY 6, MO.



#### ENGINEERS . CONSTRUCTORS . MANUFACTURERS

FOR THE CHEMICAL, PETROLEUM, GAS AND POWER INDUSTRIES

HOUSTON + TULSA + PITTSBURGH + CHICAGO + NEW YORK + DETROIT + ATLANTA + ST. LOUIS DENVER + SALT LAKE CITY + EL PASO + OMAHA + LOS ANGELES + MEXICO CITY + MINNEAPOLIS

ALKATERGE-C is an oil-soluble, cationic surfaceactive agent which has been found useful in the preparation of a wide range of products including lubricants, polishes, cleaners, and textile penetrants.

AGENT

Try this NEW SURFACE-ACTIVE

While Alkaterge-C is less than 0.002% soluble in water, a saturated aqueous solution has a surface tension of less than 35 dynes per centimeter as compared to 72 for water alone. The presence of 1% Alkaterge-C in oil reduces the interfacial surface tension against water to 1 or 2 dynes, although it has no effect on the surface tension of the oil.

It reacts readily with mineral and organic acids to form salts and soaps, some of which are water soluble and are excellent wetting and penetrating agents. It shows no apparent thermal decomposition up to 430C at atmospheric pressure. It appears to have anti-oxidant properties and has been used to increase the effectiveness of rust-inhibiting preparations.

Alkaterge-C is useful as a dispersing agent, a spreading agent, and a flotation agent for some nonmetallics.

Alkaterge-C is available in drum quantities. Write our Technical Service Division for further data and suggestions regarding the use of Alkaterge-C in your products or processes.

COMMERCIAL SOLVENTS Corporation 17 East 42nd Street, New York 17, N.Y.

CHARACTERISTICS Oil Soluble Heat Stable

MERCIAL SOLVENIS

Alkaterge.C

Nonmetallic High Flash Point

### **USED FOR**

**Pigment Grinding** Wool Carbonizing Hydraulic Oils Textile Penetrants Rust Inhibitors Quenching Oils

Metal Primers **Metal Cleaners** Polishes Lubricating Greases

# NAMES IN THE NEWS\_



W. W. Scull

W. W. Scull, formerly plant manager of the Louisville, Ky., and Port Neches, Tex., govcriment synthetic rubber plants operated by B. F. Goodrich Chemical Co., has been named production manager of plants for Goodrich.

W. F. Perkins is now manager of the tire testing laboratories of the B. F. Goodrich Co. Mr. Perkins, a graduate of Purdue University in chemical engineering, joined the company in 1928. For the last four years he had been manager of process inspection at the Lone Star Ordnance Corp. in Texas.

Oscar K. Irgens, for the past four years chief chemist at the Lake City, Missouri plant of the Remington Arms Co., has joined the chemical research staff of Gustavus J. Esselen, Inc., of Boston.

Lewis Larrick has been appointed acting director of applied research of the Institute of Textile Technology, Charlottesville, Va.

Gilbert L. Cox, metallurgical and chemical engincer, is in charge of the new Empire State Technical Section of the Development and Research Division, The International Nickel Co. Offices of the new section are located in the Genesee Valley Trust Bldg., Rochester, N. Y.

Louis A. Oberly has been appointed research director for the Hartford Rayon Corp. of Rocky Hill, Conn.

Walter Miller, who retired last month as vice president in charge of manufacturing for Continental Oil Co., has been retained by Universal Oil Products Co. as a consultant.

A. T. Nielsen, formerly application engineer with the Worthington Pump and Machinery Corp., has been named plant superintendent for the Citro Chemical Co. of America at Maywood, N. J. Mr. Nielsen received his master's degree in chemical engineering from Lehigh University.



E. R. Braun

Eric R. Braun has been appointed assistant director of engineering by Merck & Co., Rahway, N. J. Mr. Braun, a chemical engineering graduate of Princeton University, will also continue as chief chemical engineer, which duties he assumed last year.

Joseph M. Perrone, who for the last three years has been doing research and development work on protective coatings at Mellon Institute, has been named director of research of Watson-Standard Co.

O. E. May, chief of the Burcau of Agricultural and Industrial Chemistry, has resigned and has been succeeded by L. B. Howard, formerly assistant chief of the burcau. Dr. May left the Department of Agriculture to become associated with the Coca Cola Co. in an executive capacity.

Donald F. Chamberlain has been appointed assistant professor of chemical engineering at Washington University, St. Louis. Dr. Chamberlain assumed his duties on February 18. He was formerly employed in the research engineering department, National Aniline Division of the Allied Chemical and Dye Corp.

Allen M. Bond, Jr. has joined the Votator Division of The Girdler Corp. where he will have an important part in Votator's research projects and enlarged engineering service program. Formerly director of research of the Brown & Williamson Tobacco Corp., Mr. Bond served for three years in the Navy before. joining Votator. He received his B. S. degree in chemical engineering at Purdue.

Boris Schwartz has been named chief research chemist for the Hart Products Corp., New York.

J. Eugene Lindsay has rejoined the research department of the Plastic Metals Division of The National Radiator Co., Johnstown, Pa., after more than four years of active duty with the Chemical Warfare Service.



F. Manchester

Frank H. Manchester has been made plant manager of the Pathfinder Chemical Corp., vinyl plastics subsidiary of The Goodyear Tire & Rubber Co. He assumes active control of the Pathfinder concern, scheduled to go into production in August.

Ian M. Heilbron, professor of organic chemistry in the Imperial College of Science and Technology, University of London, received the Priestley Medal on April 8. The medal is awarded triennially by the American Chemical Society.

**Robert B. MacMullin**, formerly manager of development of the Mathieson Alkali Works, Inc., has announced the opening of a consulting practice in the field of chemical engineering, with temporary offices at 8249 Troy Avenue, Niagara Falls, N. Y.

M. Scott Moulton, of B. F. Goodrich Chemical Co., has been promoted to technical service manager for Geon thermoplastic materials. Mr. Moulton was formerly manager of coatings and film materials.

Arthur W. Lissauer, vice president of General American Transportation Corp., has retired.

Steuart E. Tray, chemical engineer, has been appointed assistant manager of the basic industries department in charge of the new chemical processing machinery section at the Allis-Chalmers Mfg. Co., Milwaukce.

Alexander Frieden, vice president and director of the technical division of Stein, Hall & Co., Inc., New York, has resigned. Dr. Frieden has been associated with Stein-Hall for more than ten years as technical director. The resignation is effective June 30.

John R. Van Wazer, formerly in charge of a physical chemistry laboratory in the Tennessee Eastman Corp. division of the Clinton Engineering Works at Oak Ridge, has been added to the research laboratory staff of Rumford Chemical Works, Rumford, R. I.,



8 pages of interesting helpful data for users of ALLOY CASTINGS Ask for Bulletin 45

# Stainless & Alloy Steel Castings

The casting of alloy steels is a job for specialists. A study of the anticipated use of a particular casting often makes possible the compounding of some specific analysis more suited to the particular job. For over 20 years Atlas metallurgists have been specializing in casting Alloy Steels. May we consult with you on your next requirement?

> STAINEESS CASTINESS CASTINESS

ATLAS STAINLESS STEEL CASTING DIVISION ATLAS FOUNDRY COMPANY 540 LYONS AVENUE IRVINGTON 11, N. J.

as a physical chemist. Robert H. Elliott, M. D., an inorganic chemist for seven years at the Laurel Hill research laboratory of the General Chemical Co., will hold a similar position at Runford.

Thomas J. Cain, Jr., has been appointed director of safety for all Akron plants of The B. F. Goodrich Co. He will head an expanded safety program as part of the industrial relations department.

William F. Newton has been appointed manager of market research and development for Columbia Chemical Division of Pittsburgh Plate Glass Co. "Prior to his association with the Pittsburgh Plate Glass Co., he was employed by the Shell Chemical Co.

Homer S. Youngs, former chief of the chemical laboratory of the Santa Monica plant of the Douglas Aircraft Co., has been named director of the newly created Shippers' Research Division of the Air Transport Association of America. Primary duties of the new division will be to study and prepare regulations dealing with the safe transportation of hazardous commodities by air carriers.

Carl E. Barnes has been appointed head of the development laboratory of the Ansco film and camera division of General Aniline & Film Corp. Dr. Barnes has been a section leader at the central research laboratory in Easton, Pa.

II. D. Kinsey has been appointed works manager for Carbide and Carbon Chemicals Corp., New York. Mr. Kinsey was formerly general superintendent of the atomic energy plant operated for the government by Carbide and Carbon Chemicals Corp. at Oak Ridge. The post of assistant works manager has been taken over by **R. K. Turner. T. R.** Ragland, who has been assistant superintendent succeeds Mr. Turner as superintendent.

William H. Aiken, former captain in the U. S. Quartermaster Corps, in charge of recearch and development work on coated fabrics and plastics, has been named assistant manager of the plastics and coatings department in the newly organized chemical products division of the Goodycar Tire & Rubber Co. Dr. Aiken is a chemical engineering graduate of Texas A. & M. College.

Eugene D. Milener has been apointed coordinator of general research of the American Gas Association. Mahlon A. Combs has been promoted from assistant secretary of the industrial and commercial gas secretary to secretary, succeeding Mr. Milener in this post. Mr. Milener's new duties consist of coordinating the general and technical utilization research of the association.

Arnold J. Lehman is now chief of the Division of Pharmacology of the Food and Drug Administration. Dr. Lehman fills the position left vacant last September by the death of Herbert O. Calvery.

Clifford R. Keizer, formerly associated with the central research laboratories at the Monsanto Chemical Co. has been named an instructor at Western Reserve University,



SIMPLE DESIGN —Lowest cost per square foot of filtering capacity because of absence of complicated parts and structural simplicity.

LOW OPERATING COST – No skilled labor required; no power required except for feed pump.

**LEAST SPACE**-On basis of actual production, minimum floor area and head room required.

FILTER ANY MATERIAL—At any pressure or temperature.

MOST VERSATILE—You can recover solids, clarify, decolorize, deodorize, wash and/or dry cake, extract, redissolve cake, thicken slurry, etc.

**USE ANY FILTER MEDIA**—Cotton, synthetic cloth, wool, glass, metal, paper; any filter aids.

ANY MATERIAL OF CONSTRUC-TION—Metals, wood, plastics, rubber to meet specific conditions.

**ANY SIZE**—for any filterine capacity from a few gallons to 10,000 gallons per hour—and more.





When steel plates are pickled, prior to galvanizing, in 10% sulphuric acid at 180° F., corrosive action is severe. The tank shown above is lined with a double course acid-brick, laid entirely with Penchlor Acid-Proof Cement, which gives corrosion protection and also withstands the physical abuse resulting from submerging and withdrawing steel plates in this solution.

#### PENCHLOR Reg. U. S. Pot. Off. Acid-Proof Cement

... sets quickly, reducing construction delays. It is a self-hardening sodium silicate type cement and has exceptionally long life, as proved in hard service and under severe acid conditions. It is



unaffected by all acids—hot or cold—dilute or concentrated—except hydrofluoric acid.

Penchlor Acid-Proof Cement, used as a mortar, adheres strongly to brick, steel, glass, lead, rubber, and asphalt. Write today for further information.

SPECIAL CHEMICALS DIVISION PRODUCTS Acid, Alkali, and Solvent proof Cements • Lead Fluoborate Concentrates • Fluoboric acid • Acid, Alkali and Solvent Emulsion Type Cleaners • Paint Strippers • Pickling agents.

| PENNSYLVANIA SALT MAI<br>Dept. CME, 1000 Widene<br>I would like to have a free<br>Acid-Proof Cement. | NUFACTURING COMPANY<br>or Bidg., Philadelphia 7, Pa.<br>e copy of your booklet No. 6 on | Penchlor |
|--|---|----------|
| NAME   |   |          |
| TITLE  |   | 100      |
| COMPANY  |   |          |
| ADDRESS  |   |          |



The Zenith Pulp Press, with capacity up to 26 tans per hour, thoroughly dewaters wet pulps and slurries such as:

Beet Pulp • Citrus Wastes • Tomato Pomace • Cherries

• Corn Fibre • Paper Pulp • Reclaimed Rubber, etc.

Heavy screw-type spindle applies smooth, continuous pressure, forces pulp or slurry against selective resistance. Rifled drilled resistors permit use of steam when necessary. Minutely perforated screens assure efficient drainage, hold pulp losses to minimum. Ball thrust bearings and oversize shaft bearings reduce power load.

New uses for the remarkably efficient, profitable Zenith Pulp Press are being constantly developed. An experimental press is available for

trial in your plant.

Write for full information.



JACKSON & CHURCH CO. SAGINAW, MICHIGAN Cleveland. He was formerly an instructor of chemistry at the University of Illinois.

William M. Rand, president of Monsanto Chemical Co., has been elected a trustee of the Midwest Research Institute, Kansas City, Mo.

Charles D. Coryell has been appointed professor of chemistry at the Massachusetts Institute of Technology. He is chief of the research section on radiochemistry and fission products of the Clinton Laboratories at Oak Ridge. Dr. Coryell is now working on final reports for the project and will join the Institute in July.

Hugh A. Neal has rejoined Phillips Petroleum Co., Bartlesville, Okla., as assistant manager of the Perco division in the chemical products department. Lt. Col. Neal was with the parachute field artillery for more than five years.

**Robert B. Jacobs** has joined the staff of Distillation Products Inc., Rochester, N. Y., where he will direct the work of the physics laboratory which is concerned with the study of physical phenomena at low pressures.

S. A. Montgomery, manager of the Whiting, Ind., refinery of Standard Oil Co. (Ind.), has been made assistant general manager of manufacturing in the Chicago general office. He has been succeeded by W. J. McGill, manager of Standard's Wood River, Ill., refinery and G. F. Ordeman, assistant general superintendent at Whiting, has been promoted to succeed Dr. McGill.

Frederick J. Clarke, a 30-year old engincer from West Point has been named commanding officer of Hanford Engineer Works, Richland, Wash., which produces plutonium as a source of atomic energy. Col. Clarke succeeds Col. F. T. Mathias, who has taken a civilian engineering job in South America. D. A. Miller succeeds B. H. Mackey as Du Pont plant manager of Hanford, while T. M. Stepleton becomes assistant superintendent.

Henry Sonneborn, III, until recently on active duty as a lieutenant in the USNR, and Hans Schindler, research chemist, have joined the technical staff of the Petrolia, Pa., refinery of L. Sonneborn Sons, Inc.

John J. Howe has joined Heyden Chemical Corp.'s Development Division.

Leonard M. Freeman has been appointed manager of the newly established works laboratories of The B. F. Goodrich Co. which will handle technical service, development and training of personnel. In the group are the general chemistry laboratory, raw materials inspection and development department and physical testing laboratories.

James S. Denham, assistant manager of the rayon department, E. I. du Pont de Nemours & Co., has been appointed general manager of the photo products department to succeed George A. Scanlon who has retired. Robert L. Richards has been promoted to fill the position left by Mr. Denham and Robert A. Ramsdell has been



Precision Built Tanks take skill and accuracy—that is why Littleford has for 66 years made plain, storage, mixing and A. S. M. E. pressure Tanks. If your problem calls for Stainless Nickle, Monel, Inconel, Aluminum, Herculoy or Plain Steel, specifications and design can be followed to the most intricate details. Send Blueprints to Littleford for estimate of cost—if you need a suggestion our Engineering Service is at your disposal.



### PRECISION MANUFACTURED **AUTO-LITE** RECORDING Thermometers

Auto-Lite Recording Thermometers chart the facts for you. These precision instruments have highly legible, 6" diameter face. Single pen-type chart with mechanical clock movement, for either 24 hour or 7 day operation. Equipped with 5 ft. flexible tubing; additional lengths up to 25 ft. Special low temperature chart range, minus 40° to plus 40° F. Wide selection of other ranges available.

TROSCOLUM

THE ELECTRIC AUTO-LITE COMPANY INSTRUMENT AND GAUGE DIVISION CHRYSLER BUILDING, NEW YORK 17



TUNE IN THE AUTO-LITE RADIO SHOW STARRING DICK HAYMES-SATURDAYS, 8:00 P. M.-E. T. ON CBS CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 • 243

# AETNA STILLS ARE USTWORTHY

#### .. AND DESIGNED FOR LONG USE

A laboratory is no place for "prima donna" equipment. Aetna Stills, sturdy and dependable, require no coddling, no specially trained attendants. Practical, sure and doubly protected from strain at critical points because of the vertical design and construction, Aetna Stills, year in, year out, produce pyrogen-free, chemically pure distillate for all laboratory purposes with a minimum of attention.

Single, double and triple stills with capacities ranging from 1 to 150 gallons per hour, for electric, gas, steam and gasoline operation.





Model DS-1025 AETNA Double Still. 10 gais. per hr. 25 gal. storage tank. 2ND & SPRING STREETS EVERETT 49, MASS.



named manager of the nylon division succeeding Mr. Richards. Charles M. Switzer, nylon division director of production, has been advanced to the post of assistant manager of the division to succeed Mr. Ramsdell.

Harold L. Sheppard, assistant plant manager at the Newark, N. J., plant of the Celanese Corp. of America, has been named plant manager at Belvidere, N. J., the new plant recently acquired by Celanese for the production of plastics, chemicals and related products. Charles C. Eckert has been named production superintendent.

Frank C. Fowler has been appointed assistant professor of chemical engineering at the University of Oklahoma. For the past three years Dr. Fowler has been employed in the chemicals products department of the Phillips Petroleum Co.

Lee C. Cheney, a recent addition to the staff of Bristol Laboratorics Inc., Syracuse, N. Y. has been assigned to synthetic organic research. Another newcomer at Bristol, Alden B. Hatch, is in charge of fermentation development. Other recent appoint ments include Harry O. Nutting, Jr., chief construction engineer; Robert C. Gasen, special assistant to the general manager; and William C. Risser who will specialize in biochemical research.

R. C. Johnson has left Purdue University to accept an appointment as research engineer at Southern Research Institute, Birmingham, Al.

C. M. Croft has been named manager of the Celanese Mexicana, S. A., plant now under construction at Ocotlan, near Guadalajara, Mexico. Mr. Croft expects to take up his new dutics sometime during the coming summer. Celanese Mexicana, S. A., is financed by Celanese Corp. of America and Mexican interests. The plant is expected to be completed in the near future.

O. M. Knudsen has been appointed to the teaching staff of the department of chemical engineering at Rose Polytechnic Institute, Terre Haute, Ind. Dr. Knudsen formerly taught at Michigan State College.

Philip Heiberger has joined the Arrow l acquer Co., Brooklyn, N. Y., as chief chemist. He was formerly project leader with the Ralph L. Evans Associates.

Austin W. Fisher has joined the staff of Arthur D. Little, Inc., Cambridge, Mass., where he will supervise chemical engineering research. Dr. Fisher was formerly with the Barrett Division of Allied Chemical and Dye Corp. and with Publicker Industries, Inc.

Paul O. Powers, widely known for his work in synthetic chemistry, has been named to the staff of Battelle Memorial Institute, Columbus, Ohio, where he will coordinate and advise on an expanded program of research in organic chemistry.

Harvey N. Gilbert, director of sodium and evanide products research at E. I. du Pont de Nemours & Co.'s electrochemicals de-

# PROCTOR CONTINUOUS CONVEYOR SYSTEM SPEEDS OUTPUT ... IMPROVES QUALITY



OF

Storch is mechanically dewatered by means of a ratary vacuum filter.
Having been scored on the filter, storch is delivered to conveyor of dryer in the form of ½" cubes, with a moisture content of 78.5% (B.D.W.B.).\*
Due to the pre-forming of the storch on the filter and breaking the filter cate into ½" cubes, it is possible to dry storch rapidly—thus preventing some Dry Weight Baus.

case hardening and assuring thorough drying. Having been broken up into small pieces, it is possible for air to circulate through the bed of material as the conveyor. Temperatures average 180 F. at beginning of the cycle and 215 F. at the end.

4. Starch leaves dryer with a moisture content of 13.6% (B.D.W.B.). Capacity 4. of dryer shown is about 4800 pounds (C.D.W.1) per how. tCammercial Dry Weight.

The physical characteristics of starch make it a difficult product to dry in large scale production. Dried too fast—or with temperatures that are too high—case hardening results and the dispersibility of the starch in liquid is ruined. Yet, with all of these factors to overcome, Proctor engineers have developed this continuous system that cuts drying time for starch down to a matter of minutes from 12 hours. Not only that, the system assures a starch that is free from surface baking or case hardening. Naturally, this greatly increases the output capacity over that which was possible with old-fashioned kiln drying. Dried starch is cleaner, contains far less impurities



STARCH

Close-up shows 1/2" cubes of starch...the form in which it enters the dryer, after having been scored on the filter. Circulation of heated air through the bed of these cubes promotes rapid, uniform drying.

and has a better color than starch dried by less recent methods. Accurate control of final moisture content is assured, and this is an important factor. This Proctor continuous drying system for starch represents one more major contribution of Proctor engineers to more efficient production in the process industries. The entire system is the outgrowth of a problem that came to Proctor research laboratories a few years ago. If you have a drying problem, you'll be on the right track by consulting Proctor engineers now!



PROCTOR & SCHWARTZ · INC · Philadelphia 20 · Pa.



MATERIALS CONVEYED

Bark Sawdust Salt Cake Silica Clays Soda ash Resin Celite Soap chips Wood chips Sov beans **Fullers** earth Ferric sulphate Malt Borax Alum Calcium acetate Stucco Bauxite Zinc sulphate Flaxseed Limestone Arsenic Pebble lime Meat scraps Iron oxide Cellulose acetate

### **ECONOMICAL HANDLING OF** YOUR RAW MATERIALS

How much can you save? It will cost you nothing to find out. We will submit an estimate on a system designed to meet your requirements with guaranteed capacity and power consumption. One operator can not only unload cars but also control distribution of materials between storage and process bins. Maintenance costs are negligible and the system can be kept in condition by the operator.

Our many years of experience in the conveying field qualifies us to design and build your materials handling equipment.

#### FULLER COMPANY CATASAUQUA, PENNSYLVANIA

Chicago 3 - 120 So. LaSalle St. San Francisco 4 - 421 Chancery Bldg. Washington 5, D. C. - 618 Colorado Bldg.



FULLER-KINYON, FULLER-FLUND AND THE AIRVEYOR CONVEYING SYSTEMS ... ROTARY FEEDERS AND LISCHARGE GATES ... ROTARY AIR COMPRESSORS AND VACUUM PUMPS ... AIR-QUENCHING INCLINED-GRATE COOLERS ... DRY PULVERIZED MATERIAL COOLER ... AERATION UNITS ... MATERIAL-LEVEL INDICATORS ... MOTION SAFETY SWITCH ... SLURRY VALVES ... SAMPLERS

partment. Niagara Falls, has been awarded the Jacob F. Schoellkopf Medal of the American Chemical Society's Western New York Section. The medal, awarded annually for outstanding service to chemistry, will be presented at a meeting on May 21.

Harold Ross, former chemist in the emulsion section of the research and development division of S. C. Johnson & Son, Inc., Racine, Wis., has been named pro-duction manager of S. C. Johnson & Son, Ltd., West Drayton, Middlesex, England. Other additions and changes in the research and development division include: Edward Wilder is now head of the natural and synthetic wax section; Donald Whyte, di-rector of the new organic research section; L. Keith Coad, in charge of the physical research chemistry section; and Enos H. McMullen is now senior chemist in the natural and synthetic wax section.

Norman Ketzlach, formerly a chemical engineer engaged in research work, has been promoted to chief chemist in charge of both control and research laboratories for Manganese Products, Inc., Seattle, Wash. Cyrus W. Richardson formerly chemical engineer in research, has been promoted to superintendent of the new fertilizer plant now under construction. Both mer are graduates in chemical engineering of the University of Washington.

Jacque E. Levy has recently become associated with the protective coatings section of Bureau of Ships, Navy Department. He was formerly attached to the Chemical Warfare Service and Ordnance Department, War Department.

Joseph C. Herbert, with the B. F. Good-rich Co. since 1927, has been named factory manager of the company's recently acquired tire plant in Tuscaloosa, Ala.

Lawrence W. Smith, M. D., is now associated with Commercial Solvents Corp., as medical director.

#### **OBITUARIES**

Alfred Springer, 92, dean of Cincinnati chemists, died in February after a long illness.

Donald B. Lowe, 62. medical director of The B. F. Goodrich Co. for 31 years, died March 2.

Albert L. Scott, 67, president of Lockwood Greene Engineers, Inc., died in his home at Chappaqua, N. Y., March 2.

George M. Deming, 53, chief research engineer for the Air Reduction Sales Co. in Jersey City, N. J., died March 18.

Gilbert N. Lewis, 70, noted scientist and dean of the College of Chemistry of the University of California, died in Berkeley March 23.

Edward H. Mayo, 77, credited with being the first man to make sulphate paper pulp from southern pine, died in Mobile, Ala.

A-63

# WHAT IS ERIEZ PERMANENT MAGNETIC PROTECTION?



**ERIEZ Non-Electric Permanent Magnets Remove Iron and** Steel Trash from: ALUMINA AMMONIA SONE BROMINE COKE BY-PRODUCTS CEMENT CASEIN CERAMICS CHEMICAL COTTON CYANAMIDE **ENAMEL** (Porcelain) FOODS GLASS FERTILIZERS MAGNESIUM LIQUIDS **TERPENE CHEMICALS** OILS PAINTS PHENOLIC PLASTICS-RESINS POWDER PHOSPHATES PULP SULPHATE PULP SULPHITE RUBBER RAW SUGAR SALT SI UDGE SOYBEAN OIL SOAP



liketch shows the construction of special tries Magnet, designed with center supressed insulation strip, or packet for efficient removal of ball-backings and microscopic particles of iron and steal from shemicals in practices.

Say EAR' EEZ

FIRST, it is the installation of powerful Eriez Non-Electric Permanent Alnico Magnets in all processing lines and on all machines where iron and steel trash could cause trouble.

**SECOND,** Eriez Magnetic Protection eliminates by the removal of iron and steel trash, the ever present fire hazard and costly machine damage. **THIRD,** it is the least expensive kind of Permanent Protection you can get against iron and steel trash because it costs little initially—and it is always on the job.

FOURTH, it is no expense to you to operate. You install Eriez Magnets at points where they will do the most good and forget them. Occasional cleaning of debris is your only operation.

Eriez Magnets cannot spark. They are "ALWAYS ON" regardless of power or current conditions. Eriez cost less than ordinary magnets . . . they are lighter and easier to install . . . Eriez can be installed anywhere there is a 6 inch opening.

The following leading chemical processing plants using Eriez Non-Electric Permanent Magnets on conveying equipment, in chutes and feed tables and on processing machines prove their high value. Why be satisfied with ordinary magnets . . . when you can get ERIEZ?

PLASTICS AND CERAMICS: Ferro Enameling Corp., Lapin Products, Durez Plastics & Chemicals. CHEMICALS AND DRUGS: Dow Chemical Co., E. I. DuPont de Nemours, Stauffer Chemical Co., Monsanto Chemical Co., Tennessee-Esstman Corp. GLASS: Owens-Illinois Glass Co., Libby-Owens-Ford Glass Co. PULP AND PAPER: West Virginia Pulp and Paper Co., Fox Paper Co. GENERAL. Congoleum Nairn Inc., Johns Manville, Proctor & Gamble, Raybestos-Manhattan, Makalot Corp., The Carborundum Co. There are many others.



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



Indicating, Recording and Controlling Thermometers for every Industrial Application





#### INDUSTRIAL NOTES

Brown & Root, Inc., Houston, Tex., has expanded its industrial services through the creation of a petroleum and chemical division specializing in the design, engineering and construction of process plants.

Hercules Powder Co., Wilmington, Del., has reported that the paper makers chemical department sales office, Atlanta, Ga., has been under the management of J. Huston McClane since the early part of the year. Mr. McClane returned to civilian status after serving as a major with the Army overseas.

United States Rubber Co., New York, N. Y., has assigned Dr. Ernest J. Joss as administrative assistant to Ernest G. Brown, vice president and general manager of the mechanical goods, general products and "Lastex" yarn and rubber thread divisions.

Dow Chemical Co., Midland, Mich., has revealed that Lt. Col. Guy DeKuiper has returned to his work with the magnesium sales staff and will be stationed at Dow's Washington office. Robert L. Featherly has returned as a member of the magnesium sales staff on cathodic protection.

Rheem Research Products, Inc., Baltimore, Md., has announced the appointment of H. C. Irvin as manager of the eastern division of the company. Mr. Irvin's headquarters will be in Baltimore. Pressurelube, Inc., Newark, N. J., has named William P. Turnesa to be director of sales.

Monsanto Chemical Co., St. Louis, Mo., has appointed Forrest M. Luckett branch manager of the organic chemicals division office in Cincinnati.

Sinclair Refining Co., New York, has appointed Paul W. Zumbrook as manager of domestic lubricating oil sales. In his new assignment, he will coordinate the service and distribution activity of the automotive and industrial lubrication staffs.

Corning Glass Works, Corning, N<sub>4</sub> Y., has named Russell Brittingham as assistant to the vice president in charge of bulb and tubing and technical products divisions.

Crocker-Wheeler Division, Joshua Hendy Iron Works, Ampere, N. J., has promoted I. C. Smith to the position of chief engineer.

Davis Engineering Corp., Elizabeth, N. J., has announced the appointment of C. Edward Bernard as manager of agency sales.

Godfrey L. Cabot, Inc., Boston, Mass., has added John Andrews to the technical sales staff of the company.

Standard Oil Co. (Indiana), Chicago, Ill., has moved W. H. Taylor to the position

# AMERSIL\* ANNEALED SILICA for HIGH PRODUCT PURITY at HIGH TEMPERATURE



Whether you are running a high temperature chemical reaction, collecting hot corrosive liquids, or refining or sintering metals, Amersil annealed silica equipment will give you a purer product. Non - porosity, high electrical resistivity at all temperatures, and the ability to withstand severe thermal shock are additional characteristics which make Amersil ware unique.

The properties and applications of Amersil annealed silica are such that they warrant your investigation.

Send for the Amersil Catalog and get the details.

\*Trade Name Registered

CHESTNUT AVENUE COMPANY Inc. ENGELHARD . HILLSIDE 5, N. J.



Completely rewritten and reorganized, you'll find this latest edition of Victor's catalog of chemicals a handy guide to headquarters for phosphates, formates and oxalates. Note typical page above . . . how products are arranged into related groups for quick, easy cross-reference of properties.

Another desirable feature is that this new "perpetual" catalog will always be up-to-date "as the last tick of your watch." Replacement sheets, as old products are modified or improved, plus additional sheets covering new products, will be sent to you from time to time. They can readily be inserted into the binder. A personal request on your business stationery will bring a copy to you promptly . . . without obligation, of course.

#### PARTIAL LIST OF VICTOR CHEMICALS

Acids ... formic, metaphosphoric, oxalic, phosphoric, polyphosphoric.

Formates . . . aluminum, sodium, sodium boro-. Metaphosphates . . . alu-

minum, ethyl. Orthophosphotes . . . ammonium, calcium, iron,

magnesium, potassium, sodium. Oxolates . . . calcium,

sodium.

Phosphorus . . . (yellow)

Ferrophosphorus

- Phosphorus Compounds.... chlorides, pentoxide.
- Pyrophosphotes . . . calcium, sodium acid, sodium iron, tetrapotassium, tetrasodium.

Sulphates . . . magnesium, sodium aluminum.

Wetting Agents

#### VICTOR CHEMICAL WORKS

HEADQUARTERS FOR PHOSPHATES . FORMATES . OXALATES 141 West Jackson Boulevard, Chicago 4, Ill.

CHEMICAL & METALLURGICAL ENGINEERING . APRIL 1946 .

249



Pledged to Quality Since 1895 WASHINGTON, PENNA. of office manager at Milwaukce, Wis. O. C. Lunsford has been promoted to the position of office manager at Green Bay, Wis.

S. P. Kinney Engineers, Inc., Pittsburgh, Pa., has made J. B. Dannenbaum, Houston. Tex., agent for the company's water strainer equipment in the southern Texas district.

Bauer Bros. Co., Springfield, Ohio has elected Col. Joseph C. Shouvlin as its president. Prior to his recent return to civilian life the colonel was in command of the Cincinnati Ordnance District.

Westinghouse Electric Corp., Pittsburgh, Pa., has integrated the manufacturing and engineering facilities of the B. F. Sturtevant Co. with those of the Westinghouse air conditioning division which has been transferred from Jersey City to the Sturtevant main plant at Hyde Park, Boston. The new organization is known as the B. F. Sturtevant Co., division of Westinghouse Electric.

A. P. Green Fire Brick Co., Mexico, Mo., has named Lt. Comdr. Robert S. Green to the position of president. He will take over his duties on May 1. He will succeed his father, Allen P. Green, who moves up to the position of chairman of the board of directors.

Speedway Conveyors, Inc., Buffalo, N. Y., has named O'Roland Read director of sales.

Solvay Sales Corp., New York, has established a new office in Houston, Tex. This new office will cover the states of Texas, New Mexico and Arizona.

U. S. Industrial Chemicals, Inc., New York, has appointed Alden R. Ludlow, Jr. manager of alcohol and chemical sales.

York Corp., York, Pa. has formed an international division with headquarters at 50 Broadway, New York. James C. Tweedell is manager of the new division.

National Electric Products Corp., Pittsburgh, has appointed S. B. Knutson general superintendent of the Flexsteel Division at the Ambridge plant.

Roots-Connersville Blower Corp., Connersville, Ind., has elected J. S. Tatman chairman of the board and John Avery president and general manager.

Goodyear Tire & Rubber Co., Akron, Ohio, has selected J. H. Conrad and Robert Anderson to handle a study of pliofilm as a moisture-vapor-waterproof packaging material.

National Starch Products, Inc., New York, has opened a southern division with headquarters at Front St., New Orleans. II. F. Stegall is manager.

Maas & Waldstein Co., Newark, N. J., has made C. B. Knepper and C. R. Peterson sales representatives operating out of the Chicago office.

Rheem Research Products, Inc., Baltimore. Md., moved the manufacturing and sales

# Wrinkles to iron out?

Mrs. Jones smooths out the wrinkles in her velvet gown by hanging it over a steaming tub of water. By humidifying the air, she takes advantage of a crude form of air conditioning.

Scientific, year-round air conditioning — the Carrier kind — is ironing out countless wrinkles for industry. In chemical plants, for example, it keeps the temperature right for desired reactions, prevents tackiness or brittleness of materials, and makes it possible to weigh accurately minute amounts of material in all kinds of weather. 'The temperature and humidity of the air are controlled in plants making precision measurements. In others, the air is cooled when summer heat would interfere with operation. Always the air is cleaned. Employee efficiency and production are kept high.

The right kind of air conditioning



takes superior engineering skill. That's why Carrier has been the air conditioning leader for 44 years. Its engineers have supplied the answer to many perplexing production questions in the chemical industry. Why not ask them about yours? Carrier Corporation, Syracuse, New York.

> AIR CONDITIONING REFRIGERATION INDUSTRIAL HEATING

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



WITH Republic STEVENS Metal BARRELS AND DRUMS of ENDURO Stainless Steel

Down come container maintenance costs when you use barrels and drums of Enduro-because this lustrous metal resists corrosion, resists hard use and abuse, never needs repainting or refinishing and lasts indefinitely. Enduro is safe to use, too, because it neither affects nor is affected by most chemical and food products.



Republic

You'll find just the style and size you need in the Republic STEVENS Line. Write us for further information.

\* \* \* Easy to open-easy to close-that's the patented Ringlox\* closure shown at the left. It insures a positive and permanent seal-and you may have it on STEVENS Products.

\*U. S. Patent No. 1792281

NILES STEEL PRODUCTS DIVISION REPUBLIC STEEL CORPORATION NILES, OHIO

METAL BARRELS AND



DRUMS

operations of the Eastern Division to 4004 East Monument St., Baltimore, on the first of April.

Electro Rust-Proofing Corp., Dayton, Ohio, has been acquired by Wallace & Tiernan Co. Inc., and Dorr Co. E. H. Ingle continues as president.

Stein, Hall & Co., Inc., New York, has opened its new Chicago offices and laboratories at 23 East Jackson Blvd. The new location includes general and private offices, an industrial and a food laboratory.

Chicago Metal Hose Corp., Maywood and Elgin, Ill., has purchased the entire capital stock of Apex Machine Co., Elgin, and will operate the new unit as a division of the parent organization. The engineering staff will function as a department of Metal Hose.

American Engineering Co., Philadelphia, has promoted F. C. Messaros to the position of chief engineer.

Harper Packing Co., Inc., Chester, Pa., has secured the services of James A. McPeak and Raymond P. Farrell in a managerial and financial capacity.

Dexter Chemical Corp., New York, has selected Alfred Driscoll as a member of the research staff of its textile chemical division.

Dow Chemical Co., Midland, Mich., has assigned Murray W. Healy and William F. Hardy, both recently released from the United States Army, to the St. Louis, Mo., office.

Joseph Turner & Co., Ridgefield, N. J., has returned Jack Henry, recently released from the Navy, to his position in the sales department.

Ampco Metal, Inc., Milwaukce, Wis., has placed F. C. Hawks on the sales staff as a field engineer, specializing in mill products. J. R. G. Harris becomes manager of resistance welding sales. D. S. Goebel has been appointed manager of mill products sales. G. E. McCulloch is now manager of safety tool sales.

Portland Gas & Coke Co., Portland, Ore., announces that C. H. Gueffroy has been elected a vice president of the firm to have charge of market investigations and sales of byproduct benzol, toluol, solvent naphtha, lampblack and creosote oil.

General Electric Co., San Francisco, has appointed Marion S. Barnes as assistant manager of the central station division of the apparatus department in that city. Mr. Barnes, a graduate of the University of California and an employee of the company for over thirty years, was formerly sales engineer and test man

Food Machinery Corp., San Jose, Calif., has announced the appointment of Howard C. Lisle as manager of the combined operations of the Bean-Cutler Div., San Jose, Calif., and the John Bean Div., at Lansing, Mich. T. O. Eaton, formerly with General Electric at Pittsfield, Mass., will succeed

Special container linings are required by many individual products. Special container linings are required by many individual products So we start working on your packaging problem from the inside out. A wide selection of steel container sizes and types offer accommodation for almost any product. And we'll reproduce you accommodation for almost any product. And we'll reproduce you present label or design a new one through our complete lithography facilities. Why not consult us on your present or future steel and the selection of advise you on our ability to meet them.

HEFING CONIAL

THE INSIDE STORY





· Solve many of your storage and processing problems with these rust-proof, acidresisting, easy-to-clean Stock Pots.

Made throughout of 16 gauge, 18-8 Stainless Steel, welded construction, with all inside welds ground smooth and polished.

### METAL GLASS PRODUCTS CO.

SPECIAL EQUIPMENT

These pots can be purchased with or without covers and if desired can be fitted with casters to make them portable.

Write for complete specifications and prices.

We also manufacture a complete line of Storage Tanks and Equipment.

DEPT. C BELDING, MICH.





FREE. This illustrated FREE. 1 ms instiffness brochure on stiffness and resilience testing. (Also handbook on wear with the Taber Abraser.)



Sheet, Paper and Paper Board, and other Flexible Materials

### WITH THE TABER STIFFNESS GAUGE

The Taber V-5 Stiffness Gauge not only gives a precise measurement of stiffness, but also provides a method for testing resilient qualities of materials. Its simplicity of operation and direct recordings make it an exceptionally practical instrument for industrial research. Light weight, portable. Motor driven (115 volts.)

TABER INSTRUMENT CORP.

111CM Goundry Street, North Tonawanda, N.Y.



Mr. Lisle as manager of the Lansing division. These administrative changes have been made to coordinate more closely the activities of the two divisions manufacturing similar lines of agricultural and fire fighting equipment.

Wellman Engineering Co., Cleveland, Ohio, has clected W. C. Swalley as vice president in charge of sales. A. J. Lichtinger has become a member of the board of directors.

Pennsylvania Salt Manufacturing Co., Philadelphia, Pa., has promoted G. Webber Knight to the position of manager of the Washington, D. C. Office. R. George Har-tig has been transferred to the Special Chemicals Division to aid in the plastic program.

Hammel-Dahl Co., Providence, R. I., has promoted Russell Milham to district sales engineer in charge of their Chicago and Mid-West District.

Northern Equipment Co., Erie, Pa., will be represented in Southern New Jersey, Southcastern Pennsylvania, Eastern Maryland and Delaware by the Kissick Co., Philadelphia. The company will act as sales and service representatives for Copes regulators, pump governors, desuperheaters and allied equipment.

Colorado Fuel and Iron Corp., Wickwire Spencer Steel Division, New York, has promoted Alvin F. Franz to the position of works manager of the Pueblo, Colo. plant. G. Gordon Llovd has been promoted to general superintendent of the Buffalo plant. In his new position Mr. Lloyd will be in charge of all production at Buffalo, including open hearth, hot mills and wire departments.

Allis-Chalmers Mfg. Co., Milwaukee, Wis. has named R. F. Muller assistant manager of the New Orleans district office.

Filter Media Corp., Irvington-on-Hudson, N. Y., has moved its factory and main office to Hamden 14, Conn., where it will have much larger quarters. Branch offices in Chicago and Salt Lake City are continued.

United States Rubber Co., New York, has promoted Walter F. Spoerl to be general sales manager of the mechanical goods division.

Catalytic Engineering and Construction Co., Philadelphia, Pa., is the name of the new company formed to engage in the design and construction of oil refineries and oil refinery equipment. T. Ellwood Webster is president of the new company.

Edward Valves, Inc., East Chicago, Ind., has advanced Raymond A. Durand to the position of sales manager.

Emulsol Corp., Chicago, Ill., has appointed Wilfred S. Cowan chief engineer of the company.

American Development & Engineering Corp., Boston, Mass., has been established to provide supervision of construction and operation of plants for the manufacture of



THE NAME TO WATCH IN CHEMICALS

# -ONE OF FOUR BY ORONITE



| PRIMARY APPLICATIONS     |   |  |
|--------------------------|---|--|
| USED IN:                 | PROPERTIES CONTRIBUTED BY PURIFIED SULFONATE: |  |
| Emulsifiers              | Imparts polarity to oil phase                 |  |
| Soluble Cutting Oils     | Emulsifying action                            |  |
| Textile and Leather Oils | Wetting and emulsifying agent                 |  |
| Emulsion Breakers        | Ability to migrate between phases             |  |
| Rust Preventives         | Displaces electrolytes from metal surfaces    |  |
| Fat Splitting            | Improves contact between acid and fat         |  |

Purified Sulfonate, one of four different sulfonates made for particular industrial uses by Oronite, has polar properties as evidenced by its power to orient itself at oil interfaces, making it exceptionally efficient for the preparation of the specialized products listed above.

Laboratory samples are available if desired for your own experimentation. Please write for them, or for further information concerning specific applications, on your own business letterhead. No obligation will be involved.

| TYPICAL TESTS:                      |               |  |  |
|-------------------------------------|---------------|--|--|
| Content by Weight                   |               |  |  |
| Sodium Sulfonates *                 | 65%           |  |  |
| Mineral Oil                         | 29            |  |  |
| Water                               | 6             |  |  |
| Inorganic Salts                     | None          |  |  |
| Free Acidity                        | None          |  |  |
| Free Alkalinity                     | Trace         |  |  |
| Malecular Weight (Sodium Sulfanate) | 440 (approx.) |  |  |
| Weight, 1bs. per. gal.              | 8.6           |  |  |
| Approximate pH Value                | 8.5           |  |  |
| Char disettion method               |               |  |  |

517.0

# ORONITE CHEMICAL COMPANY

Russ Building, San Francisco 4, California White-Henry-Stewart Bldg., Seattle 1, Wash30 Rockefeller Plaza, New York 20, N.Y. Standard Oil Bidg., Los Angeles 15, Calif.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



# The John Van Range Co. Specializing in Fabrication of STAINLESS STEEL EQUIPMENT for the Chemical and Processing Industries

Also manufacturers of Monel Metal, Aluminum, Copper, Zinc and Steel Equipment. Founded in 1847, our Experience should be invaluable to Manufacturing Chemists, Food, Dairy, Drug and Textile Processing Industries.

CONSULT US ON YOUR PROBLEMS SEND US YOUR INQUIRIES



Division of The Edwards Manufacturing Co. 306-346 CULVERT ST. CINCINNATI 2, OHIO rayon, as well as those suited to the production of purified cellulose and cellulose products. Gustavus J. Esselen heads the new organization.

Link-Belt Co., Chicago, Ill., has named Arthur J. Olson district sales manager at Kansas City, Mo.

Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., has placed Harry E. Smith in complete charge of the corporation's rubber product sales and marketing.

Bemis Bro. Bag Co., St. Louis, Mo., has purchased the Indiana Cotton Mills at Cannelton, Ind. A new company was being organized to operate the plant. The transfer was made effective April 1, 1946, without interrupting the operation of the mill.

American Brake Shoe Co., New York, has appointed Roger W. Batchelder general purchasing agent. He recently returned from the armed forces, holding the rank of Colonel at the time of his discharge.

Polytechnic Research & Development Co., Inc., Brooklyn, N. Y., announces the opening of its consulting engineering laboratory coincident with a change in name from P. I. B. Products, Inc. The new name has been adopted to better identify the expanded operations of the organization.

Duriron Co., Inc., Dayton, Ohio, has made the following changes in personnel locations: R. C. Schenck has been made executive vice president. W. D. Staley is now in charge of the New York sales office. R. A. Prosser has taken charge of the Chicago sales office. W. A. Schumacher has taken over the Detroit sales office. R. H. Stalbaum now handles sales for the New England States.

Traylor Engineering & Mfg. Co., Allentown, Pa., reports the appointment of Lt. Col. Clyde W. Spears as special sales engineer.

Sugar Research Foundation, Inc., New York, reported the appointment of Neil Kelly as executive director, and the resignation of Ody H. Lamborn from that post. Mr. Lamborn was elected to the board of directors.

Sprout-Waldron & Co., Muncy, Pa., announces that its representation for the entire state of California will be in the hands of Ralph J. Musser, Los Angeles, Calif.

American Tool & Machine Co., Hyde Park, Boston, Mass., has named J. F. Tholl president. C. I. Day has become chairman of the board.

Manning Maxwell & Moore, Inc., New York, N. Y., has announced the appointment of J. Robert Kelly as executive vice president.

Sarco Co., Inc., New York, has opened an office at 1129 Vermont Ave., N. W., Washington, D. C. The office is in charge of Major H. F. Collins, formerly of U. S. Army Engineers.

# Wide Range, Heat-Transfer Operations Employing DOWTHERM VAPORIZERS



Dowtherm application in Oil Polymerization Process.



Type 3-A McKee Dowtherm Vaporizers. In Varrish Plant.

Above are a few of many heat-transfel operations requiring temperatures up to 700° F. in which McKee-Eclipse Dowtherm Vaporizers are us d with the following distinct advantages —

With temperatures as high as 650° F. the pressure is less than 55 lbs. Requires lighter, less tostly installation. Using vapor phase or liquid phase—there's no local overheating — no burning, scorching or discoloration of the product.

ECLIPSE



Type 3AOR Dowtherm Vaporizer off-on control. In Refining Plant.



McKee Dowtherm Vaporizer. In Food Processing Plant.

A complete unit, the McKee Dowtherm Vaporizer is fully assembled — ready for installation. Write for bulletin giving complete details. Eclipse Fuel Engineering Co., 719 South Main St., Rockford, Ill.

McKee-Eclipse Dowtherm Vaporizers available in gas-fired or oil-fired models, 33,000 to 2,000,000 BTU per hour.



NOW ... a handbook treatment of nonferrous metallurgy answering hundreds

of questions on processes apparatus methods EASY TERMS



Here are hundreds of detailed descriptions of processes, materials, methods, apparatus, data —every bit of information, every fact the met-allurgist needs to get the results he wants. Check your methods against those employed by experts in every branch of specialization— have at hand all the charts, tables, all the help-ful facts which answer every question, solve every problem involved in reduction and refin-ing.

Just Published

### HANDBOOK OF NONFERROUS METALLURGY

DONALD M. LIDDELL, Editor-In-Chief Metallurgical Engineer; Lieutenant-Colonel Air Reserve (Inactive)

Two Volumes. Second Edition. 1377 pages, 5¼ x 8¼, 468 figures, 247 tables, and diagrams

Vol. 1. Principles and Processes

Vol. II. Recovery of the Metals

Vol. 11. Recovery of the interdes This two-volume handbook is an invaluable methods guide for the practicing metallurgist. It gives you firshand, from men who have spe-claized for years in their field, a careful de-scription of every type of metallurgical process, the apparatus involved, the way to get best results, necessary data on materials, the strength, weight, performance, etc. It covers each of the metals with regard to analysis of physical, chemical and mechanical properties, a comprehensive study of its sources, abund-ance, geographical distribution, principal pro-ducers, and output. Gives facts on data on met-allurgical fuels, power plants and accessories, electric furnaces, etc.—describes current and standard practice in the preparation and pro-puoducts, including information on markets, prices, and commercial and industrial uses.

#### 10 days on approval • Easy Terms

See this Handbook for 10 days on approval. Look over the chapters; note the many diagrams, curves, flow sheets, tables, and photographs. If you decide to keep the books, send \$4.50 in 10 days, and then \$3.00 a month till the price of \$13.50 has been paid. Take advantage of these convenient terms to add these books to your library now.

#### SEND THIS McGRAW-HILL COUPON

McGraw-Hill Book Co., 330 W. 42 St., N.Y.C. 18 Send me Liddell's HANDBOOK OF, NONFERROUS METALLURGY for 10 days' examination on approval. In 16 days I will send \$4.50 plus few cents postage and \$3.00 monthly till \$13.50 is paid, or return books post-paid. (We pay postage on orders accompanied by remit-tance of first installment.)

| Name  |
|---|
| Address   |
| City and State  |
| Company   |
| Position  |
| For Canadian prices, write to Embassy Book Co.,<br>12 Richmond St. E., Toronto, 1 |

### **CONVENTION PAPER ABSTRACTS**

#### CONTENTS

| Proteins From Mill Waste       | 258 |  |
|--------------------------------|-----|--|
| Desalting Petroleum            | 258 |  |
| Waste of Scientific Manpower   | 260 |  |
| Karbate Improvements           |     |  |
| German Dyestuff Research       | 264 |  |
| Chemical Engineers as Citizens | 266 |  |
| Madison Wood-Sugar Process     | 268 |  |
| Cottrell Developments          | 270 |  |
| Electronics in Feed Systems    | 272 |  |
| Japanese Industrial Expansion  | 272 |  |
| Quality Control Statistics     | 274 |  |
| Building Export Businesses     | 276 |  |
| Professional Problems          | 278 |  |
| Corporation Patent Problem     | 282 |  |
| Scientist vs. Military         |     |  |
| Electronic Potentiometers      | 284 |  |
|                                |     |  |

#### MILL WASTE COULD OFFSET **PROTEIN SHORTAGE**

More than 150,000,000 lb. of high-grade yeast and cattle fodder could be obtained from waste liquors discharged annually into the nation's rivers and streams by the mills. Besides producing this high-protein food, the waste-utilization project would reduce stream pollution by 40 percent and thus curb the annual loss of fish from this cause.

Protein as it occurs in a beeksteak or in yeast is actually a combination of amino acids. The absorption of the latter into the blood stream is the normal method by which food protein is transformed into body tissue protein. Yeast, whether made from pulp or wood waste, or by other methods, contains all the essential amino acids for human or animal nutrition. This is contrasted with cereal proteins, which tend to be deficient, thus producing poor results of growth when used alone.

In addition to the 150,000,000 lb. of yeast which can be produced from pulp wastes, a practically inexhaustible amount can be made from sawdust, wood waste and unsalable wood. Forests will be regarded more and more as suppliers of many human wants, as contrasted with exhaustible mineral and petroleum.

R. S. Aries, Northeastern Wood Utiliza-tion Council, before Division of Industrial and Engineering Chemistry, American Chemical Society, Atlantic City, April 11, 1946.

#### **DESALTING PETROLEUM WITH** FIBERGLAS PACKING

DURING the past five years the concentration of inorganic salts in crude petroleum delivered to refiners has increased sharply. Essentially all of the salt is in a fairly concentrated aqueous solution which is emulsified in the oil. Today salt contents in excess of 200 lb. (expressed as NaCl) per 1,000 bbl. of crude oil are common. The increase in



# **Crystalline and Colloidal Precipitates Removed**

On Sparkler's Horizontal Plates the diatoms float into position naturally and evenly, forming a cake of uniform density and thickness. Your solutions are filtered as through a pure silica sieve of uniformly micro-sized mesh. Sediment, suspended particles, haze and turbidity are removed and your solution is given a brilliant polish.



LET INGERSOLL-RAND

WORK FOR YOU!

Ingersoll-Rand builds and applies both the COMPRESSORS that generate the AIR-POWER and the TOOLS that use it

IT CAN

AERATE cultures as in yeast making AGITATE liquids (by bubbling through them) ATOMIZE water for humidification and washing BLOW dust, dirt, scale, coal, soot CONVEY grains, mail, packages CUSHION pistons and recoil mechanisms COOL materials and workers DISPLACE liquids and gases DRILL rock and metals FORM rubber, glass, and wood in moulds DRY fabrics, paper rolls HAMMER rivets, nails, chisels, forgings HOLD liquids under pressure LIFT by piston or air-motor hoist INFLATE tires, pontoons OXIDIZE materials in furnaces and converters OPERATE all kinds of Air Tools PUMP water, oils, chemicals (by ''air lift'') ROTATE grinders, motors, and machinery SAND-BLAST against metal and stone surfaces SCAVENGE spent gases from gun barrels SPRAY paint, cleaning fluids, insecticides SUPPLY air to mines, caissons, divers VENTILATE rooms, tunnels, mines VIBRATE sifters, mixers, concrete And a thousand-and-one other time- and money-saving jobs.

11 BROADWAY, NEW YORK 4, N. Y.





# For QUICK OPENING and QUICK CLOSING Valve Operation

A 70-degree turn of the operating wrench completely opens or closes the Straight-Lever Type of Everlasting Valve . . . and the operation is easy, because the wrench gives ample leverage.

Add to this valuable time-saving feature the many other important advantages of the Everlasting Valve . . . its drop-tight seal, its self-grinding action at each motion, its provisions against damage to disc and seat, and its "everlasting" wearing qualities . . . and you have a valve that is literally unequalled for many services on process lines, emergency shut-offs, equipment outlets, boiler blow-off, etc.

#### Write for Bulletin

#### EVERLASTING VALVE COMPANY

49 FISK STREET

JERSEY CITY 5, N. J.



salt concentration has been accompanied by rapid corrosion of refining equipment as well as deleterious effects on the refining processes themselves.

An investigation was carried out to determine the feasibility of using bed of fine glass fibers for desalting petroleum. The process consists briefly of (1) contacting the crude oil with water at a temperature over 250 deg. F.; (2) passing the oil and water through beds of glass fibers of 0.00028 in. in diameter to coalesce the emulsified water, and (3) separating the desalted oil from the aqueous phase. The water phase is recycled to conserve heat. Only sufficient fresh water is used to maintain the salt content of the recycled water at a maximum of 3 percent by weight.

It has been found that salt content can be reduced to less than 5 lb. per 1,000 bbl. of oil by proper control of temperature, superficial velocity, density of the Fiberglas beds and total depth of the beds. In general, temperature should be at least 275 deg. F. for best results. Maximum permissible superficial velocities ranged from 0.25 to 1.0 ft. per min. which depend on the type crude oil being desalted. The effectiveness of the Fiberglas Packs increased rapidly with increasing density of the beds up to about 15 lb. per cu. ft. A total depth of the beds of glass fibers of 5 in. is adequate for desalting to less than 5 lb. per 1,000 bbl. About 90 percent of the salt is removed in the first 2 in. of bed depth.

The process is effective and appears to be quite attractive from an economic standpoint for commercial application.

T. A. Burtis and C. G. Kirkbride, A. and M. College of Texas, before Houston Regional Meeting, American Institute of Chemical Engineers, Houston, April 3, 1946.

#### WASTE OF SCIENTIFIC MANPOWER

ABILITY to do creative scientific research is rare indeed, although it may be more widespread than many have thought possible. An interest and ability in any phase of technology, science, medicine and allied fields is to be cherished.

Yet what did we do with this ability during the war and what are we doing now?

There is and will be for some time an appalling shortage of scientific manpower, thanks to decisions at top and lower levels during the war. In some fields training was cut down as early as 1940. Progressively the flow of trained manpower in science was reduced, just when the greatest results of science applied to war were beng rushed to the battlefields. Can it be that democracies, too, in their ignorance, have no need of scientists?

Scientific manpower is being wasted in time of peace. Some of the most essential young men in the great war projects of the OSRD have been rescued from the postwar draft only with great difficulties. Some have been swallowed up ruthlessly in the postwar Army. Such is the gratefulness of our national Such is our national ignorance. Such is our unappreciation of whence comes our strength for recovery from war.

This abuse and misuse of potential scientific manpower is continuing. Selective service boards in their eagemess to fill the ranks of occupation armies are snatching young men, regardless, when they reach 18. The war is won, and we have no need of doctors.

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

TYPICAL SERVICES WHERE

EVERLASTING VALVES

EXCEL

Outlets of storage and

Throttles of hammers

Washers for laundries.

Blow-offs of conden-

sers, economizers, vul-

canizers, purifiers, com-

Suitable for acids,

alkalies, caustics, cel-

luiose, coal tar, emul-

sions, syrups and other

liquids; also gases and

measuring tanks

**Presses** for plastics

cleaners and dyers

Spray lines to rolls

pressed air tanks

and hoists

Are You Contemplating a Process... and Puzzled Over Its Commercial Possibilities, Production Costs Capacity, etc.?

Buflovak RESEARCH & TESTING LABORATORIES TEST YOUR PRODUCT...AND GIVE YOU THE DEFINITE RESULTS!

LET.



In the development of new and better processes, Buflovak can help you save time and money by processing your product in full semi-plant scale.

To assist you in the solution of processing problems and the development of new methods, Buflovak operate modern Research and Testing Laboratories. Here practical research is conducted on semi-plant units; designed for drying, evaporating and processing foods or chemicals.

Tests, such as these, give you definite results that safeguard your investment in New Buflovak Equipment, because they show unmistakably—right at the start, what will be obtained from a given process.

There's a valuable "Know-How" learned through completing more than 5000 processing tests. May we share that experience with you?

BUFLOVAK EQUIPMENT DIVISION OF BLAW-KNOX CO.



Hydramotor operated Saunders valves for chemical solutions, acids and pulpy liquids.

Simplified two-wire control returns to the closed position on current failure assuring trouble-free operation.

Hydramotor operator is sealed in oil for life, eliminating oiling and annual checkups, which represents a saving in maintenance costs.

Write for new 1946 Catalog 52C.



engineers and scientists! That seems to be their attitude. The possibility of a sciencetalented young man getting to college promptly for training for great future usefulness is less promising in many cases than it was during the war.

Even worse is the lack of any wide-spread serious effort to persuade science talented youth to do something about their potentialities in the interest of civilization. We are told that there is a shortage of 15,000 scientists in the land. This is far more serious than a shortage of sugar or wheat in the world, and it gets much less thought and attention.

As a consequence of the enaction in Congress upon the science foundation bills and because so much effort has been expended in trying to keep fundamental science out of the clutches of the military, this major problem of the continuing supply of scientific personnel has all but been neglected.

If we are to have enough scientists in the future to do the needed fundamental basic research that must be government- and foundation-supported in non-commercial research laboratories, and to fill the beautiful and monumental research laboratories that industries are building in such magnificent profusion, much must be done immediately.

The very essence of our scientific continuity is contained in the stores of our accumulated scientific knowledge, whether these be in our libraries of technical and scientific literature, our patents, our secret war archives or in the minds of men. War has mussed up the channels and disordered the files and a major job in scientific and technologic reconversion is the bringing of all the modern methods we can devise to work upon this problem of scientific communication and intelligence.

Watson Davis, Science Service, before American Association for the Advancement of Science, St. Louis, March 27, 1946.

#### IMPROVEMENT OF KARBATE MATERIALS

AN INITIAL report on the development of Karbate equipment was given before the American Institute of Chemical Engineers in 1939. Commercial use since then has proved the usefulness of the basic material, but, naturally, has brought out the need for certain improvements.

The base stocks which form the continuous structure of Karbate stock are slightly permeable. Resin is deposited in the pores for the purpose of rendering the stock impermeable and increasing strength. It does not change thermal conductivity. Considerable advances have been made in developing and utilizing new resin impregnents which will accomplish these purposes without limiting the corrosion resistance or useful temperature range of Karbate stock any more than necessary.

The first resin employed—and the one still used in greatest quantity because of wide corrosion resistance and case of handling—was a furfural type. This resin has proved quite satisfactory, except at elevated temperatures. The temperature range has been extended by two other resins. One of them is a phenolic resin which may be used up to 340 deg. F., and which has corrosion resistance similar to the furfural resin. The third, a modified phenolic, is used rel-



# **ALUNDUM TUBES**

For Higher Temperatures-Pure Oxide Refractories

RECENT ADVANCES IN NORTON REFRACTORIES include the development of improved ALUNDUM furnace tubes classified as "Pure Oxide Refractories". These tubes which are essentially sintered alumina, without bond, greatly extend the utility of the ALUN-DUM furnace tube line which in standard mixtures RA 98 and RA 1139 has met industry's needs for many years. The new mixtures RA 1191 and RA 1192, produced at temperatures up to 1775°C, will provide greater refractoriness and much longer life.

NORTON COMPANY - Worcester 6, Mass. ALUNDUM-Trade-mark Reg. U. S. Pat. Off.

N

NORTON REFRACTORIES

# PENFLEX FLEXIBLE METALLIC INTERLOCKED GALVANIZED STEEL HOSE, BRONZE STEAM HOSE .....

ALL-METAL SAFETY with FLEXIBILITY for gives your TANKS, VATS, PROCESSING EQUIP-MENT and PIPE SYSTEMS

PENFLEX-Four-wall Interlocked gives you high resistance to wear, absorption and fire. It is vibration-absorbing . . . severe pulsations of pressure and frequent flexure do not affect its useful life. Construction provides great strength and flexibility. Full flow area is always maintained, the hose remains tight and cannot collapse.

#### AVAILABILITY in two materials

PENFLEX GALVANIZED STEEL HOSE-for oil, grease, hot tar, paint, gas, air or any other free-flowing material or liquid. Fire-resistant, strong and flexible.

PENFLEX BRONZE HOSE—for water or steam, and for many types of appli-cation on processing equipment. Resists corrosive action. Also available in various alloys.

THREE BASIC TYPES - STANDARD FOUR-WALL INTERLOCKED

-for heavy duty service.

TYPE HR HIGH RIDGE-medium duty hose.

TYPE FP LIGHTWEIGHT - An extremely flexible construction with lubricated packed joints.

All of the three types can be reinforced by the addition of braiding and armor.

**PENFLEX COUPLINGS**—Available in two types SOLDERED-ON TYPES for use at temperatures to 250 degrees Fahrenheit and HEAT-PROOF TYPES for higher temperatures. Supplied in brass or malleable iron . . . plain or reinforced.



atively infrequently, but was selected to meet certain extreme corrosion conditions such as those encountered with concentrated caustic and certain oxidizing acids. Karbate stock impregnated with this resin is also recommended for the 340 deg. F. temperature range, and under proper conditions may be used up to 400 deg. F. Thus, from a single resin, the grades of Karbate have been extended to cover more and more of the severe corrosive conditions encountered in industry.

Equipment is usually fabricated from Karbate stock by cementing the parts together. In this way large tanks or towers are built up from slabs of impervious stock, tubes are scaled into their tube sheets, pumps are as-sembled, etc. The bonds are normally stronger than the stock. A variety of bonding agents has been employed, but by far the best are the special cements whose development has paralleled that of the resin impregnates. Three cements are available and are quite similar in chemical makeup and corrosion resistance to the three impregnants. These are particularly valuable in the field for final assembly and repair work. All three bonding materials will set up at room temperature, but the curing time may

be shortened by application of heat. Along with the improvements in resins have come improvements in the quality of the structure of the base materials. Stronger, more uniform stocks suitable for impregnation have been developed. Simultaneously has come increased size of parts, including tube sheets, tower sections, and many others. For example, pipe was originally made in 6-ft. lengths. To meet the requirements of heat exchanger equipment the more popular sizes are now available in 9-ft. lengths.

M. R. Hatfield and C. E. Ford, National Carbon Co., before the American Institute of Chemical Engineers, Chicago, Dec. 19, 1945.

#### GERMAN DYESTUFF RESEARCH

THE I. C. employed approximately 800 research chemists in the field of dyestuffs and intermediates. Not more than approximately 5 percent of these research workers were engaged in studies of color application and properties of dyestuffs. The remainder were engaged chiefly in the syn-thesis of new dyes and intermediates, the development of manufacturing processes, and improvement of existing products and processes. This appeared to be a rather poor balance in effort; and this same opinion was expressed by more than one I. G. man in the course of various interviews. The policy of concentrating on new products with little emphasis on application was ascribed chiefly to the fact that most of their executives formulating policies were organic chemists and, therefore, primarily interested in purely chemical development of new dyestuffs and intermediates. Furthermore, they were extremely aggressive in developing new products, especially those which could be protected by patents; and which, through their sale, would result in a direct monetary return to the organization. They were nowhere near as enthusiastic about expending efforts to develop better application processes for their customers, especially in view of the fact that such processes might result in lowered dye-stuff requirements. On the other hand, the

# "Yes, this Flintkote material is Just what we've Just heen looking for

"I'm glad you sent that Flintkote man down to the lab, J. D. He knew just what we needed.

"It seems he had worked out problems like ours before. We tried his recommendation in a pilot run yesterday, and it worked perfectly.

"Let's remember that fellow in the future. He told me that Flintkote makes a full line of asphalt and rubber base liquid products to meet both everyday and specific requirements. He'll probably be able to help us again."



Flintkote asphalt and rubber base liquid products, in the form of protective coatings, mastic flooring binders, adhesives, saturants, laminants, sizings, backings, impregnants, insulation coatings, etc., are serving industry in hundreds of applications today.

In many cases, Flintkote Service Technicians first studied requirements thoroughly. Then the Flintkote Research Laboratory worked right along with the user to develop a better, quicker, or less costly way to do the job.

This widely varied background of experience is at your service. Chances are it can offer you the solution to a troublesome production problem. Send us full details and we'll be glad to help you work out a practical solution.

intkote-Products for Industry

THE FLINTKOTE COMPANY - INDUSTRIAL PRODUCTS DIVISION Atlanta · Boston · Chicogo Heights · Detroit · Houston



30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y. Los Angeles • New Orleans • Washington • Toronto • Montreal



block over-drift, to prevent per-sible damage, the plugging limit switch will automatically estabswitch will intromatically estimated in the second out with the noist motor as the load hook reaches its upper limit of travel.

BALANCED DRIVE The driving pinion drives a train of alloy steel gearing at points diametrically opposite thus balancing all stresses. Balanced drive assures smooth operation and long life under constant load handling.

ONE POINT LUBRICATION-Gearing, bearings and mechanical load brake automatically lubricated by single oil reservoir.

ANTIFRICTION BEARINGS -Highest grade antifriction bearings are used throughout.

FULLY ENCLOSED-Operating mechanism sealed in cylindrical hoist frame-free from dust, moisture and fumes.

ALLOY STEEL GEARING-Heat-treated, machine cut from forged alloy steel.

### LIFTABOUT, JR. IS BUILT LIKE A HEAVY-DUTY HOIST TO STAND UP UNDER

Y popular demand - Shepard D Niles developed a lightweight hoist that has all the features and advantages you have come to expect of load lifting equipment. Every detail of construction has been thoroughly tested, every condition of performance proved. Built to give dependable load handling service, the new LiftAbout, Jr. assures you of long durable service with a minimum investment and maintenance cost.

You are invited to visit our booth, number 1112, at the

#### **GOLDEN JUBILEE FOUNDRY SHOW** Cleveland, May 6th to 10th

and see the new LiftAbout, Jr. in action

Write today for bulletin giving complete particulars about the new lightweight LiftAbout, Jr.

nepard E & HOIST CORPORATION

356 SCHUYLER AVENUE . MONTOUR FALLS, N.Y.

organization did do a very thorough job of determining the properties of their colors; and they were especially capable in developing trade literature and handbooks for consumers. Here again, however, it was obvious that one of the important motives was the sales promotion of all their own products, including both dyestuffs and auxiliaries.

As to the caliber of their research personnel, it was our opinion that they were highly experienced but in general far from brilliant in new ideas. Their productivity insofar as as new dyestuffs were concerned seemed to be due more to mass effort than to individual brilliance.

Lengthy processes involving considerable labor were not particularly important prob-lems to them. They normally had an abundance of intelligent workers, paid at so much lower a rate per hour than prevails in this country that they could afford to do many things which would be economically impossible here. Perhaps we shall find that some of the specialties imported prewar from Ger-many cannot be produced in the United States at the prewar selling prices, due to our higher labor costs. Their equipment in both laboratories and dyestuff plants was far from modern by American standards. Evidently their low labor cost made it advantageous to spend money on operating labor rather than to make extensive investments in modernized equipment.

Our American research workers in the dyestuff field certainly do not suffer by comparison with their I. G. contemporaries. On the average our research people must be two or three times as productive on a man-for-man

basis as the I. G. group. From a "quality" point of view, American research is superior and this applies likewise to control of quality and uniformity of the final products in manufacture.

As to new developments in color applica-tion, it must be said that there was far less interest in Germany than is current in the United States at the present time.

Miles A. Dahlen; E. I. du Pont de Nemours & Co., before American Associa-tion of Textile Chemists and Colorists, New York, January, 1946.

#### CHEMICAL ENGINEERS AS CITIZENS

The chemical engineer cannot help being a very practical sort of scientist. It is his responsibility to carry the developments of the laboratory into the stage where they become available to and of tangible benefit to the ultimate consumer. So, it follows, it is the chemical engineer who is in continuous contact with the layman, and it is the factories and the products and the processes of the chemical engineer which the layman is most likely to understand.

A designation of the research worker in the laboratory as "the long-haired boy"— conveying the idea of a detached and perhaps impractical and cloistered seclusioneven though said half in jest-can never be even remotely descriptive of the thinking of the chemical engineer and his approach to his problems. This situation makes it especially incumbent upon the chemical engineer to see to it that the laity have a true concept of the part which applied science

plays or may play in their lives. If the world that our families and you and I must live in were truly and solely the prod-

# FOR PRECISION CONTINUOUS BLENDING OF FLUIDS ...





The Pulsafeeder hydraulically-balanced diaphragm isolates pump from fluid being handled. Action of the piston results in like action of the diaphragm, imposes no pressure differential on the diaphragm itself.

The hydraulically-balanced diaphragm does it ...

# ACCURACY OF FLOW ... PURITY OF PRODUCT

To assure absolute purity of product with the Wilson Pulsafeeder, it is necessary only to select materials, impervious to the fluid being handled, for Pulsafeeder head, valves and diaphragm. The diaphragm prevents contamination of product from piston, lubrication or packing. It also protects the pump from chemical attack by fluids being handled. Rate of flow is continuously adjustable by micrometer hand knob-while machine is in operation-from zero to full maximum. Models available for flow up to 800 gallons per hour, or against pressures up to 5000 lbs. per square inch. Write for description and specifications. Process Equipment Division, Lapp Insulator Co., Inc., 164 Maple Street, LeRoy, N.Y.

20

PATENTS APPLIED FOR



# Furnaces Are Known by the COMPANIES they serve



Since 1889, Nichols Herreshoff Multiple Hearth Furnaces have served in the—

"BEST COMPANIES" Leaders in their respective fields. And always the furnaces have proved

dependable, economical and efficient. Thousands of furnaces have been installed—scores of materials thermal processed.

On this background of long experience, technical knowledge and operating practice, Nichols offers an Engineering Service as consulting, designing and contraction managers for the construction of new, or the modernization of plants for—

**ROASTING**•**CALCINING**•**DRYING** — of ores and concentrates, filtering clays, core sands, chemical salts, etc.



DIVISION OF AMERICAN MACHINE AND METALS, INC. SELLERSVILLE, PENNSYLVANIA (1) uct of our efforts and the result of our thinking, would it be a better world in which to live? Would the basic moralities, upon which even the most ordinary and rudimentary approach to right living must depend, be inculcated more generally in the training of our youth? Would justice and a consideration for the other fellow be a much more prominent feature of the political landscape than it is today?

If the answer is "yes"—and it must be yes—if we are not consciously shirking our most ordinary responsibilities, not to mention those of the good citizen, then why are we not now more personally and intimately concerned with the effort to bring about these desirable conditions in the world as it is?

Perhaps this whole question is closely bound up with our realization of the obvious fact that you and I are an indissoluble part of the body of unorganized citizens who are comprised in no pressure groups, told by no bosses what we are to think or how we are to behave, and who have no private axes to grind surreptitiously upon the public grind-stone. We are a part of the Public. Consequently we are of course concerned with all the conditions which determine our daily living. If we have a contribution to make to the public thinking from our specialized training, or from our broad knowledge of a wide variety of manufacturing processes, then by all means let us be sufficiently interested in questions of the public welfare (synony-mous with our own) to make these contributions, for they are most valuable to the comprehensive and informed thinking upon which alone are based accurate answers to questions of this nature.

C. M. A. Stine, vice president of AIChE, before Philadelphia-Wilmington Section, American Institute of Chemical Engineers, Wilmington, Jan. 15, 1946.

#### THE MADISON WOOD-SUGAR PROCESS

A PROCESS; known as the Madison woodsugar process, has been developed by the Forest Products Laboratory for hydrolyzing mixtures of wood waste consisting of chipped slabs and edgings, sawdust, and shavings, with 0.5 to 0.6 percent sulphuric acid at temperatures of 150 to 180 deg. C. by allowing the dilute acid to flow continuously through the charge of wood.

Compared with the German Scholler process, hydrolysis was accomplished in less time because the sugars produced by the hydrolysis were removed more rapidly. Heating was at a lower rate and more efficient use could be made of the heat given off by the liquors being removed from the hydrolyzer, resulting in a lower steam requirement. Decomposition was less because the sugars were in contact with the acid for a shorter period of time and, consequently, yields of sugar and alcohol were higher. Fewer byproducets inhibitory to fermentation were produced, resulting in more rapid fermentations. Life of valves and other equipment was increased because they were set once for the run and not changed until the end of the run. The sugar produced in 2.8 hr. from a ton of dry, barkfree Douglas fir wood waste yielded 64.5 gal. of 95 percent alcohol as compared to 3.2 hr. for 58 gal. by the rapidcycle method developed earlier, and 13 to



NO. 7 OF A SERIES OF DIGEST REPORTS FROM CYANAMID RESEARCH LABORATORIES

## **EXAMINE THE POSSIBILITIES OF THIS REACTIVE COMPOUND**



AERO ACRYLONITRILE, a low cost intermediate, was restricted to the production of synthetic rubber during the war years. Today, off allocation, it is available in tank-car lots for you to explore its vast range of possibilities. Illustrative of a few of the many reactions of this highly interesting compound are:

With hydroxy compounds-

 $R-OH + CH_2 = CH-CN \rightarrow R-O-CH_2-CH_2-CN$ 

Included in this group are alcohols, phenols, and oximes...

With ammonia or amines-

Americ

 $RR_1NH + CH_2 = CH-CN \rightarrow RR_1N-CH_2-CH_2-CN$ R and R<sub>1</sub> can be hydrogen or an aliphatic, aromatic, alicyclic, or heterocyclic radical... With compounds containing active hydrogens-

 $RR_1R_2CH + CH_2 = CH-CN \rightarrow RR_1R_2C-CH_2-CH_2-CN$ 

This group includes ketones, aldehydes, and esters...

Acrylonitrile will also react with halogens, mineral acids, compounds containing conjugated double bonds and numerous others.

The cyano group in acrylonitrile, or its derivatives obtained by the reactions outlined above, will undergo any of the typical nitrile reactions such as hydrolysis to an amide, acid or ester; or reduction to an amine.

AERO ACRYLONITRILE is a highly refined chemical. The boiling point of the pure compound is 77.3°C. It weighs about 6.7 pounds per gallon. It is miscible with most common organic solvents but only slightly soluble in water.

Further technical information regarding the reactions of acrylonitrile and samples of the material are available. Write to the Synthetic Organic Chemicals Department of the American Cyanamid and Chemical Corporation, 30 Rockefeller Plaza, New York 20, New York.

\*Trade-Mark



20,

N.

HEADQUARTERS FOR NITROGEN CHEMICALS 30 ROCKEFELLER PLAZA • NEW YORK 2 CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



Hook up a Troy-Engberg Steam Engine to a pump, compressor or blower and you can rest assured it will drive the unit without faltering throughout any run you schedule.

Troy-Engberg Steam Engines are dependable.

They have the conservative though flexible speed that is needed for so many drives: They have the high starting torque and high sustained overload capacity. And units for refineries can be obtained with sparkproof and explosion-proof construction.

Write us direct about your requirements or have the manufacturer from whom you are buying your equipment investigate the Troy-Engberg Engines for the drives.



20 hr. for 55 gal. by the Scholler process as practiced in Germany.

These new findings indicate that the estimated capacity of the wood-hydrolysis plant being built at Springfield, Ore., may be increased from 4,100,000 to 5,959,000 gal. per year.

E. E. Harris and E. Beglinger, Forest, Products Laboratory, before Division of Cellulose Chemistry, American Chemical Soclety, Atlantic City, April 11, 1946.

#### COTTRELL PRECIPITATOR DEVELOPMENTS

FUNDAMENTALLY the principle of the Cottrell Precipitator is the same today as that established by Dr. Cottrell about 1905 but there have been, of course, marked changes in technical and engineering features as well as new developments and improvements in order to meet the requirements of modern industrial applications.

Precipitators are applicable to problems covering a wide range of conditions. They can be employed for the removal of almost any kind of liquid or solid particles from practically any gas with no lower limit on particle size. The temperature may vary from atmospheric to as high as 1,100 or 1,200 deg. F. on certain applications and at least one installation operates at 125 psi. ga. pressure. Efficiency of removal can be varied to suit requirements irrespective of inlet concentrations, but for economic reasons it is usually specified between 90 and 99.9 percent.

Power consumption is quite nominal usually, ranging between 3 and 5 kwh. per million cu.ft. of gas cleaned, while the pressure drop between inlet and outlet is less than  $\frac{1}{2}$  in. of water.

Development and improvement in design and details are being made continuously. Among such developments may be cited: (1) Development of so-called half wave rectification with resultant reductions in the amount of electrical equipment required and in power consumption; (2) air-swept insulators or insulator compartment ventilation to prevent excessive dust and moisture deposits or excessive temperature of insula-tors; (3) oil seals for insulator compartments to prevent deposition of materials on in-sulators for certain types of applications; (4) water flushed pipe type precipitators for continuous cleaning of collecting electrodes in certain installations; (5) utilization of hot cathode tube rectifiers on certain applications and location of transformers and rectifiers in metal containers at precipitator instead of substation; (6) development of combination collector for carbon black industry including precipitator for agglomeration followed by cyclones; (7) addition of conditioning agents (e.g., a trace of am-monia gas in approximately 1 part per 10,000 to flue gas in one general application) to improve precipitator efficiency.

In addition to the above, numerous other innovations, developments and improvements in design, construction and operation have been made over the past years in order to better adapt the equipment to the requirements of industry.

Application of the Cottrell equipment in the chemical industry is quite extensive, including such standard applications as detarring manufactured gas and cleaning of gases from roasters, sintering machines, cal-

# OXALATES

# Ammonium Oxalate

### Potassium Oxalate

Iron Oxalate

Iron and Ammonium Oxalate

# Iron and Sodium Oxalate

CHAS. PFIZER & CO., INC., 81 Maiden Lane, New York 7, N.Y. 444 West Grand Avenue, Chicago IO, III. 605 Third Street, San Francisco 7, Cal.

PHIAR Manufacturing Chemists Since 1849


# **Transmission Drives**

We are equipped to engineer and specify the correct drive for each individual installation whether a positive drive such as Chain or Gears or a flexible drive such as V-Belt or Flat Belt



A complete line of V-Belt Sheaves for "A" through "E" section belts in standard bushed, taper bushed or made-to-order types. Continental V-Belts "A" through "E" section carried in stock for prompt shipment. All Sheaves made from close grain, high tensile strength Meehanite iron, assuring longer life expectancy and highest drive efficiency

# Roller Chain Drives



Complete range of stock size Sprockets and single strand Roller Chains, from 3/8" to  $2\frac{1}{2}$ " pitch, carried in stock for quick delivery. Steel or cast iron construction, with standard hubs. are available on order.

Send your inquiries to our nearest District Office.

67-A



ciners, blast furnaces, gypsum kettles, recovery furnaces in pulp mills, carbon black furnaces, phosphorus furnaces and regenerators in fluid catalyst units in the petroleum industry.

C. E. Beaver, Research Corporation, before the American Institute of Chemical Engineers, Chicago, Dec. 17, 1945.

### ELECTRONICS IN CHEMICAL FEED SYSTEMS

CONTROLLED volume chemical pumps may be used for accurate metering transfer of liquids in chemical processing. These pumps are normally driven by standard alternating current constant speed motors. By employing an electronic controller, alternating current is rectified to control speed of a direct current drive motor, the speed of which is constant at a given potentiometer setting from zero to full load. The speed of the motor determines the exact speed of the pump. The quantity of chemical delivered by the pump is directly proportional to pump speed, therefore a control of motor speed is a direct control on quantity of chemical feed.

a direct control on quantity of chemical red. A 10,000-ohm potentiometer is required for regulation of motor speed. The motor speed follows a straight line relationship with potentiometer setting. This potentiometer may therefore be mounted in any metered circuit to give automatic control of chemical feed in accordance with the metered variable. Application of this system has been made for automatic proportioning and for pH control Applications are contemplated using temperature, pressure, liquid level, or conductivity as the metered variable.

Robert T. Sheen, Milton Roy Pumps, before American Institute of Chemical Engineers and Water Committee of the Technical Association of the Pulp and Paper Industry, New York, Feb. 28, 1946.

### HOW JAPAN EXPANDED HER INDUSTRIES

JAPAN, with no indigenous sources of coal of grades suitable for making metallurgical coke, has 40 percent of the ovens in non-Soviet Asia for making such coke. She has no economical ores of aluminum or magnesium, yet has about half of the manufacturing facilities. She has well over three-quarters of the chemical equipment and slightly less than three-quarters of the electric equipment. She had even a larger proportion of merchant shipping.

It is easy to look at these rather startling figures of Japanese basic industrial power and to credit it merely to the superior education and training of the Japanese. But that is too easy an answer, because the training and abilities of the Japanese have been devoted not only to increasing their own industrial might but also to suppressing the industrial strength of their neighbors. When it became neces-sary to draw upon the manpower of the conquered areas, Japan held this development pretty largely to the more primary stages of manufacture. The conquered territories thus were made dependent on Japan for markets for the cheaper products. While this was going on, Japan expanded her home island capacities and trained her own labor in the more skilled steps of manufacture which added a larger portion to the value of the final commodity.

By exporting manufactured products at



You can save time, money and materials with Parker Fluid Power Engineering.

The actual case record pictured is typical. Our recommendation enabled this manufacturer to cut down on number of connections, on space and avoid leakage. Moreover, his customer got a better job—one that operates more efficiently, is easier to service. We've solved many a manufacturer's problems with equally simple recommendations—using standard Parker equipment. For unusual conditions of design, where stock parts will not serve, we are able to supply "custom-bilt" valves and couplings. In every case the result has been the same—a simplified installation. May we show you how Parker Fluid Power Engineering can do the same for you?

Stocks Available at your Distributor's and at Parker Warehouses



CHEMICAL & METALLURGICAL ENGINEERING · APRIL 1946 ·



very low prices, Japan made Asia increasingly dependent on Japanese industry and at the same time encouraged expansion at home. Low-priced exports were made possible because of the very low prices paid Japanese labor, and also through such devices as inflation, subsidy, confiscation and coercion. Profits at home were guaranteed by cash grants, price fixing, preferential shipping rates and tax preferences, which were paid for by consumers and smaller taxpayers. Since this was accompanied also by a great centralization of ownership of productive facilities in the so-called Zaibatsu of Japan, these owners prospered and grew. But the Japanese people themselves were unable to afford the goods and services which normally would be available to a population of a country industrialized to the same degree.

When this expansionism created unendurable drains on Japanese foreign exchange balances, territories with natural resources were gradually brought into the Yen area and industrial expansion under Japanese ownership was started in these territories. And despite the tribute obtained from the conquered areas, the people had to tighten their belts more and more as the war lengthened.

Thus we find at the end of the war a farreaching dependency on Japan for outlets for natural resources, and for supplies of finished products. Unless this dependency is reversed, most of the rest of Asia will be in no shape to resist possible future Japanese aggression, economic or military.

Martin T. Bennett, Washington, D. C., before American Academy of Political and Social Science, Philadelphia, March 18, 1946.

## STATISTICAL METHODS IN QUALITY CONTROL

IN THE past 20 years industry has been gradually adopting statistical methods as a practical means of obtaining quality and production control. With the advent of the war in 1939 and the rapidly increasing demand for more and more good products in the shortest possible time, engineers have been increasingly anxious to use every means at their disposal not only to produce more but to obtain an increasingly larger percentage of good product. This increase in the proportion of good product can be obtained only by maintaining a high and consistent level of quality in all related operations. The statistician dealing with quality control in a manufacturing plant of practically any description finds, almost before he can realize the fact, that he has changed from the status of statistician to that of quality control engineer.

In any industry producing material by repetitive processes, constancy of the factors involved is not obtained. The numerous variables associated with quality and production occur with more or less mathematical regularity about any one desired value. Generally, the desired value is the most frequently encountered, with values on either side occurring with less and less frequency between certain limits which can, in most cases, be determined by statistical methods.

Regardless of the characteristic shape of any curve, there is one thing which should be known about any distribution, and that is whether or not it takes its shape from a chance or nonchance system of causes. To

# How to mix production with economy!

Get this Complete Lubrication Program for all your machines

- Lubrication Study of Your Entire Plant
- Recommendations to Improve Lubrication
- Lubrication Schedules and Controls
- Skilled Engineering Counsel
- Progress Reports of Benefits Obtained

ARCOVI

Lubricants

Illustration prepared with cooperation of Ferrel-Birmingham Co., Inc., Ansonia, Conn.

**T** OP PROBLEM now facing factory executives is how to keep machine production up... and costs down. This cutaway picture of a Banbury mixer chewing up rubber, shows the vital importance of Correct Lubrication in the solution of this problem.

Here in this mixer, as in many machines in your plant, the main bearings work under heavy pressures, frequently at high temperatures. Socony-Vacuum tailors special lubricants to meet these conditions, to reduce friction, wear and power loss. On those heavily loaded pinions and gears, special prescription lubricants cushion the shocks. Similarly, special oils protect dust stops and couplings.

No matter what machines you're operating, Socony-Vacuum's Complete Lubrication Program gives you the right oil or grease for every moving part. Yes, and you also get the additional services listed at the left. Ask for this sure way to mix greater production with economy.





New developments and changes in modern industry have created a demand for improved pumping equipment for handling fluids at high temperatures. American Marsh, with their broad knowledge of hydraulic engineering, has met this demand with the Type OSO Process Pump.

Designed for handling fluids at high temperatures and pressures; liquids that require special stuffing box structures; and other abnormal pumping conditions. Capacities up to 1200 GPM. Temperatures up to 800° F. Differential heads to 750 ft. with suction pressures up to 400 lbs. Send for Bulletin 460.



**TYPE OSCV** 

The Type OSCV Process Pumps are especially designed for handling liquids of moderate temperatures (up to 350F.) and also give maximum protection against corrosion in the pumping of such liquids, as Acids, Crude Oil, Black Liquor, Ammonia, Organic fluids and others.

Material specifications to fit your own special pumping problems are optional on both the OSO and OSCV Process Pumps.

The OSCV is designed for capacities up to 1200 GPM. Temperatures up to 350°F. Differential Heads to 750 with suction pressures to 300 lbs. Send for Bulletin 461.

> American-Marsh has been building pumps for over 70 years-you can benefit through this experience. Write now-representatives in all principal industrial centers.

MERICAN MARSH PUMPS INC.

BATTLE CREEK, MICHIGAN

determine this fact correctly is one of the important tasks of the quality control statistician.

Chance causes may differ from time to time so that a distribution of any one variable will have a different form in one period than in another. As time progresses, an element may periodically enter and leave the system. A factor may appear in different magnitude from time to time, depending upon previous processes, or a completely new factor may enter or an old established factor leave the system. Regardless of these situations, one thing is constant whether statistical control is practiced or not, and that is, that in every manufacturing process the manufacturer aims for a definite mark in controlling all of his processing variables to the end that the most satisfactory product may be made with the greatest economy.

Frequency distributions are not suited to the routine analysis of observed data in a manufacturing process. If one wishes to know the whole story relative to the chance or nonchance occurrence of observed values, the control chart is of inestimable value, in that it tells: (1) The state of statistical control; (2) the evidence of more than one level of control; (3) the existence of nonchance causes; (4) the existence of cycles or trends.

By setting up statistiscal relationships based on reliable past experience, statistical methods of control are not only practical but are a valuable adjunct to any control program.

W. T. Rogers, National Tube Co., before American Society for Metals, Cleveland, Feb. 4, 1946.

## FACTORS IN BUILDING A NEW EXPORT BUSINESS

MANY companies in the chemical industry and in other fields are beginning to be interested in starting a new export business, or else broadening the scope of their present international activities. It seems timely, therefore, to outline briefly some of the factors which are important to such an undertaking.

Everyone knows that the ultimate aim of any business is to make a profit. It is also true that many products are often sold abroad at less actual profit than that earned in the domestic market. This statement should be analyzed, however, with the understanding that there are many indirect expenses in the domestic market such as advertising and various consumer service items, which while they are not usually charged to selling expense, actually do have a bearing on sales volume. The important conclusion to be drawn is that the percentage of profit alone should not be the only consideration when it is decided to begin or to expand in the export field.

New export markets should be entered with the definite aim to obtain and hold a fair share of the available business. Once it is decided to enter these new markets, enough goods should be allotted to accomplish this purpose, otherwise it is probably much better to stay out. Some companies in this country will have much more interest in export at some future date when they discover that their domestic sales are beginning to decline. It will be much too late then to decide to start or expand an export business. Many businessmen in South Amer-

# The most Versatile Adsorbent...

PITTSBURGH COKE & CHEMICAL CO. PITTSBURGH, PENNA. NET WEIGHT SO LBS.

# Other "Pittsburgh" Coke and Chemical Products

ACTIVATED CARBON

C&C

Activated Carbon · Benzol—Motor, Nitration, Pure · Coke Oven Gas · Creosote · Cresol, Meta Para · Cresol, Ortho · Naphtha, Heavy Solvent · Naphthalene · Oleum (Fuming Sulphuric Acid) · Phenol · Picoline—Alpha, Beta and Gamma · Pitch—Briquetting, Roofing, Waterproofing · Pyridine—Medicinal and Industrial · Sodium Cyanide · Sodium Thiocyanate · Sulphate of Ammonia · Sulphuric Acid—60° and 66° · Tar Acid Oils · Tar Bases, Crude · Tar —Crude and Read—Toluol—Nitration and Commercial Grades · Xylol—10°, 5° and 3°,

### also

Neville Coke • Emerald Coal • Pig Iron • Green Bag Cements • Concrete Pipe • Sterling Old Range Iron Ore • Limestone Products Inquiries Invited Isolates Recovers Deodorizes Decolorizes Fractionates Purifies Catalyzes

# in Gas or Liquid Phase

More adaptable adsorptive qualities and physical characteristics make *Pittsburgh* Activated Carbon the most versatile adsorbent known. New uses are being added constantly to the already imposing list of dividend paying industrial applications.

Chemically stable, susceptible to controlled variety of form and size and readily regenerated, Activated Carbon offers present and potential opportunity for solving problems of adsorption that were previously impossible.

Pittsburgh Coke & Chemical Company is one of the leading manufacturers of Activated Carbon and was the largest single supplier of this adsorbent for the Chemical Warfare Service. Now concentrating on the development of Activated Carbon for the many commercial uses in both gas and liquid phases, the experience of our technical staff is at your service.

Quantity supply is immediately available. Send us your inquiries for quotation.

**Chemical Sales Division** 

Pittsburgh Coke & Chemical Company Grant Building Pittsburgh, Pennsylvania

280

# MATCHING SCREENS



# to meet

# **Your Processing Requirements**

Hendrick Perforated Metal Screens assure fast, full clearance screening and long service life because they are made to meet your specific processing requirements. Materials are selected for the application—stainless steel, aluminum, copper, brass, bronze, Monel, nickel or other commercially rolled metals. Perforations are furnished in any required shape or size of opening, and flat, flanged or curved to any diameter. If you need screens for tank bottoms or other equip-ment, put your requirements up to Hendrick. Write for further information.

further information.

HENDRICK

Manufacturing Company

**51 DUNDAFF STREET, CARBONDALE, PENNA.** 

Sales Offices In Principal Cities

**Perforated Metals Perforated Metal Screens** Architectural Grilles Mitco Open Steel Flooring, 'Shur-Site" Treads and Amorarids.



ica believe that one dollar in American goods which is shipped now, would probably be as effective in holding the market as five dollars in goods which might be shipped to them

five years from now. It is good practice for any company to agree on certain definite percentages of its production for export for at least a period of twelve months. This figure can then be reviewed at the end of each quarter, and revised if necessary. If this is not done, it is impossible to plan intelligently an effective export program.

A firm which has even a very limited export business is familiar with the necessity of protecting their trade-marks and patents in all important foreign countries. The usual method is to retain the services of a legal firm, with international connections, who specializes in this type of work. Considerable help can also be obtained through the advice of legal counsel which may be retained by distributors or agents in their respective countries. If the size of the business warrants it, the legal services of a local firm in certain foreign countries may be justified on a direct basis. In many cases this would not cost any more than other methods and it might yield better results.

If we assume next that it is necessary to make a preliminary survey of certain new markets, and possibly also in regard to mar-kets which may be expanded, then the best policy is to have some well qualified official of the company visit these places and bring back a first-hand report. The alternative is to employ some outside organization, such as an advertising agency with international connections to do this job. The experience of most companies indicates that better results are obtained when this type of job is done by a responsible member of their own organization and this usually does not cost as much as the method of employing an outside group.

E. M. Melton, Ansco Division of General Aniline & Film Corp., before Chemical Market Research Association, New York, Feb. 14, 1946.

### PROFESSIONAL PROBLEMS

ENGINEERS of the country are faced with a number of problems due to the rise of labor unions and their further extension of union influence in industrial relations. The problems of the chemical engineer are those of all engineers and can only be separated in a few specific details which are not of vital importance in the broad picture.

In recent years the impact has been ad-vancing at an accelerated pace so as to be, at the moment, a very pressing matter. So long as the labor unons were confined to the hourly workers in a plant, the impact on the engineering profession was negligible and involved principally their relations with the workers rather than their own relations as workers. Unions now however, include all sorts of white collar employees and there are unions which purport to be representatives of technical groups including both the pro-fessionals and the technicians who serve them. The Federation of Architects, Engineers, Draftsmen and Technicians is a good example of this type of union. They are attempting to include the professional worker and in isolated cases have done so through the medium of the closed shop. The situation is more than academic and if

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING



# ATLAS SPANS and TWEENS have the range to help you do it!

You can get any hydrophile<sub>z</sub>lipophile balance you want with Atlas Spans and Tweens. These emulsifiers range from complete oil solubility to complete water solubility—including all of the stages in between.

One reason why Atlas emulsifiers are so versatile is because they are a numerous family to begin with. Another reason is that they are compatible with each other—can be blended in any proportions, at the same time building up their effectiveness. That means you can use Atlas Spans and Tweens to get *exactly the right* emulsifier to fit your formula.

Yet complete versatility is not the only feature that sets Atlas Spans and Tweens apart. Being non-ionic in character, they are not only compatible with each other but with most surface active agents of the cationic and anionic types. In addition, they are neutral, pre-formed, generally non-toxic, and form emulsions that are stable to electrolytes and freezing.

For complete information about Atlas Spans and Tweens, write for the booklet illustrated below. If you have special problems involving emulsifiers, Atlas will be glad to help you solve them.

# ATLAS SPANS AND TWEENS

Atlas Spans constitute a series of technical long chain fatty acid partial esters of hexitol anhydrides. The hexitol anhydrides include sorbitans and sorbides, mannitans and mannides.

Spairs - Tweens

Atlas Tweens comprise a series of polyoxyalkylene derivatives of hexitol anhydride partial long chain fatty acid esters.

Spans and Tweens: Reg. U. S. Pat Off.



INDUSTRIAL CHEMICALS DEPARTMENT



ATLAS POWDER COMPANY, Wilmington 99, Del. · Offices in principal cities · Cable Address-Atpowco



chemical engincers are to maintain their true professional status they must stop disregarding the tide of affairs and indulge in positive action.

When we come to professional engineering however, the question of hours and rates hardly applies in any usual trade union sense. True professional engineering is creative work and the difference between two individuals can be so great as to be a differ ence of kind rather than a difference of degree. No uniform standard could ever be adopted which would be fair to the average without tremendously penalizing the highly creative workers. Further, creative work knows no hours. A professional man thinks about his job whether he happens to be in the plant or home taking a shower. Strict limitation of hours is meaningless in this respect. This type of work is not susceptible of handling by the usual criteria of trade unions.

It therefore seems inevitable that the handling of employer-employee relations, insofar as professional men are concerned, must be solely in the hands of the professional employees themselves if conditions of employment are to be discussed with the management. Professional objectives are such, that they could not be attained through representation by a heterogeneous trade union, but as things are developing, this is the way in which these problems will be handled if the engineers do not take steps to protect themselves, and their status as professional men.

One difficulty is that all engineering graduates do not become professionals. Many of them remain merely technicians, the draftsmen and the laboratory analyst are examples of such technicians. With such types it seems probable that trade union methods may prove more effective than methods designed for the needs of the truly professional group.

In order to make progress, the first thing we must have is a clear cut distinction be-tween the professional and the technician. This definition must be a legal one and not one prepared by self-constituted bodies such as any of the engineering associations and their membership requirements.

There is a quantity of work to be done in all the states in welding the chemical engineers together as a true professional group and in their combining with local groups of other types of engineers, preferably through the society of professional engineers to safeguard the inroads that are being made on the individual rights and freedom of the professionals. If our laws are such that engineering employees must bargain with the employers through a bargaining unit, let it be a bargaining union of engineers and solely professional engineers. In such a unit the question of wages would be merely one of a minimum wage for a full professional engineer and a minimum for an engineer in training at the outset of his career. Quite a few of the state societies of professional en-gineers are setting up standards in this regard, one for private employment and one, somewhat lower, for public employment under civil service rules. More than this would not be necessary because we cannot place a ceiling upon the value of professional services.

The question of hours should not enter into the picture at all, so that bargaining, if

# DESCENDED FROM A LONG LINE OF ABLE PERFORMERS

Behind this Sivyer casting is the experience of nearly 38 foundry years. Before it is the promise that it will do its job long and well—will provide the kind of service which the skill from these casting years has put into it.

Men long experienced in every phase of foundry practice carefully watch over the making of all Sivyer Steel castings. And the latest in scientific testing and control work with these men to the end of finished products embracing greater integrity of metal ... greater dimensional accuracy.

Whatever your steel casting requirements, consult Sivyer. You'll find that the Sivyer diamond I means castings worth looking for.



thurber

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



necessary, would take an extremely simple form and be of a very different nature than that carried on by a trade union. Such purely professional matters as credit for discoveries, rights to publication and the like would be a very much more popular question than wages or hours.

When all that is said and done, the engineer belongs on the managerial side of industry. Anything that would place him in the trade union status with trade union requirements would stifle initiative and stop development. It would indeed be to the disadvantage of the trade unions themselves, if the developments which increase productivity and em-ployment were strangled at the source. The leaders of the trade union movements know that the future of the country and them-selves depends on scientific and engineering development. They also must know that such creative work cannot be standardized to meet trade union norms. May the professionals work together to approach their ideals in concert, not in opposition to trade unions, but apart from them. If they do not do so, the rising tide will engulf them to the ultimate detriment of all.

John M. Weiss, John M. Weiss and Co., before American Institute of Chemical Engineers, Baton Rouge, Mar. 21, 1946.

### CAN CORPORATE RESEARCH PATENT INVENTIONS?

IN A recent decision it was held, in effect, that it was doubtful whether an invention could be made in a corporate research laboratory.\* If an invention were asserted to have been made, it would have to be proved that it required more than the exercise of the inventive faculties of the experts in the labora-tory in question. The decision stated that, prior to the development of the corporate research laboratory, the circumstances under which an alleged invention was made were not ordinarily examined; but today, where the record shows that the real party in interest is the owner of such a research laboratory, then it must assume the burden of proving the presence of inventive genius with evidence disclosing the level of the art in the research laboratory at the time the patent application was made. It is further asserted that this is only a recognition of the obvious fact that some further proof be made beyond the blue-prints and specifications in the patent application with respect to the products of the laboratory. In the specific case in question, the court held that these circumstances, in the absence of evidence of individual achievement, create at least an inference that the alleged invention is a step-by-step improvement, the result of skill and experimentation in the use of existing knowledge, and not in invention. In other words, the court felt that because the invention was made in a corporate research laboratory, it was necessary for the company to prove things which the ordinary individual inventor does not have to prove. Such additional proof is not required by the patent law but has been the product of judicial legislation. As a result of this reasoning. the court held that the inventor did not make an invention which was patentable. Accordingly, it would be desirable for your laboratory records to contain evidence that the researcher has made an invention and \* Potts vs. Coe.

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

NEW ORLEANS

WASHINGTON

PITTSBURGH

NEW YORK

# Eight Improvements

make STRONG 70 Series Traps **Better than Ever!** 

# Look at these new features:

Renewable seat replacing pressed-in design;

Anum-Metl\* valve and seat with new scientifically designed Hi-Cap\* (patent applied for) orifice . . . up to 25% greater capacity;

Oversize inlet and outlet ports

increased flow capacity;

Relocated inlet and outlet connections-avoids backflow on light loads;

- Drain connection added-available for bottom inlet;
- One-piece, deep-drawn, stainless bucket-no welds;

Larger gasket area-means positive seal:

New, improved, stainless, high-ratio leverage.

Plus Adaptability to older models with change-over assembly including Hi-Cap orifice.



New 70 Series Strong Trap, No. 170



Old 70 Series Strong Trap

WITH THE OLD In improving the 70 Series trap, Strong has remembered the thousands of older style 70 Series traps still in service after many years. Each improvement bears the "proof in service" label, so Strong quality remains uniformly high. Service continues to be available on all Strong traps, and they can be completely modernized to include the improvements listed above.

With a complete line of Strong open and inverted bucket traps at their disposal, Strong engineers can specify exactly the right type of trap for your particular application. For full details, write for the new Strong Catalog No. 67.

# STRONG, CARLISLE & HAMMOND COMPANY, Cleveland 13, Ohio

\*Registered Trade Mark



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



deliveries are not coming through as fast as you would like to have them, we would like to borrow the artist's idea and say "Don't shoot, we're doing the best we can." We are trying our best to furnish the same prompt delivery service that has been available to SOLVAY customers for years, but in spite of all our efforts, current demands have kept ahead of production. We appreciate the friendly cooperation of loyal SOLVAY customers and we hope that it will not be long before apologies for tardy deliveries will no longer be necessary.

SOLVAY SALES CORPORATION Alkalies and Chemical Products Manufactured by The Solvay Process Company 40 Rector Street New York 6, N. Y.



Soda Ash • Specialty Cleansers Caustic Soda • Arr • Chlorine Products

Ammonium & Potassium Products

Galcium Chloride

has exercised his inventive faculties beyond the skill of the experts in the laboratory. Furthermore, the records should show that the researcher has made a contribution to the art and has added an increment of knowledge to the existing knowledge, not only in the art but in the laboratory itself, and that such increment which had been contributed was not obvious to the experts in the laboratory and required more than the ordinary skill of such experts as well as others in the art.

A. W. Deller. The International Nickel Co., before Graduate Division of New York University College of Engineering, Dec. 20, 1945.

### FRICTION BETWEEN SCIENTISTS AND MILITARY MEN

This country has been engaged in two major conflicts within the space of about 25 years. In both instances, we had allies who held off the enemy until we were ready, and we were on the side which had an enormous preponderance in manpower, in natural resources, and probably also in technical knowledge.

If we do engage in future wars, we may not always be lucky enough to have such enormous advantages, and it may be necessary for us to be more economical of our manpower and our resources.

It is therefore imperative that the nation examine its recent war effort to determine whether it did things well or whether its resources were such that it had to win no matter how many mistakes were made.

An example of the way scientists and the military should cooperate was presented by the relationship between units of the Office of Scientific Research and Development and the Chemical Warfare Service. By the end of the war OSRD personnel were stationed at many Army posts, some OSRD representatives held positions on the staffs of general officers, and in many respects the civilian and Army programs had been fused into one coordinated whole. It should not be implied that friction was entirely absent, but it is safe to say that few instances exist of more whole-hearted and complete cooperation.

W. A. Noyes, Jr., University of Rochester, before Virginia Section, American Chemical Society, Jan. 18, 1946.

### ELECTRONIC POTENTIOMETERS

THE INCREASING application of the selfbalancing recording potentiometer to chemical processing has been brought about largely by the advent of basic improvements in their detecting and rebalancing mechanism. One improvement is the direct result of using electrical means other than the conventional galvanometer for detecting changes in the measured variable. Further improvement resulted from the replacement of the cyclic rebalancing mechanism with an electronically controlled motor continuously rebalancing the indicating or recording system to correspond to changes in the measured variable.

Such variables as temperatures, pH, high vacuum, spectographic quantities, mechanical strain and rotative speed are particularly susceptible to measurement with this type of continuously balancing potentiometer. It is to be expected that even other variables will be measured to greater advantage with these



Heat that never Sleeps"

Chromalox Electric Strip Heaters



á

÷1 0 1.1

# EASY TO INSTALL

CHROMALOX Strip Heaters are installed by welding stud bolts to tank bottom and clamping Strip Heaters in place with CHROMALOX Utility Clamps. (Illustrated left.)

# For Process Kettles, Cleaning and Plating Tanks, Tempering Baths

You get quick heat-when and where you want it-with CHROMALOX Strip Heaters. They provide dependable, efficient, economical "around the clock" service in chemical applications requiring continuous, accurately-controlled heat temperatures.

Users of Heat find "it more than pays" to change to CHROMALOX Electric Heaters. In thousands of chemical-plant applications-for heating liquids and gases . . . for heating pipes . for processing, degreasing, making steam and drying-CHROMALOX Heaters are proving themselves in performance, reliability and long service life.

Our Application Engineers are glad to discuss your heat requirements with you; no obligation.

IC-16







- A. Sheath of Rust-resisting fron or High-temperature Chrome Steel, constructed to remain rigid and flat under all work conditions.
- Highest quality Nickel-chromium Resistance Wire. CHROMALOX Refractory compacted under tre-C
  - mendous hydraulic pressure.

The heat source of CHROMALOX Electric Heaters is nickel-chromium wire embedded in a special refractory and encased in a metal sheath. Efficient heat transfer from heat source to sheath is assured by hydraulically compact-ing refractory surrounding resistance wire. The unit is fired to semi-vitrify and cure the refractory. Thus the refractory becomes an insulator around wire and serves as an efficient conductor to transmit heat to the sheath surface. All CHROMALOX Heaters are thoroughly tested during and after manufacture to meet rigid standards of performance.

# FOR MORE "KNOW-HOW"

Write for "100 Ways to Apply Electric Heat" booklet, Catalog 42 and address of CHROMALOX Application Engineer serving you.

EDWIN L. WIEGAND COMPANY · 7514 THOMAS BOULEVARD · PITTSBURGH 8, PA.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

285



# CONTINUOUS vs. Periodic Analysis

Combridge Gas Analysers give industry continuous records, accurate and automatic. No intermittent sampling . . . no chemicals. These Analysers are used for determination of

OXYGEN in flue and stack gases and in furnacce atmospheres

DISSOLVED OXYGEN in boller feedwater CARBON DIOXIDE in flue gases HYDROGEN in stram

CARBON MONDXIDE, NITROGEN, ARGON and many other gases can be determined by available Cambridge analysers designed to meet specific industrial conditions.

OTHER CAMBRIDGE INSTRUMENTS are available for use of industry and Science.

Send for literature Cambridge Gas Analysers CAMBRIDGE INSTRUMENT CO., Inc. 3705 Grand Central Terminal, New York, N. Y.

PIONEER MANUFACTURERS OF PRECISION INSTRUMENTS

# A Portable INDICATOR Pyrometer



Built with the ENGELHARD frictionless galvanometer, eliminating bearings and pivots.

Strongly built to stand rough service. Nine standard scales—4 Centrigrade, 5 Fahrenheit. Special scales available. Weight 11½ lbs.

Write for descriptive Bulletin 400. Charles Engelhard, Inc. 233 N. J. R. R. AVE., NEWARK, N. J. newer instruments where speed and accuracy are essential. Higher speed of operation, down to approximately four seconds across full scale for many of these instruments, has brought about the first really adequate measurement of multiple temperatures. Temperature measuring instruments indicating as many as 48 separate points with speed and precision allow scanning of a chemical unit operation as it has never been done before.

Greater sensitivity of measurement has been accomplished in these newer types of self-balancing recording potentiometers through improvement in the rebalancing mechanism. In most cases positive detection of changes as small as 0.03 percent of full scale is guaranteed and the sensitivity of measurement is sometimes better than this figure. On a pyrometer calibrated from 0 to 300 deg. F., for example, this sensitivity would allow consistent measurement of changes in temperature as low as 0.09 deg.

The advantage of this great sensitivity is apparent where it is desired to measure process variables which change slowly, such as fractionating column temperatures. In such measurements a sensitive instrument will sense a temperature change in one-half the time required for an instrument with one-half the sensitivity.

From the standpoint of maintenance, these instruments are easier to service and more simple to maintain. The use of electronic and electromechanical components has virtually eliminated the multiplicity of mechanical moving parts. Longer life is thereby attained because of their reduced wear on fewer moving parts. Reproducibility is also improved as a result of reduction of wear.

The sturdiness and reliability of the electronic potentiometer have been proved in severe service. The absence of a delicate galvanometer movement and its associated parts make an instrument which in many aspects is more powerful and rugged than its mechanical counterpart.

D. M. Considine and D. P. Eckman, The Brown Instrument Co., before the American Institute of Chemical Engineers, Chicago, Dec. 18, 1945.

# FOREIGN LITERATURE ABSTRACTS

PYROCATECHIN FROM WOOD CRESOTE

TREATMENT of wood creosote with aluminum chloride results in practically complete splitting of the phenol ethers of creosote without the use of an autoclave. Approximately 60 percent aluminum chloride is necessary for the almost complete splitting of the phenol ethers, which corresponds approximately to a mol to mol proportion of ether and reagent. Decreasing this proportion results in a sharp decrease in the yield of product and an increase in the content of OCH<sub>3</sub> in the residue. Splitting of the phenol ethers by means of aluminum chloride is a more rapid rejection than that resulting from treatment with aniline hydrochloride and hydrogen chloride. When aluminum chloride is used, pyrocatechin is extracted from the reaction mixture by treatment of the reaction mixture with an aque-

# FABRICATED WIRE CLOTH

Shown here are Stainless Steel Filter Cloth covers designed to fit around the customer's present Bakelite Leaves, which were originally designed to be used with canvas covers. It was not an easy job to do this, but Multi-Metal invites the hard ones.

Come to Multi-Metal with all problems involving wire and filter cloth units. Multi-Metal maintains stocks in all meshes and metals. Top notch fabricating equipment and wire cloth craftsmen turn out units of all types, sizes and degree of complexity for chemical process engineers. Consult Multi-Metal without obligation.

Write for our New Catalog and free wire cloth samples.

Wire Cloth

Filter Cloth All Meshes

All Metals

Wire Cloth in Fabricated Units, or by the Rall and the Cet Piece.



WIRE CLOTH COMPANY, INC.

1350 Garrison Ave., New York 59, N.Y.

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING



287

# THRUST-TROUBLE-FREE PERFORMANCE



In Pennsylvania *Thrustfre* multi-stage centrifugal pumps dynamic hydraulic balance is effected without the aid of internal or external mechanisms. Result, thrust-trouble-free performance and elimination of thrust control devices with their attendant worries.

Descriptive Bulletin 238 on request.



# GYRO SIFTERS



ROBINSON MANUFACTURING CO. Plant: Muncy, Pa. SALES REPRESENTATIVE MERCER-ROBINSON COMPANY, INC. 30 CHURCH ST., NEW YORK 7, N. Y. ous solution of hydrochloric acid, but the problem of recovery of the aluminum chloride from the waste liquors has not yet been solved. Crystalline pyrocatechin is separated from the ether extract directly by vacuum distillation, which method yields a sufficiently pure product with a larger yield than treatment of the extract with a solution of sodium chloride for the purpose of preliminary separation of the monoatomic phenols.

Digest from "Preparation of Pyrocatechin from Wood Creosote by Splitting the Phenoi Ethers of Creosote under Atmospheric Pressure," by B. P. Sumarokov, C. C. Ryilkin and E. E. Kurmileva, Zhurnal Prikladnoi Khimii XVII, 9-10, 552-556, 1944. (Published in Russia.)

### NITRATION OF HIGH MOLECULAR WEIGHT HYDROCARBONS

HYDROCARBONS above C<sub>8</sub> should be nitrated at a low temperature and in the liquid phase by conducting superheated and finely divided nitric acid over the hydrocarbons. The reaction can be carried out in a special apparatus which feeds nitroparaffins simultaneously with small quantities of fatty acids. First pure hydrocarbons and then mixtures of hydrocarbons from the Fischer-Tropsch synthesis were subjected to the reaction. The most suitable temperature for  $C_{10}$  hydro-carbons is 160-180 deg. Mononitroparaffins are never formed alone without the accompanying formation of polynitroparaffins. Part of the material does not react at all, and fatty acids and ketones are obtained as a result of the oxidizing action of the nitric acid. These are readily separated. The products of the Fischer-Tropsch synthesis produce hardly any tertiary nitroparaffins, since very few branched hydrocarbons exist in the portions having high moleculer weight. The mononitroparaffins are colorless liquids with a flowerlike odor and are distillable in a vacuum without decomposition up to the limit of C<sub>18</sub>. n-Dodecane was also nitrated with nitric acid and nitrogen dioxide, and diesel oil was nitrated with nitric acid (200-320 deg. C.). The reaction products are chiefly secondary nitrocompounds, with a small quantity of primary nitro compounds. Nitration takes place chiefly in the second position. This results in derivatives nitrated at the end of the chain, which is especially interesting for the preparation of compounds with active properties of capillarity.

Digest from "Nitration of Paraffin Hydrocarbons of High Molecular Weight," by Ch. Grundmann, Chemie 56, 159, 1943. (Published in France); 1on IV, No. 35, 422-423, 1944. (Published in Spain.)

### ACTION OF METALLIC SODIUM ON CELLULOSE DERIVATIVES

METALLIC sodium in liquid ammonia causes cleavage of the methyl ethers of cellulose with formation of desoxy derivatives of cellulose. The following derivatives have been prepared by means of this reaction. The last two were unknown until now.

 $C_{s}H_{7}O_{2}(OH) (OCH_{3})_{2}$   $C_{s}H_{7}O_{2}(OH) (H) (OCH_{s})_{2}$   $C_{0}H_{7}O_{2}(H) (OCH_{s})_{3}$ The methyl ethers of d-glucose are decom-

The methyl ethers of d-glucose are decomposed by the action of metallic sodium both in the cold (slowly) and with heating, and still more readily in a solution of liquid ammonia. It has been found that heating of tetramethyl-methyl-glucoside with metallic sodium, in the determination of the mole-

# FOR CONVENIENCE IN HEATING **CORROSIVE SOLUTIONS\_**

HOW DO YOU LIKE THAT?-IT DEFIES ME !

# BAYONET HEATER

**USE THIS** 

KARBATE

• This "Karbate" Bayonet Heater is ideal for the heating of chlorides, fluorides, sulphates, and almost all other corrosive solutions. (The bayonet designs, shown at right, are also useful for cooling solutions.)

Made of "Karbate" impervious graphite, this heater is chemically inert, as well as resistant to thermal and mechanical shock. It will not rust or corrode. And "Karbate" impervious graphite provides higher rates of heat transfer than most commonly-used materials.

This highly adaptable heater is light in weight, simple to install. It is now in stock in various standard sizes-ready for immediate delivery. Order now and keep handy for any number of applications around the plant.



**THIS CATALOG** 

For more details of the "Karbate" Bayonet and the Plate-Type Heaters, send for Catalog Section M-8804.

# NATIONAL CARBON COMPANY, INC.

**USE THE "KARBATE"** 

PLATE-TYPE

HEATER!

Unit of Union Carbide and Carbon Corporation The words "National" and "Karbate" are registered trade-marks of National Carbon Company, Inc.



30 East 42nd Street, New York 17, N.Y. Division Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

289



# ITS FABRICATOR

From the minute you decide on a made-to-order stainless steel vessel, you're in the hands of a fabricator. In fact the selection of your fabricator is generally one of your big problems.

It's more than a question of following blueprints. Stainless steel is a difficult alloy to work. It "acts up" during fabrication. In cutting, forming, welding and even in finishing, your fabricator must know how to guard the corrosion resistance and strength of the alloy. His plant must be specially equipped for working with stainless steel. The longer his experience, the more help he'll give you in building vessels that meet your requirements.

We work exclusively with stainless steel and alloys. Our plant is specially tooled to fabricate this metal. Our engineers and mechanics are particularly trained for the work. Why not consult us when you plan your next stainless steel vessel?

S. BLICKMAN, INC. . 604 GREGORY AVENUE . WEEHAWKEN, N. J.



cular weight of high molecular weight carbohydrates, leads to a decreased yield of tetramethylmethylglucoside and therefore to exaggerated values of the molecular weight. It is difficult to obtain complete etherification when methylating carbohydrates by treating the substance repeatedly with metallic sodium in liquid NH<sub>a</sub> and CH I, since decomposition of the ethers formed by the metallic sodium leads to partial formation of desoxy derivatives.

Digest from "Action of Metallic Sodium on Ethers of Cellulose and Glucosides," by N. N. Shorigina, Zhurnal Obschei Khimii NIV, 7-8, 825-823, 1944. (Published in Russia.)

### SENSITIVITY OF EXPLOSIVE MIXTURES

SENSITIVITY of explosives to shock is determined in practice by means of a drop hammer. This test is very sensitive to various factors such as temperature, pressure, humidity of the air, and care must be taken to work under the same conditions for comparable results. Tests were made on mixtures of trinitrotoluene with a crystallization point of 80.5 deg. C. and pure Merck potassium chlorate. The samples, 0.05 g. each, consisted of very finely divided and homogeneous mixtures, were spread out on a piece of tin foil with a surface of approximately 1 sq.cm., and dried in a desiccator for 24 hr. No sample was used more than once and the equipment was carefully cleaned after each test. The temperature was approximately 25 deg. C. Ten experiments were carried out for each percentage and the average results are shown in the attached graph. Small ad-



ditions of potassium chlorate to trinitrotoluene result in greater sensitivity than small additions of trinitrotoluene to the chlorate. In the first case the decompositions begin by appearing in the incipient form. Usually they are not audible and are recognized by the presence of smoke or by careful examination of the sample. In the second case, as a rule, the decompositions caused by the shock develop suddenly, even with the accompaniment of considerable though localized noise. The most sensitive mixtures are those which contain the explosives in approximately equal parts.

Digest from "Sensitivity to Shock of Mixtures of Trinitrotoluene and Potassium Chlorate," by Alvaro Alberto and Marcello R. Liberalli, Anais da Associacao Quimica do Brasil III, No. 1, 37-39, 1944. (Published in Brazil.) NOW AVAILABLE IN STANDARD SIZES

by MagniLastic—For all pressures from

Vacuum to



EXPANSION

Typical Unit

MagniLastic Expansion Joints have long been specified for unusually severe applications. Five standard types are now available to engineers and designers. These cover a very wide range of operating conditions, including

• Pressures from vacuum to 1000 lbs./

- sq. in.
- Temperatures from minus 300° to plus 1600°F.
- Nominal pipe sizes from 1/2 to 24 inches.
- Steam, oil, gas, diesel, corrosive chemical, and other process installations
- VanStone lap self-aligning pipe flange or welding end fittings as standard equipment.
- Directional flow inner liners as optional equipment.
- Cycleage in average use upwards of 106.

MagniLastic development and field engineers can recommend standard or special units for your specific requirements. A new condensed catalog containing complete dimensions and performance data for the five standard types will be mailed upon request.

COOK

## STANDARD 25# COPPER

Operating pressures: vacuum to 25 p.s.i. Temperatures: minus 100° to plus 300°F. Construction: all-silver-brazed copper. Total longitudinal movement: 2 inches. Lateral deflection: ¼ in. per flange.



# 

# STANDARD 55# MONEL

Operating pressures: vacuum to 55 p.s.i. Temperatures: minus 300° to plus 750°F. Construction: all-silver-brazed Monel. Total longitudinal movement: 1 inch. Lateral deflection: 1/8 in. per flange.



# STANDARD 150# STAINLESS STEEL

Operating pressures: \*15 to 150 p.s.i. Temperatures: minus 100° to plus 1600°F. Construction: atomic-hydrogen-welded S.S. Total longitudinal movement: 1 inch. Lateral deflection: ½ in. per flange.



# STANDARD 400# STAINLESS STEEL

Operating pressures: 250 to 400 p.s.i. Temperatures: minus 100° to plus 1600°F. Construction: all heli-arc-welded S.S. Total longitudinal movement: 1 1/2 inches. Lateral deflection: ½ in. per flange.



ELECTRIC COMPANY . CHICAGO 14,

# STANDARD 1000# STAINLESS STEEL

Operating pressures: 600 to 1000 p.s.i. Temperatures: minus 100° to plus 1600°F. Construction: all heli-arc welded S.S. Total longitudinal movement: 1½ inches. Lateral deflection: 1/8 in. per flange.

DIVISION OF

LLINOIS

291

GNI

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



# The NEWEST Filtering Techniques use one of nature's OLDEST materials

Plants which were alive from 2 to 5 million years ago are the basis of the most modern filtration processes in industry!

These plants later formed deposits of diatomaceous silica, the raw material from which Celite\* is produced. A cubic inch of Celite contains over 35,000,000 diatoms, greatly varied in shape and size. They interlace to form a fine filter coating, with openings finer than the finest filter cloth. Teamed up with modern filtering

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

equipment, this coating traps out suspended impurities, allows only clear liquid to flow through.

Johns-Manville produces 9 Celite Filter Aids of varying degrees of fineness to provide every desired combination of clarity and flow in the filtering of sugars, syrups, fruit juices, fats and oils,

vitamins, drugs, lubricants, and many other liquids. Write Johns-Manville, Box 290, New York 16, N. Y., for further information.







• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

# CHEMICAL ENGINEER'S BOOKSHELF-

LESTER B. POPE, Assistant Editor



results. It's variation in technique say the authors of "Surface Active Agents"

### SURFACE TENSION

SURFACE ACTIVE AGENTS. By C. B. F. Young and K. N. Coons. Chemical Pub-

lishing Co., Brooklyn. 381 pages. \$6. SURFACE tension is a phenomenon involved in many processes used by the chemical process industries and their customers. Emulsification, electroplating, froth flotation and many other techniques are dependent on wetting power for successful operation. It is for chemists, operators, formulators and others in these industries that Drs. Young and Coons have prepared their book.

First of the book's two parts deals with the theory of surface tension, determination of surface tension and the structure of wetting agents. Also in part I is an alphabetical listing of wetting or emulsifying agents. It gives trade name, type or chemical composi-tion, industrial use and manufacturer for more than 500 such agents.

Part II, introduced by a discussion of emulsions, is primarily concerned with applications. Its 12 chapters deal with problems and processes in plating, metal clean-ing, pickling, cosmetic, printing ink, leather and other industries wherein detergents and wetting agents are important. Many recipes are included.

Chief merits of the book lie in the fact that considerable material has been assembled and is presented on a subject of evergrowing importance. The few typographical errors are merely disconcerting. Some as-pects are over-emphasized while others are slighted. There should have been some discussion of the soap industry. On the whole, however, workers among the hydrophilic and hydrophobic groups cannot afford to overlook the possibility that the book may contain a suggestion or key to solve a perplexing problem.

### HIGH POLYMER SYMPOSIUM

Advancing Fronts in Chemistry. Vol. I -HIGH POLYMERS. Edited by Summer B. Twiss. Reinhold Publishing Corp., New York. 196 pages. \$4.

Reviewed by F. C. Nachod IT SEEMS that in this brave new world of ours we never retreat but always advance, and due to this optimistic outlook the literand due to this optimistic outlook the hter-ature lately has been swamped with texts bearing titles such as "Frontiers," "Ad-vances," "Fronts," "Advancing Fronts," and what have you which really leaves the in-nocent reader in a state of bewilderment.

In the Spring of 1944, Wayne University sponsored a symposium on high polymers. These lectures have now been presented to the public in book form. A list of the chapters will outline the contents of the book: Molecular structure and mechanical behavior of high polymers by H. F. Mark; Relation between structure and physical properties of high polymers by S. S. Kistler; Some applications of catalysis to hydro-carbon reactions in the synthesis of high polymers by E. C. Pitzer; Some aspects of the mechanism of addition polymerization by C. C. Price; Polymerization as a study of reactions of free radicals by F. R. Mayo; Molecular size distribution in high polymers by W. H. Stockmayer; Effect of chain by W. H. Stockmayer; Effect of chain length on physical properties of cellulosc de-rivatives by E. Ott; Nature of the solid state of chain polymers by W. O. Baker, Mechanical Properties of Concentrated Solutions of high polymers by J. D. Ferry, Some concepts of textile fibers by M. Harris.

The contributions are not of equal quality nor do they strike the same tenor. Some of the papers are too general to help the worker in the field even as a review and

yet not general enough to be useful to the uninitiated reader who does not know any polymer chemistry.

The best contributions, in the reviewer's opinion, are the chapters by Stockmayer. Price, Mayo, and Baker in the order mentioned.

As a bird's-eye view of the various aspects of some phases in polymer chemistry, the little text may well serve but those who turn to it as a more or less complete review of the "recent advances" in the field, will be disappointed. Also the price appears to be somewhat high for such a text.

## GAS TESTING MANUAL

GAS ANALYSIS AND TESTING OF GASEOUS MATERIALS. By V. J. Altieri. Published by American Gas Association, 420 Lex-ington Ave., New York 17, N. Y. \$5 per copy to members; \$7.50 per copy to nonmembers.

## Reviewed by Russell S. McBride

This is the third in a series of volumes prepared under the sponsorship of American Gas Association to establish authoritative reference books, especially for the public utility gas industries but of equal value for any chemical or process industry use. Earlier numbers in the series dealt with testing of light oils and the control of dry box purification of gas.

This particular volume on gas analysis is an admirable composite of authoritative testing methods which are widely recognized and used. It affords an outstanding aid for any laboratory which is required to make any tests or analyses of any type of industrial gas. The sponsorship was in the committee of real specialists from the industry charged by A.G.A. with revision of the now out-of-date "Gas Chemists' Handbook." The chairman of the committee describes this volume by Altieri in the foreward as follows: 'This treatise is a comprehensive book of

- RECENT BOOKS RECEIVED
- The Chemistry of the Carbon Compounds, Vol. 111, The Aromatic Compounds. By V. von Richter, ed. by R. Anschutz, translated by A. J. Mee. Nordeman. \$15.
- A. J. Mee. Nordeman. \$15. Colloid Chemistry, Theoretical and Applied. Vol. IV. By J. Alexander, Reinhold. \$20. Kingzett's Chemical Encyclopaedia. 7th ed. Ed. by R. K. Strong. Van Nostrand. \$16.
- Manual for Water Plant Operators. By A. A. Hirsch, Chemical. \$6.50.
- Organic Reagents for Organic Analysis. Chemi-cal. \$3.75.
- Physical Constants of Hydrocarbons, Vol. 111, Mononuclear Aromatic Hydrocarbons. By G. Egloff. Reinhold. \$15.
- G. ZEIGH. Reinfold. \$15.
   Quantitative Organic Microanalysis. 4th English ed. Revised and ed. by J. Grant. Blakiston. \$5.
   Tinplate. By W. E. Hoare & E. S. Hedges. Longmans, Green & Co. \$12.



# TTER THAN N STE

standards on gas analysis and testing of gaseous materials. Its thorough index gives a bird's-eve view of each subject, instantly enabling the reader to find essential principles, methods, specifications, tests, interpretations, and related matters. It correlates information widely scattered throughout the technical literature together with hitherto unpublished information generously contributed by contemporary workers in many

scientific and technologic fields." This book is a "must" for every gas lab-oratory and for every general laboratory.

## LIGHT-CATALYZED REACTIONS

PHOTOSYNTHESIS AND RELATED PROCESSES. By Eugene I. Rahinowitch. Interscience Publishers, New York. 599 pages. \$8.50.

Reviewed by J. O. Umberger

"PHOTOSYNTHESIS and Related Processes" by Eugene I. Rabinowitch presents a wealth of very well-indexed material of interest to botanists, plant physiologists, physicists, and chemists in general on a topic whose great importance and fundamental nature stirred the imaginations of natural philosophers as far back as 1700 and which is receiving more and more attention as the fields of photochemistry, plant physiology, enzyme chemistry, etc., develop to a point where the complexities of photosynthesis begin to fall into a regular pattern.

This is the first of two volumes and contains predominantly the chemical material of photosynthesis, chemosynthesis, and related processes in vitro and in vivo. It should, as the author hopes, unite the efforts of plant physiologists with those of chemists and physicists. The second volume will discuss the spectroscopy and fluorescence of the pigments and the kinetics of photosynthesis and is expected to be published later this year. The author's approach to the still un-

solved problem of photosynthesis is the study of the effect of light on oxidationreduction systems involving organic dyes. This is a particularly fruitful and satisfying approach. His photochemical researches and association with the Solar Energy Conversion Research Project at the Massachusetts Institute of Technology have familiarized him with many of these light-catalyzed oxidation-reductions, but he emphasizes that photosynthesis-the reversal of the combustion of carbohydrates in the green plant—is far away the most important example of this type of reaction.

(HCOH) +  $O_2 \xrightarrow{\text{dark}}_{\text{light}} CO_2 + H_2O$ 

In darkness the right side of the equation is favored, but in light and in the presence of chlorophyll the reaction is so strongly shifted to the left that carbohydrates (IICOII) and oxygen are given off. The organic dye (chlorophyll) probably takes part in as a light-activated oxidation-reduction enzyme.

The author has preserved a critical attitude throughout the book. The material is logically arranged and is supplemented by unusually complete table of contents, subject index, and author index. Research workers in this field will find the complete chronologically-arranged bibliography at the end of each chapter especially valuable.

There has been a definite need for this

APRIL 1946
 CHEMICAL & METALLURGICAL ENGINEERING

to HIGH TEMPERATURE Mansfield, Massachusetts, In these two large Aluminum Stills at John D. Lewis, Inc., **RESINOUS MATERIALS** are raised

Stills, because of negligible pressure of the Merrill Process System. PROCESSING are delivered with Safety, even to Aluminum These High Temperatures necessary for DELICATE

FOR our 64-page Merrill Process book. Send engineers, plant managers, and suchicr your copy on company letterhead Men Only -- certain men, like

# 1104 T ENGINEERS AND CONTRACTORS ramer OIIIO an

DId South Building, Boston, Massachusetts

# Gulf Quality Petroleum Products

# can help you gain an edge

# in the "battle of costs'

WHEN you are planning ways and means to improve production and reduce costs in the competitive months ahead, be sure you are getting the benefit of recent developments in petroleum science!

Make sure your heat-treating department, for example, has explored the possibility of improved quenching practice with Gulf Super-Quench, the revolutionary dual-action quenching oil.

Check up to see that your machine shop has the facts on the advantages of Gulf Lasupar Cutting Oil for tough, hard-to-speed-up machining operations. In almost every case, this quality cutting oil reduces machining costs, often improves production as much as 50 per cent, and meets the requirement for an exceptionally fine finish on the work. How about your ball and roller bearing lubrication? Gulf Precision Grease and Gulf Anti-friction Grease have greater stability—will meet your requirements over a wide range of speeds and types of service.

If you operate Diesel or heavy-duty gasolinepowered trucks, you can get cleaner engines and lower maintenance costs by the use of Gulf Dieselube H.D., the modern detergent oil for heavyduty service in gasoline and Diesel engines.

These are just a few of the quality Gulf products that can help you <u>improve production</u> and <u>reduce costs</u>. Call in a Gulf Service Engineer today and ask him to recommend the oils and greases best suited to your needs. They are available to you through more than 1200 warehouses located in 30 states from Maine to New Mexico.

GUID CORPORATION & GUID REfining Company Boston & New York & Philadelphia & Pittsburgh & Atlanta & New Orleans & Hauston & Louisville & Toledo GUID INDUSTRIAL UBRICATION helps make machines produce more at lower cost

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

# For Dependable, Continuous **Uniform Reduction**

American Laboratory and Production Mills



In capacities of 100 to 2000 lbs. per hour. Americans provide various reduction ac-tions for fine grinding and reduction of fibrous or friable materials of various degrees of softness and hardness.

Very compact and extra sturdy --- of plate steel construction. Custom built to do your specific job.



Typical Installation For Sawage Dispersion Sewage Disposal

Ideal for continuous production runs of limited tonnage and especially for laboratories and pilot plants.

Write for builetin of data and specifications

INFERENCE

IS A DANGEROUS

GUIDE TO

PUMP

SELECTION



If Industrial Pumps are one of your responsibilities, ask now, for free copy of this authoritative, unbiased analysis of Industrial Pumps. It is a timely presentation of pump facts.

This is the first analysis, insofar as we know, to prevent the misapplication of Industrial Pumps. It is written by one who has a rather wide and diversified

knowledge of many types of pumps. But the author holds no more of a brief for any one type than its adaptability warrants.

He endeavors to explain the limitations of various types of pumps such as piston, plunger, rotary and centrifugal. Thus he attempts to prevent, as much as possible, misapplication.

> Based also on the long experience of Taber Pump Co., this modest contribution is offered to users of pumps in the processing industries. We will gladly send a copy of this bulletin No. S-146, when it is requested on business stationery.

TABER PUMP CO. . Est. 1859 . 294 ELM ST., BUFFALO 3, N.Y.

book because of the many applications of new physical-chemical and other methods in the 20-year interim since the last treatment of photosynthesis in the well-known monograph by H. A. Spoehr of the Laboratory of Plant Physiology, Carnegie Institute of Washington. For example, by use of the heavy isotope of oxygen, O<sup>15</sup>, it has been possible to show that the oxygen liberated by photosynthesis originates from water and not from carbon dioxide. Dr. Rabinowitch is to be congratulated for filling the gap with this complete, timely, and important book. We eagerly await his second, predominantly physical, volume on this sub ject.

## THE EXAMINATION OF ZINC

POLAROGRAPHIC AND SPECTROGRAPHIC AN-ALYSIS OF HIGH PURITY ZINC AND ZINC ALLOYS FOR DIE CASTING. Published by H. M. Stationery Office, 429 Oxford St., London, W. 1, 117 pages. 5s. 4d. postpaid.

> Reviewed by C. L. Luke and E. K. Jaycox

This book comprises four papers, one concerning the polarographic, and three the spectrographic analysis of high purity zinc and zinc base die casting alloys. They are the results of four years work by a panel of the British Standards Institution and the recommended procedures contained therein. are due to the combined efforts of the greater part of the zinc industry in Great Britain.

The paper on polarographic analysis of high purity zinc and zinc base die casting alloys describes in detail the development of methods for the determination of iron, copper, lead and cadmium in nitric acid solutions containing sodium citrate, and of copper, lead, tin and cadmium in hydrochloric acid solutions.

Some of the recommended methods described in the paper deal with the analysis of but a single element and others involve simultaneous determinations. The problem of developing simultaneous polarographic methods of analysis appears to be a difficult one and the authors are to be commended for the progress they have made; but it is evident that the methods submitted are limited in their applicability (and probably in their accuracy) and can be used only by trained personnel. It would seem that the speed of polarographic simultaneous analysis is somewhat offset by the enormous number of variables that must be controlled.

The reviewers encountered a number of ambiguous and questionable statements of minor nature. For example, the statement made at the top of p. 4 to the effect that nitric oxide interferes with the copper wave is apparently ignored in the subsequent de-velopment of the recommended method.

The three papers on the spectrographic analysis of high purity zinc and zinc base die casting alloys each treat of a different method of excitations namely: The high voltage spark, the intermittent alternating current arc and the direct current arc. The three procedures together cover, thoroughly, all the various problems that are likely to arise in the analysis of zinc alloys both from the viewpoint of the fabricator and the consumer.

Methods of sampling, the fabrication and

# NE PLACE TO LOWER OVERHEAD IS ...

There's a lot of unnecessary money spent on some floors because one fundamental fact is overlooked: that excessive wear and mechanical failure are frequently induced by decay. Halt the decay—and the floor lasts.

In one large warehouse, four years of service left the original floor in such bad condition that a new one was necessary. Pressuretreated wood was used for the replacement . . . and after 12 years it was still good, with no indication that the end of its usefulness was anywhere in sight.

... Underfoot

The decay hazard is greater when moisture is present, and here pressure-treated wood pays extra dividends. The high degree of protection that pressure-treatment gives under these conditions has been demonstrated many times over, under all types of service.

For floors, platforms or other structural members exposed to chemical attack, Koppers has developed a new plastic impregnated' wood you will find it worthwhile to investigate. Ask for the facts about "Asidbar."\*

Our illustrated bulletin, "Economical and Permanent Construction with Pressure-Treated Wood" will give you timely information. We will gladly send a copy, on request. Wood Preserving Division, Koppers Company, Inc., Pittsburgh 19, Pennsylvania. \* Trademark





# **DOLPH TRIGGER-TOUCH**

# EXTINGUISHERS

In fighting fires, it's ACTION that counts! With Randolph "4" it's action you get ... easy, quick and effective.

Just one hand snaps this extinguisher from its bracket . . . one trigger-touch sends clouds of penetrating carbon dioxide into the blaze—smothers the fire in split-seconds! With no valves or nozzles to adjust, Randolph extinguishers and lok eliminate panic-get the employee to the blaze before it spreads!

> A dry, non-toxic gas, carbon dioxide does not damage equipment or conduct electricity. It leaves no stain or liquid to clean up. And here's a fire-fighting agent that can't freeze or deteriorate . . . ends constant refilling and repairs.

> Check up on your flammable liquid and electrical hazards . . . mobilize against fire with Randolph "4", "10", "15" and "25" fast-action extinguishers. To get the complete fire protection facts, simply tear out the coupon below, or write us-today!

# Randolph Randolph Laboratories, INC. 91/2 EAST KINZIE STREET. CHICAGO. ILL.

| Pleas<br>book<br>Also<br>extin | e send me<br>"How To F<br>rush detai<br>juishers. | your FREE<br>ight Fires<br>Is on new | fire prot<br>With Carb<br>carbon | ection han<br>on Dioxide<br>dioxide fi |
|--------------------------------|---|--------------------------------------|----------------------------------|--|
| NAM                            |   |                                      | 1                                | h martin                               |
| CON                            | PANY  | - 1                                  |                                  | 1                                      |
| ADD                            | ESS   | 11.11                                |                                  |  |

standardization of standard samples, the various aspects of the types of excitation employed, the effects of one constituent upon the analysis of another, the choice of internal control lines or lines of elements added for this purpose, the photographic techniques, plate calibration, densitometry and precision are all discussed at some length. These discussions serve as a back-ground and a basis for understanding the final recommendations given for each procedure and leave the reader with the impression that every factor involved in the techniques has been thoroughly and well investigated. These studies are not only of value in the problem of the analysis of zinc allovs, but because of their fundamental nature, will be found useful to spectroscopists interested in the analysis of other base metals.

The authors have elected to present complete chronological accounts of their investigations. As a consequence the papers lack the clearness and conciseness usually found in technical publications. The descriptions of the numerous unsuccessful procedures which were tried may be of value to future workers in the field but their inclusion tends to obscure the positive results of the investigations. The relegation of unsuccessful or irrelevant material to an appendix would have been one solution. However, this book should certainly be included on the library shelf of every analytical laboratory engaged in polarographic or spectrochemical analyses.

## RECENT BOOKS

### and

### PAMPHLETS

Bibliography on the Petroleum Industry. By E. DeGolyer and Harold Vance. Bulletin No. 83, published by School of Engineering, Agricultural and Mechanical College of Texas, College Sta-tion, Tex. 725 pages. References arranged under some 900 different subjects using a decimal sys-tem of indexing.

The Foreman and the Veteran. By Ted Handel-man. Published by National Foremen's Institute, Deep River, Conn. 32 pages. 25 cents. A booklet tor the toreman, the key factor in reconverting the veteran.

Code for the Prevention of Dust Explosions in the Plastics Industry. Published by National Fire Protection Association, 60 Batterymarch St., Bos-ton 10, Mass. 22 pages. 25 cents. Detailed pro-visions for all common types of plastic dusts with data on relative susceptibility to dust explosions.

Potash Reserves in the United States, Pre-pared by Behre Dolbear & Co. for the American Potash Institute, 1155 Sixteenth St., Washington 6, D. C. 20 pages, Report on an investigation covering the potash resources of the United States States

Public Domain. Published by Scientific De-velopment Corp., 614 West 49th St., New York 19, N. Y. 218 pages. \$45 per year. Vol. I, No. I of a new weekly publication. Each issue will contain over 1.000 patents due to expire four weeks after date of issue and which will then be in the public domain and open to exploitation by whoever cares to use them.

Research Publications of the Polytechnic Insti-tute of Brooklyn, 1941-1942. Published by the Institute, Livingston St., Brooklyn 2, N. Y. 103 pages. 25 cents. Vol. V, Part III. Reprints of articles by the chemical engineering staff.

Pemco Reference Manual. Published by Pemco Corp., Baltimore, Md. \$5. Loose-leaf reference book of porcelain enameling.

Report of the National Academy of Sciences. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 154 pages. 30 cents. Annual report for the fiscal year 1943-1944.

Resume of the Proceedings of the Twelfth Na-tional Conference on Labor Legislation, Bulletin

298

"25"

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

# CHECK THESE 2 \* PERFORMANCE PROVED CEMENTS AGAINST YOUR NEEDS

# N-100 SELF-CURING ADHESIVE for cementing together or one to another raw fabrics, coated fabrics, molded parts, leather, wood, paper, \* tubing, sponge, channel-stock, stripping and sheet material ... as a Sealant for rubber and synthetic

valve seats, gaskets, etc.

A Two-Part Neoprene Base Formula of Brush Viscosity and Neutral in Color ... Extremely high green strength... Good strength after standing 3 to 4 hours... Optimum cure reached in 10 days at 68-70°F (in 16 hours at 100-125°F; in 1 hour at 255.260°F) ... Excellent water, oil, flame and delamination resistance... Chemical resistance to acetic acid, alcohols, aliphatic hydrocarbons, ammonia, calcium chloride, copper sulphate, fatty acids, hydrochloric acid, oxalic acid, phenol, sodium hydroxide, sulfuric acid...Extremely high shear strength...Contains no Benzol.

# N-800 NEOPRENE PUTTY \*

for Filling rubber, neoprene and other synthetic rubber parts . . . for Repairing wire cable . . . as a Binder . . . and for Caulking.

A Two-Part Neoprene Base Formula of Putty Consistency and Black in Color ... Bonds without Primers ... Optimum cure reached in 10 days at 68-70°F (in 16 hours at 100-125°F; in 1 hour at 255-260°F)...High dielectric strength...Excellent water, oil and flame resistance . . . Chemical resistance to acetic acid, alcohols, aliphatic hydrocarbons, ammonia, calcium chloride, copper sulphate, fatty acids, hydrochloric acid, oxalic acid, phenol, sodium hydroxide,

sulfuric acid.

Address all inquires to the Union Bay State Chemical Company, Rubber Chemicals Division, 50 Harvard St., Cambridge 42, Massachusetts.

Serving Industry with Creative Chemistry ORGANIC CHEMICALS - SYNTHETIC LATEX - SYNTHETIC RUBBER PLASTICS - INDUSTRIAL ADHESIVES - DISPERSIONS COATING COMPOUNDS - IMPREGNATING MATERIALS - COMBINING CEMENTS \* Both of these formulas have been performance-proved in important war production work over a period of several years.

UNION BAY STATE Chemical Company





# In Close Co-operation with the Packing Industry

# PRATER DUAL SCREEN DUAL FEED PULVERIZER

Uniform reduction of material is a prime requirement in processing by-products where uniformity of result must be repeated in cycle after cycle.

Close co-operation with the packing industry is the background of the specialized experience and engineering skill that enables Prater Service to maintain the standards of the industry in quality of product and high yield.

Prater Service will aid you in establishing proper reduction standards through engineering analysis, co-operative study, test grinds with particular reference to uniformity, control of grain size and quality of the grind. Once established, Prater Pulverizers will unfailingly maintain those standards.

For complete information address:

INDUSTRIAL DIVISION



1501 South 55th Court



No. 76, published by Division of Labor Standards, U. S. Department of Labor, Washington 25, D. C. 40 pages. 10 cents. Recommendations adopted at the conference held last December.

A Test for Mercerization in the Presence of Dyes. By Sidney M. Edelstein, Dexter Chemical Corp., 819 Edgewater Road, New York 59, N. Y. 7 pages. Gratis. Reprint from American Dye-stuff Reporter. Includes a brief discussion on the effect of aniline black on barium activity deter-minations.

Report on Behavior of Ferritic Steels at Low Temperatures. By H. W. Gillett and F. T. Mc-Guire. Published by American Society for Test-ing Materials, 260 S. Broad St., Philadelphia 2, Pa. 210 pages. 54. Experimental data on the low-temperature behavior of commercial, national emergency, SAE, and similar steels.

Electronics for Engineers. By J. Markus and V. Zeluff. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. 390 pages. \$6. 142 articles, reference sheets, charts and graphs reprinted from *Electronics*. Includes a brief section on electronic heating.

New Facts on Locating Regional Plants. Pub-lished by Ford, Bacon & Davis, 39 Broadway, New York 6, N. Y. 12 pages. Trends and mar-kets in southern and western states.

California Planning. Published by State Re-construction and Reemployment Commission, Sacramento, Calif. 65 pages. A survey based on annual reports of city and county planning com-missions. Contains maps and statistical data.

Economic Poisons, 1944-1945. Publication 213, published by Bureau of Chemistry, State of Cali-fornia, Department of Agriculture, 1125 10th St., Sacramento 14, Calif. 101 pages. Contains bioassay of household sprays, list of economic poisons registrants, summary in table form of samples examined, including arsenicals, sulphurs, metallic compounds, fluorine compounds, bo tanicals, petroleum oils and some miscellaneous compounds.

Nevada Mines, Sales Opportunities, 1946. Published by Board of Supervisors of Los Angeles County. 30 pages. A comprehensive survey of Nevada mines, indexed by counties and company or name of mine. Gives location and post office address of mine; name and address of owner; list of officers of company or operators; type of ore, description of development; equip-ment and number of employees.

Notes on Building-Block Materials of Eastern Oregon. GMI Paper No. 14. By Norman S. Wagner. Published by Oregon Department of Geology and Mineral Industries, 702 Woodlark Bldg., Portland, Ore. 6 pages. 10 cents. A pamphlet describing deposits of suitable raw ma-terials, tests for absorption and crushing strength of blocks, test results, equipment required and discussion of market area.

Economic Base for Power Markets in Wash-ington. Published by Bonneville Power Adminis-tration, Portland 8, Ore. A series of booklets averaging approximately 60 pages each, covering 8 counties in Washington. Surveys made for use in appraising the prospects for electric power con-sumption in the Pacific Northwest. Covers the physical base, the people and their incomes, pro-duction and employment, public facilities and finance. Contains maps, graphs, photographs and appendix tables.

Wealth and Resources of Utah. Published by Utah Department of Publicity and Industrial De-velopment, 210 Dooly Bldg., Salt Lake City 1, Utab. 47 pages. A pamphiet describing the agri-culture, industries, water development and re-sources of Utah. Gives a short summary of oil refining, beet sugar industry, metallic ore treating facilities, light metals and miscellaneous minerals deposits, and coal and byproducts. Includes a map of distribution and trade areas and many photographs. photographs.

Ten Years of Progress, 1934-44. State of Wash-ington. Published by Washington State Planning Council, 404 Transportation Bldg., Olympia, Wash. (Sixth and final report). 111 pages. A report of the council's survey of potentialities of land; water, including hydroelectric power mar-kets; population; transportation; industry, in-cluding forestry and forest products, light metals, mines and minerals; agricultural research; trade and commerce. and commerce.

Economic Base for Power Markets in Benton and Franklin Counties, Wash. Published by Bonneville Power Administration, Portland 8, Ore. 52 pages. A survey made for use in appraising the prospects for electric power con-sumption in the Pacific Northwest. Covers the physical base, the people and their incomes, pro-duction and employment, public facilities and finance. Contains maps, graphs, photographs and appendix tables.

Economic Base for Power Markets in Mon-na; Flathead and Lake Counties. Published tana;

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING



**T**HE "essentials" for a trout-stream fisherman are rubber hip-boots, fly-rod, flies . . . and experience! Any substitutes are handicaps. You need trout equipment . . . and trout technique. That expresses MOSINEE philosophy in terms of creative essential papers for industry. Experienced MOSINEE paper technicians find out what the function of paper must be in your product ... as well as how that paper can be adapted to your processing technique. And MOSINEE doesn't offer substitutes ... nor try to adapt a standard stock paper that merely approximates the chemical and technical characteristics your paper needs. That's why so many manufacturers find MOSINEE such a dependable source for production of essential industrial papers.



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



# Ask Us What PENSACOLA Can Offer Your Industry

Pensacola is especially advantageous as a site for paint and varnish, plastics and a variety of chemical industries. Many basic products for these industries are already produced here. Others are quickly obtainable by cheap water-haul. Steel shipping containers are also made here.

Pensacola has excellent port, barge-canal, highway, rail and air transportation facilities. The climate is ideal for year-round worker efficiency and for low plant construction and maintenance costs. Labor is cooperative, taxes are low and inexpensive electric power, coal and natural gas are available.

These, plus Pensacola's proximity to major U. S. and Latin-American markets, with a 52-hour "turn-around" service to Cuba, all clearly indicate that—PEN\$ACOLA I\$ THE \$POT.

Write today, for information telling us your requirements. Your letter will be held in strict confidence.



by Bonneville Power Administration, Portland 8, Ore. One 99-page volume; one 62-page volume. Surveys made for use in appraising the prospects for electric power consumption in the Pacific Northwest. Covers the physical base, the people and their incomes, production and employment, public facilities and finance. Contains maps, graphs, photographs and appendix tables.

Tentative Specifications and Tentative Standard Methods of Test for Liquefied Petroleum Gases. Bulletin TS:441. Published by California Natural Gasoline Association, 510 West Sixth Street, Los Angeles, Calif. 64 pages. \$1.50 to non-members: \$1.00 to members. Prepared for the use of manufacturers, marketers, and consumers who have occasion to gage, blend, sample, specify or test LPG products. Contains extensive gravitytemperature correction tables, NGAA volume correction factors, chart of corrected vapor pressures, diagrams and graphs.

Herbicidal Use of Carbon Disulfide. By H. A. Hannesson, R. N. Raynor, and A. S. Craits. Published by University of California, Berkeley, Calif. 57 pages. A survey of the history of carbon bisulphide; studies of toxicity, movement of vapor in soils, permeability, airflow and plot studies on soils, discussion of results and practical use. Contains statistics, graphs, diagrams and photographs.

Report and Recommendations (for the year ending December 31, 1945). Published by California State Reconstruction and Reemployment Commission, Sacramento, Calif. 167 pages. Summary of California's economic outlook for 1946 with fact-finding committee recommendations.

Bibliography of Geologic Literature and Maps of Nevada. Ceology and Mining Series No. 43. By Vincent P. Gianella and Robert W. Prince. Published by Nevada State Burcau of Mines and Mackay School of Mines, Reno, Nev. 205 pages. Compilation of sources of information on state's mineral resources with titles arranged according to mining districts and districts grouped according to counties. Maps are arranged by counties.

Report on Columbia River Power System. Published by U. S. Department of the Interior, Bonneville Power Administration, Portland 8, Oregon. 71 pages. Contains complete report for fiscal year 1945, including tables, photographs and auditor's report.

# GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington 25, D. C. In ordering any publications noted in this list always give complete title and the issuing office. Remittances should be made by postal money order, coupons, or check. Do not send postage stamps. All publications are in paper covers unless otherwise specified. When no price is indicated, the pamphlet is free and should be ordered from the bureau responsible for its issue.

Hides and Skins and Leather. U. S. Tariff Commission. War Changes in Industry Series, Report No. 13. Price 25 cents.

Aluminum, U. S. Tariff Commission. War Changes in Industry Series, Report No. 14. Price 25 cents.

Use of Training Aids in the Armed Services. U. S. Office of Education Bulletin 1945, No. 9. Price 10 cents.

Synthetic Organic Chemicals. United States Production and Sales, 1941-43. U. S. Tariff Commission. Report No. 153, Second Series. Price 30 cents. Prevention of Explosives Accidents in Metal

Prevention of Explosives Accidents in Metal Mines. Metal-Mine Accident-Prevention Course --Section 4. Bureau of Mines, Miners' Circular 54. Price 20 cents.

Chlorination of Magnesia. By H. A. Doerner and W. F. Holbrook. Bureau of Mines, Report of Investigations R. I. 3833. Mimeographed.

Rapid Specific-Gravity Method for Estimating the Iron Content of Birmingham, Ala., Red Ores.



# ... Its Superior Qualities Make It Ideal for a Wide Range of Industrial Uses

The Indians knew it, the Spaniards knew it, the French knew it, and those of English decent of the Southeastern regions have known for 150 years the superior qualities of Tidewater Red Cypress and its resistance to decay. Along the Atlantic Coastal Plain where lie buried cypress trees that grew over 100,000 years ago in the Pleistocene Age, many of which have since been dug up, give mute evidence of the lasting qualities of cypress never equalled for its decay resistance. In more recent years industry has also learned that it licks the difficulties of odor, taste and acid. Tidewater Red Cypress has ALL the qualities you demand for many specific industrial demands.



4232 DUNCAN AVE. • ST. LOUIS 10, MO. • NEWSTEAD 2100

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

The Reason for this Facting for this Fact

# Your GATES VULCO ROPES are Today Making Performance Records NEVER EQUALED Before!

No V-belts built by anyone before the war had anywhere near the strength and durability that was found necessary on U. S. Army tanks, tractors and self-propelled big guns in combat service. Gates developed these greatly superior V-belts for Army use—and here is why this fact is important to industrial users of V-belts:—

Here is the reason

Every improvement developed by Gates for U.S. Combat Units — and many later improvements, also—have been added, day by day, to the quality of the <u>Standard Gates</u> <u>Vulco</u> <u>Ropes</u> which have been delivered to you.

That is why, long before the war was over, you were getting in your Standard Gates Vulco Ropes a product built to far higher service standards than any V-belts ever built by anyone before the war.

And that is not all of the story. Through continuing *specialized* research, the service qualities of these superior Gates Vulco Ropes have been still further improved as all of Gates facilities and energies have been returned to the service of industry.

These are the simple reasons why the standard Gates Vulco Ropes you are getting today are far and away the best V-belts Gates has ever delivered to you.

# THE GATES RUBBER COMPANY

Engineering Offices and Jobber Stocks in All Large Industrial Centers





All Gates V-Belts

464

ATES VULCO ROPE DRIVE

CHICAGO 6, ILL., 549 West Washington. NEW YORK CITY 3, 215-219 Fourth Avenue. ATLANTA 3, GA., 521 C. & S. Nat'l Bank Bldg. LOS ANGELES 21, CAL., 2240 E. Washington Blvd. DENVER 17, COLO., 999 S. Broadway. DETROIT 2, MICH. 223 Boulevard Bldg. PORTLAND 9, ORE., 333 N.W. 5th Ave. DALLAS 2, TEXAS, 1710 N. Market St. SAN FRANCISCO 3, CAL., 170 Ninth St.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



Consider these questions for a moment: If you have vaults for filing tracings, blue prints or other valuable records; storage spaces where highly flammable liquids and chemicals are kept; bake ovens, dip tanks, spray booths, and electrical equipment—and a serious fire occurs, how long would you be out of production? How much damage would irreplaceable records and other materials suffer from improper extinguishing agents or methods? If the answers suggest a survey of your present fire protection then consider these facts:

C-O-TWO smoke detecting combined with fire extinguishing is new-modern. The slightest trace of smoke is detected instantly. This new C-O-TWO protection is not dependent upon heat. It operates instantly on the detection of smoke. C-O-TWO pressure release will automatically close doors and windows-isolating a fire. Dry subzero carbon dioxide gas from a C-O-TWO built-in system will extinguish a fire in seconds without damage to materials or machinery.

Portable extinguishers including the famous C-O-TWO Squeez-Grip valve—wheeled units or hose reel types, afford additional protection against incipient fires. All employ carbon dioxide, the fastest nondamaging fire extinguishing agent. C-O-TWO engineers will help you plan modern fire protection. Write for information.



By I. L. Feld, G. D. Coe, and Will H. Coghill. Bureau of Mines, Report of Investigations R. I. 3838. Mimeographed.

Manufacture of Sponge Iron in Periodic Brick Kilns, By Kenneth M. Smith and S. E. Burton, Bureau of Mines, Report of Investigations R. I. 3841. Mimeographed.

Suggested Methods for Installing Dust-Allaying Equipment in Bituminous-Coal Mines. By C. W. Owings. Bureau of Mines, Report of Investigations R. I. 3843. Mimeographed.

Performance of a Hydraulic Classifier Designed to Incorporate Four Hitherto Neglected Principles. By Will H. Coghill, G. D. Coe, and I. L. Feld. Burcau of Mines, Report of Investigations R. I. 3844. Mimcographed.

Mineral Resources Summaries. Final monthly or quarterly reports on various metals and minerals for which such statistical statements are issued by U. S. Burcau of Mines have been prepared to include annual figures for the calendar year 1945. Those requiring such statistics may now be supplied by the bureau on request.

Scheelite Deposits in the Northern Part of the Sierra de Juarez, Northern Territory, Lower California, Mexico. By Carl Fries, Jr. and Eduardo Schmitter. Geological Survey, Bulletin 946-C. Price 25 cents.

The Data of Geochemistry. 5th Edition. By F. W. Clarke. Geological Survey, Bulletin 770. This important volume is again available, in the 5th edition, reprinted without changes. Price \$1.25.

Heat Contents above 25°C. of Seven Manganese-Copper Alloys, By B. F. Naylor. Bureau of Mines, Report of Investigations R. I. 3835. Mineographed.

Missouri Valley Maps. Series of four reports with maps have been prepared showing mineral resources of Missouri River Valley. These are available singly at 40 cents each, or in a set \$1.50 for four, covering: Part I, Metallic mineral resources. Part II. Nonmetallic mineral resources. Part III. Fuel resources. Part IV. Construction materials. Orders and remittances should be addressed to Director, U. S. Geological Survey, Washington 25, D. C.

List of Available Publications of the U. S. Department of Agriculture. Revised to January 1945. Department of Agriculture Miscellaneous Publication No. 60. Printed.

Changes in Lemons During Storage as Affected by Air Circulation and Ventilation. By E. M. Harvey. Department of Agriculture Technical Bulletin No. 908. Price 10 cents.

Bulletín No. 908. Price 10 cents. Surplus Property Reports. Surplus Property Administration has made interim reports to Congress on various important groups of plants or commodities. Now available at Superintendent of Documents are the following, which report descriptions of existing facilities, as well as summaries of surplus property disposal policy: Aircraft and Aircraft Parts, 10 cents. Aircraft Plants and Facilities, 15 cents. Aluminum Plants and Facilities, 25 cents. Chemical Plants and Facilities, 20 cents. Supplement III. Progress in Disposal of Synthetic Ammonia and Alcohol Plants (for insertion in Chemical Plants and Facilities Report). 5 cents. Disposal of Government Iron and Steel Plants and Facilities, 15 cents. Nagnesium Plants and Facilities, 15 cents. Ocents. Government Owned Pipe Lines, 20 cents. Government Owned Pipe Lines, 20 cents. Supparent Owned Pipe Lines, 20 cents. Supparent Owned Pipe Lines, 20 cents. Government Acailities, 10 cents. Synthetic-Rubber Plants and Facilities, 10 cents. Transportation Facilities, 10 cents. Transportation Facilities, 10 cents. Synthetic-Rubber Plants and Facilities, 10 cents. Transportation Facilities, 10 cents. Synthetic-Rubber Order States 1944-

Statistical Abstract of the United States 1944-45. Bureau of the Census. Price \$1.75 (buckram).

Statistics of Natural Gas Companies 1944. Federal Power Commission, FPC S-44. For sale only by Federal Power Commission, Washington 25, D. C. Price \$1.

25, D. C. Price \$1. Federal Specifications. New or revised specifications which make up Federal Standard Stock Catalog have been issued on the following items: Soap; Grit, Hand, Cake P-S:576a. Paint; Primer-Sealer, (for) Plaster and Wallboard TT-P:55a. Gaskets; Rubber (natural or synthetic). Molded, Sheet, and Strip. HH-G-156b. Packing; Diaphragm HH-P-61d. Ink, Stencil; Opaque, for marking Non-Porous Surfaces (Metal, Glass, etc.) TT-1-558. Ink, Stencil; Opaque, for Marking Porous Surfaces (Wooden-Boxes, Fiber-Cartons, etc.) TT-1-559. Valves, Bronze; Angle, Check, and Globe, 125- and 150 Pound, Screwed and Flanged (for Land Use) WW-V-51a. Valves. Bronze, Gate; 125- and 150-Pound, Screwed and Flanged (for Land Use) WW-V-51A. Mendment-2. Floor-Covering; Rubber, Sheet ZZ-F-461. Amendment-1. Valves; Rubber ZZ-V-51a, Price 5 cents each.

C-O-TWO Detects Smoke . . . Kills Fire Saves Lives . . . It's Fast . . . It's Modern

C-O-TWO FIRE EQUIPMENT COMPANY Newark 1, New Jersey AFFILIATED WITH PYRENE MANUFACTURING COMPANY Sales and Service in the Principal Cities of the U. S. and Canade



# Trim, Modern CABINETROL Cuts Installation Time and Cost

Rambling, space-taking racks are a thing of the past. Control in the modern chemical plant is compact, centralized G-E Cabinetrol. It's attractive in design, safe to operate, and it costs no more!

Cabinetrol saves installation time and expense because it's a single, self-supporting unit. No cumbersome frames-no cluttered walls. Just one attractive, allmetal unit that will greatly enhance the appearance of your mill.

The savings in installation cost that you get with Cabinetrol usually far outweigh its higher original cost. Only two operations are necessary-placing the unit in the designated location and connecting external power, motor, and control leads.

### IT'S PRE-ENGINEERED

Cabinetrol is based on the use of standard enclosures equipped with the right combination of standard control devices. Each unit is pre-engineered to meet your specific requirements. All starters and accessory equipment necessary to your application are incorporated in the Cabinetrol unit before it is shipped.

# PROTECTS YOUR OPERATORS

CONTROL

S EXPENSIVE!

Because metal-enclosed Cabinetrol is completely deadfront, it offers your operators and servicemen maximum protection. Each motor control is installed in an individual sheet-steel compartment with an interlocking door. Operating mechanisms for motorcircuit switches and air circuit-breakers are available from the front of the panel.

LET US HELP YOU equip your plant with co-ordinated control. We'll be glad to work with you now-to provide a Cabinetrol system specially engineered for your plant-and, if you desire, to help you fit Cabinetrol into your over-all plans.

If you'd like more facts about Cabinetrol ask for Bulletin GEA-3856. Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

# **G-E INDUSTRIAL CONTROL**





H.C.THOMPSON CLOCK CO. BRISTOL, CONNECTICUT

# MANUFACTURERS' LATEST PUBLICATIONS

Chem. & Mct.'s Reader's Service, in cooperation with manufacturers, makes it possible for you to secure catalogs, bulletins, and other publications herein listed without cost or obligation (unless a price is specifically mentioned). Please check the items you wish to receive and fill out the coupon below. Then send to Reader's Service, Chem. & Met., 330 W. 42nd St., New York 18, N. Y.

1

Advertising. Magazines, Inc., Chicago, Ill.-6-page advertising brochure designed to assist in solving the problems incident to building a catalog, getting out flyers, or carrying on a publicity campaign. It is entitled "Your Catalog and Publicity Problems."

### 2

Automatic Clutch. Hardinge Co., Inc., York, Pa.-Bulletin No. 45. 8-page booklet illustrating and describing the Type BLM clutch for use in various types of drives.

3

Boilers. John Nooter Boiler Works Co., St. Louis, Mo.—Two leaflets featuring the facilities and services offered by this company in the manufacture of boilers and other process equipment. Includes data on this company's metallizing service, and also features the corrosion resistance equipment manufactured by this company.

### 4

Case Hardening. American Cyanamid & Chemical Corp., New York, N. Y.-4 data sheets each describing one of the following chemicals: Aero Brand Nitriding Salt, Aerocarb C, Aeroheat 1400, and Aerocarb Deep Case 40.

### 5

Conveyors. Speedways Conveyors, Inc., Buffalo, N. Y.--2-page leaflet featuring the Speed-Lift belt conveyor, which is adjustable, reversible, and portable. Specifications, sizes and capacities are included.

### 6

Crushers. Allis-Chalmers Mfg. Co., Milwaukee, Wis.-Bulletin 7B6006C features the Type R reduction crusher. Various features of this crusher are illustrated. Bulletin 7B5469 describes the A-1 jaw crusher med for tough, abrasive, high compressive strength materials. Capacities and sizes are given.

### 7

Diesel Engines. Cooper-Bessemer Corp., Mount Vernon, Oho-8-page folder featuring the Type FW-supercharged locomotive diesel engine available from this company.

### 8

Dryers. J. O. Ross Engineering Corp., New York, N. Y.--2-page leaflet featuring the ovens and dryers manufactured by this company.

### 9

Electrical Equipment. Cook Electric Co., Chicago, 111.—20-page booklet covering this company's line of electrical relays.

### 10

Electro-Coating. MacDermid, Inc., Waterbury, Conn. A data sheet is now available describing the electro-cleaning of copper-coated articles with Anodex 61-X. Included are typical cleaning cycles for use with any copper-coated article.

### 11

Equipment. Gardner-Denver Co., Quincy, Ill.-Illustrated brochure giving the history, organization and facilities of this company. Shows application pictures of the various products made by this company.

### 12

Equipment Lining. Industrial Lining Engineers, Inc., Edgewood, Pa.—4-page leaflet featuring the facilities and services offered by this company.

13

Evaporators. Swenson Evaporator Co., Harvey. 111.--52-page booket entitled "Heat Transfer and

## MAILING COUPON-GOOD UNTIL JUNE 30, 1946, ONLY

## **READER'S SERVICE, CHEMICAL & METALLURGICAL** ENGINEERING

330 West 42nd Street, New York 18, N. Y.

Please have manufacturers send me, without obligation, literature checked below.

 1
 2
 3
 4
 5
 6
 7
 8
 9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20

 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32
 33
 34
 35
 36
 37
 38
 39
 40

 41
 42
 43
 44
 45
 46
 47
 48
 49
 50
 51
 52
 53
 54
 55
 56
 57
 58
 59
 60

..... Title...

Company

Name

Street Address

City

Please fill out this coupon completely in order to avoid delay in handling. (Numbers correspond to descriptive paragraph numbers.)

Zone State

# INITIAL RUN 240 DAYS... BACK ON STREAM IN 11 DAYS!

This T C C unit of the Tide Water Associated Oil Co., in Bayonne, N. J., was placed on stream May 12, 1945. On last January 7th, it was shut down for inspection and minor repairs, having run 240 straight days at full capacity, charging a variety of five stocks.

After an eleven day "turnaround," this TCC unit resumed production of catalytic gasoline and is daily setting new records of on-stream efficiency. It provides another example of these notable TCC advantages:

- high percentage of on-stream time
- flexibility of operation
- Iow investment cost
- Iow operating cost
- high liquid recovery
- high quality and yield of gasoline
- stability of products
- continuous engineering service

## HOUDRY PROCESS CORPORATION WILMINGTON, DELAWARE

New York Office: 115 Broadway, New York 6 Houdry Catalytic Processes and the TCC Process are available through the following authorized firms: E. B. BADGER & SONS CO. Boston, Massachusetts BECHTEL-McCONE CORP. Los Angeles, Calif.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

田


### ✓ Saves Material V Lowers Costs

Tests of S & S Universal Fillers have shown savings in a single year, more than sufficient to pay for the machine.

525 **Two Station Filling Machine** 

Material ordinarily wasted in filling an individual package inefficiently, means little. But multiply this by the number of packages filled on a machine in one year and the waste becomes serious.

In fact, the accuracy of the S & S Universal Filler, resulting in a saving of 1/16 oz. per package, plus the increased speed of machine filling, may save the user as much as \$1000 in a year. This worthwhile saving is more than enough to pay for the machine.

S & S Universal Fillers are supplied in four models and as one, two or four station machines. For filling powders, granular products or pastes, by volume or gross weight. Auger or rotary feed as suits material.

While we can't turn out machines fast enough these days to meet the demand, now is a good time to discuss your requirements with us. S & S have recommended the best methods of filling and handling packagings for packers of nationally known products, with excellent results. Consultation invited.



4914 Summerdale Ave., Philadelphia 24, U. S. A. FILLING • PACKAGING • WRAPPING MACHINES Speeds to suit your needs --- 15-30-60-120 per minute

"Better machines for better packages"

Crystallization," a newly revised edition of a previous publication, edited by Dr. W. L. Badger, consulting engineer, and G. E. Seavoy, manager of this company. Includes chapters on basic prin-ciples of heat transfer, evaporator types, heat transfer coefficients in evaporators, steam economy of evaporaotrs, theory and practice of crystalliza-tion. This is a high calibre engineering handbook and contains a wealth of valuable information for the evaporator engineer.

#### 14

Fatty Acids. Emery Industries, Inc., Cincin-mati, Ohio.—Four loose-leaf pages for insertion in this company's loose-leaf data book, giving data on stearic-palmitic acid mixes. Includes informa-tion on the storage and handling of fatty acids and gives equipment and materials of construction for use in handling these materials. This table in-cludes data on storage tanks, heating coils, piping, valves, pumps, heat exchangers, processing vessels and shipping containers. One of these data sheets is devoted to the chemistry and applications of certain plasticizers, such as Azelaic acid.

#### 15

Filters. Filtration Engineers, Inc., Newark, N. J.—16-page illustrated bulletin featuring this company's rotary vacuum filters for various indus-tries including chemicals, foods, ceramics, metal-lurgy, pulp and paper, sewage, etc. The prin-ciples of operation of the FE String Discharge Rotary Vacuum Filter are discussed and illus-trated. Construction details are given and a sec-tion is devoted to materials of construction, motor drives, filter cloth, and the FE automatic valve.

#### 16

Filters. Niagara Filter Corp., Buffalo, N. Y.--Bulletin A.246. Booklet describing Niagara filter systems for a wide variety of applications in a number of different process industries.

#### 17

Fire Extinguishers. Walter Kidde & Co., Inc., Belleville, N. J.—12-page booklet illustrating and describing the inspection and maintenance of fire extinguishers. Covers in detail the maintenance system required for this work. The different kinds of extinguishers used, their inspection, refilling and maintenance are included.

#### 18

Flame Cutting. Victor Equipment Co., San Francisco, Calit.—4-page illustrated folder fea-turing the portable flame-cutting outfits which can be carried and operated by one man.

#### 19

Gas Alarm System. Davis Emergency Equip-ment Co., Inc., Newark, N. J.—Technical Bul-letin No. 1116 E describes a method for detecting and giving audible notification of hazardous gas or vapor conditions sometimes present during in-dustrial processing operations. This 8-page bulle-tin describes the various combinations possible and illustrates the different parts of the equipment. Operating principles, together with installation diagrams, are included.

#### 20

Gas Atmospheres. Surface Combustion Corp., Toledo, Ohio.—12-page bulletin, No. SC-129, fea-tures the preparation and use of gas atmospheres for heat-treating purposes. The development and use of gas atmospheres in heat-treating is covered in detail, and the preparation of these atmospheres, using different gases is discussed. Equipment for preparing these gases is illustrated with pictures as well as cross-sectional diagrams showing operat-ing principles. A table showing the composition of gases, applications, capacities of units and costs for different gas atmospheres is included.

#### 21

Heat Exchangers. Griscom-Russell Co., New York, N. Y.-Bulletin 1614. 16-page catalog illustrating and describing the twin G-Fin element used in heat transfer equipment. The outstanding features of this equipment are listed in tabular form with corresponding advantages. Construc-tion details, including specifications, sizes, dimen-sions, for the different types of elements, are illustrated and listed.

#### 22

Laminating Resins, Reichhold Chemicals, Inc., Detroit, Mich.—Booklet entitled Phophen Phenolic Resins for Bonding and Laminating. Contains formulas and complete descriptions of all this company's Pliophen resins.

Lead Equipment. O. G. Kelley & Co., Boston, Mass.-44-page booklet featuring the use of lead in chemical and processing plants. Applications of lead for various purposes are illustrated and described, and the important properties and uses of different kinds of lead are given. The dif-



WHEREVER tubing is needed that is highly resistant to severe alkaline corrosion or to low-temperature embrittlement, B&W Nicloy Seamlers Tubes can always be depended upon to provide the right answer. Because they have been developed expressly to combat those tube hazards, Nicloy Seamless Tubes give long, satisfactory service life, and at moderate cost. Nicloy Tubes are much more resistant to attack by alkaline media and have higher impact values at sub-zero temperatures—than do any carbon steels and many of the usual alloy steels.

Nicloy Tubes are especially suited to such applications as these: handling crude oils with substantial salt water and hydrogen sulphide content; handling liquefied gases or other low-temperature fluids in such processes as oil dewaxing; in black liquor recovery units and evaporators of pulp and paper mills; for caustic solution evaporation and alkalinephenol solution work.

Nicloy Tubing can be readily rolled-in, expanded, or flared and can be produced to standard dimensional tolerances. Investigate the advantages of Nicloy Tubing and let the B&W Research Staff help you apply Nicloy's superior service characteristics to your tough tube jobs. Write for detailed B&W Tube Specifications.







B

0

### LESLIE

- Section of Operating Board in Power Plant of Beattie Manufacturing Co. (A)
- LESLIE Class PTH Pump Governor on Turbine Driven Feed Pump maintaining constant feed water pressure to boilers. (8)
- LESLIE Class PRH Pump Governor on Recipro-(C) cating Pump maintaining constant water pressure in Beattie Dye House.
- LESUE Class LTCO Temperature Regulator in Beattie boiler room controlling tempera-ture of fuel oil to burners and holding within ±2 under all load conditions. (D)

LESLIE CO. 279 Grant Avenue • Lyndhurst, N. J.



## DOES YOUR OPERATING **BOARD SHOW THIS PICTURE** of AUTOMATIC CONTROL?

These operating board gages in the power plant of Beattie Manufacturing Company, makers of Axminster, Velvet and Wilton Rugs, Little Falls, N. J., tell a real "behind-the-scenes" story of steam power automatically controlled to extremely close limits regardless of load variations.

The second gage, recording boiler feed water pressure shows 470 lbs. set pressure maintained by a LESLIE Pump Governor which completely controls operation of turbine-driven feed pump. Third gage indicates efficient operation of a LESLIE Pressure Controller working instantly to make up any deficiencies in low

> pressure heating system. This make-up steam is taken from 125-lb. system and controlled so that pressure is held accurately at 9 psi.

The steady needle pointer on fourth gage shows process steam reduced to 120-lbs. by a LESLIE Pressure Controller from 400-lbs. initial boiler pressure, shown on first gage.

The real reason for this extreme accuracy of control lies in LESLIE'S policy of only building better regulators — giving extra features such as stellited valve seats, surface hardened

stainless steel valves and heat-treated stainless steel cylinder liners with highly ground finish—all as standard equipment which guarantees positive dead-end service and close regulation.

Investigate today the savings which LESLIE Regulators make possible. Write for LESLIE Catalog of Engineering Data.

Look for "LESUE Regulators" in your classified telephone directory in these cities, for LESUE factory-trained engineers to help you with your regulation problems:

Baltimore, Md. Boston, Mass. Anntreal, Que,, Can. Bridgeport, Conn. New Orleans, La. Chicago, Ili. View York, N. Y. Cleveland, Ohio Philad elphia, Pa. Datlas, Tex. Detroit, Mich. Greenville, S. C. Houston, Tex. Kichmond, Va. Kantos City, Mo. Rochester, N. Y. Los Angeles, Cal. Rutherford, N. J. Louisville, Ky. San Antonio, Tex. San Francisco, Cal.

San Francisco, Cal. Savannah, Ga. Seattle, Wash. St. Louis, Mo. Syracuse, N. Y. Toronto, Ont., Can. Troy, N. Y. Tulsa, Okla. Vancouver, B.C., Can. Wilkes-Barre, Pa. Youngstown, Ohio

PRESSURE REDUCING VALVES . PUMP GOVERNORS . PRESSURE CONTROLLERS TEMPERATURE REGULATORS . SELF CLEANING STRAINERS . LESLIE-TYFON WHISTLES ferent types of lead fittings and pipe are included and the different weights and wall thicknesses for different sized lead pipe are given. A section is devoted to the recommended materials of con-struction for some 44 different chemicals.

#### 24

Leather Belting. E. F. Houghton & Co., Philadelphia, Pa.—Large-size wall chart covering all phases of "Care of Leather Belting." Includes detailed information on installation, operation, maintenance, etc. Covers such details as cutting leather belts, preparing surfaces, cementing, lacing. Includes engineering information on how to cal-culate belt speeds, belt sizes, pulley ratios, etc.

#### 25

Liquid Level Sight Gages. Jerguson Gage & Valve Co., 87 Fellsway, Somerville 45, Mass. 4-page leaflet illustrating the various types of liquid-level gages and specialties manufactured by this company. Specifications, sizes, and list prices are included.

#### 26

Lubrication. Gulf Oil Corp., Pittsburgh, Pa.-20-page booklet featuring the manufacture of lubricating oil for steam turbines. Includes a pic-torial description of the Gulf Alchlor process for refining lubricating oils.

#### 27

Magnetic Drives. Electric Machinery & Mfg. Co., Minneapolis, Minn.—16-page illustrated book-let describing the magnetic adjustable-speed drives for boiler draft fans, centrifugal blowers and compressors, and other applications. Principles of operation, performance characteristics, and ap-plications are described.

#### 22

Materials Handling. Jeffrey Mfg. Co., Colum-bus, Ohio-Catalog 791. 32-page catalog illustrat-ing and describing the materials handling and process equipment manufactured by this company. Includes information on vibrating feeders, weigh feeders, rotary bins, check valves, bin level indi-cators, mechanical feeders, reduction machinery, screens, magnetic separators, elevating machinery, conveyors, and other equipment. Also 6-page folder featuring the Bin Eye Indicator for positive accurate control of bin level.

#### 29

Materials Handling. Robins Conveyors, Inc., Division of Hewitt Rubber Corp., Passaic, N. J. —Bulletin 128. 8-page booklet featuring the Robins Car Shakeout for rapidly emptying hop-per bottom railroad cars. The principle of op-eration is described and illustrated pictorially. Operations of the various applications of the Robins Car Shakeout are described for the dis-charge of different types of material.

#### 30

Mercerizing. Dexter Chemical Corp., New York, N. Y.—Booklet containing two reprints entitled "A Test for Mercerization," and "The Effect of Aniline Black on Barium Activity De-terminations." Also a 12-page booklet featuring the use of Dyphenol in mercerizing operations.

#### 31

Metal Fabrication. Hungerford Corp., Big Flats, N. Y .--- 16-page pictorial booklet describing the metal fabrication services and facilities available from this company.

#### 32

Metallurgy. Sam Tour & Co., Inc., New York, N. Y.--2-page leaflet describing the facilities and services of this company.

#### 33

Packing. Graton & Knight Co., Worcester, Mass.--336-page book describing the selection of mechanical packing packs, their application, and the design of adjacent parts in hydraulic or pneu-matic equipment. Basic principles which influ-ence packing life and machine performance are outlined. Includes data on both leather and synthetic rubber packings, as well as illustra-tions and photographs of various packing designs, and applications. Nearly fifty reference tables are included to save time-consuming calculations. Price, \$4.50.

#### 34

Paint. Peninsular Chemical Products Co., Van Dyke, Mich.--4-page leaflet describing "Pen-Kote 500 Maintenance Paint" manufactured by this company. Outstanding properties of this paint, together with instructions for applications, are included.

#### 35

Paper Bags. Bemis Bros. Bag Co., 408 Hines

## Lost in a Maze of Pipe Processing Troubles? Turn to...



— expertly fabricated in any size, any amount, for any job:

OIL • GAS • CHEMICALS STEAM • WATER • AIR

Whatever your requirements, we are completely equipped to precision-tailor them more accurately and more economically.

### IF IT'S FABRICATION - CONTACT FLORI



St., St. Louis 2, Mo.-8-page booklet describing the proper method used in caring for paper bags in storage and how to protect paper bags from deterioration.

#### 36

### For Handling **All CLEAN LIQUIDS REGARDLESS of VISCOSITY**

See Our Catalog In SWEETS

### The Viking Pump is designed from start to finish

for the handling of all clean liquids regardless

of viscosity. It is noted for its "2 Moving Parts-Gear Within A Gear" principle, its single outside bearing and packing box, its smooth, positive performance with no pulsation, its simple, correctly engineered construction for the job.

In addition, the most complete line of styles and sizes in the rotary pump field eliminates compromise in your selection. The correctly engineered Viking Pump built to fit your job assures dependable and economical service.

Send for free Bulletin Series 802 today. It completely illustrates and describes Viking Pumps for the chemical and metallurgical field.

VIKING PUMP COMPANY **CEDAR FALLS, IOWA** 



Plastics. Bakelite Corp., 300 Madison Ave., New York 17, N. Y-19-page illustrated booklet describing and illustrating Vinylite Plastic Elasto-meric compounds. Includes data on molding and extrusion compounds, flexible sheathing and film, cloth coating compounds, and other valuable in-formation formation

#### 37

Plastic Specialties. The Emeloid Co., 286 Laurel Ave., Arlington, N. J.---24-page catalog featuring the plastic advertising specialties manu-factured by this company.

#### 3.2

Petroleum Process. Chefnical Construction Corp., Empire State Building, 450 Fifth Ave., New York 1, N. Y.—Bulletin S-107. 6-page leaflet describing the Chemico alkylation acid re-generation process. Details of this process are shown in diagram form and each unit of the process is discussed.

#### 39

Porcelain Enamel. Farrel Enamel Corp., 4150 E. 56th St., Cleveland 5, Ohio-Booklet entitled "Guide and Reference for Color in Porcelain Enamel" which features the oxides and colors manufactured by this company for use in tint-ing porcelain enamels and plastics. A color chart is also available from this company which illus-trates the basic oxides and some of the blends that can be made from base colors.

#### 40

Pressure Control. Meletron Corp., 950 N. Highland Ave., Los Angeles, 38, Calit.,--8-page booklet featuring pressure-operated switches which operate from 30 in. of Hg. vacuum to 5,000 lb. per sq. in. pressure for use in gas, steam, oxygen or oil systems.

#### 41

Process Equipment. The Youngstown Welding and Engineering Co., 3700 Oakwood Ave., Youngstown 9, Ohio-16-page brochure illustrat-ing and describing the various types of process equipment, tubing, fittings, etc., made by this company.

#### 42

Product Testing, Pattsburgh Testing Labora-tory, Pittsburgh, Pa.—30-page brochure illustrat-ing and describing in detail the services and facilities offered by this company in its district branches and laboratories throughout the U. S., Canada and England. These services include testing of materials, field inspection and testing and product performance testing in many indus-trial fields.

#### 43

Pulverizers. Prater Pulverizer Co., 1825 So. 55th Ave., Chicago 50, Ill. 16-page booklet featuring the dual-screen pulverizer for use in the process industries. Principles of operation are illustrated and discussed, and the application of this piece of equipment to various industries is covered covered.

#### 44

Pumps. The ECO Engineering Co., 12 New York Ave., Newark 1, N. J.-2-page illustrated instruction sheet describing the installation and operation of ECO gearless pumps used for circu-lating water and oil. Pump dimensions, capacity checks and prices are included.

#### 45

Pumps. Ingersoll-Rand Co., Phillipsburg, N. J.--Bulletin 7057. 20-page illustrated catalog covering the design, construction, and engineering details of the Cameron single-stage general service pumps manufactured by this company. Applica-tions and installations are illustrated and some typical pumping problems are described.

#### 46

Pumps. Taber Pump Co., 288 Elm St., Buffalo 3, N. Y.—Bulletin No. S-146. 8-page illustrated brochure discussing the use of various types of pumps in different applications. Discusses basic principles of pump selection.

47

Regulating Valves. Strong, Carlisle and Ham-mond Co., 392 W. 3rd St., Cleveland, 13, Ohio---Catalog 155. 12-page illustrated catalog featuring pressure regulating valves for steam, air and gas, furnished by this company. Types, sizes and capacities, together with list prices are given.



for COOLING LIQUIDS FROM 212°F TO 40°F

> These coolers are designed for either continuous or batch operation. The cooler shown at left is designed to continuously cool 376,000# distillery mash and slops per hour from 190° to 75° F. The completely automatic controls system eliminates the necessity for an operator. There are no moving parts to wear. These units can be furnished in sizes to meet your requirements and fabricated of the proper materials to meet your conditions. When writing please state kind and quantity of material to be cooled, amount and temperature of cooling water available, steam available, and pressure.

We will be pleased to give complete information as to operation and costs.

## The GUARDITE CORPORATION Vacuum Process Engineers 332 S. MICHIGAN AVENUE • CHICAGO, ILLINOIS



R. E. BURGER STATION Ohio Public Service Co.

I his 850 lb., 900 degree Power Piping Installation is an example of the specialized fabrication and erection experience which Daugherty Company provides to the power and process industries.

DAUGHERTY's facilities include: FABRICATION of high pressure, high temperature piping including alloy tubing • EQUIPMENT for field stress-relieving and radiographic inspection • WELDERS qualified for all classes of work • SUPERVISION by unexcelled metallurgical engineering and construction staff.

Daugherty Company, Inc.

502 Union National Bank Building, Youngstown 3, Ohio PIPING CONTRACTORS for the POWER and PROCESS INDUSTRIES

Details of operation are illustrated and discussed. Comprehensive capacity tables are given and accessory equipment such as strainers, separators and traps are described.

#### 48

Resins. Hercules Powder Co., Wilmington, Del.—8-page booklet describing Polypale resin, a polymerized rosin which is used in the paint and varnish industry. Physical and chemical properties are given, color, grades and applications are described.

#### 49

Resins. Synvar Corp., Wilmington, Del.—New instruction pamphlet covering uses of a series of resorcinol-type resins manufactured by this company. Includes data on many applications for the Synvaren PLS-resins and includes data on their properties.

#### 50

Relief Valves. Farris Engineering Co., Palisades Park, N. J.—Catalog No. 45. Catalog featuring safety and relief valves manufactured by this company. A catalog supplement, No. 45 A, gives prices for this equipment.

#### 51

Scales. O. K. Scale Co., 1389 Niagara St., Buffalo 13, N. Y.-Bulletin No. 38. Two-page leaflet featuring the O. K. bagging scale for filling and weighing materials burlap, cloth or paper sacks.

#### 52

Slime Prevention. Wallace and Tiernan Products, Inc., Belleville 9, N. J.--4-page leaflet featuring the use of chlorination for the removal and prevention of slime fouling on waterside surfaces.

#### 53

Stainless Steel. Allegheny Ludlum Steel Corp., Brackenridge, Pa.—100-page handbook of stainless steel containing data on types of stainless and corrosion resistance against various materials. Discusses properties, products, available forms and sizes and fabrication methods. Contains general tables of bar weights, weights of sheets, weights of tubes, etc.

#### 54

Stainless Steel. Lebanon Steel Foundry, Lebanon, Pa. 4-page leaflet featuring the straight chromium stainless steels made by this company. Includes data on the live grades of stainless made by this company. Contains a list of materials which do not corrode these steels.

#### 55

Storage Batteries. Gold Storage Battery Corp., Depew, N. Y.—Catalog 100. Illustrated catalog featuring the storage batteries manufactured by this company for industrial truck and tractor service. Included are discussions on the theory of lead-acid storage batteries and the care and maintenance of batteries.

#### 56

Synthetic Rubber. Raybestos-Manhattan, Inc., Passaic, N. J.—Bulletin No. 6885. New folder illustrates and describes Flexlastics which are compounds of natural and synthetic rubbers combined with age-resisting chemicals. pigments, fillers, etc., to produce a balance, coordinated and homogeneous material.

#### 57

Turbine Pumps, Worthington Pump & Machinery Corp., Harrison, N. J.—Bulletin RP-277. 4-page illustrated reprint entitled "Influence of Groundwater Level on Turbine Well Pump Performance."

#### 58

Visual Study Curve. American Optical Co., Southbridge, Mass.—A brochure entitled "Industrial Visual Efficiency, A Management Opportunity" describes a vision testing program developed and designed to promote industrial efficiency by testing employees who need eye examinations and correction.

#### 59

Welding. Handy & Harman, New York, N. Y. -4-page leaflet featuring the use of this company's low-temperature brazing alloys.

#### 60

Wood Tanks. O. G. Kelley & Co., Boston, Mass.—16-page booklet illustrating and describing the various types of wood tanks manufactured by this company. A wide variety of applications are illustrated. Tables of dimensions, capacities and weight of the various types of tanks are given.

## The Nash Clean-Air Compressor has but one simple moving part.



The Nash Clean-Air Compressor has but one moving part, cast in one piece and rotating in the pump casing without metallic contact. No internal lubrication is necessary; therefore air or other gas compressed with a Nash is entirely free from oil contamination.

Dust and heat are removed from the air, or gas compressed, by the unique Nash "Liquid Piston". Air from a Nash Compressor is therefore delivered free from dust, heat, or oil, without supplementary filters or air washers, in a perfected mechanical structure with no internal wearing parts.

Air or gas from a Nash Compressor may be used for agitating, blending, maintaining pressure on storage tanks, or moving liquids and materials by pressure displacement, in connection with the most delicate food, beverage, or chemical process, without danger of contamination.

Bulletin D-252 tells all about Nash Clean-Air Compressors, and it is free on request.

## THE NASH ENGINEERING COMPANY SOUTH NORWALK, CONNECTICUT. U.S.A.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

# SEE FAIRBANKS-MORSE FIRST FOR MOTORS

Fairbanks-Morse Motors outstanding. Today, they are an accepted standard in industry.

They serve dependably in underground dampness, in dust-choked mills and elevators, amid the flying chips of iron and steel in the metalworking industry, and on many other difficult jobs.

That's why so many motor users insist on Fairbanks-Morse Motors ... and that's why you can specify them with assurance of satisfaction.

Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

**Fairbanks-Morse** 

Diesel Locomotives • Diesel Engines Scales • Motors • Pumps • Generators Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment

A name worth remembering

## CHEMICAL ECONOMICS-

H. M. BATTERS, Market Editor

#### INDUSTRIAL CONSUMPTION OF CHEMICALS IN FIRST QUARTER HIGHER THAN A YEAR AGO

PRODUCTION of chemicals has been gaining ground and is rapidly returning to the highest levels reached in wartime. As measured by the index of the Federal Reserve Board, the output in first quarter of this year was somewhat less than 3 percent below that for the comparable period of last year and less than 5 percent under that of the second quarter of 1945, which formed the record period. With the closing of some government plants and the drop in demand for chemicals for the manufacture of ammunition, there has been a change in the relative activity of some of the more important chemicals with several now being turned out in reduced volume. It is obvious that marked increases in outputs in other materials are necessary to keep the over-all total on a rising line. The progress in industrial chemical production is shown in the index number for last December which is revised to 378 and which moved up to 386 in January and to a preliminary figure of 389 in February.

Consumption of chemicals likewise is moving forward with the Chem. & Met. index for January sharply revised to 192.92 which is an all time high for industrial consumption. The unadjusted index for February fell to 175.22 due to the reduction in the number of working days and the precipitous drop in activities in the steel and coke industries. In some cases daily rates of operation were higher in February as shown by the fact that superphosphate production fell but little below the January figure and woodpulp output also compared favorably with that for the preceding month.

A study of the individual consuming industries shows that only a few of them are holding at or near their highest points. Fertilizers, rayon, and plastics have contributed more than their share to the rise in the index numbers and rubber production which should hold about the same as last year is more important because of the larger percentage which is moving into civilian use. A large part of packaging requirements still rests upon glass and this is reflected in the high outturn of glass containers. Flat glass is becoming increasingly important and as the building and automotive programs gather headway, requirements for plate glass should be larger than at any previous time in the history of the industry. Plate glass production in February amounted to 13,849,000 sq. ft. which is the largest monthly total since November 1941.

Work stoppages have directly affected outputs of such products as steel and some of the coal-tar chemicals, notably sulphate of ammonia, so that the possibility of new production records this year has been eliminated. But in other important industries, with the exception of petroleum refining and textiles, conditions from a demand standpoint warrant new highs for output although in the case of textiles, it is the curtailment of demand on the part of manufactures and not of consumers which is the deterring fac-These premises lead to the conclusion tor. that the Chem. & Met. index for consumption of chemicals will advance considerably above its present figure. Had normal conditions prevailed in January in the steel and coke industries the index for that month would have crossed 200. Estimates have been made that chemical production this vear will double that of 1939. As the Chem. & Met. index for 1939 stood at 124.15. it is possible that consumption of chemicals at some period during the year will come close to doubling the 1939 rate of opera-

#### Chem. & Met. Index for Industrial Consumption of Chemicals 1935=100

|   | Jan.   | Feb   |
|---|--|---|
| Fertilizers<br>Pulp and paper<br>Patroleum refining<br>Paint and varuish<br>Fron and Steel<br>Rayon<br>Pextiles<br>Coal products<br>Leather<br>Leather<br>Leather | Jan.<br>revised<br>45,11<br>20,55<br>18,50<br>21,60<br>18,41<br>7,58<br>20,62<br>11,04<br>6,47<br>4,65<br>5,24 | Feb<br>44.0<br>19.7<br>16.8<br>20.5<br>17.8<br>2.0<br>18.7<br>10.2<br>2.3<br>4.6<br>5.2 |
| Rubber<br>Plastics  | 6.90<br>6.25   | 6.8<br>6.1  |
|   |  |   |

tion. Rayon production for the quarter was at a rate much more than double the 1939 figure.

Export demand for chemicals has been active and outward shipments will increase as stocks become more plentiful. Such shipments naturally will take up a part of production but domestic consumption has been aided by making surplus government chemicals available for industry. For instance the large stocks of phosphorus on hand at the close of the war were turned over to chemical manufacturers. Early this month it was announced that more than 180,000 tons of excess sulphuric acid stocks in the form of oleum and spent acid stocks been declared surplus by the Army Ord-nance Department since V-J Day. Almost 60 percent of the spent acid coming from TNT manufacture was sold to private industry before July 1, 1944. Since the war the Ordnance Department has processed the left-over stocks of oleum to salable strength and purity for disposal through the War Assets Corp.

Soap makers have worked so far this year under the restrictions which were in effect in the latter part of last year. Some indications of improvement are noted in reports that shipments of copra from the Philippines are gaining in volume with still larger shipments in prospect for the latter part of the year. Paint makers have found no relief in the tight situation surrounding pigments and drying oils. The quota for lead pigments for the second quarter has been cut to 381 percent of that used in the first half of 1944. This represents a cut from 48 percent allot-ted for the first quarter. While the output of titanium pigments has held up well and is expected to be expanded, the amounts made available for civilian use arc not sufficient for all requirements and attempts are being made to have the Navy cut down its consumption through the use of substitute materials.



## Reduce Pressure Problems



The CASH-ACME Type "B" Pressure Reducing and Regulating Valve is imade to be installed and forgotten.

Quality materials and workmanship have been combined to make the Type B. under normal operating conditions, give many years of DEPENDABLE, TROUBLE FREE SERVICE. Available for Industrial applications on STEAM. WATER, AIR, OIL, and many other GASES & LIQUIDS in sizes ranging from ¼" to 2" inclusive.



#### CONTINUED WORLD SCARCITY OF NITROGEN FORECAST

OFFICIAL compilations of the world nitrogen situation have not been available in recent years but estimates for requirements and production as far ahead as the 1947-48 season were published last month in The Financial Times of London. There is no information about Russian requirements or production, hence that country is not included in the compilation. Data for the other countries were prepared by what is described as "a well-known nitrogen expert."

The article points out that prior to the war, the International Nitrogen Cartel was in operation to control the excessive world capacity while now there is a worldwide shortage which will continue through the 1947-48 season. Commenting on the position of the industry in the separate geographical divisions, the article states that United States capacity at the end of the war had reached 1,250,000 tons but since then six plants have been closed. Thus annual production is now only about 735,-000 tons with another 210,000 tons in Canada.

In Cermany, current production is estimated at 200,000 tons which will be increased next year if the coal supply improves. Shortage of coal also limits production in Italy and has diverted hydroelectric power for other uses. In Japan output has been reduced to an annual rate of 100,000 tons as a result of war damage. Plants for 100,000 tons are under discussion in India.

#### Estimates of World Requirements and Production of Nitrogen

|   |                   | 1,00            | 0 tons c                       | of nitrog         | en              |                                |                   |                 |                                |  |
|---|-------------------|-----------------|--------------------------------|-------------------|-----------------|--------------------------------|-------------------|-----------------|--------------------------------|--|
|   | 1945-46           |                 | -14                            | . 1946-47         |                 |                                | 1947-48           |                 |                                |  |
|   | Require-<br>ments | Pro-<br>duction | Distri-<br>bution <sup>1</sup> | Require-<br>ments | Pro-<br>duction | Distri-<br>bition <sup>1</sup> | Require-<br>ments | Pro-<br>duction | Distri-<br>bution <sup>1</sup> |  |
| United States and Canada.                         | 1,015             | 945             | 900                            | 1,015             | 1,000           | 965                            | 1,015             | 1,050           | 985                            |  |
| British Empire                                    | 350               | 310             | 315                            | 375               | 310             | 340                            | 400               | 310             | 380                            |  |
| Central and South America                         | -40               | 270             | 35                             | 40                | 320             | -40                            | 45                | 340             | 45                             |  |
| Europe and Egypt, exclud-<br>ing Germany, Poland, |                   |                 |                                |                   |                 |                                |                   |                 |                                |  |
| Czechoslovakia                                    | 725               | 340             | 615                            | 950               | 470             | 730                            | 1,000             | 550             | 840                            |  |
| Germany, Poland, Czecho-                          |                   |                 |                                |                   |                 |                                |                   |                 |                                |  |
| slovakia  | -100              | 200             | 200                            | 500               | 400             | 400                            | 500               | 500             | 500                            |  |
| Far East, excluding Japan.                        | 100               | 50              | 50                             | 120               | 100             | 100                            | 175               | 150             | 150                            |  |
| Japan   | 400               | 100             | 100                            | 400               | 100             | 100                            | 400               | 100             | 100                            |  |
| Total   | 3,030             | 2,215           | 2,215                          | 3,400             | 2,700           | 2,700                          | 3,535             | 3,000           | 3,000                          |  |
| Deduct for industrial use                         | 365               | 365             | 365                            | . 365             | 365             | 365                            | 365               | 365             | 365                            |  |
| Agricultural nitrogen                             | 2,665             | 1,850           | 1,850                          | 3,035             | 2,335           | 2,335                          | 3,170             | 2,635           | 2,635                          |  |

Includes 275 tons industrial nitrogen for the United States and Canada; 65 tons for the British Empire; 25 tons for Europe and Egypt.



for the Smaller Chemical Plant ....positive, experienced, practical Chemical Engineering for better, cleaner, more economical production You'll get action when you



S. D. HICKS & SON COMPANY 1671 HYDE PARK AVE., BOSTON 36, MASS. New YORK OFFICES



evillac O A Plasticize<sup>x</sup> Specifications and Properties

Sp. Gr. © 30° 15.6°C..... Viscosity (Gardnet-Holdt)... Distillation by volume.....

W (average) @ 25°C Essentially between 300°C and 375°C

.Amber

Good

5% 1.5355 . . Sweet, Characteristic

Max..% off @ 300°C.... Refractive Index @ 20°C... Molecular Weight... Odor ..... Color Color Retention....

# rields of Use

Adhesives of the waterproof, optical, shoe, packaging and pressure sensitive types; Paper coatings both waterproof and greaseproof and for ordnance wrep; Paints and varnishes including laminating varnishes, printing and duplicating inks; Artificial leather and leather finishes;

As a plasticizer for ethyl cellulose in Raincoats; lacquers, plastics and stripping compounds.

HIS new plasticizer is an alkylated phenol and has a wide range of solubilities and compatibilities. It is soluble in almost all liquids except water and glycerol. It is compatible with most synthetic resins including cellulose esters and ethers (nitrocellulose, ethylcellulose, cellulose acetate, etc.), vinyl acetate, vinyl butyral, zein, nylon, and partly compatible with vinyl acetate and chloride copolymer.

Being an alkylated phenol, Nevillac OA undergoes typical reactions. For instance, with formaldehyde, oil-soluble phenolic resins are produced which can be formulated as such in varnishes, or can be used in fortifying rosin, rosin esters, alkyd resins and established types of phenolic resins.

Write for gratis sample and further information on Nevillac OA lor your particular application.

A-21

### THE NEVILLE COMPANY PITTSBURGH, 25, PA. Chemicals for the Nation's Vital Industries

BENZOL . TOLUOL . XYLOL . TOLLAC . NEVSOL . CRUDE COAL TAR SOLVENTS HI-FLASH SOLVENTS . COUMARONE INDENE RESINS . PHENOTHIAZINE . TAR PAINTS RUBBER COMPOUNDING MATERIALS . WIRE ENAMEL THINNERS . DIBUTYL PHTHALATE RECLAIMING, PLASTICIZING, NEUTRAL CREOSOTE, AND SHINGLE STAIN OILS

### **PRODUCTION AND CONSUMPTION TRENDS**



| NITRIC ACID                |
|----------------------------|
|                            |
| 1945                       |
|                            |
|                            |
|                            |
| JFMAMJJASONI               |
|                            |
| 1945                       |
|                            |
|                            |
|                            |
|                            |
|                            |
| PHOSPHATE OF SODA TRIBASIC |
|                            |
|                            |
| 1945                       |
|                            |
|                            |
|                            |
| METHANOL SYNTHETIC         |
| <b></b>                    |
|                            |
|                            |
| 1945                       |
|                            |
|                            |
| PETROLEUM REFINED          |
|                            |
| 1945                       |
|                            |
|                            |
|                            |
| WOODPULP                   |
|                            |
|                            |
|                            |
|                            |
| 1945                       |
|                            |
| GLASS CONTAINERS           |
|                            |
|                            |
|                            |



1945

**PASED** ON activities carried out in the first quarter of the year, the manufacture and distribution of chemicals is moving ahead and is approaching the highest tonnages ever recorded by the industry. Based on expansion plans already announced future capacities will be considerably higher than those now installed. General production, in the face of adverse conditions, continued to decline during the quarter but the only effect on chemicals was to restrict the rate of growth. Sea-sonal influences were at work during the quarter as was seen in larger outputs of agricultural chemicals such as calcium arsenate, lead arsenate, ammonium nitrate, and superphosphate. Production of copper sulphate, for which there is a record demand, was held in check by labor troubles at important producing plants.

The position of chlorine has brought out considerable discussion because all of available capacity is not now being utilized and stocks of chlorine and its derivatives are large enough to subject some of them to selling pressure. However there is good reason to believe that before long chlorine requirements will increase materially and that larger production schedules will be put into effect.

production schedules will be put into effect. Some of the important basic chemicals such as soda ash and caustic soda have been turned out in smaller volume in recent months yet there is a scarcity of both these products. Delivery of soda ash to domestic consumers has been delayed and numerous orders for caustic soda for export have gone unfilled. In some instances production of chemicals is retarded by scarcity of raw materials. This is particularly noted in the case of lead pigments where a reduction in second-quarter production has been enforced because of a smaller allotment of the metal to corroders.

Looking to the future, it was estimated some months ago that the process industries had new construction plans which would call for an expenditure of \$800,000,000. More recent developments connected with scarcity of building materials and non-residential constructions imposed by CPA have made uncertain the time when much of this expansion can get under way. However, a schedule for enlarged capacities for plastics calls for a graduated scale of new completions which by the middle of 1947 will add 300, 000,000 lb. to current capacities. The rubber industry which had its largest peacetime output in 1940 expects that its 1946 output will come close to 90 percent in value above that of 1940.

With some of the large consumers of rosin raising their estimates of requirements, the question of supplies has been under examination. Originally it had been expected that new production of wood rosin would get into operation early this year with further additions to follow. Delays in such plans and the statistical position of the market bring fears that a shortage may develop in the fall months. The industry has advocated larger export quotas for rosin but present studies are concerned with a reduction in export quotas in order to conserve stocks for the domestic trade.

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING



THESE pictures show plant equipment in special shapes and large sizes, fabricated of Revere sheet copper and sheet Herculoy by the Camden Copper Works, Camden, N. J. They illustrate the amazing versatility of these metals, which skilled coppersmiths the country over fabricate into practically any desired shapes from the flat.

Easy workability of course means faster and more accurate fabrication of apparatus for your plant. It may also mean lower prices from the fabricator, or lower labor costs in your own plant if you make your own equipment. Whether the final form be simple or complicated, the workability of copper and its alloys is a tremendous advantage.

More than this, copper's high heat conductivity may speed up processing, and cut fuel expense.

Copper resists attack by many substances, and thus has a long, sometimes endless life. Often copper pipes and vessels are replaced only because of a change in the plant; then the metal has a high reclaim value.

1

The Revere Technical Advisory Service will gladly cooperate with you in working out applications of copper, whether plate, sheet, strip or roll, or in other mill forms such as pipe and tube, rod and bar, and extruded shapes. Write Revere or see your Revere Distributor.



Listen to Exploring the Unknown on the Mutual Network every Sunday Evening, 9 to 9:30 p.m., EST.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



## Thousands of Cities

#### HAVE LAYNE WELL WATER SYSTEMS

Quality that gives supreme satisfaction was the ultimate deciding factor with thousands of cities that now own Layne Well Water Systems. These cities—and they range from the Nation's largest to those of only a few inhabitants—were careful to place known performance before idle claims. In buying Layne Well Water Systems they obtained the very best that skill and experience could create.

Layne Well Water Systems have long been first choice by big and little cities every-where—first choice for highest efficiency, lowest cost operation and unparalleled long life. In a like manner, thousands of industries;-processing plants, factories, railroads, cil refineries, ice plants and irrigation proj-ects also buy and use Layne Well Water Systems.

Each Layne Well Water System is built to fulfill a specific need—and built to produce the utmost amount of water under any and all conditions. For illustrated literature, address Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

#### HIGHEST EFFICIENCY

Layne Vertical Turbine pumps are available in sizes to produce from 40 to 16,000 gallons of water per minute. High efficiency saves hundreds of dollars on power cost per year.

AFFILIATED COMPANIES: Layne Arkansas Co., Stottkart, ark. \* Layne Atlance Ge., Atorik ya. \* Layne-Contral Co., Mientonia, \* Layne-Northern Co.. Mishawaka, Ind. \* Layne-touiklana Co.. Lake Charles, La. \* Louisiana Weil Co., Monroe, La. \* Layne-New York Co., weilkee, Wit. \* Layne-Ohio Co., Columbus, Ohio \* Layne-Texas Co., Houston, Texas \* Layne-vestern Co., Kansas City. No. \* Layne-Western Co. of Minnesota, Minnespolis, Mian. \* Interma-Conada \* Layne-Hiepano Americana, S. A.



WELL WATER SYSTEMS VERTICAL TURBINE PUMPS

#### United States Production of Certain Chemicals

January 1946 and January 1945

| Chemical and Basis                         | Units      | January<br>1946 | January<br>1945 |
|--|------------|-----------------|-----------------|
| Ammonia, synthetic anhydrousi              | Tene       | 41-017          | 10 000          |
| Ammonia nitrate (100% NH-NO.)              | Tons       | 41,217          | 43,863          |
| Calcum carbida (commercial)                | Tons       | 37,695          | 111444          |
| Calrium phosphete:                         | long       | 45,192          | 61,759          |
| Monobasic (100%, Call, (PO.).)             | 35 11.     | F F00           |                 |
| Dibasic (100% CoHPOs)                      | M ID.      | 5,569           | 4,716           |
| Carbon dioxide:                            | WI 1D.     | 1,750           | 3,519           |
| Liquid and mag                             | 3.6.11.    | 17 000          | 10 110          |
| Solid (dry ice)                            | . N1 10,   | 17.630          | 16,442          |
| Chlorine                                   | W1 10.     | 38,308          | 41,2/4          |
| Chrome groon (CP)                          | LONS       | 89,037          | 103,953         |
| Chrome vellow and orange (C.P.)            | MI ID.     | 1,748           | 646             |
| Conner seatos senita (naria groen)         | AL 10.     | 4,01/           | 3,350           |
| Lydrochloria agid (100% HCI)               | MI ID.     | 00 800          | 625             |
| Hydrofluoria acid                          | Tons       | 26,799          | 35,155          |
| Hydrogen                                   | MI ID.     | 2,204           |                 |
| Logd preamate (agid and begin)             | Al cu. It. | 1,405,000       | 2,071,000       |
| Molybdata phrome orange (C P)              | M ID.      | 6,229           | 8,593           |
| Nitrie acid (100% HNO.)                    | AT ID,     | 464             | 137             |
| Ovigan                                     | rons       | 34,769          | 40,876          |
| Phoenhoria poid (50%, H-PO)                | M Cu. 15   | 721,506         | 1,393,942       |
| Soda ash (commargial addium carbonate)     | Tons       | 68,534          | 51,264          |
| Ammonia socia process (09, 1000/ Na. CO)   |            |                 |                 |
| Total wat and drug                         | m          | 0.01 0.00       |                 |
| Kinishad light3                            | Tons       | 387,012         | 365,718         |
| Finished dones                             | lons       | 196,492         | 185,516         |
| Noturali                                   | Tons       | 132,339         | 124,948         |
| Sodium bicarbonate (rofined) (1000) No HCO | 1013       | 17,645          | 14,468          |
| Sodium bickromate and elements             | lons       | 15,132          | 12,614          |
| Sodium bydroxide (10097 NoOH).5            | lons       | 7,735           | 6,582           |
| Electrolytic process                       |            |                 |                 |
| Liquid                                     | m          |                 |                 |
| Soud                                       | Lons       | 85,810          | 97,740          |
| Lime sode process                          | Toua       | 17,757          | 19,461          |
| Liquid                                     | m          | 00.40           |                 |
| Souid                                      | Tons       | 68,427          | 63,360          |
| adjum phoephete                            | 1005       | 21,018          | 19,860          |
| Monobasic (100% NoFL-PO.)                  | T          | 1.014           | 1 101           |
| Dibasic (100% NacHPO)                      | Tons       | 1,244           | 1,101           |
| Tribasia (100% Na-PO)                      | 1 ODS      | 5,727           | 4,090           |
| Moto (100% No PO.)                         | lons       | 9,216           | 6,875           |
| Tatra (100% No.P.O.)                       | 1 0118     | 2,272           | 1,934           |
| Sodum plicate (aphydroue)                  | Lous       | 4,343           | 2,861           |
| Sodium subhata                             | TODS       | 34,524          | 38,397          |
| Anh. (droug (refined) (100% No.SO.)        | mana       | 7 004           |                 |
| Glauber's sult and anycle salt cake        | TOHS       | 7,804           | 5,258           |
| Subburie neid (100% H-SO.) -1              | rons       | 53,575          | 64,336          |
| Chamber process                            | Tana       | 928 900         | 005 040         |
| Net contact process                        | Tona       | 420 000         | 293,940         |
| (ine vellow (zine chromata) (C.P.)         | Tons       | 402,080         | 411,800         |
|  |            |                 |                 |

Data for this tabulation have been taken from "Facts for Industry" series issued by Bureau of the Census and WPB Chemicals Bureau. Production figures represent primary production and do not include purchased or transferred material. Quantities produced by government-owned arsenals, ordnance works, and certain plants operated for the government by private industry are not included. Chemicals manufactured by TVA, however, are included. All toos are 2,000 lb. Where no figures are given, data are either confidential or not yet available. Includes a small amount of aqua ammonia. "Total wet and dry production, including quantities diverted for manufacture of caustic soda and sodlum blearbonate, and quantities processed to finished light and finished dense. "Not including quantities converted to finished dense. "Data collected in cooperation with the Bureau of Mines. "Figures represent total production of liquid material, including quantities evaporated to soild caustic and reported as such. "Includes oleum grades. Excludes spent acid. "Data for sulphuric acid manufactured as a byproduct of smelting opera-tions are no longer included. This production by eight plants accounted for approximately four percent of the 1945 total production.

#### United States Production of Certain Synthetic Organic Chemicals

December 1945, December 1944 and Annual Totals for 1945 and 1944

| Chemical   | December<br>1945        | December<br>1944 | Total, Twel<br>1945 | ive Months<br>1944 |
|--|-------------------------|------------------|---------------------|--------------------|
| Acetanilid, technical and U.S.P.   | •••••                   |                  | 6,951,294           | 4,610,813          |
| Synthetic <sup>1</sup>   | 22,476,478 63,616,951   | 24,701,553       | 261,024,379         | 291,953,913        |
| Natural <sup>2</sup> , <sup>8</sup> .<br>Acetic anhydride <sup>3</sup> . | 1,845,913               | 3,239,071        | 31,949,565          | 40, 489, 764       |
| Acetone<br>Aniline   | 25.591,935<br>5.945.580 |                  |                     |                    |
| (Continued   | on page 32              | 4)               |                     |                    |



### "GLAND TROUBLE"

has no packing glands or stuffing box

On recirculator systems of condenser hotwells, de-aerators—or wherever the level of liquids must be controlled — UNITROL will do it more accurately! Simple . . . self-contained . . . this exclusive design eliminates trouble-making restrictive elements. Fric-tion is minimized. Action is free and unhampered. Feed or drain is regulated promptly and positively. Available for temperatures up to 750° F.-in valve sizes ½" to 4"—and with the fine aratismanship for which K & M has been recognized for 66 years. Our Engineering Department will be glad to make specific recommendations.

2025-43rd St., NORTH BERGEN, N. J.

## THE SARCO STRAINER

## LOW COST INSURANCE

HEATING

FOOD

Sarco Strainers are effective and inexpensive insurance against costly shut-downs and heavy repair bills caused by dirt or scale in pipe lines. Keep a supply on hand and slip them in whenever changes are made. The cost is negligible.

### FOR FOOD, CHEMICALS AND OIL

Sarco strainers are used to strain such products as syrup, varnish, orange juice, fuel and lubricating oils in the process of manufacture. Chemical and steel industries using large quantities of river water employ strainers on pipe lines up to 8 inches.

### The SARCO SCRAPER STRAINER (Patented)

A helical, knife-like scraper rotated by hand or by motor is fitted snugly inside the screen wall, for conditions requiring continuous removal of solids without interruption of service.

Standard Sarco strainers are made in four types, 1/4" to 8" for pressures up to 900 pounds. Scraper strainers 3/4" to 8" and 200 pounds. Ask for Bulletin No. 1200.



CHEMIC

114

RIVER WATER





FOUR STARS ON OUR E PENNANT TESTIFY TO SARCO PERFORMANCE IN THE WAR EFFORT





SARCO COMPANY, INC., 475 FIFTH AVE., NEW YORK 17, N.Y. • Sarco Canada, Ltd., 85 Richmond St., W., Toronto I, Ont.

CHEMICAL & METALLURGICAL ENGINEERING . APRIL 1946 .

323





#### U. S. Production of Synthetic Organic Chemicals (Cont. from p. 322)

|   | Desember    | Describes  | 01 + 1 00     |             |
|---|-------------|------------|---------------|-------------|
| Chemica                                   | 1945        | 1944       | Total, Twe    | 1944        |
| Acetylsalicylic acid                      | 910,287     | 845,689    | 10,860,346    | 9,256,636   |
| 5-Ethyl-5-phenylbarbituric acid and salts |             |            |               |             |
| (Phenobaroltal)                           | 15,863      | 13,776     | 276,763       | 234,074     |
| Motor grade:                              |             |            |               |             |
| Tar distillers                            | 487,426     |            |               |             |
| All other grades:                         | 4,812,492   |            |               |             |
| Tar distillers <sup>4</sup>               | 1,314,228   |            |               |             |
| Coke-oven operators <sup>6</sup>          | 8,780,556   |            |               |             |
| Carbon bisulphide                         | 26 620 660  |            | *******       |             |
| Carbon tetrachloride                      | 13,080,177  |            |               |             |
| Chlorobenzene, mono                       | 19,094,194  |            |               |             |
| Tar distillers.                           | 9 894 584   | 10 813 369 | 197 977 497   | 191 140 071 |
| Coke-oven operators                       | 2,364,237   | 3,420,784  | 35, 459, 883  | 41,425,558  |
| Utesols:7                                 | F44 010     |            |               |             |
| Ortho-meta-para.                          | 544,319     | 735,683    | 7,833,171     | 7,072,828   |
| Cresylic acid, refined <sup>7</sup>       | 2,108,164   | 3,076,886  | 29,224,088    | 40,725,366  |
| Diputyl phthelate                         | 1,180,722   |            | ********      |             |
| Ethyl acetate (85%)                       | 7, 109, 575 | 9 851 538  | 102 654 106   | 102 191 447 |
| Ethyl ether, technical and U.S.P.         | 3,020,034   | 6,873,034  | 75,580,610    | 69,756,963  |
| Methanol                                  | 29,252,064  |            |               |             |
| Natural <sup>9</sup>                      | 1.568.355   | 1.792.800  | 18,665,040    | 22 267 904  |
| Synthetic.                                | 45,304.861  | 38,850,640 | 491,463,922   | 473,299,200 |
| Tar distillers (less than 79° C.)4        | 14 803 551  | 18 005 190 | 905 009 EDC   | 202 025 950 |
| Tar distillers (79° C and over)4          | 7,015,898   | 6,216,754  | 77,227,365    | 82,138,629  |
| Coke-oven operators (less than 79° C.)6   | 7,036,372   | 8,032,656  | 87,539,004    | 102,638,980 |
| Phenol (synthetic and natural)7           | 14.738.105  |            | *******       |             |
| Phthalic anhydride                        | 8,555,102   | 10,778,529 | 123, 311, 944 | 124,063,494 |
| Sulfa drugs                               | 24,412,751  | 200 000    | F 707 000     |             |
| Toluene:                                  | 100,110     | 338,925    | 0,735,990     | 4,405,193   |
| Coke-oven operators <sup>6</sup>          | 1,668,847   |            |               |             |
| An other, "                               | 919,051     |            |               |             |

All data in pounds except benzene (gal.), creosote oil (gal.), toluene (gal.), and penicillin (million Oxford units). Statistics collected and complied by U.S. Tariff Commission except where noted. Absence of data on production indicates either that returns were unavailable or confidential. <sup>1</sup> Excludes the statistics on recovered acid. <sup>2</sup> Acid produced by direct process from wood and from calcium acetate. <sup>3</sup> All acetic anhydride including that from acetic acid by vapor-phase process. <sup>4</sup> Product of distillers who use purchased coal tar only. <sup>5</sup> Statistics are given in terms of bulk medicinals only. <sup>6</sup> Statistics collected by Bureau of Mines. <sup>7</sup> Total production including data reported both by coke-oven operators and by distillers of purchased coal tar. <sup>8</sup> Reported to U.S. Bureau of the Census. <sup>9</sup> Reported in gal. by Bureau of the Census but converted to lb, for comparison with the production of synthetic methanol. <sup>10</sup> Includes toluene produced from petroleum by any process.



• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING



PUT THEM WITHIN Easy reach ...

You can't wait to "write for samples" when you have an experiment under way. So send for samples of Alorco Aluminas now, to have ready on the shelf. We'll gladly send a pound or a hundred pounds; yes, a ton, if the job's real "hot".

Alorco Aluminas are being employed in the preparation of catalysts, as carriers and auxiliary catalysts, and used by the petroleum, rubber, and other chemical industries. They're serving to dry air, gases, and many organic liquids in processes where DRYness is all-important. Chemical companies use various Alorco Aluminas as the base material from which to make many products.

Name the Alorco products you'd like to have on the shelf, and we'll send you those samples. Call the nearby Alcoa office, or write ALUMINUM ORE COMPANY, 1910 Gulf Building, Pittsburgh 19, Pennsylvania.



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

## Let DRACCO Dust Control help you meet POSTWAR competition



Dust ALWAYS causes LOSS. DRACCO Dust Control ALWAYS SAVES MONEY by ending many losses that add up to a big yearly total. It reduces accident hazard . . . lowers maintenance expense . . . adds to life of valuable machinery. DRACCO Dust Control can help you meet postwar competition by increasing the efficiency of your plant. DRACCO Engineers have had over 30 years experience in handling dust problems of every type. Why not consult them about dust control in your plant.



#### CHEM. & MET.

Weighted Index of Prices for

#### CHEMICALS

Base = 100 for 1937

| This month  | 109.13 |
|-------------|--------|
| Last month  | 109.13 |
| April, 1945 | 108.93 |
| April, 1944 | 109.55 |

#### **CURRENT PRICES**

The accompanying prices refer to round lots. Where it is trade custom to sell f.o.b. works, quotations are so designated. Prices are corrected to April 11.

#### INDUSTRIAL CHEMICALS

| Acetone, tanks, lb.  | SO                               | .06  |            | àà    |  |
|--|----------------------------------|--|------------|-------|--|
| Borie, bbl., ton   | 109                              | .38  | E          | 53    | 63   |
| Citric, kegs, lb.  |                                  | .20  | -          | 10    | 23   |
| Formic, cbys., lb.   |                                  | .10  | -          |       | .11  |
| Lactic, 44% tech light bbl lb  |                                  | .08<br>073   | 2          |       | 07   |
| Muriatic, 18°, tanks, 100 lb   | 1                                | .05  |            |       |  |
| Nitric, 36°, carboys, lb   |                                  | .05  | -          |       | .05  |
| Oralia crustale bbl lb   | 18                               | .50  | -          | 20    | 00   |
| Phosphoric tech., tanks, Ib.   |                                  | .04  | Ξ.         |       | 14   |
| Sulphuric, 60°, tanks, ton   | 13                               | .00  |            |       |  |
| Alashal amul   |                                  | .62  | -          |       | .65  |
| From pentane, tanks, lb.   |                                  | .i31   | Ξ:         | •••   |  |
| Alcohol, butyl, tanks, lb.   | 2.1                              | .10  | -          |       | .20  |
| Alcohol, ethyl, denatured, 190 proo  | f                                | = 1.   |            |       |  |
| Alum ammonia lump lb   |                                  | .541   | <u>-</u> • | • • • | • • • •  |
| Aluminum sulphate, com. bags 100   | 5                                | .01  |            | •••   | • • • •  |
| 1b   | 1                                | .15  | -          | 1     | .49  |
| Ammonia, anhydrous, cyl., Ib   | 50                               | .14  | <u>}</u>   | àò    | 'àà'   |
| Ammonium carbonate, powd.  | . 09                             | .00  | -          | 09    | .00  |
| casks, lb  |                                  | .09  |            |       | .10  |
| Sulphate, wks, ton   | 28                               | .20  |            | • • • |  |
| tanks. lb  | • .                              | 1 43   | i-         |       |  |
| Aqua ammonia, 26°, drums, lb   |                                  | .02  | -          |       | .03  |
| tanks, ton   | 65                               | .00  |            |       |  |
| Arsenic, white, powd., bbl., lb.,  | 05                               | .04  | -          |       | .04  |
| Chloride, bbl., top  | 75                               | 00   | ~          | 1078  | 00   |
| Nitrate, casks, lb   | 10                               | .09  | -          |       | 11   |
| Blanc fix, dry, bags, ton  | . 60                             | .00  | -          | 70    | .00  |
| Bleaching powder, f.o.b., wks.   | 0                                | 50   |            | 2     | 00   |
| Bores, gran, bars, 100 lb  | 45                               | .00  | _          | 9     | .00  |
| Calcium acetate, bags, 100 lb  | 3                                | .00  |            |       |  |
| Arsenate, dr., lb.   | -                                | .07  | -          |       | .08  |
| Carbide, drums, ton  | 10                               | .00  |            | 95    |  |
| Carbon bisulnhide, drums, lb.  | 10                               | .05  | _          | 20    | 05   |
| Tetrachloride, drums, gal  |                                  | .73  | -          |       | .80  |
| Chlorine, liquid, tanks, wks., 100 lb  | . 1                              | .75  | -          | 2     | .00  |
| Copperas, bgs., t.o.b., wks., ton  | 17                               | .00  | -          | 18    | .00  |
| Sulphate, bbl., 100 lb.  | 5                                | .00  | -          | 5     | .50  |
| Cream of tartar, bbl., lb  |                                  | .50  |            |       | .52  |
| Diethylene glycol, dr., lb   |                                  | .14]   | -          |       | .15  |
| Ethyl acetate tanks lb   | . 1                              | 107  | -          | 2     | .00  |
| Formaldehyde, 40%, tanks, lb. wks  |                                  | .032   | -1         |       |  |
| Furfural, tanks, lb.   |                                  | .09]   |            |       |  |
| Glaubers salt, bags, 100 fb  | 1                                | .05  | -          | 1.    | .10  |
| Lead:  |                                  | .102   | -          |       | .19  |
| White, basic carbonate, dry, casks   |                                  |  |            |       |  |
| Bod deer ask th  |                                  | .08  |            | • • • |  |
| Lead acetate white crys bhl lb   |                                  | 124  |            | • • • | 12   |
| Arsenate, powd., bag, lb   |                                  | 111  | -          |       | 12   |
| Lithopone, bags, lb  |                                  | 04   | -          |       | 043  |
|  |                                  | .071   | -          |       | 08   |
| Magnesium carby tech., bags, ib  |                                  | 60   |            |       |  |
| Magnesium carb, tech., bags, ib<br>Methanol, 95%, tanks, gal<br>Synthetic, tanks, gal.   |                                  | .60<br>.24   | ~          |       | 1.1  |
| Magnesum carb, tech, bags, 10<br>Methanol, 95%, tanks, gal<br>Synthetic, tanks, gal<br>Phosphorus, yellow, cases, lb   |                                  | 60<br>24<br>23   |            | •••   | 25   |
| Magneshim carb, tech., bags, ib<br>Methanol, 95%, tanks, gal<br>Synthetic, tanks, gal<br>Phosphorus, yellow, cases, lb<br>Potassium bichromate, casks, lb  |                                  | 60<br>24<br>23<br>101  | 111        | ••••  | 25   |
| Magnesum carb, teen, bags, ib<br>Methanol, 95%, tanks, gal<br>Synthetic, tanks, gal<br>Phosphorus, yellow, cases, lb<br>Chlorate, pwd., lb.<br>Hydroxide (a etil b, batsh) dr. lb.   |                                  | 60<br>24<br>23<br>101<br>093   |            | ••••  | 25<br>10<br>12   |
| Magnesum carb, teen, bag, ib.,<br>Synthetic, tanks, gal.,<br>Phosphorus, yellow, cases, lb.,<br>Potassium bichronnate, casks, lb.,<br>Chlorate, pwd., lb.,<br>Hydroxide (c stie potash) dr., lb.,<br>Muriate, 60%, bags, unit  |                                  | 60<br>24<br>23<br>101<br>093<br>07<br>534  | 11111      |       | 25<br>10<br>12<br>07   |
| Magnesulm carb, tech., bags, 10.<br>Synthetic, tanks, gal.<br>Phosphorus, yellow, cases, lb.<br>Potassium bichronnate, casks, lb.<br>Chlorate, pwd., lb.<br>Hydroxide (c'stie potash) dr., lb.,<br>Muriate, 60%, bags, unit.<br>Nitrate, ref., bbl., lb.   |                                  | 60<br>24<br>23<br>101<br>09<br>53<br>07<br>53  | 1111111    |       | 25<br>10<br>12<br>07<br>09   |
| Magnesulin carb, teen, bags, 10.<br>Methanol, 95%, tanks, gal.<br>Synthetic, tanks, gal.<br>Phosphorus, yellow, cases, lb.<br>Chlorate, pwd., lb.<br>Hydroxide (c sic potash) dr., lb.<br>Muriate, 60%, bags, unit.<br>Nitrate, ref., bbl., lb.<br>Prussica valor and the second second second second<br>Prussica valor and the second second second second second<br>Prussica valor and the second secon |                                  | 60<br>24<br>23<br>101<br>09<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>10<br>53<br>53<br>53<br>53<br>53<br>54<br>53<br>54<br>53<br>54<br>53<br>54<br>54<br>54<br>55<br>54<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55  | 11111111   |       | 25<br>10<br>12<br>07<br>20   |
| Magnesilin carb, teen, bags, ib.<br>Methanol, 95%, tanks, gal.<br>Synthetic, tanks, gal.<br>Potassium bichromate, casks, lb.<br>Chlorate, pwd., lb.<br>Hydroxide (c'stie potash) dr., lb.<br>Muriate, 60%, bags, unit.<br>Nitrate, ref., bbl., lb.<br>Permanganate, drums, lb.<br>Prussiate, yellow, casks, lb.  |                                  | 60<br>24<br>23<br>101<br>092<br>07<br>53<br>10<br>53<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10   |            |       | 25<br>10<br>12<br>07<br>20<br>17<br>06   |
| Magnesum carb, teen, bags, ib<br>Methanol, 95%, tanks, gal<br>Synthetic, tanks, gal<br>Phosphorus, yellow, cases, lb.<br>Potassium bichronnate, casks, lb<br>Chlorate, pwd., lb.<br>Hydroxide (e stic potash) dr., lb.<br>Muriate, 60%, bags, unit<br>Nitrate, ref., bbl., lb.<br>Permanganate, druns, lb.<br>Prussiate, yellow, casks, lb.<br>Sal ammonine, white, casks, lb  | 1                                | 60<br>24<br>23<br>101<br>09<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>53<br>107<br>50<br>50<br>50<br>50<br>50<br>50<br>50<br>50<br>50<br>50<br>50<br>50<br>50 |            |       | 25<br>10<br>12<br>07<br>20<br>17<br>06<br>05   |
| Magnesulin carb, teen, bags, 10.<br>Methanol, 95%, tanks, gal.<br>Synthetic, tanks, gal.<br>Phosphorus, yellow, cases, lb.<br>Chlorate, pwd., lb.<br>Hydroxide (c stic potash) dr., lb.<br>Muriate, 60%, bags, unit.<br>Mitrate, ref., bbl., lb.<br>Permanganate, drunns, lb.<br>Prussiate, yellow, casks, lb.<br>Sal sammoniac, white, casks, lb.<br>Salsda, bbl., 100 lb.<br>Salt cake, bulk, ton.   | 1<br>15                          | 60<br>24<br>23<br>101<br>092<br>531<br>07<br>531<br>05<br>10<br>16<br>051<br>00  |            | 1     | 25<br>10<br>12<br>07<br>20<br>17<br>06<br>05   |
| Magnesulin carb, teen, bags, 10.<br>Methanol, 95%, tanks, gal.<br>Synthetic, tanks, gal.<br>Phosphorus, yellow, cases, lb.<br>Chlorate, pwd., lb.<br>Hydroxide (c'sic potash) dr., lb.<br>Muriate, 60%, bags, unit.<br>Nitrate, ref., bbl., lb.<br>Permanganate, drunns, lb.<br>Prussiate, yellow, casks, lb.<br>Sal annoniac, white, casks, lb.<br>Salsoda, bbl., 100 lb.<br>Salt cake, bulk, ton.<br>Soda ash, light, 58%, bags, contract<br>100 lb.   | 1<br>15                          | 60<br>24<br>23<br>101<br>091<br>07<br>531<br>08<br>19<br>16<br>051<br>00<br>00   |            | 1     | 25<br>10<br>12<br>07<br>20<br>17<br>06<br>05   |
| Magnesulin carb, teen, bags, 10.<br>Methanol, 95%, tanks, gal.<br>Synthetic, tanks, gal.<br>Phosphorus, yellow, cases, lb.<br>Potassium bichromate, casks, lb.<br>Chlorate, pwd., lb.<br>Hydroxide (c'stic potash) dr., lb.<br>Muriate, 60%, bags, unit.<br>Nitrate, ref., bbl., lb.<br>Permanganate, drums, lb.<br>Prussiate, yellow, casks, lb.<br>Sal anmoniac, white, casks, lb.<br>Salate, bbl., 100 lb.<br>Salt cake, bulk, ton.<br>Soda ash, light, 58%, bags, contract<br>100 lb.<br>Dense, bags, 100 lb.  | 1<br>15<br>1                     | .00<br>24<br>23<br>101<br>.09<br>.09<br>.07<br>.53<br>.07<br>.53<br>.07<br>.53<br>.07<br>.05<br>.16<br>.05<br>.16<br>.00<br>.00<br>.05<br>.15  |            | 1     | 25<br>10<br>12<br>07<br>20<br>17<br>06<br>05   |
| Magnesulin carb, teen, bags, 10.<br>Methanol, 95%, tanks, gal.<br>Synthetic, tanks, gal.<br>Potassium bichromate, casks, lb.<br>Chlorate, pwd., lb.<br>Hydroxide (e stic potash) dr., lb.<br>Muriate, 60%, bags, unit.<br>Nitrate, ref., bbl., lb.<br>Permanganate, druns, lb.<br>Prussiate, yellow, casks, lb.<br>Sal annuoniae, white, casks, lb.<br>Salsoda, bbl., 100 lb.<br>Salt cake, bulk, ton<br>Soda ash, light, 58%, bags, contract<br>100 lb.<br>Dense, bags, 100 lb.<br>Soda, casute, 76% solid, drums, 100  | 1<br>15<br>1                     | .60<br>.24<br>.23<br>.101<br>.091<br>.07<br>.531<br>.08<br>.191<br>.08<br>.191<br>.16<br>.051<br>.00<br>.00<br>.05<br>.15  |            | 1     | 225<br>10<br>12<br>07<br>20<br>17<br>06<br>05  |
| Magnesulin carb, teen, bags, 10.<br>Methanol, 95%, tanks, gal.<br>Synthetic, tanks, gal.<br>Phosphorus, yellow, cases, lb.<br>Chlorate, pwd., lb.<br>Muriate, 60%, bags, unit.<br>Muriate, 60%, bags, unit.<br>Muriate, 60%, bags, unit.<br>Muriate, 60%, bags, unit.<br>Muriate, 40%, casks, lb.<br>Sal animoniac, white, casks, lb.<br>Sal animoniac, white, casks, lb.<br>Sal animoniac, white, casks, lb.<br>Sal animoniac, white, casks, lb.<br>Sal animoniac, bags, lb.<br>Sal animoniac, bags, lb.<br>Sold a, sh, light, 58%, bags, contract<br>100 lb.<br>Dense, bags, 100 lb.<br>Soda, caustic, 76% solid, drums, 100<br>lb.  | 1<br>15<br>1<br>1                | .60<br>.24<br>.23<br>.101<br>.092<br>.07<br>.531<br>.08<br>.192<br>.051<br>.00<br>.051<br>.00<br>.051<br>.15<br>.30  |            | 1     | 25<br>10<br>12<br>07<br>20<br>17<br>06<br>05   |
| Magnesulin carb, teen, bags, 10.<br>Methanol, 95%, tanks, gal.<br>Synthetic, tanks, gal.<br>Phosphorus, yellow, cases, lb.<br>Chlorate, pwd., lb.<br>Mydroxide (c'stie potash) dr., lb.<br>Muriate, 60%, bags, unit.<br>Mitrate, ref., bbl., lb.<br>Permanganate, drums, lb.<br>Prussiate, yellow, casks, lb.<br>Sal samoniac, white, casks, lb.<br>Salsoda, bbl., 100 lb.<br>Salt cake, bulk, ton.<br>Soda ash, light, 58%, bags, contract<br>100 lb.<br>Dense, bags, 100 lb.<br>Soda, caustic, 76% solid, drums, 100<br>lb.<br>Accetate, del., bfl., lb.<br>Biearbonate, hbl., 100 lb.   | I<br>15<br>1.<br>1.<br>2.        | .60<br>.24<br>.23<br>.101<br>.09<br>.53<br>.09<br>.53<br>.09<br>.101<br>.07<br>.53<br>.08<br>.19<br>.16<br>.051<br>.00<br>.00<br>.15<br>.30<br>.051<br>.30<br>.051   |            | 1     | 25<br>10<br>12<br>07<br>20<br>17<br>06<br>05   |
| Magnesilin carb, teen, bags, ib.<br>Methanol, 95%, tanks, gal.<br>Synthetic, tanks, gal.<br>Phosphorus, yellow, cases, lb.<br>Potassium bichromate, casks, lb.<br>Chlorate, pwd., lb.<br>Hydroxide (c'stic potash) dr., lb.<br>Muriate, 60%, bags, unit.<br>Nitrate, ref., bbl., lb.<br>Permanganate, drums, lb.<br>Prussiate, yellow, casks, lb.<br>Sal anmoniac, white, casks, lb.<br>Salsoda, bbl., 100 lb.<br>Soda asu, light, 58%, bags, contract<br>100 lb.<br>Dense, bags, 100 lb.<br>Soda, caustic, 76% solid, drums, 100<br>lb.<br>Acetate, del., bbl., lb.<br>Bichromate, bags, lb.  | I<br>15<br>1<br>1<br>1<br>1<br>2 | 60<br>24<br>23<br>101<br>092<br>07<br>534<br>08<br>19<br>16<br>051<br>00<br>00<br>05<br>15<br>30<br>05<br>15<br>70<br>07   |            | 1.    | 25<br>10<br>12<br>07<br>20<br>17<br>06<br>05<br><br>00<br>06<br>00<br>00<br>08             |
| Magnesilin carb, teen, bags, ib.<br>Methanol, 95%, tanks, gal.<br>Synthetic, tanks, gal.<br>Potassium bichromate, casks, lb.<br>Chlorate, pwd., lb.<br>Hydroxide (c'stic potash) dr., lb.<br>Muriate, 60%, bags, unit.<br>Nitrate, ref., bbl., lb.<br>Permanganate, drums, lb.<br>Prussiate, yellow, casks, lb.<br>Sal anmoniac, white, casks, lb.<br>Salsoda, bbl., 100 lb.<br>Salt cake, bulk, ton.<br>Dense, bags, 100 lb.<br>Soda ash, light, 58%, bags, contract<br>100 lb.<br>Dense, bags, 100 lb.<br>Soda, caustic, 76% solid, drums, 100<br>lb.<br>Acetate, dcl., bhl., lb.<br>Bicarbonate, bbl., 100 lb.<br>Bichromate, bags, lb.<br>Bisalphate, bulk, ton.   | 1<br>15<br>1<br>1<br>1<br>2<br>1 | 60<br>24<br>23<br>101<br>092<br>107<br>53<br>109<br>109<br>109<br>109<br>109<br>109<br>109<br>109<br>109<br>109  |            | 1     | 25<br>10<br>12<br>07<br>20<br>17<br>06<br>05<br><br>00<br>06<br>00<br>06<br>00<br>08<br>00 |

• APRIL 1946 • CHEMICAL & METALLURGICAL ETGINEERING



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



Our general bulletin #21 containing detailed description of the Type SAD will be sent for your files. We have had nearly 35 years' experience as designers and manufacturers of fuel oil and gas burner equipment. If you have a combustion problem, perhaps we can help solve it.

for FUEL OIL . . . for GAS

#### NATIONAL AIROIL BURNER Company, Incorporated 1235 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PENNA. Texas office: 2nd National Bank Bldg., Houston OIL BURNERS . GAS BURNERS . GAS PILOTS . PUMP SETS . EXPLOSION DOORS ACCESS DOORS . AIR DOORS . BURNER BLOCKS . FURNACE OBSERVATION WINDOWS

CHEM. & MET.

**OILS & FATS** Base = 100 for 1937

OILS AND FATS

COAL-TAR PRODUCTS

MISCELLANEOUS

145.80

145.24

.121-....

.121 .122 .155-..... .0865-..... 121-....

.13 -..... .089-..... .081-..... .091-.... .111-.... .13 -.....

.081-....

.32 - .....111 - .....22 - .....45 - ....

.70 - .54 - .15 - .22 -

.101-

.18 -

-... .071

41 -...

42 -

1.55 -

25 -

\$0.55

.34 .12 .24

.50

.56

.24

.83

.45

19

23 25 -----

.50

43

.11 \_

70

.33

1.60

-.... .96 -....

.0365- .097

Shell Chemical Corporation is pledged to progress ... to continually seek new and better ways for petroleum derivatives to serve industry.

To this end, present products are constantly being improved and directed toward new uses . . . other products are being formulated to fulfill new requirements. In many cases it is necessary to design and build new equipment to do a research job that has never been done before.

The lathe for working glass pictured here aids in the creation of specialized equipment needed in evaluating new chemical products formulated for industrial applications



## **JSOPROPYL ALCOJOL** Iow-boiling latent solvent



Durable high gloss nitrocellulose lacquers are more economically formulated with Isopropyl Alcohol. The secret lies in Isopropyl's evaporation rate ... which allows the use of less high boiling alcohol to produce satisfactory blush resistance and flow-out.

For the same reason Isopropyl aids in the production of rapid-drying high solids lacquers.

Recently improved processing resulting in a higher standard of purity, increases the value of Isopropyl Alcohol for pharmaceutical, germicidal and cosmetic use.

Vitamin and food processors are finding Isopropyl Alcohol valuable as an extractant.

ISOPROPYL ALCOHOL IS AVAILABLE IN DRUM, COMPARTMENT OR STRAIGHT TANK CAR QUANTITIES



100 Bush Street, San Francisco 6 500 Fifth Avenue, New York 18 Los Angeles • Houston • St. Louis • Chicago • Cleveland



#### PROPOSED WORK

- Ark., Benton-Owosso Manufacturing Co., Benton, plans to rebuild its veneer plant recently destroyed by fire. Estimated cost \$40,000.
- Ark., El Dorado—Lion Oil Co. plans to construct a catalytic cracking unit here to produce hioctane gasoline, furnace oil, etc. Estimated cost will exceed \$750,000.
- Calif., Oakland—Walter N. Boysen Co., 42nd and Linden Sts., plans to construct an addition to its paint and varnish factory. Reynolds & Chamberlain, 3833 Piedmont Ave., Archts. Estimated cost \$150,000.
- Calif., Martinez-Shell Oil Co., 100 Bush St., San Francisco, plans to construct a 2 story laboratory building with provision for a third floor. Estimated cost will exceed \$40,000.
- III., Carbondale---Koppers Co., Inc., Wood Preserving Div., Broad St. Sta. Bldg., Philadelphia, Pa., plans to rebuild three buildings recently destroyed by fire. Estimated cost \$500,000.
- III., Springfield—Springfield Paint Manufacturing Corp., 14th and Ridgley Sts., plans to construct a 1 story factory building within the next year to cost \$25,000 and a 2 story building within two years to cost \$53,000.
- Ind., Hartford City-Fulton Class Co., East Washington St., Muncic, Ind., plans to rebuild its plant recently destroyed by fire. Estimated cost \$60,000.
- Ind., Muncie-Owens-Illinois Glass Co., Muncie, plans to improve and construct additions to its plant. Estimated cost \$100,000.
- La., New Orleans—Flintkote Co., 4500 North Galveston St., plans to construct a 2 and 3 story industrial building. Billingsley Engineering Co., Interstate Bldg., Eng.
- N. J., Carney's Point—E. I. du Pont de Nemours & Co., Du Pont Bldg., Wilmington, Del., plans to construct a new plant here. Estimated cost \$100,000.
- N. J., Decpwater—E. I. du Pont de Nemours & Co., Du Pont Bldg., Wilmington, Del., plans to repair fire and explosion damage to processing plant at Chambers Works. Estimated cost \$60,000.
- N. C., Burlington-Celanese Corp. of America, 180 Madison Ave., New York, N. Y., plans to construct an addition to its plant and install clevator.
- O., Brecksville—B. F. Goodrich Co., Akron, O., plans to construct a group of laboratory buildings on Cleveland-Akron Hy., here. Estimated cost \$1,750,000.
- Pa., Eric-Hammermill Paper Co., Eric, plans to construct a 2 story addition to its plant. Estimated cost \$100,000.
- Pa., Philadelphia—Quaker City Japanning & Enameling Co., 916 Cherry St., plans to rebuild its plant recently damaged by fire. Estimated cost \$40,000.
- Tex., Brownsville—Hydrocarbon Research, Inc., 115 Broadway, New York, N. Y., plans to construct a synthetic gasoline plant to produce gasoline from natural gas and other products. Estimated cost \$14,000,000.

|                   | Ourrent a    | Tojecta ,    |              |              |  |  |
|-------------------|--------------|--------------|--------------|--------------|--|--|
|                   | Proposed     |              | Proposed     |              |  |  |
|                   | Work         | Contracts    | Work         | Contracts    |  |  |
| w England :       |              |              | \$540,000    | \$1,683,000  |  |  |
| ddle Atlantic     | \$300,000    | .\$300,000   | 996,000      | 2,131,000    |  |  |
| th                | 80,000       | 430,000      | 9,870,000    | 19,198,000   |  |  |
| idle West         | 2,488,000    | 900,000      | 9,128,000    | 32,724,000   |  |  |
| st of Mississippi | 18,790,000   | 5,940,000    | 45,840,000   | 19,819,000   |  |  |
| West              | 190,000      | 65,000       | 1,315,000    | 6,409,000    |  |  |
| nada              | 405,000      | 6,230,000    | 405,000      | 14,863,000   |  |  |
| Total             | \$22,253,000 | \$13,865,000 | \$68,094,000 | \$96,827,000 |  |  |
|                   |              |              |              |              |  |  |

Current Desiret

Tex., Houston-Stanolind Oil & Gas Co., Gulf Bldg., plans to construct a plant here to conserve and utilize wasted flare gas. Estimated cost \$4,000,000.

Ne

Mis

Mid

We

Far

- Ont., Belleville-Geen Drugs Ltd., Belleville, plans to construct a chemical manufacturing plant. Estimated cost \$50,000.
- Ont., Toronto-Atlas Chemical Co., 127 Roslin St., plans to construct a chemical manufacturing plant. Estimated cost \$40,000.
- Ont., Toronto-C. G. Beveridge & Co., Ltd., 10 East Adelaide St., plans to construct a plant for the manufacture of disinfectants, deodorizes, etc. Estimated cost \$40,000.
- Ont., Toronto—British Drug Houses of Canada, Ltd., Terminal Warehouse Bldg., plans to construct a factory on Queen Elizabeth Hy. Estimated cost \$200,000.
- Ont., Toronto-Scelite Plastic Enterprises, Ltd., 293 Bay St., plans to construct a new plant on Villier St. Estimated cost \$75,000.

#### CONTRACTS AWARDED

- Ark., Little Rock—Acme Brick Co., 208 Louisiana St., will remodel its plant and install new machinery. Work will be done by owner. Estimated cost \$150,000.
- Ill., Chicago—Enterprise Paint Manufacturing Co., 337 South Peoria St., has awarded the contract for remodeling its factory and office building to E. H. Marhoefer, Jr., 222 North Bank Dr., at \$140,000.
- Ill., North Chicago—Atlas Powder Co., Zapon Div., Marquette St., has awarded the contract for a 5 story factory to Campbell-Lowrie-Lautermileh Co., 400 West Madison St. Estimated cost \$300,000.
- Md., Relay—Jos. E. Scagram Sons, Louisville, Kv., has awarded the contract for 6 story distillation plant to Consolidated Engineering Co., 20 East Franklin St., Baltimore, Md. Estimated cost \$300,000.
- Mich., Detroit—Michigan Chrome & Chemical Co., 6340 East Jefferson Avc., has awarded the contract for a plant addition to Cunningham-Rudy Co., 3087 West Grand Blvd. Estimated cost \$60,000.
- O., Findlay—Ohio Oil Co., has awarded the contract for a factory and office building to Sam W. Emerson Co., 1836 Euclid Ave., Cleveland. Estimated cost \$400,000.
- Orc.. Wilbridge—California Asphalt Corp., 225 Bush St., San Francisco, has awarded the contract for a tool room and office building at its refinery to W. C. Smith, Inc., Board of Trade Bldg., Portland, Orc. Estimated cost \$65,000.

Tex., Freeport—Dow Chemical Co., Freeport, has awarded the contract for an addition to glycol plant and a hydro-carbon or methyl chloride plant to Tellepsen Construction Co., 3900 Clav St., Houston. Estimated cost \$150,000.

- Tex., Houston—International Rubber & Plastic Co., L. E. Scherck, Pres., has awarded the contract for a 1 story, 150x150 ft. p'ant building to Marxen & Son, 1921 Westheimer Rd., Houston. Estimated cost \$100,000.
- Tex., LaPorte—E. I. du Pont de Nemours & Co., LaPorte, and Du Pont Bldge, Wilmington, Del., will construct a chemical manufacturing plant. Work will be done by owners. Estimated cost \$2,500,000.
- Tex., Lufkin—Southland Paper Mills, Inc., c/o E. Kurth, has awarded the contract for doubling the capacity of its paper mill to Brown & Root, Inc., P. O. Box 3, Houston. Estimated cost \$2,000,000.
- Tex., San Marcos—Texas Ceramics Products Corp., c/o A. K. Moulton, will construct a ceramics manufacturing plant. Work will be done by owner. Estimated cost \$40,000.
- Tex., Wink—C. V. Lyman, Midland, will construct a natural gasoline plant, also repressuring unit adjacent to plant. Work will be done by force account. Estimated cast \$750,-000 and \$250,000 respectively.
- W. Va., Grafton-Hazel Atlas Glass Co., 15th and Jacob Sts., Wheeling, has awarded the contract for two additions to its factory to Washington Engineering & Construction Co., Oakland and Pennsylvania Aves., Washington, Pa. Estimated cost \$230,000.
- W. Va., Newell—New Castle Refractories Co., New Castle. Pa., has awarded the contract for the construction of a manufacturing plant and tunnel kilns to Nellis Construction Co., East Liverpool, O. Estimated cost \$200,000.
- B. C., Vancouver-St. Regis Paper Co., 146 West Second Ave., has awarded the contract for a plant to Dominion Construction Co., Ltd., 150 West Second Ave. Estimated cost \$160,000.
- Ont., Hamilton-Steel Co. of Canada, Ltd., Hamilton, has awarded the contract for a coke plant to Wilputte Construction Co., Inc., 40 Rector St., New York, N. Y. Estimated cost \$6,000,000.
- Ont., Toronto—Film Laboratorics of Canada, Ltd., 358 Adelaide St., W., has awarded the contract for a plant on Jennings Avc., to Milne & Nicholls, Ltd., 57 Bloor St., W. Estimated cost \$70,000.



... proven 100% dependable on crushers, agitators, centrifugal pumps, mixers, compressors, blowers, filters, mills and many other heavy duty installations.



TYPE DBZ

TYPE AM

Thomas "ALL-METAL" Flexible Couplings do not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull. Perfect balance under all conditions of misalignment . . . No Lubrication is Required.

Engineered to stand up on even the toughest jobs, Thomas Flexible Couplings can be supplied in special corrosion resisting materials for the chemical industries.

vible COUPLINGS

REQUIRE NO LUBRICATION

The Destructive Evils of

BACKLASH, FRICTION,

WEAR and CROSS-PULL

ARE ELIMINATED

Free end float allows

the motor, generator,

gears or turbine to run without end thrust.



TYPE DBZ



TYPE DSM







TYPE AM



requirements. But if unusual conditions exist we are equipped to engineer and build special Flexible Couplings. Write for our Complete Catalog!

The Standard line of Thomas Couplings meets practically all

Remember! The longer life of Thomas Flexible Couplings, without costly inter-ruptions and replacements, adds much to volume to solve the second seco

THOMAS FLEXIBLE COUPLING COMPANY WARREN, PENNSYLVANIA

## HERE'S HOW ...

### X-Ray Diffraction Brings Tomorrow Closer

Nylons . . . Wispy-sheer, ankle-flattering—yet amazingly durable . . . Gossamerlike threads that are writing finis to King Silk's centuries-old reign.

Superiority of nylon and many other synthetic yarns to their natural counterparts is pre-determined by x-ray diffraction analysis of materials to be used—G-E X-Ray in most cases. Diffraction patterns are produced from fundamental fiber structures of these materials. Guided by this basic evidence, durability, elasticity and insulating properties are better evaluated. Unlike slower, impractical physical testing, x-ray diffraction permits rapid appraisal of product potentialities—eliminates all gamble from sales-anticipation.

Highly precise G-E X-Ray instruments are exclusive choice of most industries employing x-ray diffraction—and may well prove the answer to many of your hitherto unsolvable problems. For counsel and further data, write to General Electric X-Ray Corporation, 175 West Jackson Blvd., Chicago 4, Illinois, Department 2529...today.

## GENERAL ELECTRIC X-RAY CORPORATION

## Is <u>this</u> the SECRET of LOS ANGELES LEADERSHIP?

05

 "The Los Angeles area, we believe, will enjoy greater growth and development than any other region in the United States.

"It has for many years been the most progressive retailing market in the country.

"Because of the natural advantages of living, as well as working, we believe more outstanding executive personnel can be attracted to Los Angeles than any other single city in the United States.

"For these reasons and many others, United-Rexall has moved its executive headquarters to Los Angeles.

"Our plans call for an expenditure of more than \$5,000,000 in Southern California in the next two years."

> J. W. Dart, President UNITED DRUG, INC.

> > IN THE WEST

Why is one city preferred over all others in the West as a place to live and a place to work?

Why is one Pacific Coast city led only by Chicago and New York as a rich market place?

There are many reasons...all of them backed by an impressive array of facts. But there is, in addition, a vital human factor. Many competent analysts believe that it is the secret of Los Angeles' preferred position, because nowhere else does this combination of conditions flourish.

The accompanying statement by Mr. J. W. Dart, president of United Drug, Inc., admirably sums up the unique quality of this region.

In evaluating new plant factors, don't overlook the human factor. It is the *plus* value you get when you build your industrial future in Los Angeles.

IN YOUR INDUSTRIAL FUTURE

FOR BUSINESS EXECUTIV

NAME

Los Angeles City-Owned DEPARTMENT OF WATER AND POWER 207 South Broadway, Los Angeles 12, California "Serving the water and power needs of 1,700,000 citizens"



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •





Write today for descriptive, technical Bulletins.



This diagrammatic view shows the mixing chamber in position for cleaning or inspection. Chambers can be rotated to any position within 180° limits.

## **Provide Rapid, Complete Discharge**



### STRUTHERS WELLS Corporation

NORTHMASTER DIVISION TITUSVILLE, PENNA.

Plants at Titusville, Pa. and Warren, Pa. Offices in Principal Cities



## cleaner, drier steam

## from a cyclone...

Elimination of solids and moisture from steam leaving boiler drums, and an assurance of positive boiler water circulation, are accomplished with an unusual degree of effectiveness by the B&W Cyclone Steam Separator. Seven years of wide use in Babcock & Wilcox boilers have thoroughly proved the efficiency of the B&W Cyclone Steam Separator for the consistent and reliable production of clean, dry steam.

### WHAT THE CYCLONE DOES:

The separation of the water and its attendant solids from the steam is so nearly complete in the Cyclone Steam Separator that boiler and turbine performance are improved in many important ways:

- 1 Boilers can be operated at greater water-level variation without priming, making larger and more rapid load swings safely possible.
- 2 Complete separation of the steam from the water produces a maximum circulating head and delivers solid (steam free) water to the downcomers, thereby protecting boiler tubes against overheating and burnout.
- 3 Dry steam is assured over wider range in hoiler water concentration.
- **4** Superheater tubes are protected from burnouts and failure due to scale deposits.
- **5** Longer periods of continuous boiler operation are secured.
- 6 Savings in maintenance time and expense are effected in boilers and turbines.
- Safety is promoted by reducing variations between water levels in drum and gauge glass.
- 8 Turbine blades stay clean longer, permitting longer operating periods between cleanings.
- 9 Desired KW output can be maintained for longer periods.

The Cyclone Steam Separator is another B&W "first" in the development of better steamgenerating equipment—another reason why it pays to see B&W first for the latest solution to any steam problem.



Water-Tube Boilers, for Stationary Power Plants, for Marino Service . . . Water-Cooled Furnaces . . . Superheaters . . . Economizers . . . Air Heaters . . . Pulverized-Coal Equipment . . . Chain-Grate Stokers . . . Oil, Gas and Multifuel Burners . . . Seamless and Welded Tubes and Pipe . . . Refractories . . . Process Equipment.





B&W Cyclone Steam Separator with section cut away to show functioning.



Cross section of typical Cyclone Steam Separator installation in a large boiler drum.

G-284

## How to keep pH continuously OK



When you know pH is always right, regardless of variables affecting process liquid, you save yourself worry and can safely eliminate constant or periodic attention.

In the Bristol method of controlling pH automatically, the liquid is examined by an electrode of either enclosed-flow type (for liquids under pressure) or immersion type (for liquids in tanks or vats). A temperature bulb mounted in the electrode assembly compensates for variations due to temperature changes of the solution.

The pH value is reported to the pH controller a Bristol Pyromaster which operates a Bristol Synchro-valve — to vary input of the solution for adjusting pH value. Meanwhile, the value is recorded continuously on the round chart.

Bulletin pH 1302 gives further information on the complete system. Address The Bristol Company, 109 Bristol Road, Waterbury 91, Conn.



Engineers process control for better products and profits



AUTOMATIC CONTROLLING AND RECORDING INSTRUMENTS Air-operated Continuous pH Controller has exclusive Free-Vane, the most accurate of all air-operated designs. Rugged, vibration-proof construction ... precision potentiometer measuring system ... throttling range and automatic reset adjustment. (Available as recorder and as an indicator). Center: Beckman Amplifler unit; right: Beckman Electrode Assembly.



• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

# parts that take the punishment!

Specify Specify CERTIFIED COOPER CERTIFIED STAINLESS STEEL STAINLESS

COOPER Valve Certification applies to all Stainless Steel parts which come in contact with the fluid being handled. Therefore, compliance to your specifications is automatic. You know you will get exactly what you need.

In producing "Certified" valves COOPER registers the analysis of reach heat and stamps each casting with its heat number. This new advance in foundry practice assures you of top quality and fullest protection, because every "Certified" Stainless Steel valve is positively identified. Duplication of analysis is quick and simple. Mixups in storage are cut to a minimum.

Standard types of "Certified" Stainless Steel valves offered now include: Globe, Gate, Y, Check, Needle, Quick-opening. COOPER valve users may obtain certificates on request with each unit specified.

A complete line of Stainless Steel pipe fittings and intricate castings of Stainless Steel, monel and nickel are also available.

If you want to be able to forget about the parts that take the punishment in your Stainless Steel valves, write today for complete data about the COOPER Certification method. Or if you have a particular valve problem, a COOPER engineer will be glad to assist you.

### THE COOPER ALLOY FOUNDRY CO.

170 BLOY STREET-HILLSIDE, NEW JERSEY

THE

STAINLESS STEEL



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •





#### COOPER'S 25 YEARS

Cooper's quarter century in the specialized study of Stainless Steel castings is the foundation which maintains the company's unusual ability to produce sound castings. Today, the Cooper Stainless Steel foundry is the largest of its kind in the country—with all services under one roof for full control of each production phase of your valve.

ALLOY FOUNDRY CO.

VALVES

CA-107

339

## This Simplifies Ordering STEEL VALVES and PARTS



This six-page, file-size folder contains much useful information in convenient form. Here are the standard names of all component parts of steel gate, globe and check valves. Cut-away pictures make it a very simple matter to identify each part. Send for your copy.

Reading-Pratt & Cady distributors are located in principal cities.

Reading Cast Steel Valves and Fittings • Pratt & Cady Brass and Iron Valves d'Este Automatic Regulating Valves

Reading, Pa. + Atlanta - Chicago - Denver - Detroit - Houston - Los Angeles - New York + Philadelphia - Pittsburgh - Portland, Ore. + San Francisco + Bridgeport. Conn.

READING-PRATT & CADY DIVISION AMERICAN CHAIN & CABLE

ACCO

## If it's a TOUGH job... ask Q.C.f.

**THE PROBLEM:** The Mathieson Alkali Works, in order to provide more efficient distribution of Carbon Dioxide, designed a high pressure tank for liquefying dry ice. The process required a pressure vessel designed for a working pressure of 1,200 p.s.i. with a capacity of a thousand pounds of dry ice. A standard nozzle and cover plate would be too slow and difficult to operate in service.

**THE SOLUTION:** The tank was designed with sufficient diameter and height to obtain the weight of dry ice capacity desired. A special closure assembly design was adopted—not only withstanding the 2,400 pound test pressure required by the A.S.M.E. Code, but completely gas-tight at low pressure. This involved developing a method of welding the closure neck to the tank head with a minimum distortion in the precise threading of the neck. Q.C.f. experience and facilities long used in the manufacture of welded tank cars, processing tanks and heavy storage tanks were readily adapted to the construction of this special pressure vessel.

If you are faced with a difficult manufacturing problem in construction of tanks or pressure vessels take advantage of Q.C.f. advanced techniques in tank car, processing vessels and storage tank design and manufacture.

### MATHIESON JUMBO DRY ICE LIQUEFIER

Taking the place of 7 small liquefiers the Jumbo is the most economical and convenient method of converting dry ice into liquid carbon dioxide. A large capacity of one thousand pounds of dry ice; tank is in accordance with stringent A.S.M.E. specifications and Hartford Inspection. Within ten minutes after ice is deposited the liquefier operates at top efficiency and pressure tight performance is assured.

AMERICAN CAR AND FOUNDRY COMPANY Storage Tank Department - 30 Church Street, New York 8, N. Y.

# TURN OPENS TO FULL FLOW

FULL



Pipe area—regular 4-inch A.C.F. Lubricated Plug Valve (12.75 sq. inches) Larger than area of 4-inch standard pipe (12.73 sq. inches)) Unrestricted flow and full pressure of fluids throughout pipe lines is of paramount importance in chemical and processing plants. Q.C.f. Lubricated Plug Valves give you straight-through FULL flow. Fast operating, one quarter turn moves from full closed to full open.

A well-proportioned, round-cornered, full-pipe area opening permits your piping to handle fluids with maximum efficiency, and at minimum cost in time, labor, and power. Full pipe area also materially increases life of the valve, since flow velocities are not increased, and abrasion is reduced. Actual seating surfaces are tightly sealed away from the flow in the open position—no surfaces are exposed to the wear of ladings resulting in longer life and smoother operation.

Other types of plug construction reduce the port opening and restrict the flow by as much as 42%. Why restrict flow in your pipe line when you can obtain Full Flow? Try  $\Omega_{*}C_{*}f_{*}$  Lubricated Plug Valves in your own operations and learn the difference. Representatives in principal cities carry adequate stocks. For a description of types and complete specifications write for catalogue 3-CM.

OCC AMERICAN CAR AND FOUNDRY COMPANY Valve Department • 30 Church Street, New York 8, N. Y.

## **CORRUGATED TRANSITE** ... in the Age of Streamlining



### Attractive, maintenance-free walls and roofs . . . low in cost . . . can't rot . . . can't rust . . . can't burn

S TURDY ... utilitarian ... Johns-Manville Corrugated Transite meets today's demand for simplified construction and streamlined design.

In the building above, the unusual architectural effect was achieved by applying the sheets horizontally instead of vertically.

Low in cost and adaptable to most types of modern building, Corrugated Transite offers a way to save money both on construction and maintenance. It's made of asbestos and cement, two practically indestructible materials. The large fireproof sheets—with their unusual strength increased by corrugations —permit a minimum of framing. Quickly installed, they require little or no upkeep.

When need for alteration arises, the sheets are practically 100% salvageable.

For more facts, send for brochure. Johns-Manville, Dept. CM-4 P. O. Box 290, New York 16, N. Y.



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



## Here's what we

TF YOU have a pressure problem, you can probably find the answer on L these two pages. As you well know, pressure must be accurately measured before it can be accurately indicated, recorded or controlled. And accurate measurement depends upon proper selection of the measuring element for the operating pressure range, required safety factors, and details of the medium to be measured.

This array of Taylor pressure-measuring elements is the result of our many years of development in serving the process industries. All are standard, proven, high quality Taylor systems. They are available in indicating, recording and controlling instruments, and widely interchangeable. With this complete line to choose from, your Taylor Field Engineer can help you select the exact combination that fits your requirements. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada. Instruments for indicating, recording and controlling temperature, pressure, . bumidity, flow and liquid level.

### GAGE (and vacuum)

Range limits: O to 1" water to O to 10,000 psi. The most common type of pressure instrument. Correct measuring element is determined by operating range and conditions of installation. Charts are usually calibrated in pounds per square inch (psi) or inches of water-but usually can be provided in any suitable units of measurement: millimeters of mercury, atmospheres, etc. Accuracy guaranteed to  $\frac{1}{2}\%$  of scale range.

\*Asterisk indicates measuring element is for pressure only, not vacuum.





manometer Cast iron, mercury sealed. Range limits: for pressure or vacuum from 0-1 to 0-10" water. or equivalent units of measurement.

bell



Standard actuation for pressure. Bronze, 25 to 0-2000

## do under Pressure...

U-tube

manometer

Mercury U-tube

with float on sur-

face. Castironor

steel. Rangelim-

200" water.



C spring\* Variation of multi-coiled bourdonspring. Entirely steel. Ranges: 0-2001

to 0-10,000 psi.



TO POINTER

hm

m



Range limits. 0-1" water to 25 psi. Widely used to measure pressure drop between two points ... over a still, for example. Also used to measure rate of flow when an orifice or other suitable differential-pressure producing device is installed in fluid line. Accuracy guaranteed to 1%.

### ABSOLUTE

Range limits: 0-5 to 0-25 psi. With this type instrument, pressures are measured by compensated bellows element. (This becomes increasingly desirable at low absolute pressures-because boiling points are related to absolute pressure, not vacuum.) Instruments with absolute pressure actuation are used on low pressure condensers, stills, vacuum pansin fact wherever absolute temperature correlation is important. These instruments are completely compensated for barometric pressure changes. Accuracy guaranteed to 1% of scale range.



bell manometer Cast iron, mercury sealed. Ranges: 0-1 to 0-10" water.

bellows

Sealed bellows,

no stuffing box.

Bellows and

housing bronze.

Ranges: 0-5 psi

absolute (or 0-

10" mercury; or

0-250 mm mer-

cury) to 0-25

psi absolute.



**U-tube** manometer Mercury U-tube with float on surface. Castironor steel. Ranges: 0-10 to 0-200" water.





#### aneroid manometer

Steel body with bellows of bronze; torque tube of stainless steel; no stuffing box. Ranges: 0 to 20 to 0-500" water absolute, or equivalent units of measurement.



#### aneroid manometer

Steel body with bellowsofbronze or 18-8 alloy. Torque tube, no stuffing box. Ranges: 0-20 to 0-500" water; 0-20 to 0-100 psi.



#### bellows

Sealed bellows, no stuffing box. Bellows and housing bronze. Ranges: 0-3 to 0-25 psi.

#### diaphragm\*

Self-contained. For measuring sludges, etc. Diaphragm of any material. Maximum length of tubing 50 ft. Ranges: 0-15 to 0-500 psi.



#### volumetric pressure for liquids\*

Steel (silver plated for sanitary services). Compression of bulb actuates spring. Temperature compensation permits tubing up to 35 ft. Range: 0-5000 psi.




# in STAINLESS!

-110 005 IE

Print

#### JET ENGINES ARE HARD TO MAKE

003

Specifications called for this stainless sheet metal elbow assembly. Notice the indicated tolerances! A tough job in any sheet metal-a terrific undertaking in stainless steel!

#### BUT SOLAR TACKLES ANY STAINLESS JOB

Utilizing the exclusive SOL-A-DIE process of forming and Solar's own specially developed welding, fitting and processing techniques, Solar's engineers and craftsmen maintained these exacting tolerances under successive production contracts.

#### SO IF YOU HAVE A TOUGH PROBLEM ...

which involves combating corrosion or heat-consider stainless steel. Put it up to SOLAR engineering and production skill. Our nearest office is ready *right now* to help you tailor stainless steel to your special needs.



SAN DIEGO 12, CALIFORNIA : DES MOINES 6, IOWA : 60 E. 42ND STREET, NEW YORK 17, N.Y.

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

17.250 2010



Like bad air, poor light and obsolete tools . . . Dust-Hog keeps a man from doing all he might. Dust . . . in his eyes . . . dimming his light . . . begriming his work . . . slows him down, invites mistakes, spoils morale.

Consider the money dust control saves — improving efficiency, reducing maintenance, reclaiming dust by-products. Pangborn's free booklet, "Control of Industrial Dust", brings you up to date on how to clear out costly "dust pockets".

Write Pangborn - world's largest manufacturer of dust control and blast cleaning equipment.



#### High recovery of finely-divided, dry dust is accomplished economically through the use of a centralized system employing a cloth-screen dust collector. The diagram shows a typical Pangborn

system. The complete system consists of three primary parts:

DUST

CENTRAL DUST CONTROL

- 1-the exhaust hoods and piping
- 2 the dust collector
- 3 the exhauster and drive

Dust is controlled and exhausted directly from the source of production and conveyed to the cloth-screen dust collector which effectively separates it from the conveying air. The cleared air is discharged from the exhauster Collected dust is periodically cleaned from the cloth-screens by the motor-driven rapping mechanism and deposited in the hoppers for removal.



Pangborn's Bulletin 909-A describes such important features as positive prevention of cloth collapse under air load, easy removal of individual screens, location of all mechanism on clear air side, etc. Write Pangborn Corporation, Hagerstown, Maryland.



#### NEW UNIT-TYPE COLLECTOR

An increasing tendency in industry is to connect individual dust-collecting units to each operation — rather than to use a large central system. Pangborn's new "CK" incorporates many proven features of its larger collectors. "CK" is a self-contained unit, occupying minimum floor space, and requiring minimum piping and installation expense. It is adaptable to a variety of dust problems.

Request Bulletin 910, addressing Pangborn Corporation, Hagerstown, Maryland.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

### ALCO's Better Answer to an Important **Need of the Chemical Industries**

A LCO values highly the confidence  $H_{\rm placed\,in\,its\,services\,by\,the\,chem-}$ ical and process industries. ALCO products are all directly related to the needs of this important industrial group. ALCO engineers are largely engrossed in serving-and anticipating-such needs.

An example is the vital necessity to many of these industries of an adequate supply of highly pure water-for boiler make-up, as a detergent, solvent, diluent, flotation medium, reagent, or raw material. Improved ALCO Evaporators, designed to produce pure water vapor

at higher efficiencies, with better means of scale removal and disposal, are ALCO's answer to this urgent requirement.

Interesting details, describing and illustrating this important new ALCO chemical and process plant equipment, are in a new ALCO bulletin, "Making Pure Water Plentiful!" A copy will be sent you promptly on request. Write for it now.

DEVELOPMEN SOLVES PURF WATER PROBLEM. WRITE FOR DESCRIPTIVE BULLETIN



AMERICAN LOCOMOTIVE CO. New York 8, N. Y. 30 Church St.

### ALCO PRODUCTS FOR THE CHEMICAL AND PROCESS PLANTS

Evaporators • Shell and Tube Heat Exchangers • Air-Cooled Heat Exchangers • Pressure Vessels • Columns • Prefabricated Piping • Condensers • Calandrias • Digesters • Converters • Reactors • Kilns • Fuel Oil Heaters • Scrubbers • Diesel Engines.



### **BEAUMONT IRON** WORKS COMPANY

Manufacturers of Dreadnaught Rotary Drilling and Production Equipment, including: Draw Works, Crown Blocks, Traveling Blocks, Coring Reels, Tubing Heads, Well Heads, and Electric Steel and Alloy Castings.





### DIFFERENTIAL PRESSURE TRANSMITTERS For Measurements of Flow-Level-Pressure Difference

The Republic Differential Pressure Transmitter is a pneumatic metering device. It employs the forcebalance principle to establish an air pressure which varies proportionately to variations in differential pressure. It is adaptable to a wide range of flow conditions and a wide variety of fluids.

### Four important features of this transmitter are:

ACCURATE...

Transmitting pressure vs. measured differential is guaranteed to be within  $\frac{1}{2}$  of 1% of the transmitter range. This is higher than can be consistently secured and maintained with any other method.

### SENSITIVE ...

Due to the negligible motions required for complete operation of all parts for full scale change, no appreciable hysteresis results from reversal of direction of measurement change. The hysteresis loop is so small that it is undetectable for ordinary means, being less than 1/20 to 1%.

### FLEXIBLE...

A range change of approximately 2 to 1 can be accomplished by merely changing the position of the reaction diaphragm along the weighbeam. The range may be increased approximately 7 to 1 by changing the size of the reaction diaphragm. Still further range change can be accomplished by changing the size of the differential diaphragm. On the most commonly used model it can be as high as 58 to 1. Minimum range 0 to 7 inches of water, maximum range 0 to 400 inches of water.

Any of these changes can be easily made in the field.

**RUGGED...** In addition to being built to operate under outdoor conditions, the construction of the Republic pneumatic transmitter is extremely rugged. The design both permits and requires strength, as the force-balance principle could not be carried out with light bendable parts. All bearings, levers, pins and other working parts must be heavy enough to carry appreciable loads and are therefore not susceptible to damage in ordinary handling.

For complete data write for Data Book No. 1000

### **REPUBLIC FLOW METERS CO.** 2240 Diversey Parkway, Chicago 47, Illinois

• Buill by STRUTHERS WELLS CORP.

STRUTHERS WEL

### right Kneading needs right bearings

N

You can be certain that when 3600 gallons of material is poured into this Northmaster Kneading Machine, its BCSP Bearings turn smoothly . . . assure long life combined with minimum wear on shaft seals and gears . . . insure close blade clearances for precision operation.

ര

carriers, they're low lubricant consumers, require no adjustments, and show practically no wear in years of dependable performance. You can be certain that BDSP puts the right bearing in the right place ... always. Radial and thrust load Front St. & Erie Ave., Phila. 34, Pa. 5994

> Puts the RIGHT BEARING in the RIGHT PLACE

### Copper and Everdur processing equipment for SUGAR...BEER...DISTILLERY MASH

CORES of greatly diversified materials and products are processed in equipment built of copper or copper alloys. The equipment shown here is typical... as is also the excellent performance provided by the metals employed.

Anaconda Copper and Copper Alloys are made in a wide range of compositions to provide efficient operation and economical life under various conditions of corrosion, abrasion, temperature, pressure and stress. Alloys are available which possess high heat transfer characteristics, strength, corrosion resistance, excellent workability and weldability for economical construction of many types of equipment for processing service.

Manufacturers and users of processing, heat transfer and other chemical equipment are invited to consult with our Technical Department on problems relating to selection of metals. For detailed information on Anaconda Copper and Copper Alloys, write for Publications B-30 and B-2.









12' long. Tubes, 3/4" O.D. by .065", and tube sheets are also Anaconda Copper.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

#### SUGAR LIQUOR HEATER... Copper Tubes still good after 10 years' service

(Left) One of the largest juice heaters built for sugar plantation work...length 25 ft., dia. 51 in., weight 30,600 pounds. Designed and built by Krajewski-Pesant Manufacturing Corporation, New York, for Central Eureka, Inc., Mayaguez, Puerto Rico. Equipped with 120 Anaconda Copper Tubes, 21/8 in. dia. by 22 ft. 4 in. long, and Everdur\* lining plates fastened on inside of covers with Everdur screws. No tubes have been replaced since installation in 1935.

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

#### **BEER CARBONATION EQUIPMENT uses** welded Everdur and 18" copper tubes

(Below, left) Multi-stage Saturating Beer Carbonators manufactured by Louis DeMarkus Co., Pittsburgh, Pa., for C. Schmidt & Sons, Inc., of Philadelphia. Bodies of the three carbonators are made of Anaconda Copper Tube 18.3125" O.D. by 18.00" I.D. DeMarkus wet gas (CO2) compressors, below, for Duquesne Brewing Co., Pittsburgh, Pa., are each equipped with two Everdur tanks which are carbon arc welded, using Everdur 1010 rod.



 Corhart Electrocast Refractories are high-duty products which have proved considerably more effective than conventional refractories in certain severe services. If your processes contain spots where a better refractory is needed to provide a balanced unit and to reduce frequent repairs, Corhart Electrocast Refractories may possibly be the answer. The brief outline below gives some of the basic facts about our products. Further information will be gladly sent you on request.

Corhart Refractories Company, Incorporated, Sixteenth and Lee Streets, Louisville 10, Kentucky.

"Corbart" is a trade-mark, registered U. S. Patent Office.

#### PRODUCTS

The Cothart Refractories Company manufactures Electrocast refractory products exclusively. Cor-bart Electrocast Refractories are made by melting selected and controlled refractory batches in electric furnaces and casting the molten material into molds of any desired reasonable shape and size. After careful annealing, the castings are ready for shipment and use. Three Electrocast refractory compositions are commercially available: CODEMART STANDARD ELECTROCAST - a

commercially available: CORHART STANDARD ELECTROCAST — a high-duty corundum-mulifite refractory, with density of approximately 183 lbs. per cu. ft. CORHART ZED ELECTROCAST—a high-duty zirconia-bearing aluminous refractory, with density of approximately 205 lbs. per cu. ft. CORHART ZAC ELECTROCAST—a high-duty zirconia-bearing refractory, with density of ap-proximately 220 lbs. per cu. ft. Other Conhect products are

Other Corhart products are:

CORHART STANDARD MORTAR-a high-temperature, high-quality, hot-setting cement for laying up Electrocast, or any aluminous

CORHART ACID-PROOF MORTARS — rapid cold-setting, vitrifiable mortars of minimum porosities.

CORHART ELECTROPLAST—2 high-tempera-ture, hot-setting plastic refractory, designed for ramming and made from crushed Standard Electrocast.

CORHART ELECTROCAST GRAINS-Stand-ard Electrocast crushed to desired screen size for use in many commercial applications.

#### PROPERTIES

Due to the unique method of manufacture, the Electrocast refractory line possesses a combina-tion of characteristics found in no other type of refractory. Data on properties will be sent on request request.

POROSITY: Apparent porosity of Corbart Elec-trocast refractories is practically nil-therefore virtually no absorption. trocast

HARDNESS: 8-9 on Mineralogist's scale. THERMAL EXPANSION: Less than that of conventional fire clay bodies. THERMAL CONDUCTIVITY: Approximately one and one-balf times that of conventional fire clay bodies.

REFRACTORINESS: Many industrial furnaces continuously operated up to approximately 30000 F. are built of Cothart Electrocast.

CORROSION: Because of exceedingly low por-osity and inherent chemical compositions, Cor-hart Electrocast refractories are resistant to corrosive action of slag, ashes, glasses, and most non-ferrous metals as well as to disinte-grating effects of molten electrolyte salt mixtures.

#### APPLICATIONS

Most heat and metallurgical processes present spots where better refractory materials are

needed, in order to provide a balanced unit and reduce the expense of repeated repairs. It is for such places of severe service that we invite inquiries regarding Corhart Products as the fortifying agents to provide the balance desired. A partial list of applications in which Corhart Electrocast products have proved economical follows: follows:

GLASS TANKS—entire installation of sidewalls and bottoms, breastwalls, ports, tuckstones, throats, forehearths, bushings, bowls, recuper-ators, etc., for lime, lead, opal and borosilicate glasses.

ELECTROLYTIC CELLS-for production of magnesium and other light metals.

SODIUM SILICATE FURNACES - sidewalls, bottoms, and breastwalls.

PIGMENT FRIT FURNACES complete tank furnaces for melting metallic oxides and salts for pigment manufacture.

ALKALI AND BORAX MELTING FURNACES —fast-eroding portions.

BOILERS-clinker line.

RECUPERATORS-tile, headers, separators, etc. ENAMEL FRIT FURNACES-flux walls and bottoms.

BRASS FURNACES-metal contact linings.

ELECTRIC FURNACES—linings for rocking type and rammed linings of Electroplast for this and other types.

NON-FERROUS SMELTERS-complete hearths, sidewalls, and tapping hole portions.



### CORHART ELECTROCAST REFRACTORIES



design achieves maximum break-up and uniformity of distribution without moving parts. Of durable bronze, these nozzles are available with male and female pipe connections; and in a wide range of sizes and capacities.

> ATOMIZING NOZZLE: For any service requiring a mist-like spray, such as maintaining humidity for heating and processing, conditioning perishable foods, and for atmospheric absorption. It is fitted with a Monel metal screen to prevent clogging and may be cleaned easily.

> TWO-PIECE NOZZLE: Features the removable plug for quick cleaning without removal from pipeline. In any service where clogging is a problem, the Marley Two-Piece Nozzle is the answer.

> **ONE-PIECE NOZZLE:** Built for maximum uniform output at lowest pressure. This nozzle is non-clogging under normal conditions and will render years of efficient trouble-free service.

Write for Marley Nozzle Bulletins or ask a Marley Application Engineer to assist in selecting the proper nozzles for your job.



### THE MARLEY COMPANY, INC. CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



This is what FLOW-MASTER Homogenization does - by means of a series of consecutive actions, each of which brings your product one step nearer to perfection. The FLOW-MASTER, patented and revolutionary in design, enables you to homogenize many products by batch or continuous method. It sim-

### plifies production because it does the work of several special-purpose machines. It is so simple that anyone can operate it. It is so reliable that any product once perfected can be duplicated with precision time after time. It usually cuts manufacturing costs substantially. Its first cost is surprisingly low.

### The -LOW-MASTER\_\_\_KOM-BI-NATOR

The Kom-bi-nator performs the function of 6 conventional special-purpose machines. You can combine any or all of these processes into a single, continuous operation -

Grinding, Mixing, Stabilizing, Blending, Bleaching, Emulsifying, Homogenizing. The Kom-bi-nator is self-contained, requires no accessory pump, has no pistons. It will grind many solids in a liquid medium to as small as 1 micron. It will emulsify many incompatible materials. It will mix and combine various materials into a homogeneous mass. It improves taste, texture and sales potential by providing uniform dispersal, and does it at low manufacturing cost. Write for Catalog No. 10.



FLOW-MASTER KOM-BI-NATOR

MARCO COMPANY Inc.,

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING



The new FLOW-MASTER Pumps were specially designed to meet the needs of chemical processors for these 12 features. Standard models are available in capacity ranges to 4000 g.p.h. against head pressures up to 750 psi. Pumps to handle higher capacity ranges can be custom built. For details, engineering data and prices, send for a copy of the new FLOW-MASTER Pump Catalog No. 25.

Catalogs describing the entire FLOW-MASTER Line - Homogenizers, Kom-binators and Pumps - are yours for the asking. Write for them, and let us help you with your chemical processing problems. Address Dept. A-4.





FLOW-MASTER COMMANDER Capacity 500-4000 G.P.H. FLOW-MASTER Pump with speed reducer

### Third and Church Sts., Wilmington 50, Del.

## 

- pump many difficult materials
- transfer, meter or proportion
- maintain volumetric efficiency
- positive displacement
- automatically compensate for normal wear
- maintain high vacuum
- hydraulically balanced rotors
- · work on high or low pressure
- automatic sanitary shaft seals on Commander, Challenger and De Luxe Mote
- minimum hazard of seizing or galling
- stainless, sanitary, easy to clean
- proved in years of service



FLOW-MASTER "DE LUXE" Phantom View 500-4000 G.P.H.

PROCESSED

OW-MASTER VICTOR for a built-in nump 5-300 G.P.H. REQUIRES NO LUBRICATION

ON THE -ILOW-MASTER IS THE FINEST THING THAT CAN BE SAID OF, ANT PRODUCT

# **STOP GASKET TROUBLES** ONCE AND FOR ALL!

### EXTRA METAL REINFORCEMENTS

Exclusive Flexitallic "tailormade" construction uses metalto-metal reinforcing windings where and as needed throughout the spiral, one of many Flexitallic patented features. This provides maximum gaskel strength and resiliency with a minimum of seating orea.

### The Answer to 1001 Gasket Problems

IIIIII

i hinn hinn i

Install Flexitallic Gaskets-and forget them! They're easier to install. They require no painstaking hand-finishing of seating surfaces. They automatically compensate for changing line conditions even under the highest of modern pressures and temperatures and the most severe conditions of use.

### POSITIVE HIGH-PRESSURE INTERLOCK

Positive in its interlocking action, the Flexitallic design provides adequate resiliency for automatic adjustment of the gasket to meet changing line conditions.

At the close of the war, more than 75% of all combat craft and a high percentage of all maritime vessels were Flexitallic equipped -convincing evidence of their dependability and uniformly precise construction. Write for catalog. Better yet, send details of your application for specific gasket recommendations by Flexitallic engineers.



FLEXITALLIC GASKET COMPANY 8th & BAILEY STREETS . CAMDEN, N. J.

#### PRESSURE-ANY TEMPERATURE BUILT FOR ANY CUSTOM

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

### Here is ROLLED DIRECT-FIRED HEATING For HIGH TEMPERATURE REACTIONS



Edge Moor High Temperature Calandria Reaction Vessel

For any chemical reaction that can take place in metal and which requires heating at temperatures higher than that of steam, Edge Moor engineers have developed a direct-fired system. It combines efficient oil heat utilization with the finer control features of the most expensive installations.

The system is composed of but two parts -a separate combustion chamber arranged to supply a uniform amount of heat, and a calandria vessel having an induced draft fan and by-pass system for mixing the furnace and exhaust gases. Through the use of simple control instruments a constant volume of gas at any predetermined temperature is drawn through the vessel to give a highly uniform heat transfer rate and economical use of the heat from the oil.

We solicit any production problems involving reactions, evaporation, heating, cooling, or any of their combinations. Edge Moor engineers are prepared to discuss the application of calandria vessel systems for their solution. For preliminary information write for descriptive literature.

Process Equipment Fabricators



EDGE MOOR IRON WORKS, INC. EDGE MOOR, DELAWARE

BRANCH OFFICES: New York 1, N.Y., Empire State Bldg., Chicago 2, Ill., One No. La Salle St.

CHEMICAL & METALLURGICAL ENGINEERINC • APRIL 1946 •

### Ready to connect to your present GLASS PIPE THAT DEFEATS CORROSION-MAINTAINS PRODUCT PURITY

CONNECTING PYREX brand Glass Pipe to metal pipe, tanks, valves and other plant equipment is easy with the simple adaptor flanges shown below. With these adaptor fittings you can easily discover where and how PYREX Pipe can be used profitably in your plant.

PYREX Pipe is practical plant equipment. Its sturdiness and serviceability have been proved by installations that have been in operation for many years. It is the only pipe that gives you the combined advantages of visibility, corrosion resistance and purity maintenance. It can be installed and used with confidence.

For complete details on PYREX Pipe, write to the Industrial Sales Department CM-4, Corning Glass Works, Corning, N. Y.



HAUDLER FRANCE HAUDLER FRANCE AUDLER FRANCE AUDLER HUBERNUT SPACE Tubing Ferrule Flange Set—for connecting glass pipe to metal tubing or unthreaded metal pipe.

METAL TUBING

Glass Lined Flange Adaptor Set—for connectin glass pipe to glass lined flanges.



equipment ...

**VISIBILITY.** The crystal clear transparency of PYREX Pipe permits visual inspection of every foot of your pipe line at any time. This feature serves to forewarn you of unexpected trouble in your pipe lines. In some cases it has saved the entire amount of the investment in PYREX Pipe in a single installation.

**MAINTAINING PRODUCT PURITY.** PYREX Pipe is resistant to all acids (except H.F.) and moderate alkalis. There is no heavy metal pick-up or danger of metallic contamination. PYREX Pipe lines assure the ultimate in obtaining product purity.

**EASE OF INSTALLATION.** Your own men can install a PYREX Glass Pipe Line. No special tools or special training are required. The Pipe, the fittings and the hardware come to your installation point ready for assembly. Stock adaptor flanges are available to connect PYREX Pipe to metal pipe and other plant equipment.

SIZES AND FITTINGS. PYNEX Glass Pipe is now available in 1",  $1\frac{1}{2}$ ", 2", 3" and 4". A complete line of standard PYNEX fittings includes ells, tees, return bends, laterals, and reducers. Special fittings can be readily made to your specifications.

TROUBLE CAN'T HIDE BEHIND GLASS Name Firm Address



Standard fittings and adaptor connections are available with which to connect Pyrex Pipe to your present equipment.

LOW COST. The initial cost of PYNEX Pipe (accessories included) is about the same or less than the cost of full weight copper or brass piping in comparable sizes, and is considerably less than the cost of most other corrosion resistant alloys. Whether you figure costs of new equipment in terms of initial outlay or in terms of over-all costs—spread over the length of service it will give you—PYNEX Pipe is your best bet.

**PRESSURES AND TEMPERATURES.** Operating temperatures as high as 250°F. are not unusual—and temperatures as high as 400°F. can be considered. Most installations operate at pressures up to 50 p.s.i.—but pressures as high as 100 p.s.i. can be considered.

CORNING GLASS WORKS CORNING, NEW YORK

INDUSTRIAL SALES DEPT., CM-4 Corning Glass Works, Corning, New York Please send me 1A-2 "Pyrex Pipe" for the Process Industry.



If moving hydrocarbons is your problem ask about

### WARREN PUMPS

These pumps are efficiently handling Rich Oil, Lean Oil, Isobutane Reflux, Isopentane Reflux, Debutanizer Reflux, Finished Product. Other Warren Pumps are used for Steam Condenser Circulating, Cooling Tower Water, Compressor Jacket Water . . . and among the facts definitely proven by experience is that dependability and longer life, plus minimum maintenance, is the type of round-the-clock performance consistently turned in by Warren Pumps at this modern plant.

Countless other fact-finding reports tell the same story and are conclusive evidence of what you can reasonably expect from all types of Warren installations.

Inquiries solicited.

#### WARREN STEAM PUMP COMPANY, INC. WARREN, MASSACHUSETTS

Atlanta Boston Chicago Cleveland Detroit Houston Hartford Indianapolis Los Angeles Minneapolis New Orleans New York Philadelphia Pittsburgh Richmond San Francisco Seatile



WARREN PUMPS HANDLING HYDROCARBONS





### ACCELATORS

ACCELATORS are doing a lot of different things to a lot of different kinds of water ... clarifying ... softening ... stabilizing ... removing color ... taking out iron, etc.

Results are always excellent . . . frequently remarkable.

You can't beat ACCELATORS for Performance and Economy. Would you like Bulletin 1824?





Diagrammatic Cross Section Showing Accelator Operation All treatment steps are combined and carried out quickly in an incredibly small space. Slurry containing previously precipitated solids is recirculated through mixing and reaction and return flow zones. Chemicals are added and raw water mixed in. The sludge contact (maintained by the mechanical recirculation regardless of water throughput) insures rapid and complete chemical reactions—and the treated water rises—not through the sludge—but from the surface of the slurry pool.

## You don't need Q hands

to repack this valve!

This OIC Steel Valve has all the advantages of 2-piece gland-and-follower construction PLUS the exclusive LIFT-LOK feature. When repacking is needed the maintenance man lifts gland and follower as a single unit. He turns the gland slightly so that its cam-shaped rim rests on two lugs on the yoke. Then he repacks easily and quickly without fumbling or hindrance.

This is only one of many ways we have found to give you more for your money with OIC Valves. Your OIC distributor has the full story.



The LIFT-LOK is one of the standard features of OIC Steel Valves. Your OIC Distributor can give you detailed information on special advantages in OIC Iron and Bronze valves for all applications.



VALVES

OHIO

WADSWORTH



**4-WAY MIXING ACTION** Assures Uniform, Perfectly Blended Batches with **Sturtevant** Rotary Batch Blenders

Because Sturtevant Rotary Blenders use a 4-way mixing action, they provide a *thoroughly blended product* no matter what the ingredients ... densities ... weights ... finenesses ... or other physical properties of the materials to be blended.

Here's how they operate—as materials are poured into the receiving hopper, they are picked up by the revolving buckets, and carried to the top of the blending chamber where they are cascaded and intimately mixed. At the same time the drum revolves forcing the materials from both ends toward the center of the drum ... while the swinging chute, which is in the blending posi-



tion produces an important lateral fourth mixing action. The result, a perfect blend with no substances floating to remain unmixed.

Investigate Sturtevant Rotary Batch Blenders. They are available in many sizes with capacities from 1000 to 7500 lbs. Write for details and specifications.





Our apologies to The Barium Reduction Company, South Charleston, W. Va.

In the advertisement reproduced above, we said they had produced sodium sulfide with an average  $Fe_2O_3$  content of 0.025%.

Mr. K. O. Priddy, Barium executive, tells us that this figure is no longer accurate.

With new processing equipment built entirely of Nickel and Nickel-clad steel, flakes having a maximum iron content of 0.002% are regularly produced. The average amount of Fe<sub>2</sub>O<sub>3</sub> in B.R.C. sodium sulfide is now 0.0015%, and occasionally the value drops as low as 0.0008%.

Mr. Priddy also goes on to say: "Our one regret -both from a standpoint of sales and maintenance -is that we did not install Nickel equipment many years ago."

PURE

USE

People who switch to Nickel equipment frequently make similar statements. For Nickel meets all their requirements. It's strong and tough. Easily fabricated. Most important, its high resistance to corrosion prevents harmful metallic pick-up and discoloration. That's why Nickel is so widely used for handling such products as caustic soda and caustic potash, phenol, ethyl cellulose, phosphorus oxychloride and many other solvents, reagents and intermediates.

Technical Bulletin T-6, The Resistance of Nickel and Its Alloys to Corrosion by Caustic Alkalies, contains further practical information for those who seek to improve product purity. Write us-on your business letterhead, please – for your copy.

THE INTERNATIONAL NICKEL COMPANY, INC.67 Wall StreetNew York 5, N. Y.

WHERE PURITY COUNTS

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

Migkal





• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

| MELTING POINTS OF HYDI   | RIM   | ΛE    | т    | FU    | ISI   | ED    | &     | c     | AS    | 5T    | M     | A     | S 1   | E     | R     | A     | LL  | 0     | YS    |         |
|--|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|-------|-------|---------|
| DEGREES CENTIGRADE:  | 7000  | °008  | 850° | 9000  | 950   | 1050° | 1100° | 1150° | 1250° | 1300° | 1350° | 1400° | 1450° | 1500  | 00071 | 1650° | 1700°   | 1750° | 1800° | - 1850° |
| Zirconium-Nickel (50% Zr)         Zirconium-Nickel (70% Zr)         Titanium-Nickel (80% Ti)         Zirconium-Copper (33% Zr)         Zirconium-Copper (50% Zr)         Titanium-Copper (50% Ti)         Titanium-Copper (50% Ti)         Titanium-Copper (50% Ti)         Titanium-Copper (50% Ti)         Zirconium-Cabalt (50% Ti)         Zirconium-Cabalt (60% Ti)         Zirconium-Cobalt (60% Ti)         Zirconium-Cabalt (80% Ti)         Zirconium-Cabalt (80% Ti) |       |       |      |       |       |       |       |       |       |       |       |       |       |       |       |       | The second se |       |       |         |
| Aluminum-Bronze (10% Al)   |       |       |      |       |       |       |       |       |       |       |       |       |       |       |       |       |   |       |       |         |
| DEGREES FAHRENHEIT:  | 1292° | 1382° | 1472 | 1652° | 1742° | 1832° | 2012° | 2102° | 2192° | 2282° | 23/2  | 2552° | 2642° | 2732° | 2822° | 2912° | 3002  | 2405  | 10700 | 3360°   |

Many new alloy combinations now possible

.... Also elimination of hot working

Study the above chart carefully. Note for yourself the many new alloy combinations Hydrimet Fused and Cast Master Alloys now make possible. Alloy combinations which may give you just the special characteristics for which you have been searching.

But this is not the whole story. Hydrimet Fused and Cast Master Alloys often can eliminate hot forging or hot rolling operations, previously required before fabrication. Their purity is so high that, when added to other molten metals, they show extremely high recoveries and usually eliminate completely all problems of gas porosity. Thus, the alloy combinations produced are sound, homogeneous ingots, in many cases satisfactory for direct fabrication purposes.

Data Sheets, giving specific characteristics and recommended melting and heat treating practices, are available for all the Hydrimet Fused and Cast Master Alloys listed in the above chart. Other special Fused and Cast Master Alloys, ternary as well as binary, can be produced to suit individual requirements. A wide range of Master Alloy Powders also can be supplied. Write for information to Dept. D.

### METAL HYDRIDES INCORPORATED

Colcium Hydride is a foolproof, convenient, easily transported source of pure hydrogen.

NYDRIMET PRODUCTS, TITANUUM NYDRIDE + TITANUUM POWDER . TITANIUM INCOTS . ZIRCONUM NYDROE ZIRCONIUM POWOLR + ZIRCONIUM INCOIS + METAL INTRICES COPPERTITIVIUM + COPPER ZIRCONIUM + SERTLUJM NOVEL TITANUM WCKEL + THICONUM WCKEL + COLUMBUL COBALT ALLOYS . CALCOUN HYDRIDE . TANTALUM

Helping Industry to Put the <u>Right</u> Metal in the <u>Right</u> Place

16 Congress Street, Beverly, Massachusetts

### Searching for a <u>better</u>

### catalyst carrier desiccant adsorbent?

The activated bauxite products of the Porocel Corporation, together with Attapulgus Fullers Earth, offer refiners and chemists a wide range of adsorbent, catalytic and drying agents. They have been used with outstanding success in such processes as catalytic desulfurization, the drying of gases and isomerization feed stocks, the filtering and decolorization of lubricating oils and waxes.

Many research men, working with these specially prepared, low-price products, are finding them useful in improving product quality and cutting costs. It is possible similar tests in your own laboratory will point the way to savings and more efficient methods. We shall be glad to send a generous free sample for testing. There is no obligation. Write for yours today.

#### POROCEL

A rugged, activated bauxite. Used widely as an adsorbent, catalyst and catalyst carrier. Efficient as a vapor phase desulfurization catalyst. As a carrier, it supports large quantities of many inorganic salts and other compounds. Favored as percolating medium for lubricating oils and waxes. Supplied in various standard meshes, moisture contents and in special low-iron, low-silica grades.

### DRIOCEL

Specially selected and activated bauxite with high moisture adsorption specifications. Applicable to most gas and liquid hydrocarbon and other chemical drying processes. Used successfully in drying natural gases, pure hydrocarbon gases, hydrogen, flue gases, feed stocks to isomerization, synthetic rubber, alkylation units and other processes. Supplied in a variety of standard meshes.

### FULLERS EARTH

Naturally active and extrusion improved qualities. Standard for many refining and processing operations, including lubricating oil, wax and petrolatum decolorization, Gray Process treating of cracked naphthas, vapor phase desulfurization of natural and straight run gasolines and general oil purification work. Supplied in a variety of mesh and water content specifications.

ATTAPULGUS CLAY COMPANY 260 SOUTH BROAD STREET · PHILADELPHIA 1, PENNSYLVANIA EXCLUSIVE SALES AGENT: POROCEL CORPORATION

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING



### WE BUILD

Rotary Kilns Rotary Coolers Rotary Dryers **Rotary Slakers** Scrubbers Evaporators Jaw Crushers **Gyratory** Crushers **Reduction Crushers Crushing Rolls** Grinding Mills **Ball Mills** Rod Mills Tube Mills **Pug Mills** Wash Mills Feeders **Rotary Screens** Elevators

therefore, when in the market for a rotary kiln, you naturally want to buy the best and most efficient. Traylor Kilns are voted the best by many satisfied users, in the cement, lime and process industries, in this and many foreign countries.

The Aluminum Industry alone has 44 kilns, totaling 11.000 feet.

These users have found out by actual experience that the special features and ideas built into their kilns, all as a result of our engineers' study of the work to be done and problems encountered, are giving them the exact, sufficient and economical production they need.

If your plans for taking care of postwar demand for your product and for meeting competition include a new rotary kiln it will be to your advantage to investigate the Traylor Rotary Kiln.

Our representative will be glad to call at your convenience.



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



Here's a Valve You Can Trust in Exposed Locations .

### CHAPMAN LIST 960

The Chapman List 960 Small Gate Valve is fitted with a flanged forged steel packing gland, which safeguards the threading on the valve yoke against rusting and corrosion when the valves are used in exposed locations. Quick-acting threads open and close easily — will not stick or freeze. Seats and plugs can be superhardened for extra severe services.

Chapman List 960 Valves in sizes from <sup>1</sup>/<sub>4</sub>" to 2"
— carbon steel for pressures to 800 pounds at 750° F. For higher pressures, specify List 990.

### The Chapman Valve Mfg. Company

INDIAN ORCHARD, MASS.

PATENT NO. 1,866,292 Saves expensive ingredients Saves time ... labor Mixes correct proportions Regulates production

### the RICHARDSON bulk weighing scale

does 'em all!

You'll be surprised at the number of money-saving, production-speeding functions of the Richardson Automatic

> Bulk Scale. Whatever type your material: borax, carbon black, clays, ores, minerals, salts, soda ash, potash, alum, etc....whether it's hot or cold, lumpy or powdery, corrosive or abrasive...Richardson Bulk Scales can make your process control more accurate, less costly, and assure uniformity of your end products.

> > Richardson specializes in building weighing machinery for chemical and metallurgical operations. Used singly, or in batteries of two or more, Richardson Automatic Scales are "in series" with production lines, conveyors, and chutes in hundreds of chemical plants today.

This automatic bulk scale-suitable for any dry ground or granular materials or chemicals -is the enclosed type (dustproof housing), with special agitator for fine or sluggish materials. The weighing mechanism itself-the heart of the Richardson system-operates on the equal-arm balance system, the most accurate known. All platework that contacts chemicals in the Richardson Automatic Bulk Scale is built of stainless steel or non-corrodible metal.

No matter what your capacity-from 10 lb. to 10,000 lb.-Richardson can build a scale for your needs. For a better idea of the applications of Richardson bulk weighing machinery send for Bulletin No. 2140-1.

RICHARDSON AUTOMATIC BULK SCALE, ENCLOSED EXTERNAL LEVER TYPE, HEAVY DUTY, POWER FEED.

> ACCURATE WEIGHING OF MATERIALS IN MOTION

> > 3 648

### RICHARDSON SCALE COMPANY CLIFTON, N. J.

Atlanta • Boston • Chicago Omaha • Montreal • New York Philadelphia • San Francisco Toronto • Wichita • Minneapolis TYPE OF GROUND, DRY OR GRANULAR MATERIALS

Alum • Ammonium Sulphate • Borax • Lime • Calcium Chloride • Graphite Carbon Black • Feldspar • Nitrates • Clays • Ores • Talc • Fullers' Earth Salt • Potash • Sludge • Soda Ash • Phosphates • Sulphur

Handled By RICHARDSON SCALES

### FEATURES YOU CAN AND CAN'T SEE IN THIS REFRIGERATION COMPRESSOR

Close study of this Worthington Vertical, Two-Cylinder, Single-Acting Enclosed Compressor made in five sizes from 6" x 6" to 10" x 10" reveals features that guarantee maximum efficiency and long life. For instance: main and outboard bearings of the self-aligning double-row roller type; force-feed lubrication of cylinders, bearings and pins; large area Feather\* Valves on suction and discharge . . . lightest, quietest, most efficient ever designed for compressor use; safety head on discharge to reduce slop-over hazard; unit-type manifold with stop, by-pass and pump-out valves and improved quick-opening relief valve. Bulletin C-1100-B18A gives all the facts about these and other features. Write for it — today.

#### OTHER WORTHINGTON ADVANTAGES

There's more to a Worthington Refrigeration Compressor than what you can see or read in the specifications. There's the application skill that accounts for the vast amount of Worthington Refrigeration equipment in the petroleum industry. There's the engineering ability that has accounted for Worthington's solution to more difficult problems of gases under compression. There's the fact that Worthington makes so many of the "inner vitals" of the high side of a refrigeration cycle that it is your best source of the efficient, economical "integrated" installation you want.

For further proof that there's more worth in Worthington, talk things over with your near-by Worthington Distributor, or write direct to Worthington Pump and Machinery Corporation, Harrison, N. J. Specialists in air conditioning and refrigeration machinery for more than so years.









IN LABORATORY TESTING of gases every detail of AMERICAN wet test meters from gage glass to water line marker and chromium

plated pointer insures not only more precise reading ... quickly ... but insures continued accuracy of operation for many years. • Greater facility of adjustment is provided. • The metals and materials employed throughout afford maximum protection against corrosion. • Bulletin AG3 describes the up-to-date features in detail, and gives complete data on capacities and applications of the various sizes. It will be mailed you on request. • These instruments are made by the originators and perfecters of wet test meters in the United States.



### Dividend - 650 GALLONS



The T Square Test shows the flush fitting of the Tri-Sure Flange which guarantees full drainage.

THE result of recent tests of closures by an independent oil company showed that Tri-Sure Closure fitted drums drained an average of 8.34 ounces more than the others. Figured on the scale of a 10,000 - 55-gallon drum shipment, the consumer will recover 650 gallons or over which otherwise would have remained in the drums.

- returned through

TRI-SURE

FULL DRAINAGE

in average

10,000-drum shipment

The flush fitting of Tri-Sure flanges assures complete drainage and you receive all you pay for.

Mark your orders, "Drums to be fitted with Tri-Sure Closures."



AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y. TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

# AO Chemical Goggle

### ... protection against splash and impact



The new AO No. 361A Duralite Chemical Goggle has been provided with greatly improved side shields — especially designed to protect against chemical splashes, while still permitting indirect ventilation to minimize fogging. Individually designed eyecups permit snug, comfortable fit — provide a wide angle of vision — are *non-conductors* of heat and electricity.

Other features include the curved ball-chain bridge, allrubber, one-piece headband, Super Armorplate or 6 Curve Super Armorplate clear or Calobar lenses in medium, dark or extra dark shades.

Your nearest AO Safety Representative can supply you.



COMPANY SOUTHBRIDGE, MASSACHUSETTS Safety Division

BRANCHES IN PRINCIPAL INDUSTRIAL CITIES

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

# do you vaporize these Solvents?

ALCOHOLS CHLORINATED COMPOUNDS ESTERS ETHERS HYDROCARBONS KETONES CARBON BISULFIDE

Any of these solvents alone or in combination can be recovered from air with "Columbia" Activated Carbon.

Carbide and Carbon Chemicals Corporation supplies complete solventrecovery systems designed and engineered to recover solvents economically with "Columbia" Activated Carbon. A large indoor installation is pictured at right.

These plants can recover solvent vapors in low concentrations even in the



centrations even in the presence of water vapor. Their efficiency is high, often better than 99 per cent of the solvent vapor passed to the adsorbers. However, overall recoveries of solvent used vary with the vaporizing operation and the type of vapor-collecting system. These solvent recovery plants can be completely automatic. The investment is moderate, the recovery expense is only a fraction of the cost of replacing the solvents. For further information write for the booklet, "Solvent Recovery by the 'Columbia' Activated Carbon System" (Form 4410).

CARBIDE AND CARBON CHEMICALS CORPORATION Unit of Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N.Y.

COLUMBIA Life-Saver for Men and Materials Activated Carbon GAS AND AIR PURIFICATION CATALYSIS SOLVENT RECOVERY

Experience in the process industries for nearly twenty-five years has demonstrated that only a LaBour Pump can make good on the kind of job LaBours are built to do.

IF YOU NEED A

NOTHING ELSE WILL DO

. . . If you need the rapid, dependable priming for which LaBours are noted, you can't get it without a LaBour Pump. . . . If you need the complete absence of packing or rubbing seal provided by LaBour Type G, there's no substitute for LaBour. ... If you need efficiency with an open impeller such as LaBour delivers, you get it only with a LaBour.

. . . If you need vapor capacity to prevent binding, one of the features of LaBour Type Q, no other non-priming pump can supply your needs.

Old-timers in the industry know the truth of these facts. They are facts worth remembering because they can save you a great deal of time and money when you buy or specify pumps.

THE LABOUR COMPANY, INC. Elkhart, Indiana, U.S.A.



#### HERE'S HOW REFRIGERATION IS DOING A JOB FOR THE CHEMICAL INDUSTRIES

**Constant temperature control.** Fully automatic G-E equipment will maintain any required temperature level for minutes . . . or weeks.

**Tailored temperature control.** G-E refrigeration equipment can be so regulated as to automatically follow a specific temperature program for any process.

**Evaporative cooling.** Where water costs are a sizeable factor, G-E evaporative coolers and condensers save many a production dollar.

**Special cooling jobs.** Wherever a chemical process requires cooling, your G-E distributor can suggest an economical efficient G-E system that will do the job to your satisfaction.

Refrigeration is used to carry batches through any desired program . . . in precipitation kettles, for example. The refrigeration first dissipates chemical heat from the reaction between ingredients . . . holding the temperature constant for uniformity in the reaction . . . and then pulls down the temperature of the resulting aqueous mixture to effect precipitation of crystals in a definite predetermined cycle.

Throwing down Crystals Throwing Knough Refrigeration

### G-E Know-How plus G-E Show-How

In this, as in other applications of refrigeration, your G-E distributor or contractor can supply you with fully automatic equipment, sized correctly to do the job you specify. He will be glad to consult with you on the installation of G-E refrigerating equipment in your plant. General Electric Company, Air Conditioning Department, Section 6404, Bloomfield, New Jersey.



### Industrial Refrigeration

### **For Never-Failing**



in Services Involving Extreme Temperatures, Pressures and Corrosive Fluids

use HOMESTEAD

LEVER-SEALD VALVES

For more than 15 years HOMESTEAD LEVER-SEALD VALVES have solved the operating difficulties of hundreds of manufacturers in services where temperature extremes, pressure and the corrosive action of line fluids would cause ordinary valves to stick or "seize."

HOMESTEAD LEVER-SEALD VALVES never stick. For built into each valve is a powerful lever and screw device which relieves seating pressure between plug and body just enough to overcome friction and permit easy turning at all times and under all conditions.

They operate faster too ... 16 to 28 times faster than screw-stemtype valves, because a QUARTER-TURN fully opens or closes them. The QUARTER-TURN principle also makes them ideal for installation in restricted areas, next to walls, floors, ceilings, congested piping and other obstructions where many other types of valves could not be operated.

HOMESTEAD LEVER-SEALD VALVES are available in combinations of metals and alloys to meet your service requirements. Sizes range from 11/2" to 10" for pressures from vacuum to 1500 pounds. For complete details write for Valve Reference Book No. 38. No obligation.



#### OUTSTANDING FEATURES

- A QUARTER-TURN fully opens or closes valve.
- INSTANT STICKPROOF OPERATION, Plug turns freely after seating pressure is relieved by screw lever.
- LEAK PROOF. Deep stuffing box and gland prevent leakage.
- POSITIVE LEAKLESS SEAL WITHOUT USE OF
- LUBRICANT is obtained by reapplying full
- seating pressure with screw lever after opening or closing.
- STRAIGHT-LINE FLUID FLOW. No obstructions to cause pressure drop.
- SEATING SURFACES ALWAYS PROTECTED In both open and closed positions. Fluid or
- grit cannot damage valve seat.
- SEALED BOTTOM prevents fluid loss and reduces hazards.

COMPANY



STICK

HOMESTEAD VALVE MANUFACTURING P. O. BOX 13 CORAOPOLIS, PA.

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

You can't beat this drum. A "Homogeneous" lead-lined treater drum, designed to resist corrosion and heatcreep. Its lead lining will not separate - even under extreme vacuum

Bonded for Life No Wonder "HOMOGENEOUS" Lead-lined Equipment stands up under Extreme Operating Conditions

The handling of acids and other corrosive liquids is frequently very tough on equipment.

This is particularly true when the problem is aggravated by conditions involving vibration, vacuum, high pressure, repeated thermal changes and shock impact.

To meet such conditions - as well as those where heat transfer is important --- National Lead offers a complete range of "Homogeneous" Lead-lined or Lead-covered Equipment.

Its outstanding feature is the tenacious adhesion of the lead to the steel, copper or brass of which the apparatus is constructed. By our special "Homogeneous" method, the lead lining or covering is inseparably bonded - giving positive assurance that it will not creep, buckle or in any way separate. And, because no tin or tin-lead solder is used in the bonding, the equipment can be used safely at temperatures closely approaching the melting point of the lead itself.

Thus, under shock, vibration, vacuum and temperature change, this rugged "Homogeneous" equipment goes on doing its job-cutting down costly replacements, and even more expensive shut-downs-proving itself, time and time again, a sound, profitable investment.

Made to Specification - Because no two acid handling projects present exactly similar requirements, all National Lead "Homogeneous" equipment is fabricated to specification ... specially designed and constructed to meet given conditions.

And remember, whether you need lead pipe, fittings, valves ... anything in lead up to a complete acid recovery plant ... National Lead can supply you. And give you the benefit of years of experience in thousands of acid processing applications.

Try and part 'em! You can clamp a strip of our 'Homogeneous'' lead-covered steel in a vise and twist it until the steel fractures, but there will be no parting of the metals. It's bonded for life!

1

1

1

1

1

1

1



Some like 'em hot, some like 'em cold. The four coils illustrated are lead - covered copper for use in a pigment manufacturing plant. National Lead "Homogeneous" heating and cooling coils are in wide use throughout industry.

#### Specify "Homogeneous" for:

Acid car and trailer tanks, acid columns, agitators, autoclaves, digestors, heat exchangers, vacuum tanks, leadcovered heating and cooling coils and other similar uses.



In the Walworth line there's a valve for every job, engineered to assure maximum economy of operation and trouble-free performance. Each Walworth valve has ALL the latest features of advanced design that are required for the service for which the valve is recommended.

Walworth Catalog 42 gives full information on the Walworth complete line of steel, iron body, bronze and lubricated plug valves, as well as a complete line of fittings: Your copy may be obtained upon request. Write for it today.

Walw VALVES AND FITTINGS

Walworth

MANUFACTURERS OF QUALITY VALVES

AND PIPE FITTINGS FOR 104 YEARS

60 EAST 42nd STREET, NEW YORK 17, N.Y. DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD APRIL 1946
 CHEMICAL & METALLURGICAL ENGINEERING

# **Overflowing** with useful information on VALVES & FITTINGS and other ACCESSORIES & SUPPLIES

- ACCESSORIES AND SUPPLIES
- · ICE CANS AND AIR FITTINGS
- VALVES AND FITTINGS
- COLD STORAGE DOORS
- RENEWAL PARTS
- TABLES AND DATA

ACCESSORIES AND SUPPLIE FOR BURICERATION = AIR CONDITIONING PLANT

You can't go wrong when the "York Catalog of Accessories and Supplies" is handy. It's crammed with useful information you need for placing an efficiently handled order. Sizes, weights, performance data, net prices, photos, mechanical drawings, descriptionsthey're all there in handy loose-leaf form to help you keep your copy up to date. Write today on your letterhead. York Corporation, York, Pennsylvania.

Other easily found subjects include: Air Filters, Automatic Controls, Brine Testing Sets, Calcium Chloride, Coils and Piping, Cork Board, Cork Pipe Covering, Freen, Gas Masks, Motors and Pumps, Oil, and tube Cleaners.






#### The high Rust Inhibition of Eagle Super "66" Insulating Cement pays you an extra dividend!

Yes, Eagle Super "66" Insulating Cement gives you an important "extra"-a rust inhibitive quality that helps prolong the life of your heated metal equipment, thus saving costly repairs and replacements. Extensive tests have proved that in addition to doing a tremendously efficient job of insulating, Super "66" actually inhibits rust!

"Springy Ball" structure, "Springy Ball" Super "66" is made up principally of "Springy Ball" Mineral Wool pellets, literally honeycombed with dead



air cells. These dead air cells effectively block the escape of heat-give Super "66" extremely low thermal



conductivity. Super "66" withstands a full range of temperatures up to 1800° F., and if not used at temperatures above 1200° F., can be removed, remixed and reused!



All-purpose - easy to apply. Super "66" can be applied easily and quickly to most any size or shape

surface. Just mix with water, spot over surface and trowel to desired thickness.

#### High coverage. As high

as 65 sq. ft. per 100 lbs. wet. Shrinkage, which occurs in thickness only, is less than 15%.

Send for data sheets. They contain complete technical information about Eagle Super "66." Available on request.

FREE Manual! Gives examples of how industrial insulation effects large fuel savings. Includes Heat Loss Estimate Sheet for your use. Write for your copy.



**Other Eagle** Industrial Products include:

EAGLE INSULSEAL. A protective coating for insulation. Trowels on - dries to a hard finish. Withstands up to 450° F.

EAGLE SWETCHEK (black). A prepared, asphaltic base, rustinhibitive anti-condensation compound.

EAGLE DRYCOTE (white). A dry, ready-to-mix, rust-inhibitive anti-condensation compound.

EAGLE "43" FINISHING CEMENT. A hard white finish coating for all types of indoor insulation within a range from 70° F. to 800° F.





#### Made by THE EAGLE-PICHER COMPANY . CINCINNATI (1), OHIO

Eagle Super "66" Insulating Cement • Eagle L-T and M-2 Feit • Eagle Supertemp Block • Eagle Blankets • Eagle Pipe Covering Eagle Insulseal • Eagle Loose Wool • Eagle Insulstic • Eagle Swetchek • Eagle Drycote

### CHEMICAL STONEWARE its place in the unit processes

MANUALLY

COPERATED

#### 1. — FLUID HANDLING General Ceramics ACID ELEVATORS For Handling Corrosive Liquids

AUTOMATIC ACID ELEVATOR

When-working out a flow sheet for a new process one of the most important considerations is the choice of apparatus for the handling of corrosive liquids.

WITH OF REALING ON COMPUTATION OF

One of the simplest devices for this purpose is the Acid Elevator, or Acid Egg. Chemical stoneware is an ideal material of construction for this equipment as it is not only corrosion resistant but corrosion proof against all acids, with the exception of hydrofluoric.

General Ceramics chemical stoneware acid elevators are made in two styles, manually operated and automatic, and in capacities ranging from 15 to 200 gallons. The manually operated acid egg is suitable for batch operations and the automatic acid elevator is used where continuous operation is required. Both types have the inherent characteristics of simplicity of operation, comparatively low first cost, ease of maintenance, and low air consumption.

If you are having difficulty with an acid handling problem SEND FOR BULLETIN 201 which describes in detail the construction, installation, and operation of this equipment.

General Ceramics engineers, experienced in all phases of the handling of corrosive liquids, will be glad to cooperate on the design and selection of this apparatus. Write to our main office or to one of our branch offices for complete information on this subject and for BULLETIN 201.



11/11/11/11

#### HEAT AND CORROSION RESISTING CASTINGS

Midvaloy 18-8 is one of the oldest and best known cast stainless steels. Its applications are wider and more varied than those of all other compositions of corrosion resistant alloys. Melted in induction furnaces to exacting compositions.

The Midvaloy family of 18-8 -

| Midvaloy   | Chrome | Nickel | Carbon | Molybdenum | Others'    |
|------------|--------|--------|--------|------------|------------|
| 1808-7     | 18     | 8      | .07    | _          |            |
| 1808-10    | 18     | 8      | .10    |            | _          |
| 1808-16    | 18     | 8      | .16    |            |            |
| 1808-20    | 18     | 8      | .20    |            | _          |
| 1808-7-Se  | 18     | 8      | .07    |            | Se .20/.30 |
| 1808-7-Сь  | 18     | 8      | .07    | _          | Cb 10XC    |
| 1808-7-Mo  | 18     | 8      | .07    | 2.00/3.50  | - 115      |
| 1808-10-Mo | 18     | 8      | .10    | 2.00/3.50  | · · · ·    |
| 1808-16-Mo | 18     | 8      | .16    | 2.00/3.50  | Сь 10ХС    |

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

OFFICES: NEW YORK + CHICAGO + PITTSBURGH WASHINGTON + CLEVELAND + SAN FRANCISCO





Custom Steel Makers to Industry



### B. F. Goodrich Chemical Company THE B. F. GOODRICH COMPANY

CHEMICAL & METALLURGICAL ENGINEERING . APRIL 1946 .

## LIFE-EXTENSION BY THE GRAM



CRUCIAL links in every wire and radio system are paper capacitors — rolls of impregnated paper and metal foil. At least one is in every telephone — and more than 100 million are in the Bell System. A single failure can sever a telephone call, put a costly line out of service. So finding out how to make capacitors stand up longer is one of the big jobs of Bell Telephone Laboratories.

All-linen paper was once the preeminent material. Then wood pulp was tried – and found to last longer under heat and direct voltage. But why? Something in the wood was helping to preserve life. What was it?

Ultra-violet light, delicate microchemical analysis and hundreds of electrical tests gave a clue. Researchers followed it up—found the answer by treating the impregnated paper with anthraquinone—a dye intermediate. A mere pinch of the stuff prolongs capacitor life by many precious years.

When war came, great quantities of capacitors were needed for military

equipment, where failures could cost lives, lose battles. The Western Electric Company, manufacturing for the Bell System, willingly disclosed the life-preserving treatment to other manufacturers. Today in communication capacitors, the new "life-extension" is helping to give more dependable telephone service.

Day by day, resources of this great industrial laboratory are being applied to perfect the thousands of components which make up the Bell System.



BELL TELEPHONE LABORATORIES EXPLORING AND INVENTING, DEVISING AND PERFECTING FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE.



Triple-alloy steels containing Nickel offer designers the following *triple* advantages:

- 1. OUTSTANDING PERFORMANCE-Strength and toughness, resistance to wear, fatigue or shock to meet a wide range of requirements, as dictated by design.
- 2. RELIABILITY-based on consistently uniform response to heat treatment.
- 3 ECONOMY-resulting from standard compositions precisely graded to match the engineers' needs.

Service records established by triple-alloy steels over a period of years show that they are giving excellent results in many diverse and exacting applications.

The large number of standard compositions available, including the 4300, 8600, 8700, 9300 and 9800 series, permit accurate and economic selection for specific uses.

Because of their many advantages, these triple-alloy steels warrant your careful consideration when planning new or improved designs. We shall be glad to furnish counsel and data upon request.

#### THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •



CORROSION-PROOFING CONCRETE

**PHOTO 1** — Concrete columns in muriatic acid plant in areas next to and above furnace. Temperature on surface is high, condensation great, when plant is shut down. High concentration of HCL fumes in the air at all times. Picture shows salt deposits caked on Prufcoat treated concrete with no failure or disintegration of either the Prufcoat coating or the concrete.

**PHOTO 2** — Ceiling in same plant. Acid fumes had eaten out the concrete and were attacking the reinforcing rods. Surface was wire brushed and treated with three coats of Prufcoat and has stood up without further treatment for six years. The supporting columns had disintegrated so far that rebuilding was necessary before treating. **PHOTO 3** — An area in the same plant where Prufcoat was applied right over previously disintegrating concrete and reinforcing rods. The newer looking sections had gone so far that they had to be rebuilt. Stack could not be coated because of its intense heat, but Prufcoat has been used on all adjacent areas. Finish is light buff color instead of customary black.

**PHOYO 4** — Close-up shot in same acid plant showing surfaces protected with Prufcoat. Joints in tile wall were treated with Prufcoat Clear, ceiling with Buff and other surfaces with Gray. Application was done by the plant's own maintenance crew. After six years of continuous HCL fumes, no failure shows. Previous coatings required repainting once a month.





#### FOR ALL INDUSTRIAL USES REQUIRING PRESSURE OR VACUUM

Agitating Acids and Liquids Agitating Film Baths Air Blast Cleaning of Dies, etc. Air Operated Calliopes Anneoling Furnaces Auto Laundries Blacksmith Forges Boosting Inlet to Compressors Ceramic Kilns, Furnaces, Ovens Chemical Processes Drying and Baking Ovens Drying of Textiles Enameling Ovens Foundry Cupolas Gas or Oll Combustion Kilns for Brick and Clay Products Low Pressure Sand Blast Mine and Tunnel Ventilation Paper Manufacturing or Handling Oil Refineries Pneumotic Conveying Row Water Ice Systems Sewage Disposal Steam Clothes Press Supercharging and Priming Vacuum and Rug Cleaning OR - wherever AIR or GAS is to be moved at any pressure between 1/2 and 12 psi or equivalent vacuum.

A determined to the sector

End view of blower with headplate removed to show impellers and preclsion machining.

MANUFACTURED BY ALLEN BILLMYRE COMPANY 477 Fayette Avenue, Mamaroneck, N. Y. Notice how the two inter-engaging impellers of the POTTSTOWN Rotary Blower rotate in opposite directions. The concave portion of each impeller alternately carries along a pocket of clean air as it passes over the bottom inlet. This impulse of air is swept half around the interior of the casing wall and then forced through the top outlet. At operating speeds these alternating impulses merge into a continuous flow of air. The impellers are inter-engaged by timing gears operating in an external sealed-case oil bath.

Efficient positive displacement is accomplished with POTTSTOWN Blowers because their precision machiping permits close tolerances of only .003" on moving parts. Their efficiency is maintained during long life because there is no actual contact or surface friction between the impellers themselves —nor between impellers and casing interior. No wearing parts here!

With friction eliminated, interior lubrication is unnecessary. Only clean air — uncontaminated by lubrication — is delivered to your air lines. No valves, springs, pistons, sliding vanes, or other friction parts to wear out or cause repairs. THAT'S the inside story of the POTISTOWN Blower!

Simplicity of design — sturdy construction — precision machining — THESE FEATURES eliminate maintenance and adjustments, even on daily 24hour service!

Write today for our new Bulletin No. P-100.

VE DISPLACEMENT

The second state of the state o

**BLOWERS AND EXHAUSTERS** 

POSITI

ROTARY





"Something caught my eye in the wastebasket... a trade journal I had flipped through and discarded. It was turned up to an ad which promised a 46% saving in material handling costs. When they talked about cutting my handling costs that much, well, I wanted to be shown.

"Literature told how this saving could be accomplished simply through the use of a bright, shiny orange and black electric truck called "Transporter"... the miracle truck that lightens life's loads. It was an impressive story. As a result I ordered one, and an A.T.C. Specialist showed up with it to demonstrate what they claimed.

"He piled 6000 pounds of our most unwieldy product on it. Then asked for one of our stenographers... and she promptly walked off with the load as easy as she'd powder her nose. Her thumb pressed a button, her hand gently guided it. That's all there was to it. Husky truckers accustomed to a three-man operation moving similar loads were amazed . . . couldn't wait to try this wonder truck that meant for them an end to back-breaking, gruelling toil.

"I was more than sold on Automatic Transporters. They have cut our material handling costs 46%...a solid \$24,480.00 saved\*-the equivalent of \$244,800.00 worth of increased volume on a 10% profit basis. That's the money-saving, profitmaking opportunity I found in my wastebasket."

Such savings may be duplicated many times over during the life of Transporters...may be multiplied many times depending on the size of your material handling operation. Mail the coupon for complete facts.

Remember: Only AUTOMATIC Makes the TRANSPORTER

| Transporter<br>A PRODUCT OF AUTOMATIC<br>Life's LOADS<br>Case 10 in "Automatic Savings Parado  | e" |
|--|----|
| AUTOMATIC TRANSPORTATION COMPANY<br>Div. of The Yale & Towne Mfg. Co.<br>49 West 87th Street, Dept. D., Chicago 20, Ill.<br>Please mail me, without cost or obligation, complete facts about<br>AUTOMATIC TRANSPORTER, the miracle electric truck plus<br>proof that it has cut handling costs in half.<br>Have an A.T.C. Material Handling Specialist call.<br>Company Name |    |
| ByPosition.<br>Street Address.<br>CityState  |    |

### PRINCO LOW TEMPERATURE LABORATORY THERMOMETERS

PRINCO "PRINTANE" THERMOMETER

PRINCO "MERCUTHAL" THERMOMETER

> PRINCO TOLUOL THERMOMETER

Check these advantages of the new PRINCO No. 164 "Printane" Thermometer against similar instruments. Maximum range. Accurate over full range of +30° C. to minus 200° C. Greater stability, at both high and low temperatures. Improved fluid compound will not separate at +60° C., yet can remain at minus 200° C. for 24 hours or more without loss of accuracy or mobility. Higher visibility, because dyed fluid is used. Dye will not precipitate at low temperatures. Better legibility. The PRINCO "Printane" Thermometer is easier to read. Flatter expansion curve of new compound results in a more uniformly spaced scale.

SPECIFICATIONS: Length, approx. 400 mm.; diameter, 6-7 mm.; scale etched on glass; total immersion; range, +30° to minus 200° C. in 1° divi-sions, or +86° to minus 330° F. in 2° divisions to special order.

A mercurial thermometer for temperatures as low as minus 60° C. The PRINCO No. 76-00 "Mercuthal" Thermometer brings to the technician the advantages of a mercury-in-glass laboratory thermometer in a range well below the freezing point of mercury. Successful operation under such conditions is made possible by the use of "Mercuthal," PRINCO'S improved mercury-thallium amalgam. Affords greater accuracy, stability, and sensitivity than the fluid-filled instruments formerly required for this temperature range.

SPECIFICATIONS: Length, 400 mm.; diameter, 6-7 mm.; scale etched on glass; total immersion; range, 2° to minus 60° in 0.2° divisions. Additional "Mercuthal" thermometers made to special order, or in ac-

cordance with Technical Society Specifications are also available.

If your temperature measurement problem involves a minimum of minus 95° C., specify the PRINCO No. 163 Toluol Thermometer. For many years a standard instrument for medium low ranges, the Toluol Thermometer is made according to the rigid certification requirements of the National Bureau of Standards. Brilliant, red-dyed fluid, large easy-reading bore and carefully etched scale graduations provide excellent visibility and facilitate manipulation.

SPECIFICATIONS: Length, approx. 350 mm.; diameter, 6-7 mm.; scale etched on glass; total immersion; range, +30° to minus 95° C. in 1° divi-sions, or +86° to minus 140° F. in 2° divisions to special order.

> For information on other PRINCO Laboratory Thermometers, write for Bulletin "C."

> > E C

LOW-RANGE "SPECIFICATION" THERMOMETERS Do you use "Specification" thermometers? If you do, consult PRINCO on your requirements. We thermometers in strict accordance rouge of these specifications of the various technical societies the Federai Specifications Board, the National Bureau of Standards and private industry. Such items as the "Rubber Reserve Sittene Test" and "A. Steveling Styrene Test" Thermome-ters and "A. Steveling Styrene Test" Thermome-mometers are among the low-range instruments to be found in the PRINCO listings. Write for latest information and prices.

THERMOMETER & INSTRUMENT COMPANY (R.O.

5

PRECISION INSTRUMENTS FOR INDUSTRY

1423 Brandywine Street, Philadelphia 30, Pa.



• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

# These New Heavy-Dury INDUSTRIAL EXHAUSTERS can SAVE MONEY



Write for Builetin 3576 which gives complete details including data on use for hot gas application.

Buffalo

Industrial exhauster service is the most exacting on which fans are used. Generally employed on continuous-service jobs, they are also subjected to fume conditions or material handling, either of which is hard on fans.

FOR YOU

The new Buffalo Industrial Exhauster was designed from the accumulated experience of sixty-eight years of fan-building. Sturdy, efficient and practical in design, it is also flexible in application. Reversible as to hand and discharge, it can be furnished with air or material wheel, in a wide range of capacities, belted or directconnected; rubber-lined if necessary.

All welded construction of housing, rotor and bearing stand provides a relatively light very strong assembly, with improved performance due to absence of bolt or rivet heads inside the housing.

BUFFALO FORGE COMPANY

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

INDUSTRIAL

FXHAIISTFRS

501 Broadway

Buffalo, N. Y.

### names worth remembering ...



for developing an electrolytic method

#### for making cellulose from wood fibre, patented 1886.



INTERNATIONAL

#### with HIGH RESISTANCE to chemical disintegration.

EVER STOP to reason why anodes are made from graphite for the electrochemical field?

The answer lies in the unique resistance of graphite to chemical action - resistance that's fortified in INTERNATIONAL Anodes by their high degree of purity and closely knit structure. That's why chemical substances, with the exception of free oxygen, exert *no* effect on INTERNATIONAL Anodes.

Add to this the fact that INTERNATIONAL Anodes are manufactured specifically for electrolytic application and you can easily understand their consistent record of long service life and low ultimate cost.

INTERNATIONAL Graphite Anodes are supplied in any required shape or form, either plain or variously impregnated to users' requirements. Write today for more details.

#### **OTHER ADVANTAGES**

Low porosity • High electrical conductivity Consistently uniform properties • Long service life • Low ultimate cost per unit of production Ease of machining and assembly • Close dimensional tolerances International Graphite & Electrode Corp. SAINT MARYS, PA.

G 590

It was ten years ago that we first introduced our improved platinum laboratory ware. At that time, our research laboratories had completed development of a new metallurgical process whereby the cause of most of the cracking that occurs in crucibles, during use, can be eliminated and by this means we have been able greatly to prolong the useful life of Baker Crucibles.

DECADE OF UNUSUAL PERFORMAN DECADE OF UNUSUAL PERFORMAN BAKER PLATINUM LABORATORY WARE BAKER

Since that time, we have had no complaints of rupture or cracking from this cause.

Send for the new edition of Data Concerning Platinum. It contains up to date information about platinum laboratory ware together with revised tables that will be very useful to you.

> BAKER & CO., INC. 113 Astor St., Newark 5, N. J.

NEW YORK 7 CHICAGO 2 SAN FRANCISCO 2

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

Longer life, higher efficiency, and ultimate economy are characteristic of Vinyon fiber filter fabrics. Perfected and developed through careful field studies Vinyon fabrics are now solving many problems in the filtration of mineral acid and alkali solutions. Subject always to certain heat limitations, Vinyon is highly resistant to corrosive fluids. We'll gladly discuss Vinyon's application to your filtration problems.

INTUAD

\*Reg. Trade Mark C & C.C.C.

### WELLINGTON SEARS COMPANY

SELLING AGENTS

65 WORTH STREET, NEW YORK 13, N.Y.

APRIL 1946
CHEMICAL & METALLURGICAL ENGINEERING

# "PRECISION" Laboratory Utilities



#### Wet Test Laboratory Gas-Flow Meters Normal Accuracy One-Half of One Percent

Designed and built for the precise measurement of gas volume, the "Precision" Wet Test Gas Meter incorporates a number of important refinements in design and construction which contribute materially to accuracy and dependability. FEATURES: Rotor is permanently fixed to its shaft and is accurately balanced on sharp knife edges. Bearings are oil lubricated, though water covered. Integrating gears reduced to minimum. Corrosion resisting material used throughout interior. Watch-like accuracy developed by "Precision" Craftsmen assures meter sensitivity and prolonged accuracy. Write for Bulletin No. 3110-2-D containing detailed information.



Diagram showing relationship be-tween vital parts.

Three standard sizes, 20 cu. ft. per hr.; 50 cu. ft. per hr.; and 100 cu. ft. per hr. Small size available with metric calibration



#### "PRECISION" SIEVES

Include a large variety of special types for sizing tests of many materials.



CERTIFIED SIEVES for referee tests, U. S. Bureau of Standard Sieves can be supplied with certificates showing they have been tested by the Bureau, and conform with their specifications and tolerances,

"MESH SERIES" SIEVES for wet or dry sizing tests in which the accuracy requirements are not so stringent as to warrant the use of U.S. Bureau of Standards Sieves, "PRECISION" Mesh Series Sieves are recommended.

OTHER SIEVES INCLUDE mechanical Soil Analysis set, Stone Sieves and Screens as specified by A.S.T.M., Soil Analysis Screens with round holes in metric sizes and others. Send for detailed Bulletin No. 4000-D. See your Laboratory Supply Dealer

#### "PRECISION"-DURABILT VERTICAL AUTOCLAVES



AUTOMATIC PRESSURE CONTROL CONTROL Available for all sizes of ELEC-TRIC Autoclaves ONLY. Will auto-matically main-tain any desired pressure between 3 and 30 lbs.-accuracy 1 lb. WRITE FOR BUL-WRITE FOR BUL-LETIN No. 7000-D

Four Models, for Heating with Electricity, Steam, Gas or Liquid Fuel.

"Precision" Vertical Autoclaves were de signed expressly for utility service in hospital, clinical, bacteriological, and other types of laboratories where the volume of work (rapid sterilization in steam under pressure of culture media, utensils and instruments) keeps them in operation for long periods of time and subjects them to frequent abuse,

### GROUND - JOINT LID ELIMINATES WASHERS, GASKETS AND PACKING.

PACKING. The heavy cast bronze lid, of sufficient rigidity to withstand warpage under repeated heating and ground to form a perfect steam-tight joint against the machined bross seat which is rivet-er. The lid is hinged and fastens down by means of large, easily gripped wing nuts. TINNED COPPER BODY

TINNED COPPER BODY Heavy gauge copper, coated internally with pure block tin, uniformly applied, impervious to the action of saturated steam at high pressures, safeguards sterilization. Construction throughout is leakproof and steam tinht.

SCIENTIFIC COMPANY 1736-54 N.Springfield Ave., Chicago 47, U.S.A. **ON** RECIS Engineers and Builders of Scientific Research and Production Control Equipment

ONE MOVING PART ... SIMPLE IN DESIGN ... SANITARY IN CONSTRUCTION

### THE DOOR TO EFFICIENCY

Increased Production at Lower Costs Definite Product Improvements are Reported by PREMIER COLLOID MILL users

) :

"Definitely improved both quality and life of our product" . . . "Increased production 15% without added labor" . . . "Greater capacity per HP consumption" . . . "Test samples superior" . . . "We no longer have packing-gland trouble or product contamination" . . . "No internal corrugations to cause unsanitary conditions". These actual quotations are typical of performance reports from users of Premier Colloid Mills.

Whether the work to be done is emulsifying, dispersing or disintegrating . . . whether the material to be processed is liquid, paste or solid, every Premier installation proves itself by giving consistently successful results. Finer particle size is an important factor in finer products. Moreover, compulsory treatment of every particle assures uniform standards of quality. A partial list of fields which benefited from these results:—

> Adhesives, sealing compounds; asphalt emulsions; ceramic colors; coating and waterproofing emulsions; cosmetics; foods and bever

ages; oil emulsions; inks; leather finishes; latex (synthetic and natural); lacquer emulsions; lubricating oils, greases; pigment dispersions; organic chemical dispersions; paints, lacquers, varnishes; paper coatings, fillers, waterproofing; pharmaceuticals; plastics, resins; polishes, waxes; rubber compounds; textile finishes. (Special laboratory models are available for research work.)

Where a new process is involved and performance data desired, a test run may be arranged. Premier Mill Corporation, Factory and Laboratory, Geneva, N. Y.; General Sales Offices, 110 East 42nd Street, New York 17, N. Y.

**Descriptive Literature on Request** 





# You Can do it Finer, Faster and Better

### with the SCHUTZ-O'NEILL PULVERIZER

The Schutz-O'Neill Pulverizer is a centrifugal air force impact pulver izer for continuous or batch operation. For extremely fine grinding and uniformity, the principle of centrifugal impact when carried by the air stream has never been surpassed. The product is floated off on air -there is no screen to clog or wear out. Thousands of Schutz-O'Neill PulverIzers have proven their sturdiness, long life, low power consumption, high output and ease of operation. With a range of sizes in several styles, any dry, grindable stock can be efficiently pulverized

CONSULT US ON YOUR PULVERIZING PROBLEMS. Write us your requirements, products to be pulverized, output desired, and send a sample. This in no way obligates you. Literature sent on request.



MILL PLAN No. 40 shows pulverizer with horizontal discharge directly into receiving chamber. One of many possible set-ups.



CHEMICAL & METALLURGICAL ENGINEERING . APRIL 1946 .



1. Clark 2-cycle economy and dependability, proved repeatedly in many types of plants, under most exacting conditions.

 "Custom tailored" to fit precisely the type of processing and special requirements involved.

3. Comprehensive engineering service from inception of the project to operation in the field. An outstanding feature of Shell Oil Company's new cycling plant at Sheridan, Texas, is the elimination of flare gas in all operations and consequent avoidance of waste.

NO FLARE GAS... NO WASTE TO BE BURNED!

... a Feature of SHELL'S New Cycling Plant

With a rated capacity of 100,000,000 cu. ft. of condensate gas daily, the new Sheridan Plant returns gas to the sand at a pressure of approximately 4350 lbs. per sq. in. The plant operates at 1800 lbs. suction pressure.

The compressor installation consists of seven 800 HP Clark "Angle" Compressors. One of these is devoted entirely to recompression service and there is one recompression cylinder on each of two other units.

CLARK BROS. CO., INC., OLEAN, NEW YORK One of the Dresser Industries

New York • Tulsa • Houston • Chicago • Boston • Los Angeles London • Buenos Aires

GAS · STEAM · DIESEL

**RK** "ANGLE" COMPRESSORS

# SIMPSOM EnsimixERS

### for ...

plants that mix DRY, SEMI-DRY, or PLASTIC MATERIALS



### 10 REASONS WHY... they mix better, faster and at less cost!

- 1. Improved control of product.
- 2. Improved quality of product.
- 3. Greater uniformity of product.
- 4. Less labor for a required production.
- 5. Shorter mixing time.
- 6. Low horsepower per ton of material mixed.
- 7. Low maintenance costs.
- Batch type mixer ideally adaptable to continuous systems.
- 10. Less capital investment—fewer machines for a required production.

The Simpson principle of mixing by mulling is used to advantage in hundreds of chemical and processing plants — on hundreds of varied type products. The Simpson works like this: a combination of plows and heavy mullers revolve in a stationary pan: the plows turn the material over and over itself; the mullers smear and knead the material, quickly blending it into a uniformity which no other method can achieve in such short mixing time.

#### A few products mixed in SIMPSON MIXERS

Asbestos Cements • Boiler Compounds • Catalysts • Ceramic Tile • Chemicals • Clays • Crucibles • Feeds • Fertilizers • Food Products • Glass Batching • Graphite Products • Mercury Reclamation • Paint Pastes • Pharmaceuticals • Plastics • Porcelain Enamel Frit • Powdered Metals • Refractory Cements • Storage Battery Pastes • Steatite • Soaps



#### NATIONAL ENGINEERING COMPANY MACHINERY HALL BUILDING . CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries: — The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia — August'a Limited, Halifax, England. For Canada — Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zaaland — Gibson, Battle & Co., Pty., Ltd. Sydney, Australia





NOT just a motto...it's a fact when Graver steel plate fabrication is the subject. Witness to the fact is this fractionating tower built by Graver for one of the major oil refineries. The refinery operator for whom it was constructed can place the tower into immediate service with the assurance that it is made to his exact specifications . . . and rugged enough to stand up under his toughest operating schedules.

There are many reasons for the built-in ability to "take it" that is characteristic of steel plate structures made by Graver. These reasons begin with the highly skilled Graver workmen and go on to include all the modern facilities of Graver's large plant, such as the new 750 ton press brake ... a square shear of the latest type ... x-ray equipment to seek out any hidden flaws in the structure ... and a huge stress relieving furnace in which the controlled application of heat frees the structure from unequal strains even under high pressure use. It's reasons such as these that make Graver a mighty good place to come for steel plate fabrication of all types.

No matter what your requirements, consult Graver. If they call for fabricated steel plate send us your blue-prints and specifications for prompt quotations.





No other fuel for the industrial production line, where heat application in any form is required, lends itself so well to control of combustion and temperature as does Gas. The rate of flow, which determines heat input, may be varied over wide limits, at an infinite number of intermediate points.

Gas may be burned at the rate needed for the minute flame of a jeweler's torch. It may be fired at the tornadic intensity required in a furnace to heat treat steel billets 10 inches in diameter at 2250° F. In between and at even higher temperatures it is called upon to do scores of other jobs where temperature readings from control panels of Gas equipment show a fidelity to exactness that is unequalled in heat treating.

Gas controllability is, at the same time, very easy to obtain with equipment that is far less expensive to install and operate. This fuel knows no mere "on," "off" or "in-between" control, but, instead, close, accurate modulation to best serve you. Your local Gas Company's Industrial Engineer will, without obligation, tell you how Gas and modern Gas equipment can bring their dual advantages to work for you, specifically.

### AMERICAN GAS ASSOCIATION

420 LEXINGTON AVENUE, NEW YORK 17, N.Y.



How to "Take the Heat Off" your motor maintenance problems

Excessive time and dollar losses are being avoided in every industry-by specifying EXCessive time and donar losses are being avoided in every industry—by specifying Fiberglas\* High Safety Factor Electrical Insulation in new motors and for rewinds. When scores of plants were operating at full-time war production, Fiberglas Insulawhen scores of plants were operating at full-time war production, ribergias insu-tion Materials provided "extra" protection to overcome conditions which caused non intraterials provided extra protection to overcome conditions which caused most motor burnouts and failures—heat, moisture, corrosive vapors or acids, over-

load and the human element. One company was operating twenty-five variable speed motors which were subjected to heavy overloads under conditions of high ambient heat, high humidity. The average life of these motors, ranging from ampient near, mign numinity. The average me or these motors, ranging from 21/2 to 10 hp. had been about four weeks. Fiberglas-Base Insulation Materials 21/2 to 10 np. nad reen about four weeks. Fibergias-base insulation Materials were specified—the service life of these motors was lengthened many times\_\_\_\_\_ and "the heat was off" the motor maintenance problem in this plant. Why not try the remedy that has been so successful for other concerns? Get complete information about Fiberglas Electrical Insulation Materials. Write

for your copy of the new catalog and ask for the names of the distributors serving your locality. Owens-Corning Fiberglas Corporation, 1950 Nicholas Building, Toledo I, Obio. In Canada, Fiberglas Canada Ltd., Oshawa, Ont. Duilaing, Loleao I, Obio. In Canada, Floergias Canada Lia., Osnawa, Ont. ASK FOR FIBERGLAS-IN YOUR NEXT MOTOR-AND ON YOUR NEXT REWIND. ELECTRICAL INSULATION MATERIALS FIBERGLAS



Other Fiberglas Products: Thermal and Acoustical Insulations • Dust-Stop\* Air Filters • Yarns, Cloths, Mats and Basic Fibers 409 CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

### Furfuryl Alcohol PRICE REDUCED TO 19c PER POUND IN TANK CARS

You have brought this price down

DECAUSE of the increasing use of Furfuryl Alcohol, we are able to announce a five percent reduction in its price to 19c per pound in tank cars at the plant. You who have made possible this decrease by your continued and expanding use of Furfuryl Alcohol are now able to effect a saving of close to \$1000 on every 10,000 gallon tank car. And those of you who have not yet developed a commercial

use for Furfuryl Alcohol might be reminded that the trend of prices for Furan Compounds has been consistently downward. The increased use of Furan Compounds, the economies resulting from large scale production and improved manufacturing facilities are reflected in lower prices. In Furfuryl Alcohol you have a real silver lining in the cloud of rising costs.

#### Here are some of the ways Furfuryl Alcohol is being used:

DISSOLVING complex dyes for use in textile printing.

- **RESINIFYING** alone and in combination with other substances for use in castings, impregnants, coatings and cements.
- WETTING abrasive grain (and plasticizing) in synthetic resinabrasive mixes for manufacture of grinding wheels.

There is also available to you when requested on your letterhead, a wall chart 18" x 24" which shows typical reactions with Furfuryl Alcohol. This may give you more ideas of what you can do with this versatile alcohol. Quaker Oats Technical Staff is also ready to give you the benefit of its background of experience with the Furans in the application of Furfuryl Alcohol to your specific projects.



FURFURAL . FURFURYL ALCOHOL . FUROIC ACID . TETRAHYDROFURFURYL ALCOHOL

**PROPERTIES OF** 

Furfuryl Alcohol

(TECHNICAL)

C4H3O-CH3OH

Flash Point (open cup) °C.....75

Standard Containers: 9, 45, 90 and 500 lb.

Tank Car, 8000 gal.....75,000 lbs.

SHIPPING INFORMATION

Cans and Drums non-returnable

drums (net).

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

410



# YOUR

PATTERSON-KELLEY Heat Exchangers Process Equipment

#### DO YOU NEED Autoclayes Coolers Heat Exchangers Condensers Heaters Kettles Mixers Stills MADE OF Aluminum **Carbon Steel Copper-Silicon** Bronze Copper Nickel-Clad Stainless-Clad **Stainless Steel**

ym

These sixteen listings cover a wide variety of processing and heatexchanger units and will give you an idea of what Patterson-Kelley can make for you.

If you would like us to design the units you require, our engineers will be glad to do so. They are familiar with most processes and requirements in the way of heat transfer equipment. They know thoroughly the principles of heat transfer. Or, if you prefer to design your own equipment, we shall be glad to quote on the manufacture.

A phone call or letter to our nearest office or representative will bring prompt service.

WARREN STREET, EAST STROUDSBURG, PA.

2.114280858444

NEW YORK 17-101 Park Avenue CHICAGO 4-Railway Exchange Bldg.

ompany, Inc. PHILADELPHIA 3-1700 Walnut Street BOSTON 16 - 96-A Huntington Avenue **Representatives in All Principal Cities** 

# BEACH-RUSS High Vacuum PUMPS HELPED SPLIT THE ATOM

An Unsolicited Letter from the WAR DEPARTMENT Manhattan Engineer District

Beach-Russ Company New York, N. Y.

Attention: Mr. C. A. Beach, President

#### Gentlemen:

It is desired to express the appreciation of this office for the outstanding development and production work accomplished by Beach-Russ Company for the Kellex portion of the Atomic Bomb Project performed under the supervision of the New York Area Office of the Manhattan District. When our design work indicated the need for large quantities of precision built high range vacuum pumps, we naturally turned to your company as a leader in the vacuum pump field. Your record of performance and the quality of your workmanship has proven that this was a wise decision.

Your vacuum pumps have operated very satisfactorily and were instrumental in the successful operation of one of the major Atomic Bomb plants.

This office is indeed appreciative of your cooperation and fine performance.

Very truly yours, (signed) JAMES C. STOWERS Lt. Col., Corps of Engineers Area Engineer Our contribution to the success of the greatest undertaking in scientific history was further recognized when Beach-Russ Company was cited as one of the prime contractors honored at the award dinner of the Atomic Bomb Project at the Waldorf-Astoria Hotel, New York City, on February 26, 1946.

While the whole story of this production miracle cannot be revealed, the engineering and technical experience gained in meeting its extraordinary high vacuum requirements is available for improving chemical and allied processes today. To this can be added the work of Beach-Russ Standard Rotary Piston Pumps for high vacuum processes in the manufacture of chemicals, vitamins, penicillin, magnesium, etc., in vacuum packing and in vacuum testing of electronic and electrical devices and instruments.

For best performance in the field of high vacuum you can depend on Beach-Russ Pumps. Write for our complete catalog.

Beach-Russ Company • 50 CHURCH STREET New YORK 7, N. Y. VACUUM PUMPS • AIR COMPRESSORS • GAS BOOSTERS • LIQUID PUMPS

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

THE EFFICIENCY AND ECONOMY OF MANY MANUFACTURING PROCESSES HAS BEEN INCREASED BY

THROUGHOUT its more than fifty years of existence, the Sperry organization has cooperated closely with industry in meeting its filtration problems. It has designed and built many special types of filter presses to help increase the efficiency and reduce the costs of new manufacturing processes.

In one case, millions of pounds of material once discarded as waste are now utilized. A saving made possible because of the designing of special Sperry filter presses.

> FREE....write today for your free copy of this booklet on filter presses and their application. Valuable technical data, charts and full information are included.

In another instance, the manufacturer had trouble with gas fumes escaping during the filtering process. Sperry engineers studied the problem, designed a filter press that solved the difficulty.

Sparry

Installation of Sperry Filter Presses in large eastern plant

PRESSES

These are but two examples of Sperry's ability to meet with new filter press designs the challenge of both efficiency and economy. If you have a filtration problem our engineers will be glad to discuss it with you... there is no obligation.



Eastern Sales Representative Henry E. Jacoby, M. E. 205 E. 42nd St., New York City 17, N. Y. Phone: MUrray Hill 4-3581

### D. R. SPERRY & COMPANY

FILTER

BATAVIA, ILLINOIS Filtration Engineers for Over 50 Years Western Soles Representative B. M. Pilhashy 1033 Merchants Exchange Bidg San Francisco 4, Calif. Phone Do 0375



# Archimedes Proved His Point



RADITION says that ancient Syracuse, and

later the world, got a new and better pump ... because a local mathematician named Archimedes devised the theoretical concept of the spiral screw-and then proved that it could be applied to lifting water.

To this day, true engineering progress remains basically unchanged in principle from this classic Archimedean pattern of resolving abstract theory directly into useful application.

It is the fundamental operating pattern behind Kellogg. For Kellogg's engineering efforts revolve around its own applicationdevelopment laboratories . . . which are among the world's finest and best equipped. \*Engineered by the Kellogg Subsidiary-The Kellex Corp.

There, for example, major phases of the development of the government's war aviation gasoline program were proved, conclusively and quickly.

Pilot-plant data . . . from Kellogg . . . aided designing of the first Fluid catalyticcrackers. Again . . . when time was of utmost importance . . . similar technique was a potent force in designing the atomic bomb plant, K-25.\*

There are new theories and processes under round-the-clock examination and test in Kellogg laboratories and pilot plants right now ... of high promise for the chemicals industry. As their applications are perfected and proved, the facts will be made available to you.

THE M.W. KELLOGG COMPANY

Engineers and Economists to International Industry



225 Brandway, New York 7, N. Y. + Jorsey City, N. J. + 609 South Grand Ave., Las Angules, Calif. + Philtower Building, Talsa, Ohia. + 402 Esperson Building, Houston 2, Texas + Stone House, Bishopsgato, London EC2, Eng.



# PHTHALIC ANHYDRIDE

Clean white flaked material used widely as the principal dibasic acid for the production of alkyd resins, for automotive and other enamels and coatings. It is used as a starting material in the manufacture of dyestuffs, pharmaceuticals, plasticizers and insectifuges.

0.01% Max.

Solidification point130.5° C MinimumSolid colorPure whiteMolten colorMax. 55 Hazen

Insoluble in water

Availability

Light wood barrels even net weight 275 pounds and reinforced paper bags, even net weight 80 pounds.

From the catalog of Barrett Basic Chemicals

#### THE BARRETT DIVISION ALLIED CHEMICAL & DYE CORPORATION 40 Rector Street, New York 6, N. Y.

In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, Que.

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

417

Barrett

### Reports, Reprints & Supplements for the Chemical Engineer's Data File

8 Opportunities in Petroleum Refining. (8 pages, June 1940.) Work, salaries and chances of advancement.....25c 250 13 Chemicals in the National Economy. (16 pages, Nov. 1940.) How American chemical industry is serving.....25c 14 Maintenance in Chemical Process Industries. (8 pages, Dec. 1940.) Symposium......25c 30 Chemical Industries' Role in Midwestern Economy. (8 pages, April 1941.) itegional survey......25¢ 33 Southern Chemical Progress. (2 pages, July 1941.) Re-port on growth and the effects of the national emergency.25c 34 Process Steam and Power. (8 pages, Aug. 1941) .... 25c 54 Chemicals Go to War. (40 pages, Feb. 1942.).....25¢ 58 Southwestern Chemical Trends and Progress. (16 pages, June 1942.) Regional survy......25c 59 Wartime Construction in Chemical Process Industries. (8 pages, July 1942.) Government forms......25c 60 Fire Protection Methods for Process Plants. (8 pages, August 1942.) Methods for minimizing hazards......25c 62 Recent Advances of Catalysis in Chemical Process In-dustries. .(8 pages, Oct. 1942)......25c .25c 80 Maintenance of Electric Lamps and Motors. (8 pages, March 1943.) Suggestions for wartime care......25c 81 Mechanical Maintenance in Process Plants. (8 pages, April 1943.) Prolonging process equipment life......25c 82 Measurement and Control of Process Variables. (48 pages, May 1943.) Reporting 10 years of progress......50¢ 87 Bulk Packaging of Chemicals; Wartime Trends,-Postwar Possibilities. (8 pages, Oct. 1943.)......25c Filtration in Chemical Process Industries. (8 pages, 1944) 250 Jan. 1944.) 90 Chemical Engineers in the War and Postwar Industry. (8 pages, March 1944.) Manpower problems......25c 91 Government Disposal of Surplus Stocks and Facilities. (8 pages, April 1944.) Government-owned surplus.....25r 93 Pacific Northwest Offers Power and Resources for In-dustry. (8 pages, June 1944.) Regional survey......25¢ 94 Latin America Plaus Postwar Industrialization. (8 pages, July 1944.) Import and export statistics......25c Change.

102 Technical Service; Value to Chemical Process Industries. (4 pages, March 1945.)..... 100 107 Industrial Waste, an Important Factor in Process Plan-ning. (8 pages, Aug. 1945.).....25c Handling Materials With Lifting, Tiering and Special ks. (12 pages, Nov. 1945.) Materials handling.....25 Trucks. 111 Petroleum Byproducts, a Big Factor in Organic Chem-ical Industry. (8 pages, Dec. 1945.) Chemicals from oil..25¢ 113 Chemical Requirements of the Petrolum Industry. (8 pages, Jan. 1946.) Refineries consume chemicals......256 114 Chemical Engineering Progress for Peace. (24 pages, Feb. 1946.) Appraisal of technological trends......25c FREE. As long as the limited supply on hand lasts, copies of the reprints listed below will be sent gratis if requested with an order for any of the above reports or flowsheets. 42 Fine Chemicals Now Engineered Into Mass Production. By J. R. Callaham. (4 pages, Jan. 1944.) 43 Better Utilization of Mineral Resources Through New Chemical Technology. (10 pages, May 1944.) 44 Collective Bargaining: Does It Conflict With Engineer-ing Ethics? By Z. G. Deutsch. (4 pages, Aug. 1944.) 45 Colloids From Kelp Give Rise to a Unique Process In-dustry. By C. K. Tseng. (4 pages, June 1945.) 46 Capacity Control for Atmospheric Cooling Towers. By Edward Simons. (4 pages, June 1945.) 47 Graphical Solution of Friction Loss Problems in Fluid Flow. By A. E. Kroll. (2 pages, March 1945.) 48 Alcohol Economics Will Determine Future Production Processes. By Rayburn D. Tousley. (4 pages, Oct. 1945.) **Editorial Department** Chemical & Metallurgical Engineering 330 West 42nd St., New York 18, N. Y. Enclosed is \$..... Please send me reprints numbered: ..... Name ..... Address .....

4-46-418

### YOU CAN DEPEND ON DOWNINGTOWN ... FOR CORRECT SELECTION OF MATERIALS AND VERSATILE FABRICATION EXPERIENCE





### A-Two tanks 3' $11\frac{1}{2}$ " I.D. x 9' 11" long. B-Vertical tank 4' 6" O.D. x 5' 5" straight height. C-Steam heated tank 5' $5\frac{1}{4}$ " x 11' 5" tangent length.

These tanks, built for a large eastern Oil Refinery, for use in the production of petroleum sulfonate, are Monel clad with 10% cladding on the inside. They are representative of structures, fabricated of carefully selected metals and alloys, by Downingtown, for numerous applications under ASME and API—ASME Codes for unfired pressure vessels.

Downingtown is equipped to produce and has produced many pieces of equipment from the following materials:—Nickel Clad, Monel Clad, Inconel, Monel, Nickel, Stainless Steels and varying analysis of Carbon Steel.

Experience extending over more than thirty consecutive years and the consultation of a nationally known metallurgist, contribute to the thoroughly satisfactory performance of Downingtown products. We also operate a Heat Transfer Division, under the direction of men thoroughly experienced and trained in this field. Engineering consultation is available to aid you in the plans and specifications for definite jobs.



### "PENNSYLVANIA" SERVICE APPLICATIONS

"Pennsylvania" STEELBUILT Reduction Machinery is specialized for Primary, Secondary and Finer Crushing of Ores, Sinters, Refractories, Heavy Chemicals, Cement-making Materials, Agricultural

Limestone, Burned Lime, Gypsum Rock, Calcined Gypsum, Chalk, Garbage, Tankage, Paper-making Materials, etc. — including special types for breaking down agglomerated Chemicals for processing.



The Single Roll type, as specialized by "Pennsylvania" in the PENN-LEHIGH, PENNSTEEL, SUPER-ARMORFRAME and Type K Series, affords heavy duty, reliable service and low maintenance, for primary and secondary reductions of many of the above materials, as required by the Heavy Chemical, Metallurgical, Cement, Lime, Gypsum and other Process Industries.

This simple, dependable type is notable for wide reduction ratios, ability to reduce wet and sticky materials, to relatively uniform products with minimum extreme fines. Twenty-six (26) sizes to meet varied requirements.

Penn-Lehigh Primary Single Roll Crusher, size 30" x 72".

"Pennsylvania" REVERSIBLE Hammermills have established new standards of efficiency and low overall operating costs, as a result of provision for major reduction by smashing impact, automatic turning and resharpening of Hammers and Cage Bars, increased output and/or fineness per frame size, and lower power demand.

This advanced type has been specialized for the preparation of coking coals for By-Product Ovens—Secondary Cement Plant Service—Agricultural Limestone —Secondary and Fine preparation of Gypsum Rock—and many similar reductions in the heavy Chemical and other Process Industries.



"Pennsylvania" Reversible Hammermills in By-Product Coke Plant Service.



"Pennsylvania" Double Reduction Impactor.

"Pennsylvania" STEELBUILT Impactors have introduced a new technique for the Primary and Secondary reductions of abrasive materials by smashing impact, with resulting roughly cubical products with minimum extreme fines. Impactors are made in this Double Reduction type, for breaking down relatively large feed by impact and the return of oversize tailings to secure a finished product, accurately sized to meet requiremets. As all the crushing is accomplished by smashing impact, between massive Manganese steel anvils and beaters, with ample clearance, abrasive wear is sharply cut, as compared with other types.

Six (6) sizes to meet material and capacity requirements.

"Pennsylvania" REVERSIBLE Impactors—10 sizes—are indicated equipment for the reduction of abrasive materials—Refractories—Metalliferous Ores—Electric Furnace Products—etc.—from sizes 6" to 8" down—to a wide variety of product sizes, of roughly cubical form.

Such products assure "premium" bonding in Furnace Linings, and more efficient, fine reductions in Ball and Rod Mills, and other Pulverizer types.

The effect of impact reductions on your materials can be determined by our Laboratory tests and reports.



"Pennsylvania" Reversible Impactor.

#### PUT YOUR REDUCTION PROBLEMS UP TO US

17th Floor, Liberty Trust Bldg. Philadelphia 7, Pa.







• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING

### FIGHTING CORROSION in Ammonia Refrigeration Systems

Costly shutdowns and interruptions due to the failure of tubing used in ammonia refrigeration systems can be appreciably reduced through the use of Bridgeport's Duplex Tubing. For example, steel tubing is subject to severe corrosion from the water or brine side even though it successfully withstands attack from the ammonia side. However, by using Bridgeport's Duplex Tubing made up of steel to the ammonia side and copper to the fresh water or brine side, tube life is greatly increased. This combination also has better heat transfer properties than straight steel tubing, which means greater efficiency and increased production.

There are many other applications for Bridgeport's Duplex Tubing, where double corrosion, too severe for a single metal or alloy, is causing tube failure. Various combinations are available, such as Duronze IV (Aluminum Bronze), Cuzinal (Aluminum Brass), Cupro Nickel, Admiralty, Muntz, red brass or copper with steel, stainless, monel or aluminum.

BINDER OF DURING MURING

Contact our Technical Service Department through your nearest Bridgeport Office for assistance in solving corrosion problems in your plant. Also write for your copy of Bridgeport's Duplex Tubing Technical Bulletin which contains applications and information about methods of installing.

Bridgeport BRIDGEPORT BRASS COMPANY BRIDGEPORT 2, CONN. • Established 1865

Condenser and Heat Exchanger Tubing BRIDGEPORT BRASS


Save on fuel with the

## WELLMAN-GALUSHA GENERATOR

## WELLMAN WILL BUILD IT!

Car Dumpers Gas Producer Plants Gas Flue-Systems Gas Reversing Valves Coke Pushers Mine Hoists Ore Bridges Skip Hoists Clamshell Buckets FUEL costs are usually lower when there's a Wellman-Galusha Generator on the job. It delivers a clean, dependable and uniform supply of gas in quantities and with characteristics to suit your individual requirements.

This gas can be used for all furnaces and kilns in the manufacture of ceramic ware, for chemical processes requiring special composition, and for all heating requirements in the manufacture of steel and non-ferrous metals.

THE WELLMAN ENGINEERING COMPANY 7032 CENTRAL AVENUE . CLEVELAND 4, OHIO

## PH Drop A Forged

e ...

0

6

67

6

0

## stay on the job longer

1

Once installed, Phoenix Flanges are on the job to stay. Possessed of all the fatigue resistance and stamina that the process of drop forging imparts to steel, they fulfill every demand for strength, dependability, and long life.

Phoenix Flanges are made of mild steel especially suited to welding and machining and are available in a wide range of styles and sizes. They can also be supplied in stainless steel, Everdur brass, and other alloys.

Every Phoenix Flange complies with ASA requirements and ASME and ASTM specifications. Write for your free copy of the new Phoenix

Flange Catalog today.



60

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

⊿

0

O

63



Chemical and phosphate tanks with automatic proportioner, designed, prefabricated and erected by Graver for the Kankakee Ordnance Plant.



No. 4 in a series



## 

Accurate feeding of softening chemicals in direct proportion to the amount of water being treated is of utmost importance in any water conditioning plant. It is particularly so in boiler feed water treatment. Here, improper chemical proportioning results in over-treated or under-treated water which will increase the total solids in the boiler water. Increase of solids in boiler water causes carryover of water in the steam and necessitates frequent blowdown resulting in heat losses and poor boiler operation.

## 

The Graver Proportionerfeeds the precise amount of chemicals for the amount of water entering the treating plant. This proportioning is accomplished automatically in direct proportion to the flow of water. In addition, this equipment provides a means whereby chemical charge can be varied as much as 100% to take care of variations in the quality of the incoming water. This variation does not require a change in the strength of the solution in the chemical mixing or feed tank. It is accomplished by simple adjustment of a graduated dial on the proportioner which varies the amount of chemicals fed.

#### ALL CHEMICALS ARE UNIFORMLY MIXED

Graver chemical mixers and feed tanks are provided with multiple horizontal paddles which insure uniform mixtures throughout the tank even when using concentrated lime suspension. Pumping of the proportioned chemicals into the water treating plant is done by ordinary centrifugal pump after they have been diluted with sludge from the treating plant. This dilution by sludge eliminates entirely the plugging up of pump impellers and chemical lines leading to the treating plant, thus assuring continuous troublefree operation of the proportioning equipment.

## GRAVER OFFERS A COMPLETE SERVICE

You are invited to submit your water conditioning problems to Graver. You will receive expert advice and an unbiased recommendation as to the equipment required to meet your specific needs. With Graver you are assured of complete service with undivided responsibility from the drawing board to the operating unit.



# Lithium Borohydride

# Now Released Now Released Private Industry to Private Industry for Experimental Purposes \* DIBORANE \*

This compound will soon be available to private industry in commercial quantities. For the present, however, Lithium borohydride is a safe and convenient source of  $B_2H_6$ . Methods of preparation for  $B_2H_6$  will be sent upon request.

## LITHALOYS CORPORATION

444 MADISON AVENUE, NEW YORK 22, N. Y.

## What Makes A Mailing Click?

• Advertising men agree —the list is more than half the story.

McGraw-Hill Mailing Lists, used by leading monufacturers and industrial service organizations, direct your advertising and sales promotional efforts to key purchasing power. They offer thorough horizontal and vertical coverage of major markets, including new personnel and plants. Selections may be made to fit your own special requirements.

New names are added to every McGraw-Hill list daily. List revisions are made on a twenty-four hour basis. And all names are guaranteed accurate within two per cent.

In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want. Ask for more detailed information today. You'll probably be surprised at the low over-all cost and the tested effectiveness of these hand-picked selections.

McGraw-Hill Publishing Co., Inc. DIRECT MAIL DIVISION 330 WEST 42nd ST. NEW YORK 18, N.Y.

Mc GRAW-HILL

DIRECT MAIL LIST SERVICE



#### POSITIONS VACANT

APPLICANT FOR installation of chlorine plants in foreign countries. Must have com-plete installation and operating experience, in-cluding evaporation and liquid bleach. P-556, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York 18, N. Y.

PAINT AND Varnish Chemists to assist plant superintendent. Excellent opportunity for advancement. Knowledge of master painter products and alkyd resins desirable. Inquiries held confidential. Our employees know of this ad. Mautz Paint & Varnish Co., Madison. ad. Maut Wisconsin.

CHEMICAL SALESMEN: Middle West chemi-cal manufacturer desires services of several men with experience in selling industrial nitro-gen products and industrial alcohols. Give full details concerning education, experience, age, salary, and recent photograph. P-588, Chemi-cal & Metallurgical Engineering, 520 N. Michl-gan Ave., Chicago 11, 11.

METALLURGIST TO take charge of research work for well-known specialty sleel plant producing tool and stainless steels. In reply-ing give full information concerning training and experience. P-633, Chemical & Metallurgi-can Engineering, 330 W. 42nd St., New York 18, N. Y.

PLANT ENGINEER: Chemical plant in North-castern New York State requires assistant to plant engineer, supervising about 100 main-tenance men. State agc. education, experience and salary desired. P-639, Chemical & Metal-lurgical Engineering, 330 W. 42nd St., New York 18, N. Y.

MECHANICAL ENGINEER with chemical plant experience, or a chemical engineer with some plant experience, for chemical equipment and chemical manufacturing plant design and layout work under experienced direction. Posi-tion involves boardwork mainly to start. Should preferably he 30-25 years of age. Small, well established, conservative concern in a metropolitan area in Eastern Pennsylvania. Proper man would become part of the com-pany's regular organization. Application letter to be as complete as possible. P-640, Chemical & Metallurgical Engineering, 320 W. 42nd St. New York 18, N. Y.

#### SELLING OPPORTUNITY OFFERED

CONTACT PRESSURE Resins, flexible and non-flexible types now available. High qual-ity resins. Reliable concern willing to make arrangements on commission basis-full or part time. If you have good selling connec-tions. Sw-641, Chemical & Metallurgical Engi-neering, 320 W. 42nd St., New York 18, N. Y.

#### EMPLOYMENT SERVICE

SALARIED POSITIONS \$2,500-\$25,000. This thoroughly organized confidential service of 36 years' recognized standing and reputation carries on preliminary negotiations for super-visory, technical and executive positions of the calibre indicated, through a procedure individ-ualized to each client's requirements. Retain-ing fee protected by refund provision. Identify covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 260 Dun Bidg., Buffalo 2, N. Y.

(Continued on page 428)

Additional **Positions Vacant Ads** on pages 428 and 429

#### CHEMICAL ENGINEER

The University of Alberta invites applications to fill a vacancy in the Department of Chemical Engineering. Depending upon the qualifications and experience of the successful candidate, appointment will be made to one of the following ranks, at be made to one of the following ranks, at the salary range noted: Lecturer, \$2,400 to \$2,600: Assistant Professor, \$2,700 to \$3,300: Associate Professor, \$3,400 to \$4,000: Professor, \$4,100 to \$5,000. The two senior ranks will probably be con-sidered only for applicants with the doc-torate in chemical engineering and a record of successful teaching experience.

Duties to begin September 1, 1946, will include teaching and research. It is ex-pected that the appointee will interest himself not only in fundamental chemical engineering problems but also in problems concerning the utilization of Alberta's natural resources such as oil, gas and coal.

Applications, stating age, nationality, and other personal information, particulars of academic and technical qualifications and experience (including teaching ex-perience), a copy of a recent photograph or snapshot, if available, and names and addresses of references, should be sent before April 15 to Dean, Faculty of Ap-plied Science, University of Alberta, Edmonton.

## **OPPORTUNITY**

A career with a large California food processing company is available to a 25 to 35 year old man who has the following qualifications:

- 1. Good physical condition.
- 2. Mechanical ingenuity and a strong interest in the development and use of mechanical equipment.
- 3. Several years mechanical experience such as machinist, pipe fitter, electrician, welder, general repair mechanic, refrigeration engineer, etc.
- 4. Diploma from an accredited university in mechanical engineering or its equivalent.
- 5. Ambition.
- 6. Willingness to spend majority of time away from home.
- 7. Willingness to work long hours, and any hours, when necessary.

In reply give full particulars on each of the above.

P-624, Chemical & Metallurgical Eng. 68 Post Street, San Francisco 4, Cal.

Prominent manufacturer of pumps largely sold to the chemical industry can use two men with engineering knowledge to train for sales engineering department. Previous machinery sales experience in the chemical field advantageous. Give full information with application.

SW-658, Chemical & Metallurgical Eng. 520 North Michigan Ave., Chicago 11, Ill.

## WANTED

Senior Metallurgist-PhD or equivalent with general experience, required for work in fabrication and working of non-ferrous metals. Research and De-velopment Projects require capable man to supervise experimental group. Senior Mechanical Engineer—Profes-sional Mechanical Engineer with ten years experience or equivalent. Knowledge of power work essential. At-tractive position in field of design and engineering development.

Metallurgist and Chemical, Mechanical or Electrical Engineers Interested in possible employment in new field may also apply.

Senior Mechanical Engineer-Engineering degree required—with 6 years ex-perience in Industrial Mechanical Engineering.

Senior Power Engineer-Engineering degree required-with 4 years experience in Industrial Power Plant Operation.

Chemists-B.S., M.S., and PhD men in physical, inorganic and anlytical chemistry.

Glassblowers-Professional experience required and working all types of glass and fabrication of laboratory apparatus.

In reply please give age, education, experience, professional references and salary expected.

Address reply to Box 1991, Knoxville 11, Tennessee Attn: Personnel Supervisor.

#### **Assistant Research Director**

#### Age, 35-45, graduate

Chemist or Chemical Engineer thoroughly grounded in physical and inorganic chem-ical research methods. Post graduate work, Doctor's degree, phase rule training, desirable. Knowledge of organic chemis-try helpful.

Five to ten years required experience in research and development work in institu-tional or industrial laboratory, employing not less than ten to twenty Chemists or Chemical Engineers. Inclination and abil-ily to organize and direct work of others, and to execute predetermined research programs must be demonstrated by sev-eral years administration experience.

Excellent salary and opportunity in active expansion program of old, well estab-lished, industrial Corporation located in small community in Southern California, (outside Los Angeles County.)

P-626, Chemical & Metallurgical Eng. 68 Post St., San Francisco 4, Calif.

#### SEARCHLIGHT SECTION $\square$

#### EMPLOYMENT SERVICE Continued on page 427

EXECUTIVES—Industrial & Sales Engineers— Through our nationwide Service we negotiate for the better positions with well-established, aggressive companies. Your personal require-ments met by individual procedures. Strict confidence assured. Details on request. Jepson Executive Personnel & Research Service (not an agency), 564 Land Bank Building, Kansas City 6, Missouri.

#### POSITIONS WANTED

B.S. IN Chemical Engineering desires position as plant engineer or pilot/development labor-atory operation in pharmaceutical, cosmetic, or related industry. Broad experience for past twelve years in pharmaceutical, manufacturing, research and development. Familiar with lay-out and construction, with wide knowledge of materials and equipment. Know maintenance. Useful in design of special set-ups and labora-tory gadgets. Write intelligent reports. Can handle men, Eastern location preferred bu will consider any location within Continental U.S. PW-594, Chemical & Metallurgical Engi-neering, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL RESEARCH Chemists. Ph D INDUSTRIAL RESEARCH Chemists. Ph.D. Fourteen years experience. Seeks free-lance assignments in chemical literature research, compliation of technical data, economic evalu-ations of processes and products, process de-sign, mineral raw materials, inauguration and reorganization of research departments, adver-tising and publicity copy and promotion. PW-603, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York 18, N.Y.

CHEMICAL ENGINEER: age 32, married. Eleven years experience in process develop-ment and plant management in the organic field. Excellent background in unit processes. Seven years in supervisory capacity with proven ability to organize and direct operation of large plant. Prefer production work, but will accept suitable position in development line. Desire permanent position with future. Salary ex-pected \$400 month. PW-612, Chemical & Met-allurgical Engineering, 330 W. 42nd St., New York 18, N. Y.

CHEMICAL ENGINEER: Doctors degree, 1942. Married, age 30. Broad industrial experi-ence. Executive ability. Interested in re-search. development. production, design in progressive, medium-size company in synthetic chemical field. Desires permanent, responsible position with good future. West or Midwest location. Minimum salary \$5000. PW-642, Chemical & Metallurgical Engineering, 520 N. Michigan Ave., Chicago 11, 111.

CHEMICAL ENGINEER: M.S. 1937. Excellent background for chemical engineering con-cerned with plant equipment and maintenance supplies requiring organization of project re-quirements and design specifications prior to purchasing. 4 years of engineering and tech-nical service with manufacturer of chemical equipment; 2½ years experience in procure-ment, planning and engineering as an officer in Army of U.S.; 2 years of chemical research. Capable, aggressive and dependable. Desires position with established firm. Salary open. Married, agg. 3. PW-643, Chemical & Metal-lurgical Engineering, 520 N. Michigan Ave., Chicago 11, 11.

(Continued on page 430-

#### **EXECUTIVE ENGINEER**

Ch. E. Having broad technical sales (ex-cellent record) coupled with intensive pur-chasing, production and administration should prove valuable it orp-flight execu-tive to add the "can-do" to his "know-how" PW-634, Chemical & Metallurgical Eng. 330 West 42nd Street, New York 18, N. Y.

#### POSITION WANTED

COSITION WANTED EXECUTIVE-ENGINEER-IN SALES-DESIGN-DEVELOPMENT-PRODUCTION Over 20 yrs. experience Chemical and Mechanical Eng. Varied Business experience. Recent position Plant Suberintendent, personnel (00-1000, entire responsibility for Prod.-Design.-Develop. Prefer location in Philadelphia area. Foreign Service considered.

P. O. Box 47, Betterton, Md.

#### PLANT MANAGER

Fine record in charge of operations chemical plant in synthetic rubber program. Diversified research and development background. Sound record and training in labor relations and costs. Expecially qualified and interested in the manufacture of chemicals from periodum. Sitteen years' service with major chemical company. Available soon. PW-633, Chemical & Metallurgical Engineering 330 West 42nd Street, New York 18, N. Y

## WANTED Petroleum Engineers

Petroleum Engineers or Chemical Engineers, thoroughly familiar with design of petroleum or gas cracking units, needed immediately by large eastern Chemical Company. Practical experience in operation of petroleum plants helpful.

Must be graduate engineer between 35 and 45 years of age with 10 or more years' association with the petroleum and chemical industries.

To engineers who can qualify we offer good salary commensurate with experience and training.

To assist us in arriving at an accurate and immediate evaluation of your qualifications, please be complete and specific in your reply.

Give age, reference, education, engineering experience, personal history, salary received and salary expected. Enclose recent snapshot.

sk \*

If interview is requested, transportation expenses will be reimbursed.

All inquiries will be considered promptly and kept confidential.

Send full particulars to

P-627, Chemical & Metallurgical Engrg. 330 West 42nd St., New York 18, N. Y.

## **CHEMISTS WANTED**

For Works Laboratory of Carbide & Carbon Chemicals Corp. at Manhattan Project, Oak Ridge, Tenn.

#### SEND

Outline of personal data, work experience, education, and salary expectation to:

CARBIDE & CARBON CHEM. CORP. P. O. Box P Oak Ridge, Tennessee 

#### CHEM. ENGRS. - TECHNICAL **RECOGNIZED PERSONNEL SERVICE** Since 1914-Nation-wide Coverage Confidential Intermediary For Both Employee and Employee SHAY EMPLOYMENT AGENCY 30 W. Washington Chicago 2, Ili.

## Wanted RESEARCH DIRECT

Young man with training and experience in organic chemistry to fill key position in independently endowed wood research laboratory affiliated with small southern liberal arts college. Doctor's degree preferred.

Salary on basis of experience and past record.

Unusual opportunity for accom-plishment by man capable of organizing and directing expanding pro-gram of research in utilization of wood products and wood waste. Full details on experience, salary

requested to be in first inquiry. P-625. Chemical & Metallurgical Eng. 330 West 42nd St., New York 18, N. Y.

## **Brass Open Hearth Operator**

Secondary nonferrous refiners. Midwes-tern Region. State experience, qualifications, references and wages desired in first letter.

P-621, Chemical & Metallurgical Eng. 520 North Michigan Ave., Chicago 11, 111.

### DESIGN ENGINEER

Senior engineer is needed to carry on long-range research and development work on special valves and control devices, primarily for the petroleum and chemical industries. This program is well-established in our Company, and is projected for several years ahead.

We are seeking a broad-gauged and versatile man We are seeking a broad-gauged and versatile man who can offer: (1) Grade A engineering com-petance in fluid and vapor flow; (2) Ability to work in organization; (3) Some practical knowl-edge of machine shop operations; (4) Ability to express findings and ideas on paper; (5) Interested in occasional field sorties to observe product ap-plications, and advise with users on professional level.

Knowledge of valves and instruments from applica-tion standpoint is important. Location—East, major city. Salary commensurate. Please reply in detail, in full confidence. This is a proposed in-crease in organization—present staff knows of this ad. Reniv

P-623, Chemical & Metallurgical Eng. 330 West 42nd Street, New York 18, N. Y.

#### Aluminum Open Hearth Operator Secondary nonferrous refiners. Midwestern Region. State experience, qualifica-tions, references and wages desired in first letter.

P-620, Chemical & Metallurgical Eng. 520 N. Michigan Ave., Chicago 11, Ill.

#### WANTED

Assayer to take charge of large laboratory in the East. Must be familiar with all branches of assay-ing of the preclous metals, including the separation of the six platinum metals. Write, stating age, ducation, experience, salary expected, and references.

P-628, Chemical & Metallurgical Engrg. 330 West 42nd Street, New York 18, N. Y.

Position Securing Bureau, Inc. Agency-Established 1922 45 John Street, New York 7, N. Y. We solicit job orders from employers and invite registration by those seeking positions in the chemi-cal and related industries. ARTHUR M. SMITH, Ph. D. Placement Manager, Chemical Dept.

## SEARCHLIGHT SECTION OP

### SOAP AND RESEARCH CHEMIST WANTED

Long established, highly rated manufacturer of soap and cleaning compounds desires to employ experienced chemist capable of taking full charge of all research activities including formula improvements, development of new products, studies of new chemicals, as well as routine tests and investigations, etc. Successful applicant will have direct contact with and aid of top executives. Position will be permanent and offers good income; other employment benefits; opportunity to exercise initiative and to become an important part of a successful and expanding business. Headquarters will be either in Hartford, Conn. area or New York City. In replying, please give age. education, complete business record, references and starting salaried desired.

P-630, Chemical & Metallurgical Engrg. 330 West 42nd St., New York 18, N. Y.

## SWISS PHARMACEUTICAL CONCERN

is interested in hiring a

## **Mechanical Engineer**

with engineering degree from ETH and experience in U.S.A. for plant in Switzerland

P-580, Chemical & Metallurgical Eng. 330 West 42nd St., New York 18, N. Y.

## SUPERINTENDENT of Maintenance & Construction

Chemical Engineer with experience in building and equipment maintenance, to have charge of construction, setup, and maintenance of equipment in small, rapidly growing plant manufacturing fine organic chemicals. Will also have charge of preventive maintenance schedules, equipment history records, and will supervise building erection and power plant operation.

Position requires practical equipment experience and knowledge of alloys and corrosion resistant materials. Should be familiar with welding, electrical, and building construction problems, and be able to supervise training programs for mechanics and craftsmen.

Small town near Chicago.

2

P-631, Chemical & Metaliurgical Engrg. 530 North Michigan Ave., Chicago 11, Ill.

# ENGINEERS and MACHINE DESIGNERS

Investigate Immediate Opportunities in the Chemical Industry

## ENGINEERS-SPECIALISTS

MACHINE DEVELOPMENT MANAGEMENT ENGINEERING MATERIALS HANDLING MECHANICAL POWER TRANSMISSION POWER

## MACHINE DESIGNERS

(with at least 5 years' experience in industrial field on design of automatic and semi-automatic machinery)

Good opportunities available for qualified applicants.

To assist us in arriving at an accurate and immediate evaluation of your qualifications, please be complete and specific in your reply.

Give age, references, education, business and engineering experience, personal history, salary received and salary expected. Enclose recent snapshot.

If we request interview in city other than your present location, transportation expenses will be reimbursed.

All inquiries will be considered promptly and kept confidential.

E. I. DU PONT DE NEMOURS & COMPANY (INC.) PERSONNEL DIVISION Wilmington 98, Delaware **G** SEARCHLIGHT SECTION

HEAT TRANSFER ENGINEER With thorough background in engineering and sales desires position with reliable manulacturer. Proven ability in executive capacities. Now employed. M.S. in Chem. Eng. Age 39.

PW-659, Chemical & Metallurgical Eng. 330 West 42nd St., New York 18, N. Y.

#### POSITIONS WANTED

(Continued from page 428)

TECHNOLOGICAL MANAGER: M.S. Ch.E., Tau Beta Ple, 15 years with large company. Broad experience in the direction of process evaluation, development, design, installation, and operation. Complete familiarity with mod-ern factory organization, process standards, job analysis, training, and production control. Can organize and direct efficiently. Wish to join active organization in factory or techno-logical management. PW-556, Chemical & Metallurgical Engineering, 520 N. Michigan Ave., Chicago 11, III.

EXECUTIVE ENGINEER: 23 years engineer-ing and business experience in heavy manu-tacturing plants, process industries, and consulting field as plant engineer, design engi-neer, assistant chief engineer, and project manager. Desire management, assistant to executive, or chief engineer's position. PW-644, Chemical & Metallurgical Engineering, 330 W, 42nd St., New York 18, N. Y.

GRADUATE CHEMICAL Engineer: 24, mar-ried, Naval officer anticipating release, avail-able June 15th; experience in metallurgy; de-stres position in Midwest; Tau Beta Pi, PW-646, Chemical & Metallurgical Engineering, 520 N. Michigan Ave., Chicago 11, III.

CHEMICAL ENGINEER: B.S., 1943. Three years experience in process development and production supervision in connection with growing concern located in Rocky Mountain or Pacific Coast area. Age 26. married. PW-646. Chemical & Metallurgical Engineering, 330 W. 42nd St., New York 18, N. Y.

GRADUATE CHEMICAL Engineer, B.S. 1943, now employed, desires position in technical service or production division of a reputable progressive organization. Three years experi-ence in design and production supervision, Married, one child. Personality affable and alert. Moderate travel not objectionable. Available on 30 day notice. PW-547, Chemical & Metallurgical Engineering, 520 N. Michigan Ave., Chicago 11, III.

CHEMICAL ENGINEER: B.S., 27; two years industrial experience; electrolysis of molten salts and production of hydrochloric acid. In-terested in development work, anywhere. Available after military discharge in midsum-mer. PW-648, Chemical & Metallurgical Engi-neering, 330 W. 42nd St., New York 18, N.Y.

Chem., M. Chem., seeking responsible posi-tion in research; corrosion. electro-plating and metal-inishing, organic and inorganic reactions. PW-649 Chemical & Metallurgical Engineering, 330 W. 42nd St., New York 18, N. Y. EXPERIENCED ELECTROCHEMIST.

PROFESSORSHIP IN chemical engineering or chemistry desired; Dr. Eng. Broad academic and industrial experience, publications patents. PW-651, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York 18, N. Y.

#### SELLING OPPORTUNITY WANTED

CHEMICAL ENGINEER and executive of recognized standing and reputation, Gov-ernment qualified, 15 years experience in the manufacture of cane sugar and allied indus-tries, and 7 years experience in supervisory ca-pacity in research, manufacture and main-tenance of a chemical pulp and paper factory using electrolytic caustic soda, chlorine and related products, at present employed by two important organizations in the Philippines, but planning to leave shortly for Europe and retire due to family conveniences, invites negotia-tions with progressive companies in the United States, wishing a representative of Spanish or-igin and Filipino nationality where technical knowledge, political and social contacts are re-quired, anywhere in Spain or in the Philippines, tute of Chemical Engineers, American Chemi-cal Society, American Institute of Chemical Engineers, Technical Association of the Pulp and Paper Industry. Personal, banking and patent reforences available. RA-650, Chemical & Metallurgical Engineering, 330 W. 42nd St.. New York 18, N. Y.

ENGLAND GROUP of seven factories pulveriz-ing, grading and refining raw materials would like co-operation with firm interested in entering European and British markets. Dohm Ltd., 167 Victoria Street, London, S.W. 1.

SELLING OPPORTUNITY WANTED

MANUFACTURERS REPRESENTATIVES MANUFACTURERS REFRESENTATIVES sales engineering company in New York selling industrial, chemical processing and oll refinery equipment. Desire additional line. RA-662, Chemical & Metallurgical Engineer-ing, 330 W. 42nd St., New York 15, N. Y.

MANUFACTURERS REPRESENTATIVE Chemical engineer with sales organization of-fers sales representation in New York and New Jersey for manufacturers of basic chemicals and process equipment. RA-653, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York 18, N. Y.

CALIFORNIA-TECHNICAL Sales — Graduate chemical and paper making engineer, age 32, 9 years industrial research, development and sales experience. Desires responsible position or would act as manufacturer's agent. Lan-guages. References. RA-654, Chemical & Met-allurgical Engineering, 68 Post Street, San Francisco 4, Cal.

#### **BUSINESS OPPORTUNITIES**

FOR SALE coal and minerals—2100 acres within Great Falls Coal Field. Sub or medium grade bituminous; 10% to 11M. BTU; five to six foot coal seam; drift truck mines, good mining coal. Gas, oll and all mineral rights included in property. Opportunity with many advan-tages for chemical and process industries. Ad-dress part-owner, L. J. Howard, 913 Third Avenue, North, Great Falls, Montana.

WONDERFUL OPPORTUNITY: to buy con-trolling stock or 100% of small efficient laboratory, now producing Stilbestrol, profit-ably. Midwest location. Full price \$15,000. BO-655, Chemical & Metallurgical Engineering, 520 N. Michigan Ave., Chicago 11, fill.

## WANTED **Sales Engineers**

For 8 new branch offices to be opened August 1st. Only interestd in men of outstanding ability who must be thoroughly acquainted chemical, food, and pharmaceutical industries and, preferbly, should be graduate chemical or mechanical engineers. Unusual opportunity for responsible men to build a future. Exclusive territorial rights. Remuneration to be on commission basis plus anuity feature with continuing share in annual returns. Applicants are requested to give age, education, and complete resume of past experience. Replies held in strictest confidence.

SW-632, Chemical & Metallurgical Eng. 330 West 42nd St., New York 18, N. Y.

## TECHNICAL SALES

Technically trained sales representative with sound chemical background desired for industrial cleaners by nationally known, long established manufacturer. Background of laboratory and sales experience desirable. Real opportunity to establish a new department. All replies confidential. Box Chicago office.

RW-577, Chemical & Metallurgical Engrg. 520 North Michigan Ave., Chicago 11, Ill.

#### WANTED

D

## **District Sales Manager**

For chemical process equipment. Applicant must be graduate Chemical Engineer with several years experience successfully selling equipment in this industry. Position requires wide knowl-edge of theory, design and operation of evaporators, dryers and similar process equipment. Excellent .oppor-tunity with old and well established company.

Write giving age, education, experience, positions held, companies em-ployed by and references. Enclose recent photograph and advise starting salary.

Our employees have been advised of this advertisement.

SW-637, Chemical&Metallurgical Engrg 330 West 42nd Street, New York 18, N. Y.

#### SALES AGENT

Manufacturer of a complete line of competitively priced LONG WEARING LIQUID SPRAY NOZZLES desires Agents in U. S., Canada and Mexico. SW-585, Chemical & Metallurgical Eng. 330 West 42nd St., New York 18, N. Y.

## Inorganic Chemist AVAILABLE

Over ten years experience in research and pilot plant work in ceramic raw materials, cements, adhesives, soluble silicates, clay, talc, minerals and ores.

Formulations, microscopic and petrographic control-Field technical service experience. Starting salary secondary to making right connection.

SA-583. Chemical & Metallurgical Engrg. 330 West 42nd St., New York 18, N. Y.

#### SALES MANAGER

Chem. Engr. twenty years sound and varied technical sales (metals and equip-ment) with five years unusual executive and administrative experience. Marked ability to analyze markets, develop meth-ods, train and quide personnel. SA-635, Chemical & Metallurgical Eng. 330 West 42nd Street, New York 18, N. Y.

MANUFACTURERS REPRESENTATIVE Eastern Seaboard Chemical Engineer, superior record of technical sales, unusually wide acquain-tance, desires to represent manufacturer with suitable products or equipment along Eastern Seaboard. Eastern Seaboard. RA-636, Chemical & Metallurgical Engrg. 330 West 42nd Street, New York 18, N. Y.



Additional Business Opportunity ads on pages 439 and 441. Wanted ads-page 438

SEARCHLIGHT SECTION D

Industry's "8-Ball" is Wanted Machinery

AND INDUSTRY IS CALLING ON

"CONSOLIDATED"

FOR FROM SINGLE ITEMS TO COMPLETE PLANTS ... We Must Have Your List of What You Can Sell-

Write or Wire TODAY!

#### DRYER SPECIALS

- -B. & C. 28'' dla. x 60'' face At-mospheric double drum Dryers Complete.
- 1—Devine Vacuum Shelf Dryer, 8 shelves, 40'' x 42'', Condenser and Stokes H. V. Pump.
- Rotary Dryers, 2'x24', 4'x30', 6'x 40'. 5...
- 9—Direct heat Rotary Dryers 4'x30', 5'x30', 70''x30', 6'x60'.
- -Buffalo 36'' x 72'' Atmo, double drum dryer, complete.
- Rotary Kilns, 6'x60'.
- -32''x72'' Buflovak Atmospheric Double Drum Dryers, m.d.
- 10—Rotary Vacuum Dryers: 3—Buffalo 5'x20'; 3—Devine 4'x25'; 1—De-vine 4'x30'; 1—Struthers Wells 30'x12'.
- 2-Atmospheric Drum Dryers 4'x12'.
- 1—Buffalo 32''x90'' Atmospheric double drum Dryer, complete, m d 1-Devine 3'x9' Bronze Double Drum
- Rotary Vacuum Dryer, complete with all auxiliaries.
- 1—42''x100'' Buflovak Atmo. double drum Dryer, complete m.d.
- 1—Buffalo 36''x72'' Atmospheric dou-ble drum Dryer, complete m.d.
- 2-Buflovak 6' dia. Jack Vacuum Crys-tallizers or Vacuum Pan Dryers.
- -Atmospheric TRUCK DRYERS Each has 4 trucks. Each Truck holds 40 Trays—1280 sq.ft. of tray surface per dryer. Equipped with trays, heating colls, fans, etc.

6-PEBBLE MILLS. 1-6' x 5' Burrstone Lines; 1-32" x 42" Rubber Lined; 1-30 gal. porcelain lined. Other Sizes.
2-18" x 18", 24" x 24", Jeffrey single ROLL CRUSHERS.
5-DRY POWDER MIXERS various sizes. To 3000 lbs.
6-RAYMOND PULVERIZERS: 4-roll Low Side; No. 3. No. 1, No. 0000.
12-OLIVER FILTERS, 4' x 6', 6' x 6', wood and iron; 8' x 8'; 8' x 12'.
8-HEAT EXCHANGERS, 50 to 1600 sq. 1t. heating surface; 5 copper, 2 steel tubes.
8-RUBBER LINED Rectangular Tank: 7-500-gal.: 1-150 gal.
23-CENTRIFUGAL EXTRACTORS, 12" to 72" bronze and steel baskets, belt and motor drives.
1-PNEUM. SCALE CARTON PACKAGING UNIT.

#### **HIGH SPEED ROLLER MILLS** 1—Kent 16 x 40, 3-roll m.d. 1—Lehman 13 x 32, 4-roll m.d.

I—Pneumatic Scale Co, Auto tight WRAPPER. I—36" dia. Cast Iron COLUMN, 23' high. I—Hardinge BALL MILL 5'x22".



#### MOVING RAPIDLY

- 4-28"x48", SIFTERS, 8 deck, 4 deck, 3 deck, 2 deck.
- 4' x 20' brick-lined ROTARY CAL-CINER, complete with firing hood, oll burning equipment, instruments, 1etc.
- 1-12" dia. x 15' long KILN, roller mounted, incl. oil burner, complete.
- 2—Dings, 12" dia. x 18" MAGNETIC SEPARATORS, each in conveyor set-up and incl. M.G. set.
- -3'x8' Hendy Iron Works, Iron lined ROD MILL, Clutch pulley with 30 H.P. motor.

1—Pangborn DUST COLLECTOR, 4800 sq. ft. filtering area, 15000 c.f.m. incl. exhauster supporting steel. Outside type.

- 3-8' x 30" Hardinge Conical Silex Lined PEBBLE MILLS, also 6' x 36".
- I-5' X 13' PEBBLE or TUBE MILL, with open trunions. 1-500 gal, 5' x 6' BALL MILL.
- 9-Dopp C. 1. Jacketed KETTLES. 25 gal. to 100 gal.; 30-steel, cast iron, jack., up to 2000 gala.
- 3-ROLLER MILLS, 12 x 30. 16 x 40 water cooled. 1-Shriver Iron FILTER PRESS, 42"x42", 30 chambers.
- I-Shriver Iron FILTER PRESS, 42\*x42\*, 30 chambers.
   3-50 gal. copper steam jacketed VACUUM PANS, Complete: other sizes to 750 gal.
   I-Size "B" Erie City COAL PULVERIZER with 40 P 3/60/220-440 V. Motor. Rated 2000 lbs. per hour.
   9-COPPER & ALUMINUM steam Jack. KETTLES 50 to 500 gal., some with agitators.
   2-200 gal. GLASS LINED jack. KETTLES.
   Indefinite Additionary Territor Machine Control
- I-Richie friction grease TESTING MACHINE, cap. 10,000 P. S. I.

I-World automatic rotary LABELER m.d. I-1000 gat. lead-lined closed TANK, lead colls. 1-100 gal. horiz. rubber lined MIXER.

One of "CONSOLIDATED" Best Buys 2-4-Roll Raymond High Side Mills, equipped for vacuum air separationone with latest "whizer" separator, one with double cone vacuum separator. Each including exhauster, cyclone collecto and inter-connecting piping.



0

#### CRANES

Immediate Shipment From ALBANY, NEW YORK

2-30 and 20 ton (lifting capacities) LOCOMOTIVE TRACK CRANES: both cranes rebuilt recently under U. S. Gov't.

- I-S00 gal. Jack. agit. AUTOCLAVE, steel, hammer welded construction 200 lb. Jack. press, 500 lb. In-ternal press.
- 1-Komarck-Greaves BRIQUETTE PRESS, with 2-32" x 24" face, rolls for egg-shaped briquettes, rated 25 tons per hour. 3-150 gal, aluminum TANKS cone bottom.

- 3-Bucket Elevators steel enclosed-78', 45', 35' e-e. including smaller elevators, screw conveyors, etc.
- 2-No. 0 Raymond Beater type Pulverizers, sach equipped with air classifier, exhauster, cyclone col-lector, tubular dust collector and inter-connecting piping. Jones Automatic CARTONERS.

- 2-Anderson PACKAGING UNITS. 2-60 gal. and 1-80 gal. Aluminum steam jacketed KETTLES. 5-Stokes R single gunch 21/2"; 4-Cotton 51/2, single punch.
- I-U. S. Bottlers 22-spout Rotary Vac. Bottle Filter complete m.d.
- 3-Sharpless No. 6 Clariflers and Separators, m.d.
- 4-DeLaval Clariflers and Separators, m.d.
- I-McCiellan Dry Powder Tumbling Mixer, 1500 Ibs. I-J. H. Day Size 10 Jack. Imperial Mixer, 30 gal.





SEARCHLIGHT SECTION 

\*\*\* Headquarters for Equipment \*\*\*







- AGITATOR DRIVES D.O. James—Size 1300 Vertical Worm Gear, Ratio 82 to 1 with base plate for 5 H.P. motor drive, General Electric Vertical Gear Reduction, Output Speed 5 R.P.M.—7½ H.P. G.E. to-tally enclosed Motor—220 volts—3 phase— —60 cycle.

- 1\_
- -42" dis. x 24'-4" Vertical Forge Welded Steel 63e bbs. Pressure--1300 gals. -4'x 6' Vertical Iron Body, Steel Jacketed 200 bbs. Pressure---600 gals. -6'x 15' Vertical Steel, Jacketed 125 lbs. Pressure--3400 gals. 1-
- Pressure-3400 gals. -10' x 25' Vertical or Horizontal, Forge Welded Steel Jacksted, 100 lbs. Pressure. 1-
- BLENDERS

#### 1-3'6" x 5 ft. Cylindrical Blender with Stands

- -3'6" x 5 fl. Cylindrical Blender with Stands and Drive. -Monson Horizontal Blender 8 Ft. Dia. Coni-cal Shape, Feed One End, Discharge Other End, Silent Chain Drive. Capacity 3000 lbs. Mounted on Structural Steel Frame.

#### CONDENSERS

- CONDENSERS 1-Eliott Ehrhart Iron Body Surface Conden-ser-two pass 245 sq. ft. Surface-1/2" brass tubing & Tube sheet. 1-All copper condenser, Coil Type, 60 sq. ft. surface, removable from shell. 2-30" x 7 ft. All Copper Condensers with 114" Tubes-300 sq. ft. Surface. 1-Goubert Condenser with 114" Brass Tub-ing-Iron Body 330 sq. ft. Surface. 1-12" x 9 ft. Steel Condenser with 172.5/a" O.D. Copper Tubes, 250 sq. ft. surface.

#### CRUSHERS

- CRUSHERS
   I-Allis Chalmers 15"x9" Type "B" Blake Jaw Crusher, Capacity 1" Material 3 tons per hour-2" Material 8 tons per hour.
   I-Eli W. Blake 15"x9" Eccentric Jaw Crusher. Belt Driven.

CRYSTALLIZERS 4' x 24' x 2'6" Deep Stainless Clad Steel, Jacketed, 1800 gais.

#### DRYERS

- -Bartlett & Snow Vertical Steel Jacketed 10 dia. x 4' high, Agitators, Reducers, 2 H.P.
- dia. x4 high, Agiantis, and Dryer. Inside Motors. -4 ft. dia. x6 ft. leng Steel Dryer. Inside lining of sprayed Stainless Steel-Foote Bros. Reducer Drive.
- EXTRACTORS

- 1-40" dia. Burkhardt with Rubber Covered Basket and Lead Lined Curb-Underdriven. 1-38" dia. King & Gerber with Bronze Basket and Iron Curb-Overdriven.

#### - PARTIAL LISTING ONLY-

#### **FILTER PRESSES**

- PILIER PRESSES
   1-12" dia. International Pressure Filter with Nickel Body and Cover—Single plate.
   1-24" dia, No. 5 International Pressure Filter with Nickel Body and Cover—Single Plate.

#### FRACTIONATING COLUMN

1-18" dia. Cast Iron with Dephleg Motor-15 sections each 6" high-2 top and bottom sections each 18½" high.

FURNACES

1—Lydon Glass Annealing Furnace with Tem-perature Controls Motor, Fan, etc.



**SUJART DRYER OR KILN** -5' dia.x 40' long Horizontal Rotary Dryer, 1/2" shell, complete with tires, ring gear, rollers gearing, base plates.

#### AUTOCLAYES

- 55 gal. Blaw-Knox Stainless Steel, Rotating Jacketed, 750 lbs. Working Pressure, Reducer and Motor. CENTRIFUGALS
- De Laval Industrial Centrifugal-Model A.OO with 10 H.P. Explosion Proof Motor, 220 volts, 3 phase, 60 cycle and controls. l-De

#### MILL

MILL MILC Conical Ball Mill Complete with 25 H.P. Motor— 220 Volt—3 Phase—60 Cycle—and Charge of Forged Steel Balls. Ball

#### **KETTLES**

- 400 gal. Jacketed, Agitator, T & L Pulley Drive, Bottom cutlet.

#### MILLS

1-16" Style D Schultz O'Neil Pulverizing Mill. 1-24" Kent Pulverizing Mill, Belt Driven.

Write or wire for the equipment you need



- 1—Raymond-Impact Mill—Direct Drive. 1—54" Brown Ball Mill—Mushroom Type. 4—40" Burkhardt Ball Mill Mushroom

- 4-40" Burkhardt Ball Mill Mushroom Type.
  1-No. 21 Quaker City Hammer Mill.
  1-5" x 8" Jeffrey Rigid Hammer Pulverizer.
  1-20" Schultz O'Neil Limited Pulverizer.
  1-Robinson Unique No. 8 Batch Mixer, Center Inlet and Discharge, Tight and Loose Pulley Drive. Capacity 50 Cu. Ft.
  1-Howe Eureka No. 4812 Improved Mixer End Inlet and Discharge, Silent Chain Drive, Capacity 5000 lbs. Mounted on Wooden Frame.

#### PRESSURE TANKS MIXERS

- MIXERS 1-5' dia, 23'4'/2" Forge Welded Steel 300 lbs. W.P. 3300 gals. suitable for storage of compressed gases. 1-6'x8" dia, x6' deep, steel, riveted 125 lbs. W.P. 1750 gals. 1-3'6" x10' high, steel riveted, 100 lbs. W.P. 750 gals.
- 750 gals.

**REFRIGERATION UNIT** American Carbonic Model V5-2 Refrigera-tion Unit Type Co2—capacity 5 ton. 1 ----

#### SEPARATOR I-No. 1002 Gayco Separator-Size 30-Model

- STILLS No. 2 F. J. Stokes Automatic Water Still.
   500 gal. Copper Still 4 ft. dia. x 5 ft. high with coil.

- with coil.
  VACUUM PUMPS
  4-Stokes Side Valve Type, size 8" x 6". Pulley Drive.
  3-Devine Rotary Valve Type, Size 8" x 6". 52 cu. ft. Displacement, Pulley Drive.
  2-Devine Rotary Valve Type, Size 10" x 10". 113 cu. ft. Displacement, Pulley Drive.
  1-No. 5 Beach Russ Vacuum Pump complete with 5 H.P. motor.
  1-Stokes Size 145-C Vacuum Pump-Capacity 10 cfm. complete with 1 H.P. motor.
  1-Mo. 3 Crowell Vacuum Pump with 2 H.P. single phase motor, 115 volt, 60 cycle. Capacity 17 c.f.m.
  VIERATING SCREENS

#### VIBRATING SCREENS

- VIBRATING SCREENS 1-Jeffrey Traylor Type 4-Vibrating Con-veyor Screen. 1-Diesel 3'x 6' Concentrator, Type C, Single Surface Leaty Heavy Duty Vibrating Screen with 1 h.p. motor-440 Volt-3 Phrme-60 Cycle. 1-Tyler Hummer Screen Single Surface, Type 38 Jr. with V-7 Explosion Resistant Vi-brator and No. 236 Tyler Thermionic Power Convertor, Stainless Steel Wire Cloth, 160 and 100 Mesh.



- KETTLES
  1-8' dia. x 10' deep, iron body with heating coll, agitator and drive, 3000 gal.
  2-4' dia. x 4'6' deep iron body, anchor agitator, and newport drive, 400 gals.
  1-4' dia. x 4' deep iron body, agitator and drive, 400 gals.
  1-3'6' dia. x5' deep, steel jacketed, lead lined with agitator, 350 gals.
  1-3'6' dia. x 3' deep, steel, jacketed, with agitator and drive, 350 gals.
  1-4'' dia. x 3' deep, steel, jacketed, with agitator and drive, 350 gals.
  1-4'' dia. x 3' deep, steel, jacketed, with agitator and drive, 350 gals.
  1-4'' dia. x 3' deep Vertical Pressure Kettle-lead lined.
  1-400 gal, Jacketed, Agitator, T & L Puller

#### SEARCHLIGHT SECTION

#### FILTERS

Oliver 8' x 6' Top Feed ACID PROOF ROTARY FILTERS or Dewaterers, stainless steel valves. Brand new.

Sperry 24" x 24" FILTER PRESS, rubber plates and frames, 2 eye, closed delivery, 15 chambers

- Shriver FILTER 2--Shriver FILTER PRESSES, 12" x 12", 18" x 18", 30" x 30', recessed and plate and frame
- Wood FILTER 6-PRESSES, 18", 24", 30", 36" square
- 1-Oliver 5' x 8' Steel ROTARY FILTER
- 1-SWEETLAND NO. 2 FILTER

1-American 6' TWO DISC ROTARY CON-TINUOUS FILTER, with Ingersoll Rand -No. 49 Vallez ROTARY CONT. FILTER

#### **GRINDERS**—**PULVERIZERS**

- 2--Fitzpatrick Model 'D' COMMINUTING MA-CHINES
  1--Williams No. 1 HAMMER MILL
  3--Rubber Lined PEBBLE MILLS, 3' x 2', 3' x 3'
  1--Hardinge CONICAL BALL MILL 2' x 8"
  1-Robinson 30" ATTRITION MILL, with 2-40

- Hobinson 30" ATTRITION MILL, with 2-40 HP motors
   I-Sprout Waldron 20" ATTRITION MILL with 2-15 HP motors
   Krupp CROSS BAR BEATER MILL with 40 HP motor
   Krupp CROSS BAR BEATER MILL with 40 HP motor
   Ambe No. 2 AW CRUSHER, 3" x 4"

#### **KETTLES & CRYSTALLIZERS**

- Walters 5' dia. Copper Jktd., PRESSURE KETTLE, 700 gal.
   Monel Metal Jacketed Kettles, 5 gal.
   AUTOCLAVE, 50 gal., cast steel, un-jacketed, agitated 3" wall
   2-2' x 4' Horiz. CAST IRON AUTOCLAVES, bolted door, 150 lb. pressure
   Builovak 3' and 6' CRYSTALIZERS
   Swenson Walker Continuous CRYSTAL-IZERS, 24" x 30"
   Devine 5' x 4' Closed JKTD. KETTLE

#### SPECIALS!

you weeks or MONTHS on

Deliveries—can you afford to wait?

- -Colton Class 9-18, 20 Punch Rotary PREFORMING PRESSES, 2" dia. die -Stokes "R" Single Punch PREFORM-ING PRESSES, 2½" dia. die. -Colton & Stokes Single Punch PRE-FORMING PRESSES, up to 34" 3-
- 5-
- 10-
- 2-6' x 5' Closed JKTD. STEEL KETTLES 4-Pfaudler GLASS LINED KETTLES, 65, 125.
- 200 gal: 5, 30, 60, 125 gal. ALUMINUM JACKETED KETTLES
- KETTLES 22--COPPER KETTLES, sieam jacketed, some with agliators, 10 to 100 gal. 1--175 gal. LEAD LINED JKTD. KETTLE. New STAINLESS STEEL KETTLES, up to 500 gal.

#### CENTRIFUGALS

- -A.T. & M. 48" Suspended type CENTRIF-UGAL, 15 and 2 HP motors, bottom dis-1-

- charge. -Tolhurst 40" Solid Basket CENTRIFUGAL, motor driven, 15 HP motor -American Tool 40" Suspended CENTRIF-UGAL, copper basket, bottom discharge, belt driven -Tolhurst 32", 40", 48" SELF-BALANCING CENTRIFUGALS, steel and copper bask-ets, top and bottom discharge. -12" to 30" Belt under driven CENTRIF-UGALS -40" American Tool CENTRIFUCAT
- 1-
- UGALS -40" American Tool CENTRIFUGAL, 30 HP motor, 1800 RPM, bottom discharge -Sharples No. 6 PRESURTITE CENTRIFUGES -Sharples No. 6 SUPER CENTRIFUGES -De Laval Nos. 200, 300, 600, 700 CLARIFIERS 4

#### **DRYERS & KILNS**

- JATIERS & AILNS 1-Allis Chalmers 9'x 70' ROTARY KILN 1-Vulcam 9'x 65' ROTARY KILN 2-4'x 20' ROTARY DRYERS 1-6'x 17' COPPER SHELL ROTARY DRYER 3-ROTARY VACUUM DRYERS, 4'x10', 4'x15', 5'x33', 1-4'x 9' Albright Nell CHILLING ROLL OR ATMOSPHERIC DRUM DRYER, 4'x10', 4'x15', 5'x30', 1-Hersey ROTARY DRYER, 5'x 30', 1-Hersey ROTARY DRYER, 5'x 30', 1-Hersey ROTARY DRYER, 5'x 30', 1-Buifalo 5'x 6', ATMOS, DRUM DRYER, 24''x 60'', 4'x 6', 2-6'x 27'6'' ROTARY STEAM TUBE DRYERS, having 42.41/2''x 25' tubes 1-Gehnrich Gas Fired TRUCK DRYER

- Partial List Only. Your Inquiries Solicited

#### MIXERS

MIXERS 8-Stainless Steel 175 gal. MIXING TANKS, with S. S. Double Motion Agitators, motor driven 12-AGITATOR DRIVES, ior Tanks from 10' to 24' dia. New and Used PORTABLE AGITATORS, from 1/4 to 2 HP, 440 and 1750 RPM 1-Howes 24'' x 12' DRY POWDER MIXER 5-Day, Ross DOUBLE ARM MIXERS, 10 to 100 gal. 1-30'' dia, LANCASTER MIXER 2-W. & P. MIXERS, 9 and 20 gal. 6-DRY POWDER MIXERS, 100 to 1000 lb. 3-POWDER BATCH MIXERS, 100 to 1000 lb. 3-POWDER BATCH MIXERS, with side entering agitators, 650 to 1500 gal. 2-Scott 1250 gal. Jacketed, HORIZONTAL CLOSED MIXERS 4-Readco 100 gal. DOUBLE ARM MIXERS, steam jacketed 1-Fowler and Rockwell 5 BBL. Mixer, single

will SAVE

- 1-Fowler and Rockwell 5 BBL. Mixer, single arm

#### **EVAPORATORS**

- LATFORMIURS
   Scott Quadruple Effect EVAPORATOR, each body 8'3" dia. calandria type, approx. 2500 sq. ft. each effect
   Triple Effect EVAPORATOR, 7'6" dia. bodies, 1850 sq. ft. each effect
   Zaremba Double Effect EVAPORATOR, ell copper, 5' dia., 500 sq. ft. per effect, ver-tical tubes
   Luille All Coppar Double Effect FVEPO

- tical tubes -Lillie All Copper Double Effect EVAPO-RATOR, 1000 sq. it. per effect -Swenson Single Effect Aluminum EVAPO-RATOR, 100 gql. per hour -Buflovak Stainless Steel Single Effect EVAPORATOR, forced circulation type, 900 sq. ft., 7' dia.
- 900 sq. ft., 7' dia. Zaremba Multi-Circular EVAPOBATOR, to manufacture 25 tons of Caustic Soda. Complete unit. Exceptionally fine condition. Details on request.

#### MISCELLANEOUS

- 6-Copper VACUUM PANS, 30", 42", 5' and 6' dia., 50 to 750 gal. 1-Stokes Steel VACUUM PAN, 100 gal. 4-TUBULAR CONDENSERS AND RECEIVERS,

- 4—TUBULAR CONDENSERS AND RECEIVERS, 25 to 260 sq. ft.
  10—12" BELT CONVEYORS, built for any length, motor driven
  1—16" TROUGHING IDLER BELT CONVEYOR, 175' centers
  2—1750 gal. LEAD LINED CLOSED TANKS
  10—LIQUID PASTE AND FOWER FILLING MACHINES
  6—CAN AND BOTTLE LABELERS
  15—COPPER, GLASS LINED and ALUMINUM TANKS, 25 to 600 gal.
  25—CENTRIFUGAL, PISTON AND ROTARY PUMPS, 1" to 5" discharge
  6—TYLER, ROTEX, LEAHY SCREENS



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

#### G SEARCHLIGHT SECTION Ð

# **UNION STANDARD EQUIPMENT**

Micro Pulverizers 24", Model 4TH with 50 HP motor, 3 phase, 60 cycle 220 V, including magnetic starter and motor driven feeder with motor. 4 year old.

Micro Pulverizers 8" size with special discharge chute. Two motors, one 1¼ HP motor, 3 phase, 60 cycle, 220 V, 1140 RPM and one 3 HP motor, 3 phase, 60 cycle, 220 V, 3400 RPM, complete with control. Standard iron welded bare ord stad of 1 welded base and stand, feed trough and side liners, special large hopper. Size 46" long, 36" wide, 84" high.

Enamel lined Vacuum Pan with Agitator 32" diameter.

Rebuilt - Guaranteed

- Copper Vacuum Pans with Agitators 4
- ft., 5 ft., 6 ft. Steel Vacuum Pans with Agitators 4 ft. Centrifugal 40" with Copper Basket and 40 H.P., 220 Volt, 60 Cycle, 3 Phase
- Motor with drum control and brake. Longitudal Mixer 5,000 lb. cap. with Spiral Agitator.
- National 9 ft. diameter Chaser, 2 Roll. Shriver Filter Press, Plate and Frame Open Delivery Type size 30" x 30", 35 plates 31 frames.

Smith Vail Filter Press, Recess Type, Closed Delivery, size 32" 41 plates. Karl Keifer Rotary Visco Filler.

Elgin 24 spout Rotary Vacuum Filling Machine.

- Gayco 8 ft. Air Separator. Ermold and World Semi-Automatic Labeling Machines.
- Copper and Aluminum Steam Jacketed Kettles, with and without Agitators.
- Brand New Pneumatic Scale Co. Filling Machine.
- Hobart, Read and Century Vertical Three Speed Mixers, M.D.
- Schutz O'Neill, Rotex and Allis Chal-
- mers, Lowhead Sifters. Package Machinery Co., Johnson all types Wrapping, Packaging and Cartoning Equipment.



#### SEARCHLIGHT SECTION



- 1-Devine No. 27 Double Door, 17 Shelf Vacuum Dryer complete with conden-ser and Vacuum Pump.
  1-Black & Clawson Double Drum Dryer; 28\*X60\* with accessories.
  3-Double Drum Atmospheric Dryers; 21/5\*X63\*.
  1-Bufale Double Bronze Drum Dryer; 3\*X5' with 25 H.P. Motor.
  1-Bufale Double Drum Dryer; 32x72\*.
  1-Bufale Double Drum Dryer; 32x72\*.
  1-Bufale Double Drum Dryer; 32x72\*.
  1-Bufale Double Drum Dryer; 3/x20\*.
  1-Bufale Single Drumchrome plated Dryer; 5'X6' with auxiliaries.
  2-Vacuum Drum Dryer; 3'X18\* with auxiliaries.
  1-Botand & Henning Steam Tube Dryer; 6'X30\*.
  1-Budsale Kotary Dryer; 4'X20\* with auxiliaries.
  1-Bross 4 Pass Continuous Conveyor Dryer; 61' long.
  1-Boss 4 Pass Continuous Conveyor Dryer; 60' long with accessories.
  3-Raymond IMP Mills No. 45 with accessories.
  1-Raymond IMP Mills 24\* with accessories.
  1-Butta Merrill Hog or Shredder Model 3D.

## **ONE RELIABLE** Source for ALL Your EQUIPMENT - New and Rebuilt

STOKES and COLTON TABLET MACHINES LIKE NEW ... Rotary and Single Punch

Hardinge Conical Mills from 36" I-Dia. to 8'. -Day 12'x32" 3 roll (all watercooled) I-Mill with motor. -Kent Three Roll Mills: 16'x40"; ar-Houchin-Alken Three Roll Mill: 3-20'x48" arr. for P.D. Buhier three roll water Cooled Mills: I-16'x40"-V Belt driven. -Raymond '00" Mill with Dust Col-lecto and accessories. -Bauer Double Runner 30" Attrition I-Mill: P.D. -Sturdevant No. "0" Hammer Mill with 10 H.P. Motor. -U.S. Colloid Mill No. I with 5 H.P. -U.S. Colloid Mill No. I with 5 H.P. 1-2-1-2-1-1-

-U.S. Colloid Mill with two 10 H.P. -U.S. Colloid Mill with two 10 H.P. -Logeman S.S. Homogenizer with frac-tional motor. 1-Sparkler S.S. Filter; production size. 1-

1-Sharples No. 16 Centrliuge with Monel Contact Parts.
1-Sharples Centrifuge Type M4P with Stainless Centrifuge Type M4P with Unned bowl.
3-Toihurst & American 48" Centrliugal Extractors; 1--(Rubber) 2--(S.S.)
1-Davenport Molature Expelier Model 1A with 10 H.P. Motor.
1-Davenport Type 3R Monel Dewater-ing Press.
1-Stranson Triple Effect Evaporator: Cast iron bodies; 4'3'x10'4'.
1-Strathers Wells Triple Effect Evaporator: Cast iron Bodies; 20'X10'.
1-Zahm Evaporator or De Alcoholizer; 15'x12'.
1-Stainless Steel Vacuum Still; Jack-eted and Agliated; 33'x60'.
1-Glass Lined Jacketed and Side Agi-tated Kettle; 200 gal. open top.

- NGW AIIU ACUUIII
   -Glass Lined Jacketed and Agitated Vacuum Ketties: 200 gal., 300 gal.
   -Pfaudior 60%24% Glass Lined Jkted Evaporating Kettie with Glass Coated Agitator ... condition new.
   -Aluminum Jacketed Vacuum Pans; 230 gal.; 400 gal.
   -Copper Jacketed Vacuum Pan; about 175 gal.
   -Glass Lined 3000 gal. Soctional Vac-uum Still with Jecketed bottom.
   -Copper Distillation Column; 36%23'; sectional type.
   -Heavy Duty Vertical Copper Tanks; 4'x9'6'; with manholes.
   -Briver 18'x18' Wood Plate & Frame Filter Press.
   -Shriver 18'x18' Wood Plate & Frame Filter Press.
   -Shever Cast Iron PI. & Fr. Filter Presses: 24'-30'.
   -Louisville 36' Continuous Filters.
   -Louisville 36' Continuous Filters.
   -Industrial All Iron Rotary Filter; drum 6'x3'.
   -Standard Automatic 50 ton Plastic Molding Press with accessries.

- 1~
- -Standard Automatic 50 ton Plastic Molding Press with accessories.

Tremendous Increased Facilities make us more eager than ever for your SURPLUS EQUIPMENT. Send us your list.

| I-Farquahr  | 100   | ton   | Extru   | alon | P   | ress |
|-------------|-------|-------|---------|------|-----|------|
| 10"x321/2"; | strok | e 40  | ۳.      |      |     |      |
| -Southwark  | 500   | ton   | Curb    | Pres | s;  | 40"  |
| bed: 18" ra | m.    |       |         |      |     |      |
| -Bethlehem  | 2000  | ton   | Hydra   | ulic | Рг  | ess; |
| 8 heated p  | lates | 5'6"  | x8'9".  |      |     |      |
| Weed 7500   | 100   | M see | coulin. | Dres | 2.1 | 5.1" |

- 1-Pneumatic Scale 11 Stem Automatic Vac. Filler with Kreamer Capper. I-Rotex No. 44 Sifter 40"x84"; 4 separations.
- I-Wood 7500 ton Hydraulic Press; 54".
   I-Iriangle Model SN Auger Type Powder Filler; 30" stroke; daylight 54".
   I-Joheson Aut. Auger Type Powder Filler; arr. for M.D.
   Jacketod Autoclaves or Pressure Vessels; 4"x6".
   I-Triangle Model SN Auger Type Powder Filler; arr. for M.D.
   I-Johnson Aut. Auger Type Powder Filler; arr. for M.D.
   I-Johnson Aut. Auger Type Powder Filler; arr. for M.D.
   I-Johnson Aut. Auger Type Powder Filler; arr. for M.D.
   I-Johnson Aut. Auger Type Powder Filler; arr. for M.D.
   I-Johnson Aut. Packaging Two Station Auger Type Aut. Fillers. I-Triangle Model SN Auger Type Pow-der Filler; 8 oz. to 5 lbs.

### How could YOUR OWN tank cars **Reduce your Costs?**

Save you Labor? Save you Money? **Improve your Operations? Increase your Profits?** 

? ? ? ? ? We have just purchased several hundred good used cars right out of service. These are available to you at close to Request our prices.—"If just out of curiosity" because there is no obligation. TANK CAR TANKS ALSO FOR SALE and PRICED RIGHT, too!

IRON & STEEL PRODUCTS, INC. 41 years' experience 13460 S. Brainard Avenue Chicago 33, Illinois "ANYTHING containing IRON or STEEL"

## FOR SALE 1-LEHMANN FIVE-ROLL **Soap Milling Machine** FS-261, Chem. & Met. Engineering 310 West 42nd St., New York 18, N. Y.



### FOR SALE

FOR SALE 2-75 gal. S. S. Insul. Tank, 31"x25". 500 gal. S.S. Tank, 14"x4"x6". 500 gal. Plaudier Tanks, clamped covers, 30"x20". 150 gal, Plaudier Tilling Tank, jkt., 44"x24". 330 gal. Plaudier Tank, jkt., 45"x66", ault. 20" and 36" Tolhurst Centrifugals. Williams Lab. Pebble Mill, two i gal. Jars. Hottman Mixer, 30"x60"x18", 15 H.P. 2-2" Ingersoil Rand Pumps, 3 H.P. 50 to 500 gal. Homogenizers or Viscolizers. 28/x2 Double Drum Dryer. 3 ft. Copper Vacuum Pan with pump. Zaremba Evaporator, nickel construction, also 4x2 Oliver Filter, capacity 25 tons caustle. New i gal Laboratory Autoclaves. Send us your inquiries. Send us your inquiries.

LESTER KEHOE MACHINERY CORP. 1 East 42nd Street, New York 17, N. Y. MUrray Hill 2-4616



## FOR SALE NOW!

- 1—Blaw-Knox Stainless Steel Drum Dryer 6' x 5'
- -Devine Vacuum Shelf Dryer—3 Shelves 17" x 34"
- 1-Devine Cast Steel Autoclave 500 gal., 1000# with agitator. 1....
- Smith Hammer Welded Steel Jacketed Autoclave 500 gal., 500# W.P. 2-Sharples Super Centrifuges-M.D.
- I—Butialo Foundry Crystallizer—50 gal.
- 1-Devine Horiz. Vac. Pump 52-CFM-M.D. -Hardinge Conical Ball Mill-Magnesium lined 4-1/2' x 16" 1-
- 4-Stokes B Rotary Tablet Machines
- 1-Colton #2 Rotary Tablet Machine
- -Kux Lohner Rotary Tablet Machine up to 1" dia. 1-
- 1—Stokes E&F Single Punch Tablet Machine
- -Stokes Automatic Tube Filler, Closer & Sealer 1-
  - New Stainlescs Steel Jacketed Kettles and Storage Tanks WRITE FOR LATEST BULLETINS

What have you for sale?

MACHINERY & EQUIPMENT

CORPORATION (of N. Y.) 533 West Broadway, N. Y. 12, N. Y. **GRamercy 5-6680** 

#### FOR SALE

Day Lightning Packer-Steel Frame Automatically controls amount of material to each package. Can be adjusted to pack loosely or compacily. High. 7' 2'4" overall. Floor space 37" x 22'2".

ACE MACHINERY & EQUIPMENT CO 115 W. Pratt St., Balto -1, Md.

## D SEARCHLIGHT SECTION D



#### SEARCHLIGHT SECTION D



FOR YOUR

### FOR YOU

TO sell your business for cash to a reputable and experienced operating concern with substantial capital may be the best thing for both the company and you

WE are principals (not brokers) with a record of successful operating experience. Present company personnel retained wherever possible. • ALL discussions and negotiations strictly confidential

Box 1221 - 1474 Bway, N. Y.

#### FOR SALE - INDUSTRIAL SITE **Buildings** Power Plant Land .

8 BUILDINGS: Steel and Brick, Concrete, sprinklered. Totalling 100,000 sq. ft. MODERN POWER PLANT: Including, 2-500 H.P. B & W Stirling Boiler, 250 # Pressure, installed new 1942. 1-680 K.W. Nordberg Full Poppet Valve Engine Generator set, 3/60/480 Volt, non-condensing.

WATER SUPPLY: 2, 1200 g.p.m. Layne Motor Driven DEEP WELL PUMPS.

175 Acres of land. Each Building Serviced by Railroad Sidings, 100 Ton Track Scale. Ample Fire Protection. Excellent labor and housing conditions. Froperty can be purchased at reasonable price. Reasonable Terms.

#### NEWBERRY MANUFACTURING COMPANY

P. O. Box 295

r April Special 🖚

NEW 3 IIP. MOTORS Leuis Ailis Frame 220 V.-60-Cy. 3 Ph. 1800 R.P.M. Splesh proof. Ball Bearing. Double End Shaft. Tropical Inc. \$82 Price each, F.O.B. Rochester, N. Y.....

**MOTORS, GENERATORS,** 

For prompt action, wire specifications collect ELECTRIC EQUIPMENT CO. 63 Curlew Street + Box 51 + Rochester 1, N.Y.

CHEMICAL EQUIPMENT

4-Tanks-17' x 9' x 6' Rectangular

2—Vertical Mixing Tanks 14' x 7'. Com-plete with AC Motors & Agitators.

Very fine Pilot Plant, Pamps,

Laboratory Equip., etc.

**ROSSVILLE CHEMICAL CO.** 

Rossville, Staten Island

Main 4-3804 or Tottenville 8-1040

**REBUILT and GUARANTEED** 

Prompt Shipments from a Large Stock All Types - All Makes - All Sizes And We Really Rebuild 'Em.

General Blower Co.

CHICAGO, ILL. 515 N. Dearborn St.

MORTON GROVE, ILL 8605 Ferris Ave.

FANS\_BLOWERS

EXHAUSTERS

"Lungs for Industry"

3-Tanks-6' x 20' Cylindrical

TRANSFORMERS

**BOUGHT & SOLD** 

Telephone: Newberry 16.

1800

Newberry, Michigan

## PLANT FOR SALE

All steel building, 502' long, 162' wide. Center bay 60' with 51' bay on each side. Has 5 to 10 ton Shaw traveling crane, 30' high to top of rail and 40' from ground to bottom of truss. Railroad track running thru center of building; concrete floor, unlimited load.

Located in the Greater St. Louis Industrial Area-the Hub of America, with railroad, truck, water and air transportation facilities; complete with all utilities.

JOS. GREENSPON'S SON PIPE CORPORATION NATIONAL STOCK YARDS, ILL. Across the Mississippi from St. Louisi

Always get ISP's quotations tool! **USED TANK GAR TANKS** For Liquid Storage 6,000 to 10,000 gallons R SAFER CI CLEANED TESTED PAINTED CHEAPER HEAVIER Also, Vertical Tanks of all Capacifies IRON & STEEL PRODUCTS, INC. 41 years' experience 13460 S. Brainard Ave. Chicago 33, Ill. "ANYTHING containing IRON or STEEL"

IF there is anything you want that other readers can supply-OR ... something you don't wantthat other readers can use-Advertise it in the SEARCHLIGHT SECTION



CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

# SEARCHLIGHT SECTION P

BRASS, BRONZE AND COPPER...Rod, Bar, Sheet, Strip, pipe, tubing, and wire in Production Quantities.

## GOVERNMENT-OWNED SURPLUS STOCK

11111

**MILL PRODUCTS!** 

in many standard and non-standard grades, finishes, sizes and specifications AVAILABLE NOW in production quantities

-and new surplus declarations are being made daily.

## **HOW TO PURCHASE**

- Estimate, for any convenient period, your production needs in each specification, finish, gauge, etc.
- Write, wire or phone that information to your nearest War Assets Corporation office\* below. We will advise you of the location and condition of the stock you need, estimate possible delivery dates, quote prices and help arrange credit.

3 When satisfactory arrangements have been made, we will start shipments.

**\*WAR ASSETS CORPORATION** is a Reconstruction Finance Corporation subsidiary. When checking telephone and other directories, simply look up RFC.

VETERANS OF WORLD WAR II: To help you in purchasing surplus property from War Assets Corporation, a veterans' unit has been established in each of our Regional Offices listed below.

# WAR ASSETS ADMINISTRATION

OFFICES LISTED BELOW ARE TEMPORARILY IN RECONSTRUCTION FINANCE CORPORATION AGENCIES

 Offices located at: Atlanta
 Birmingham
 Boston
 Charlotte
 Chicago
 Cleveland
 Dallas
 Denver

 Detroit
 Helena
 Houston
 Jacksonville
 Kansas City, Mo.
 Little Rock
 Los Angeles
 Louisville

 Minneapolis
 Nashville
 New Orleans
 New York
 Oklahoma City
 Omaha
 Philadelphia

 Portland, Ore.
 Richmond
 St. Louis
 Salt Lake City
 San Antonio
 San Francisco
 Seattle
 Spokane

 Cincinneti
 Fort Worth (Telephone 3-5381)
 Salt
 Salt

EASY TO FABRICATE... This stock may be fabricated by normal production methods.

# AND MAGNESIUM PLANT FOR SALE OR LEASE

The War Assets Administration, a disposal agency, invites proposals for the purchase or lease of the following properties in the interest of continued employment. These properties were acquired by an agency of the Government for production in the war effort, and are now, or shortly will be, declared surplus to Government needs. Listing of these plants by name of lessee is for identification purposes only, and has no connection with the lessee's own plants or facilities.

Henderson and Gabbs, Nevada (Plancor 201) Basic Magnesium, Inc.

#### IN WHOLE OR IN PART

This Basic Magnesium Mine and Plant can be purchased or leased as a whole or in part. Thoroughly modern, it has a rated capacity of 112,000,000 lbs. per year.

| T | Н | E | F   | A | С | 1 | LI | Т | Y | C | 0 | V | E | R S | 5 | AN  | A. | E   | N   | T   | 1 | R | E | 1 | N | D   | U   | S | T | R | Y | F | R | 0 | M   |   | TI | H I | E | M | 1 | N | E |
|---|---|---|-----|---|---|---|----|---|---|---|---|---|---|-----|---|-----|----|-----|-----|-----|---|---|---|---|---|-----|-----|---|---|---|---|---|---|---|-----|---|----|-----|---|---|---|---|---|
| т | 0 | 1 | r H | E |   | P | R  | 0 | D | U | С | T | 1 | N   |   | ) F | 1  | R I | E J | F J | N | E | D |   | M | E 1 | T A | 1 |   | A | N | D |   | B | Y - | P | R  | 0   | D | U | С | T | S |

The Metals and Chlorination Plants are at Henderson, Nevada. The Mines and Concentration Plant are located at Gabbs, Nevada, 300 miles distant.

#### The Metals and Chlorination Plant

A complete manufacturing center producing magnesium by the Dow electrolytic process, including modern townsite with housing for 1000 families and two Apartment Buildings for single individuals. There are also two Federal Public Housing Authority Subdivisions for 824 families and dormitories for 500 workers. There is a community center consisting of schools, stores, markets, churches, recreation building, etc. This facility is suitable for any type of manufacturing or assembly not requiring urban surroundings.

#### LAND: Approx. 18,400 acres available.

**BUILDINGS:** 29 Main Buildings—1 to 5 stories high, generally of steel frame and reinforced concrete. Concrete and steel plate floors and composition or built-up roofs. Clearances run from 8 to 38 feet.

Plant buildings are arranged in 4 groups:

- 1. Preparation Plant-Rotary Kilns, Kiln Buildings.
- 2. Metals Plant Chlorination, Electrolysis, Rectifier and Motor Generator Building.
- 3. Refinery-Ingot Refinery Buildings.
- 4. Chlorine and Caustic Plant-Chlorine Cell Buildings, Boiler House, Caustic Evaporator Building.

TRANSPORTATION: U. S. Highway No. 95-R. R. spur from U. P. R. R. T. W. A. and Western Airlines. One airport 10 miles distant and the other 22 miles away. The Mines and Concentration Plant

UTILITIES: Cheap and abundant power from Boulder Dam Power House. Water from Lake Meade.

The Mines and Concentration Plant

A modern Magnesite Mining and Concentrator Plant including housing and utilities for immediate operation.

LAND: Approx. 5,000 acres.

BUILDINGS: Main Plant consists of 11 steel frame buildings with corrugated iron walls, reinforced concrete floors and composition roofs. Included are Grinding and Flotation Building, Filter Building, Roaster Building, Shop Building and a Mess Hall.

There are also 14 frame buildings with wood floors and composition roofs.

Housing for 60 families, also an Apartment Building, Hotel, Garage Buildings, School Building, Fire Station, and Recreation Building.

UTILITIES: Power from Boulder Dam Power House. Water Treatment and Storage Plant.

TRANSPORTATION: U. S. Highway No. 95. R. R. at Luning, Nevada (30 miles).

The Henderson Plant Buildings are adaptable to subdivision to accommodate a number of individual commercial or industrial units.

Write for Brochures A, B and C giving more detailed information including drawings and photographs.

#### CREDIT TERMS MAY BE ARRANGED FOR THE PURCHASE OF THESE PLANTS

General information is available from your nearest War Assets Administration Office. For specific data, contact the office indicated below. All data contained herein are necessarily abbreviated and subject to correction. They are not intended for use as a basis for negotiations. WAR ASSETS ADMINISTRATION reserves the unqualified right to reject any or all proposals or offers received for the above properties.



#### 504 Dooly Building, Salt Lake City 1, Utah

Phone: 5-7503

410-T

# SEARCHLIGHT SECTION OF HOW TO GET

## GOVERNMENT-OWNER SURPLUS STOCK

in many standard and non-standard grades, finishes, sizes and specifications AVAILABLE NOW in production quantities

-and new surplus declarations are being made daily.

## **HOW TO PURCHASE**

- Estimate, for any convenient period, your production needs in each specification, finish, gauge, etc.
- Write, wire or phone that information to your nearest War Assets Corporation office\* below. We will advise you of the location and condition of the stock you need, estimate possible delivery dates, quote prices and help arrange credit.

3 When satisfactory arrangements have been made, we will start shipments.

**\*WAR ASSETS CORPORATION** is a Reconstruction Finance Corporation subsidiary. When checking telephone and other directories, simply look up RFC.

VETERANS OF WORLD WAR II: To help you in purchasing surplus property from War Assets Corporation, a veterans' unit has been established in each of our Regional Offices listed below.

# WAR ASSETS ADMINISTRATION

OFFICES LISTED BELOW ARE TEMPORARILY IN RECONSTRUCTION FINANCE CORPORATION AGENCIES

 Offices located at: Allanta
 Birmingham
 Boston
 Charlotte
 Chicago
 Cleveland
 Dallas
 Denver

 Detroit
 Helena
 Houston
 Jacksonville
 Kansas City, Mo.
 Little Rock
 Los Angeles
 Louisville

 Minneapolis
 Nashville
 New Orleans
 New York
 Oklahoma City
 Omaha
 Philadelphia

 Portland, Ore,
 Richmond
 St. Louis
 Salt Lake City
 San Antonio
 San Francisco
 Seattle
 Spokane

 Cincinneti
 Fort Worth (Telephone 3-5381)
 San Salt Jake
 San Salt Jake</t

EASY TO FABRICATE.... This stock may be fabricated by normal production methods.

11111

**MILL PRODUCTS!** 

157-4

BRASS, BRONZE AND COPPER...Rod, Bar, Sheet, Strip, pipe,

tubing, and wire

in Production

Quantities.

# AND MAGNESIUM PLANT FOR SALE OR LEASE

The War Assets Administration, a disposal agency, invites proposals for the purchase or lease of the following properties in the interest of continued employment. These properties were acquired by an agency of the Government for production in the war effort, and are now, or shortly will be, declared surplus to Government needs. Listing of these plants by name of lessee is for identification purposes only, and has no connection with the lessee's own plants or facilities.

Henderson and Gabbs, Nevada (Plancor 201) Basic Magnesium, Inc.

#### IN WHOLE OR IN PART

This Basic Magnesium Mine and Plant can be purchased or leased as a whole or in part. Thoroughly modern, it has a rated capacity of 112,000,000 lbs. per year.

THE FACILITY COVERS AN ENTIRE INDUSTRY FROM THE MINE TO THE PRODUCTION OF REFINED METAL AND BY-PRODUCTS

The Metals and Chlorination Plants are at Henderson, Nevada. The Mines and Concentration Plant are located

at Gabbs, Nevada, 300 miles distant.

#### The Metals and Chlorination Plant

A complete manufacturing center producing magnesium by the Dow electrolytic process, including modern townsite with housing for 1000 families and two Apartment Buildings for single individuals. There are also two Federal Public Housing Authority Subdivisions for 824 families and dormitories for 500 workers. There is a community center consisting of schools, stores, markets, churches, recreation building, etc. This facility is suitable for any type of manufacturing or assembly not requiring urban surroundings.

LAND: Approx. 18,400 acres available.

BUILDINGS: 29 Main Buildings—1 to 5 stories high, generally of steel frame and reinforced concrete. Concrete and steel plate floors and composition or built-up roofs. Clearances run from 8 to 38 feet.

Plant buildings are arranged in 4 groups:

- 1. Preparation Plant-Rotary Kilns, Kiln Buildings.
- 2. Metals Plant Chlorination, Electrolysis, Rectifier and Motor Generator Building.
- 3. Refinery-Ingot Refinery Buildings.
- 4. Chlorine and Caustic Plant—Chlorine Cell Buildings, Boiler House, Caustic Evaporator Building.

TRANSPORTATION: U. S. Highway No. 95-R. R. spur from U. P. R. R. T. W. A. and Western Airlines. One airport 10 miles distant and the other 22 miles away.

UTILITIES: Cheap and abundant power from Boulder Dam Power House. Water from Lake Meade.

**The Mines and Concentration Plant** 

A modern Magnesite Mining and Concentrator Plant including housing and utilities for immediate operation.

LAND: Approx. 5,000 acres.

**BUILDINGS:** Main Plant consists of 11 steel frame buildings with corrugated iron walls, reinforced concrete floors and composition roofs. Included are Grinding and Flotation Building, Filter Building, Roaster Building, Shop Building and a Mess Hall.

There are also 14 frame buildings with wood floors and composition roofs.

Housing for 60 families, also an Apartment Building, Hotel, Garage Buildings, School Building, Fire Station, and Recreation Building.

UTILITIES: Power from Boulder Dam Power House. Water Treatment and Storage Plant.

TRANSPORTATION: U. S. Highway No. 95. R. R. at Luning, Nevada (30 miles).

The Henderson Plant Buildings are adaptable to subdivision to accommodate a number of individual commercial or industrial units.

Write for Brochurcs A, B and C giving more detailed information including drawings and photographs.

#### CREDIT TERMS MAY BE ARRANGED FOR THE PURCHASE OF THESE PLANTS

General information is available from your nearest War Assets Administration Office. For specific data, contact the office indicated below. All data contained herein are necessarily abbreviated and subject to correction. They are not intended for use as a basis for negotiations. WAR ASSETS ADMINISTRATION reserves the unqualified right to reject any or all proposals or offers received for the above properties.



504 Dooly Building, Salt Lake City 1, Utah

Phone: 5-7503

410-T



| Ace Machinery & Equipment Co  | 435  |
|---|--|
| Acme Coppersmithing & Machine Co  | 230  |
| Aetna Scientific Co.  | 244  |
| Alena Smelting & Ketinery Works   | 438  |
| All Preneater Corp  | 197  |
| Allegneny Ludium Steel Corp   | 215  |
| Allen Billmyre Co.  | 393  |
| Allow Exhibitions Jac   | 25   |
| Aluminum Co. of America   | 100  |
| Aluminum Oco Co   | 155  |
| Amarican Air Compressor Com   | 325  |
| American Brate Co   | 436  |
| American Car & Founday Co   | 243  |
| American Gyanamid & Chemical Corn 46-67   | 249  |
| American Flange & Mfg. Co   | 377  |
| American Gas Assoc  | 408  |
| American Hard Rubber Co   | 227  |
| American Locomotive Co  | 3-349  |
| American Marsh Pumps Inc.   | 276  |
| American Metal Hose   | 151  |
| American Meter Co.  | 376  |
| American Optical Co   | 378  |
| American Platinum Works   | 274  |
| American Pulverizer Co  | 296  |
| Amersil Co  | 248  |
| Ampco Metal, Inc  | 232  |
| Andover Kent  | 218  |
| Ansul Chemical Co   | 220  |
| Atlas Foundry Co  | 240  |
| Atlas Powder Co   | 2/9  |
| Armsfrong Cork Co   | 219  |
| Arrapuigus Clay Co  | 3/0  |
| Automatic Sprinkler Corp. of America  | 204  |
| Automatic transportation Co   | 374  |
|   |  |
| Babcock & Wilcox  | 337  |
| Babcock & Wilcox Tube Co  | 309  |
| Badger & Sons Co., E. B   | 36-87  |
| Bailey Meter Co   | 54   |
| Baker & Adamson, Div. of General Chem. Co.  | 23   |
| Baker & Co. Inc   | 399  |
| Baldwin-Hill Co   | 200  |
| Barcan Co., I.  | 434  |
| Barren Div. Allied Chemical & Dye Co  | 417  |
| Dauer, L. W   | 410  |
| Bell Telephone Inhereteries   | 200  |
| Bemis Bree Bre Co   | 570  |
| Bin Dicistor Co   | 104  |
| Bird Machine Co   | 400  |
| Birmingham Tank Co. Div. of logally log   |  |
| Works Co  | 287  |
| Rlack Sivalle & Bryson Inc  | 365  |
| Blickman Inc. S   | 290  |
| Blaw-Knox Co.   | 163  |
|   |  |
| Bonney Forge & Tool Works   | 75   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.   | 75   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co  | 75<br>421<br>2-453   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Brill Equip. Co  | 75<br>421<br>2-453<br>338  |
| Bonney Forge & Tool Works.<br>Bridgeport Brass Co.<br>Brill Equip. Co   | 75<br>421<br>2-453<br>338<br>244   |
| Bonney Forge & Tool Works<br>Bridgeoort Brass Co.<br>Brill Eauip, Co  | 75<br>421<br>2-453<br>338<br>244<br>54-65  |
| Bonney Forge & Tool Works<br>Bridgeoort Brass Co.<br>Brill Eauip. Co.<br>Bristol Co.<br>Brosk Eauipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.  | 75<br>421<br>2-453<br>338<br>244<br>64-65<br>446   |
| Bonney Forge & Tool Works.<br>Bridgeport Brass Co.<br>Brill Equip. Co   | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397  |
| Bonney Forge & Tool Works<br>Bridgeoort Brass Co.<br>Brill Eauip, Co.<br>Brosks Eauipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.  | 75<br>421<br>338<br>244<br>64-65<br>446<br>397<br>208  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Brill Eauip. Co.<br>Brosk Eauipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Blaw-Knox Co   | 75<br>421<br>2-453<br>338<br>244<br>64-65<br>446<br>397<br>208<br>208<br>261   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brooks Equipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Buffalo Haw-Knox Co.<br>Buffalo Wire Works Co.  | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>208<br>261<br>206   |
| Bonney Forge & Tool Works<br>Bridgeoort Brass Co.<br>Brill Eauip, Co.<br>Brooks Eauipment & Mfg. Co.<br>Brown & Root, Inc<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Vire Works Co. Inc.<br>Buffavak Equipment Division of Blaw-Knox Co<br>Bump Pump Co.   | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>208<br>261<br>206   |
| Bonney Forge & Tool Works<br>Bridgeoort Brass Co.<br>Bridgeoort Brass Co.<br>Brill Eauip. Co.<br>Brooks Eauipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co.<br>Bump Pump Co.<br>Cambridge Inst. Co. Inc.  | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>208<br>261<br>206   |
| Bonney Forge & Tool Works<br>Bridgeoort Brass Co.<br>Brill Eauip. Co.<br>Broiss Eauipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Cambridge Inst. Co. Inc.<br>Carbridge & Carbon Chemicals Corp. 33   | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>208<br>261<br>208<br>261<br>206   |
| Bonney Forge & Tool Works<br>Bridgeoort Brass Co.<br>Brill Eauip, Co.<br>Brooks Eauipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffavak Equipment Division of Blaw-Knox Co<br>Bump Pump Co.<br>Cambridge Inst. Co. Inc.<br>Carbridge Inst. Co. Inc.<br>Carbridge Inst. Co. Inc.<br>Carbridge Inst. Co. Inc.<br>Carbridge Inst. Co. Inc.<br>Sarbridge Inst. Co. Inc.   | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>208<br>208<br>206<br>206<br>286<br>379<br>194   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brooks Equipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Bufforak Equipment Division of Blaw-Knox Co.<br>Bump Pump Co.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp. 33<br>Carnegie Institute of Technology.<br>Carrier Corp.  | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>208<br>208<br>206<br>206<br>286<br>379<br>194<br>251  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Brill Eauip. Co  | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>208<br>208<br>208<br>208<br>206<br>286<br>379<br>194<br>251<br>10   |
| Bonney Forge & Tool Works<br>Bridgeoort Brass Co.<br>Bridgeoort Brass Co.<br>Brill Eauip. Co.<br>Brooks Eauipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Cambridge Inst. Co. Inc.<br>Carbride & Carbon Chemicals Corp.<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Valve Mfg. Co., A. W.   | 75<br>421<br>2-453<br>244<br>54-65<br>446<br>397<br>208<br>261<br>208<br>261<br>206<br>379<br>194<br>194<br>194<br>194<br>194<br>318   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co  | 75<br>421<br>2-453<br>338<br>244<br>446<br>397<br>208<br>261<br>208<br>261<br>206<br>379<br>194<br>251<br>10<br>318<br>324   |
| Bonney Forge & Tool Works<br>Bridgeoort Brass Co.<br>Brill Eauip. Co  | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>206<br>206<br>206<br>206<br>379<br>194<br>251<br>10<br>318<br>324<br>406  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Bross Equipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Cambridge Inst. Co. Inc.<br>Carbride & Carbon Chemicals Corp.<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Valve Mfg. Co., A. W.<br>Cayne, Albert H.<br>Cavine, Albert H.<br>Cavine, Albert H.<br>Cavine, Albert H.  | 75<br>421<br>2-453<br>2-45<br>244<br>446<br>446<br>208<br>208<br>208<br>208<br>206<br>286<br>379<br>286<br>379<br>286<br>379<br>251<br>251<br>10<br>318<br>324<br>406<br>575   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Brill Equip. Co  | 75<br>241<br>2453<br>338<br>2445<br>2465<br>446<br>397<br>208<br>261<br>206<br>286<br>379<br>194<br>275<br>318<br>324<br>406<br>175<br>235   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co  | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Broks Equipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbridge Inst. Co. Inc.<br>Carbridge Corp.<br>Cash Corp.<br>Cash Corp.<br>Cash Corp.<br>Cash Co., A. W.<br>Cash Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.  | 75<br>421<br>2-453<br>338<br>244<br>446<br>397<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown & Root, Inc.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Cash Co., A. W.<br>Cash Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Carbide Mechanical Equipment Co.<br>Chapman Valve Mfg. Co.<br>Chase Bag Co.<br>Chemical Construction Corp.<br>Chemical & Procest Machy.<br>Carbide & Procest Machy.<br>Carbide & Corp.  | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brooks Equipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbride & Carbon Chemicals Corp.<br>Campridge Institute of Technology.<br>Carreier Lastitute of Technology.<br>Cash Valve Mfg. Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Cash Valve Mfg. Co.<br>Centrituge Mechanical Equipment Co.<br>Century Elec. Co.<br>Chapman Valve Mfg. Co.<br>Chemical Construction Corp.<br>Chemical & Process Machy. Corp.  | 75<br>421<br>2-453<br>338<br>244<br>54-65<br>446<br>397<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Corp.<br>Cash Co., A. W<br>Cavne, Albert H.<br>Ceilcote Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chemical Construction Corp.<br>Chemical Construction Corp.<br>Chemical Strocess Machy. Corp.<br>Chicago Bridge & Iron Co.   | 75<br>421<br>2-453<br>328<br>446<br>54-65<br>446<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buflovak Equipment Division of Blaw-Knox Co<br>Bump Pump Co.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Cash Co., A. W.<br>Cash Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Cash Valve Mfg. Co.<br>Chayne, Albert H.<br>Ceilcote Co.<br>Chase Bag Co.<br>Chemical Construction Corp.<br>Chemical Construction Corp.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Eye Shield Co.<br>Chicago Eye Shield Co.   | 75<br>421<br>2-453<br>338<br>244<br>446<br>446<br>397<br>208<br>261<br>206<br>286<br>379<br>194<br>251<br>206<br>286<br>379<br>194<br>451<br>233<br>372<br>233<br>372<br>233<br>374<br>445<br>233<br>374<br>445<br>205<br>205<br>210<br>210<br>210<br>210<br>210<br>210<br>210<br>210<br>210<br>210                            |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown Instrument & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbride & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbride & Carbon Chemicals Corp.<br>Carrier Corp.<br>Cash Valve Mfg. Co., A. W.<br>Cayne, Albert H.<br>Cayne, Albert H.<br>Cayne, Albert H.<br>Cayne, Albert H.<br>Cayne, Albert H.<br>Cayne, Albert Go.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Bridge & Iron Co.<br>Chicago Metal Hose Corp.<br>Chicago Metal Hose Corp.  | 75<br>421<br>2-453<br>338<br>244<br>446<br>446<br>446<br>208<br>2261<br>206<br>286<br>379<br>206<br>286<br>379<br>206<br>251<br>10<br>318<br>425<br>318<br>425<br>372<br>445<br>437<br>205<br>206<br>2306  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co  | 75<br>421<br>2-453<br>338<br>446<br>45-65<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co  | 75<br>421<br>2-453<br>338<br>244<br>45-65<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown & Root. Inc.<br>Brown & Root. Inc.<br>Brown & Root. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Institute of Technology<br>Carnegie Institute of Technology<br>Carrier Corp.<br>Cash Valve Mfg. Co., A. W.<br>Cavne, Albert H.<br>Ceilcote Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Bridge & Iron Co.<br>Chicago Eyes Nield Co.<br>Chicago Eyes Nield Co.<br>Chartie Co., L. R.<br>Clark Eros. Co. Inc.<br>Clark Eros. Co. Inc.<br>Clark Eros. Co. Inc.<br>Clark Eros. Co. Inc.<br>Clark Eguipment Co.  | 75<br>421<br>2-453<br>338<br>244<br>446<br>397<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Brill Equip. Co  | 75<br>421<br>2-453<br>338<br>2244<br>446<br>397<br>208<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown Instrument & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Co., A. W.<br>Cash Co., A. W.<br>Cash Co., A. W.<br>Cash Co.<br>Cash Yalve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chemical & Process Machy. Corp.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Eye Shield Co.<br>Christle Co., L. R.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Co.<br>Clark Bros. Co., R. D.<br>Columbia Chemical Div. Pittsburgh Plate  | 75<br>421<br>2-453<br>338<br>244<br>454-65<br>208<br>2261<br>206<br>286<br>379<br>208<br>2261<br>206<br>286<br>319<br>206<br>286<br>319<br>206<br>286<br>319<br>205<br>205<br>203<br>372<br>194<br>445<br>53372<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>20   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Cash Co., A. W<br>Cavne, Albert H.<br>Ceilcote Co.<br>Centrity Elec, Co.<br>Chapman Valve Mfg, Co.<br>Chapse Bag Co.<br>Chemical Construction Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Bridge & Iron Co.<br>Chicago Eve Shield Co.<br>Chicago Metal Hose Corp.<br>Chicago Metal Hose Corp.<br>Clark Bros. Co. Inc.<br>Clark Equipment Co.<br>Clark Equipment Co.<br>Clark Equipment Co.<br>Claveland Worm & Gear Co.<br>Cole Mfg, Co., R. D.<br>Columbia Chemical Div. Pittsburgh Plate<br>Glass Co.   | 75<br>421<br>2-453<br>338<br>244<br>446<br>397<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Broks Equipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Vire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Institute of Technology.<br>Carrier Corp.<br>Cash Corp.<br>Cash Corp.<br>Cash Co., A. W.<br>Cayne, Albert H.<br>Ceilcote Co.<br>Century Elec. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chicago Erid as & Iron Co.<br>Chicago Erid Shield Co.<br>Chicago Erid Shield Co.<br>Chicago Erid Baron Co.<br>Chicago Erid Baron Co.<br>Chicago Ere Shield Co.<br>Chicago Ere Shield Co.<br>Chicago Ere Shield Co.<br>Clark Equipment Co.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Cole Mfg. Co., R. D.<br>Columbia Chemical Div. Pittsburgh Plate<br>Glass Co.   | 75<br>421<br>2-453<br>338<br>2244<br>446<br>397<br>208<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>208<br>2261<br>208<br>2261<br>208<br>2261<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbride & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbride & Carbon Chemicals Corp.<br>Carreige Institute of Technology.<br>Carrier Corp.<br>Cash Valve Mfg. Co., A. W.<br>Cayne, Albert H.<br>Cayne, Albert H.<br>Cane, Albert H.<br>Cane, Albert Go.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapter Valve Starbon Corp.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Bridge & Iron Co.<br>Chicago Ey Shield Co.<br>Christle Co., L. R.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Commercial Solvents Corp.  | 75<br>421<br>2-453<br>338<br>244<br>446<br>337<br>208<br>2261<br>206<br>286<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Cash Co., A. W.<br>Cash Valve Mig. Co., A. W.<br>Cayne, Albert H.<br>Ceilcote Co.<br>Chapman Valve Mig. Co.<br>Chapman Valve Mig. Co.<br>Chapman Valve Mig. Co.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Metal Hose Corp.<br>Chicago Eye Shield Co.<br>Clark Bros. Co., Inc.<br>Clark Equipment Co.<br>Cole Mig. Co., R. D.<br>Columbia Chemical Div. Pittsburgh Plate<br>Glass Co.<br>Combustion Engineering Co., Inc.<br>Commercial Solvents Corp.<br>Consolidated Products Co.  | 75<br>421<br>2-453<br>338<br>2244<br>446<br>397<br>208<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Co., A. W.<br>Cash Co., A. W.<br>Cash Co.<br>Cash Valve Mfg. Co., A. W.<br>Carne, Albert H.<br>Ceilcote Co.<br>Centifuge Mechanical Equipment Co.<br>Chapman Valve Mfg. Co.<br>Chapan Valve Mfg. Co.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Eye Shield Co.<br>Christle Co., L. R.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Colardia Chemical Div. Fittsburgh Plate<br>Glass Co.<br>Combustion Engineering Co., Inc.<br>Combustion Engineering Co., Inc.<br>Combustion Engineering Co., Inc.<br>Combustion Engineering Co., Inc.   | 75<br>421<br>2-453<br>338<br>244<br>454-65<br>208<br>2261<br>206<br>286<br>379<br>208<br>2261<br>206<br>286<br>379<br>208<br>2261<br>206<br>286<br>379<br>208<br>205<br>205<br>205<br>205<br>203<br>205<br>203<br>205<br>205<br>203<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>205                      |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carber Corp.<br>Cash Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Carne, Albert H.<br>Ceilcole Co.<br>Chapman Valve Mfg. Co.<br>Chapse Bag Co.<br>Chapse Bag Co.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Eye Shield Co.<br>Chicago Eye Shield Co.<br>Clark Bros. Co., Inc.<br>Clark Bos. Co., Inc.<br>Clark Bos. Co., Inc.<br>Clark Bros. Co., Inc.<br>Clark Bos. Co., Inc.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Commercial Schemical Div. Pittsburgh Plate<br>Glass Co.<br>Combustion Engineering Co., Inc.<br>Commercial Score, Co.<br>Commercial Score, Co.<br>Continental Gin Co.<br>Cook Electric Co.   | 75<br>421<br>2-453<br>338<br>244<br>446<br>397<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp. 33<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Co., A. W.<br>Cash Co.<br>Chapman Valve Mfg. Co.<br>Chicago Eve Shield Co.<br>Clark Equipment Co.<br>Clark Bros. Co., Inc.<br>Cola Mfg. Co., R. D.<br>Columbia Chemical Div. Pittsburgh Plate<br>Glass Co.<br>Consolidated Products Co.<br>Consolidated Products Co.<br>Consolidated Products Co.<br>Continental Gin Co.<br>Cook Electric Co.   | 75<br>421<br>2-453<br>338<br>2244<br>446<br>397<br>208<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>208<br>2261<br>208<br>2261<br>208<br>2261<br>208<br>2261<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208       |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Cayne, Albert H.<br>Cash Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapas Bag Co.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Ey Shield Co.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Commercial Solvents Corp.<br>Consult Construction Corp.<br>Commercial Solvents Corp.<br>Commercial Solvents Corp.<br>Consult Construction Corp.<br>Consult Construction Corp.<br>Consult Co.<br>Commercial Solvents Corp.<br>Consult Co.<br>Commercial Solvents Consult Co.<br>Continental Gin Co.<br>Cox Electric Co.  | 75<br>421<br>2-453<br>338<br>244<br>446<br>337<br>208<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>207<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown Instrument & Mfg. Co.<br>Brown & Root, Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Cash Co., A. W<br>Cavne, Albert H.<br>Ceilcote Co.<br>Centrity Elec. Co.<br>Chapman Valve Mfg. Co.<br>Chapas Bag Co.<br>Chemical Construction Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Bridge & Iron Co.<br>Clark Bros. Co. Inc.<br>Clark Equipment Co.<br>Clark Equipment Co.<br>Cole Mfg. Co., R. D.<br>Columbia Chemical Div. Fittsburgh Plate<br>Glass Co.<br>Combustion Engineering Co., Inc.<br>Commercial Solvents Corp.<br>Consolidated Products Co.<br>Cooper-Alley Foundry Co.<br>Cooper-Alley Foundry Co.<br>Cooper Shiley Co.<br>Coppus Engrg. Corp.<br>Corbart Refractories, Inc.  | 75<br>421<br>2-453<br>338<br>2244<br>446<br>397<br>208<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Bridle Eauipment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Valve Mfg. Co., A. W.<br>Cayne, Albert H.<br>Ceilcote Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chemical & Process Machy. Corp.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Bridge & Iron Co.<br>Chicago Eye Shield Co.<br>Chicago Eye Shield Co.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Combustion Engineering Co., Inc.<br>Columbia Chemical Div. Fittsburgh Plate<br>Glass Co.<br>Cooper-Alloy Foundry Co.<br>Cooper Stalloy Foundry Co.<br>Cooper Stalloy Foundry Co.<br>Corpus Engrg. Corp.<br>Corhart Refractories, Inc.<br>Corne. Cond. Co.   | 75<br>421<br>2-453<br>338<br>244<br>445<br>397<br>208<br>2261<br>206<br>286<br>379<br>208<br>2261<br>206<br>286<br>319<br>206<br>286<br>319<br>206<br>286<br>319<br>206<br>286<br>319<br>206<br>206<br>206<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Buffalo & Carbon Chemicals Corp.<br>Cambridge Institute of Technology<br>Carnegie Institute of Technology<br>Carrier Corp.<br>Cash Valve Mfg. Co., A. W.<br>Cavne, Albert H.<br>Ceilcote Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapas Fidae & Iron Co.<br>Chicago Bridge & Iron Co.<br>Chicago Eye Shield Co.<br>Clark Bros. Co. Inc.<br>Clark Equipment Co.<br>Commercial Scorp.<br>Commercial Scorp.<br>Consultated Products Co.<br>Commercial Scorp.<br>Constrated Scorp.<br>Constrated Scorp.<br>Consell Go.<br>Commercial Scorp.<br>Consellated Products Co.<br>Commercial Scorp.<br>Consellated Froducts Co.<br>Commercial Scorp.<br>Consellated Products Co.<br>Commercial Scorp.<br>Consellated Products Co.<br>Commercial Scorp.<br>Consellated Products Co.<br>Commercial Scorp.<br>Consellated Products Co.<br>Consellated Products Co.<br>Coopus Engr. Corp.<br>Consell Goas Works.<br>Scorn Machine Co.<br>Cornell Machine Co.<br>Cornell Machine Co.<br>Cornell Machine Co.<br>Cornell Machine Co.<br>Cornell Machine Co.<br>Cornell Machine Co.   | 75<br>421<br>2-453<br>338<br>244<br>446<br>397<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forçe & Tool Works<br>Bridgeport Brass Co  | 75<br>421<br>2-453<br>338<br>2244<br>446<br>397<br>208<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>208<br>2261<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Bristol Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Valve Mfg. Co., A. W.<br>Cayne, Albert H.<br>Ceilcote Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chemical & Process Machy. Corp.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Charts Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Columbia Chemical Div. Pittsburgh Plate<br>Glass Co.<br>Continental Gin Co.<br>Conternetal Gondry Co.<br>Cooper-Alloy Foundry Co.<br>Corpel Alloy Foundry Co.<br>Corpel Endry Co.<br>Cornel Machine Co.<br>Cornel Machine Co.<br>Conting Glass Works<br>Co. O Two Fire Equipment Co.<br>Cornel Glass Works<br>Consel Co.   | 75<br>421<br>2-453<br>338<br>244<br>445<br>45<br>208<br>2261<br>206<br>286<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridle Eauip. Co.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Brown & Root, Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Buffalo Kire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carbide & Carbon Chemicals Corp.<br>Cash Co., A. W.<br>Cash Yalve Mfg. Co., A. W.<br>Cash Yalve Mfg. Co., A. W.<br>Cash Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapsen Struction Corp.<br>Chapsen Valve Mfg. Co.<br>Chapsen Struction Corp.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Eve Shield Co.<br>Chicago Eve Shield Co.<br>Clark Bros. Co. Inc.<br>Clark Equipment Co.<br>Clark Equipment Co.<br>Clark Equipment Co.<br>Colleveland Worm & Gear Co.<br>Cole Mfg. Co., R. D.<br>Columbia Chemical Div. Pittsburgh Plate<br>Glass Co.<br>Commercial Solvers Corp.<br>Consolidated Products Co.<br>Contage Corp.<br>Consolidated Products Co.<br>Corpus Endig Corp.<br>Corhart Refractories, Inc.<br>Corpus Endig Co.<br>Corpus Co.<br>Co | 75<br>421<br>2-453<br>338<br>2244<br>446<br>397<br>208<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown Scutpment & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Vire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Valve Mfg. Co., A. W.<br>Cayne, Albert H.<br>Ceilcote Co.<br>Century Elec. Co.<br>Chapman Valve Mfg. Co.<br>Chemical & Process Machy. Corp.<br>Chicago Bridde & Iron Co.<br>Chicago Eridde & Iron Co.<br>Chicago Eridde & Iron Co.<br>Chicago Eve Shield Co.<br>Chicago Eve Shield Co.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Combustion Engineering Co., Inc.<br>Commercial Scivents Corp.<br>Conting Chemical Div. Pittsburgh Plate<br>Glass Co.<br>Cooper-Alley Foundry Co.<br>Cooper Stielder Co.<br>Cooper Stielder Co.<br>Corpus Engrg. Corp.<br>Cornell Machine Co.<br>Cornell Machine Co.<br>Cornes-Hinds Co.   | 75<br>421<br>2-453<br>338<br>224<br>442<br>244<br>446<br>397<br>208<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>208<br>2261<br>208<br>208<br>233<br>372<br>194<br>405<br>10<br>233<br>372<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>20 |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Cash Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapas Bag Co.<br>Chacago Bridge & Iron Co.<br>Chicago Ey Shield Co.<br>Chicago Ey Shield Co.<br>Chicago Ey Shield Co.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Columbia Chemical Div. Pittsburgh Plate<br>Glass Co.<br>Commercial Solvening Co.<br>Continental Gin Co.<br>Coopus Co.<br>Conservation Corp.<br>Consercial Solventy Co.<br>Coopus Co.<br>Conservation Co.<br>Continental Gin Co.<br>Consercial Solventy Co.<br>Coopus Enger. Corp.<br>Conservation Co.<br>Cornel Glass Works.<br>Conservation Co.<br>Cornel Glass Works.<br>Conservation Co.<br>Cornel Glass Works.<br>Conservation Co.<br>Crane Co.  | 75<br>421<br>2-453<br>338<br>244<br>446<br>337<br>208<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>207<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Force & Tool Works<br>Bridgeport Brass Co  | 75<br>421<br>2-453<br>338<br>224<br>4421<br>204<br>4421<br>204<br>4421<br>205<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206<br>206  |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Carnegie Institute of Technology.<br>Carrier Corp.<br>Cash Yalve Mfg. Co., A. W.<br>Cayne, Albert H.<br>Ceilcote Co.<br>Chemical Enstitute of Co.<br>Chemical Construction Corp.<br>Chemical Construction Corp.<br>Chemical Construction Corp.<br>Chemical Construction Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Eye Shield Co.<br>Chicago Eye Shield Co.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Combustion Engineering Co., Inc.<br>Combustion Engineering Co., Inc.<br>Compustion Engineering Co., Inc.<br>Cooper-Alley Foundry Co.<br>Cooper Stalley Foundry Co.<br>Coruse-Hinds Co.<br>Daugherty Co., Inc.<br>Daugherty Co.   | 75<br>421<br>2-453<br>338<br>244<br>442<br>337<br>208<br>2261<br>206<br>286<br>379<br>208<br>2261<br>206<br>286<br>379<br>208<br>2261<br>206<br>286<br>379<br>208<br>2261<br>205<br>205<br>233<br>318<br>406<br>175<br>233<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>205<br>205                               |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown Instrument & Mfg. Co.<br>Brown & Root, Inc.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cash Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Cash Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chemical & Process Machy. Corp.<br>Chicago Bridge & Iron Co.<br>Chicago Eye Shield Co.<br>Clark Equipment Co.<br>Clark Equipment Co.<br>Clark Equipment Co.<br>Clark Equipment Co.<br>Commercial Scorp.<br>Consulta Construction Corp.<br>Chicago Eye Shield Co.<br>Chicago Eye Shield Co.<br>Chicago Eye Shield Co.<br>Chicago Eye Shield Co.<br>Commercial Scorp.<br>Consulta Co., I. R.<br>Commercial Scorp.<br>Consulta Co.<br>Commercial Scorp.<br>Consultated Products Co.<br>Commercial Scorp.<br>Consultated Froducts Co.<br>Commercial Scorp.<br>Consultated Froducts Co.<br>Consultated Froducts Co.<br>Consert.<br>Consel Go.<br>Corpus Engr. Corp.<br>Contant Afractories, Inc.<br>Cornel Machine Co.<br>Cornel Machine Co.<br>Cornel Glass Works.<br>Co Two Fire Equipment Co.<br>Crane Co.<br>Crane Co.<br>Crane Co.<br>Crane Co.<br>Crane Co.<br>Crane Co.<br>Crane Co.<br>Crane Co.<br>Couse-Hinds Co.<br>Daugherty Co., Inc.<br>Davis Regulator Co.<br>Delaval Steam Turbine Co.<br>Decada A Steam Turbine Co.   | 75<br>421<br>2-453<br>338<br>244<br>446<br>397<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208   |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co  | 75<br>421<br>2-453<br>338<br>2244<br>446<br>397<br>208<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>2261<br>206<br>226<br>307<br>208<br>2261<br>206<br>208<br>2261<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208                                       |
| Bonney Forge & Tool Works<br>Bridgeport Brass Co.<br>Bridgeport Brass Co.<br>Brill Equip. Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument & Mfg. Co.<br>Brown Instrument Co.<br>Buffalo Forge Co.<br>Buffalo Forge Co.<br>Buffalo Wire Works Co. Inc.<br>Buffalo Wire Works Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cambridge Inst. Co. Inc.<br>Carbide & Carbon Chemicals Corp.<br>Cash Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Cash Valve Mfg. Co., A. W.<br>Cash Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chapman Valve Mfg. Co.<br>Chemical & Process Machy. Corp.<br>Chemical & Process Machy. Corp.<br>Chicago Eye Shield Co.<br>Christle Co., L. R.<br>Clark Bros. Co., Inc.<br>Clark Bros. Co., Inc.<br>Columbia Chemical Div. Pittsburgh Plate<br>Glass Co.<br>Continental Gin Co.<br>Cooper-Alloy Foundry Co.<br>Corpus Engrg. Corp.<br>Condigental Gondry Co.<br>Cornel Machine Co.<br>Cornel Machine Co.<br>Cornel Glass Works<br>Cornel Separator Co.<br>Daugherty Co., Inc.<br>Corane Co.<br>Crouse-Hinds Co.<br>Daugherty Co., Inc.<br>Davis Regulator Co.<br>Daugherty Co., Inc.<br>Davis Regulator Co.<br>Delaval Steam Turbine Co.<br>Department of Water & Power<br>Despartment of Water & Power<br>Desparth Oven Co.   | 75<br>421<br>2-453<br>338<br>244<br>442<br>244<br>446<br>337<br>208<br>2261<br>206<br>286<br>286<br>379<br>208<br>286<br>379<br>208<br>286<br>379<br>208<br>286<br>379<br>208<br>286<br>379<br>208<br>286<br>379<br>208<br>286<br>379<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208<br>208                    |

## ADVERTISERS IN THIS ISSUE

| Dave Chamleal Ca  | 443   |
|---|---|
| Downingtown Iron Works  | 419   |
| Dresser Industries Inc  | 404   |
| Duriron Co., Inc  | 21  |
| Eagle-Picher Lead Co  | 386   |
| Eclipse Fuel Engineering Co<br>Economy Co., Inc   | 257   |
| Electric Auto-Lite Co.  | 243   |
| Electric Equip. Co  | 437<br>438  |
| Engelhard Inc., Charles   | 286   |
| Eriez Manufacturing Co  | 247   |
| Ertel Engineering Corp<br>Everlasting Valve Co  | 168<br>260  |
| Esirbank Morra & Co   | 316   |
| Federal Electric Co., Inc. of Texas   | 0-31  |
| First Machinery Corp<br>Fleishel Lumber Co  | 435<br>302  |
| Fletcher Works  | 312<br>358  |
| Flintcote Co.<br>Flori Pipe Co.   | 265   |
| Floridin Co., Inc.<br>Fluor Corporation, Ltd.   | 59  |
| Foote Bros. Gear & Machine Corp<br>Foster Wheeler Corp  | 171   |
| Fuller Co.  | 246   |
| Gardner Denver Co   | 52  |
| Gates Rubber Co   | 303<br>437  |
| General American Transportation Corp157,<br>General Blower Co.  | 439   |
| General Ceramics & Steatite Corp<br>General Chemical Co.  | 43  |
| General Controls<br>General Electric Co   | 381   |
| Girard Machinery Equipment Co   | 434   |
| Goodrich Chemical Co., B. F   | 387   |
| Graver Tank & Mfg. Co., Inc   | 425 234   |
| Greenspons Son Pipe Corp  | 439<br> 99  |
| Griscom-Russell Co  | 45  |
| Guardite Corp.<br>Gulf Oil Corp.  | 295   |
| Hamer Oil Teel Co   | 67  |
| Hardinge Co. Inc  | 162<br>442  |
| Harner Co. H. M.  |   |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.  | 224<br>436  |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Helicoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.  | 224<br>436<br>190<br>278  |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Helicoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.<br>Hicks & Son Co., Inc., S. D.<br>Homestead Yalve Mfg. Co.  | 224<br>436<br>190<br>278<br>318<br>382  |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Helicoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.<br>Hicks & Son Co., Inc., S. D.<br>Homestead Yalve Mfg. Co.<br>Hooker Electrochemical Co.<br>Hooker Ash Machinery Co., Inc.  | 224<br>436<br>190<br>278<br>318<br>382<br>211<br>434  |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Helicoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.<br>Hicks & Son Co., Inc., S. D.<br>Homestead Valve Mfg. Co.<br>Hooker Electrochemical Co.<br>Hoon Ash Machinery Co., Inc.<br>Houdry Process Corp.<br>Hubbert & Son, Inc., B. H.  | 224<br>436<br>190<br>278<br>318<br>382<br>211<br>434<br>307<br>280<br>436   |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Helicoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.<br>Hicks & Son Co., Inc., S. D.<br>Homstead Valve Mfg. Co.<br>Hooker Electrochemical Co.<br>Hooker Electrochemical Co.<br>Horn Ash Machinery Co., Inc.<br>Houdry Process Corp.<br>Hubbert & Son, Inc., B. H.<br>Huber Inc., Frederick.   | 224<br>436<br>190<br>278<br>318<br>382<br>211<br>434<br>307<br>280<br>436   |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Helicoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.<br>Hicks & Son Co., Inc., S. D.<br>Homestead Valve Mfg. Co.<br>Hooker Electrochemical Co.<br>Horn Ash Machinery Co., Inc.<br>Houdry Process Corp.<br>Hubbert & Son, Inc., B. H.<br>Hubber Inc., Frederick.<br>Industrial Process Engineers.<br>Industrial Steels, Inc.   | 224<br>436<br>190<br>278<br>318<br>382<br>211<br>434<br>307<br>280<br>436<br>191<br>221<br>759  |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Helicoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.<br>Hicks & Son Co., Inc., S. D.<br>Homestead Valve Mfg. Co.<br>Hooker Electrochemical Co.<br>Horn Ash Machinery Co., Inc.<br>Houdry Process Corp.<br>Hubbert & Son, Inc., B. H.<br>Hubert Inc., Frederick.<br>Industrial Process Engineers.<br>Industrial Steels, Inc.<br>Ingersoll Rand<br>Inflico  | 224<br>436<br>190<br>278<br>318<br>382<br>211<br>434<br>307<br>280<br>436<br>191<br>221<br>259<br>363<br>164  |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Helicoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.<br>Hicks & Son Co., Inc., S. D.<br>Homestead Valve Mfg. Co.<br>Horn Ash Machinery Co., Inc.<br>Houdry Process Corp.<br>Hubbert & Son, Inc., B. H.<br>Hubert Inc., Frederick.<br>Industrial Steels, Inc.<br>Industrial Steels, Inc.<br>Industrial Steels, Inc.<br>Industrial Steels, Inc.<br>Industrial Steels, Inc.<br>Industrial Steels, Inc.<br>International Engineering Inc.<br>International Graphite & Electric Corp.  | 224<br>436<br>190<br>278<br>318<br>382<br>211<br>434<br>307<br>280<br>436<br>191<br>221<br>257<br>363<br>164<br>424<br>398  |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Helicoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.<br>Horks & Son Co., Inc., S. D.<br>Howstead Valve Mfg. Co.<br>Hooker Electrochemical Co.<br>Horn Ash Machinery Co., Inc.<br>Houdry Process Corp.<br>Hubbert & Son, Inc., B. H.<br>Huber Inc., Frederick.<br>Industrial Steels, Inc.<br>Ingersoll Rand<br>Infilco.<br>International Engineering Inc.<br>International Graphite & Electric Corp.<br>International Nickel Co.<br>   | 224<br>436<br>190<br>278<br>318<br>382<br>211<br>434<br>307<br>280<br>436<br>191<br>221<br>259<br>363<br>164<br>424<br>398<br>89<br>391   |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Heilcoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.<br>Hicks & Son Co., Inc., S. D.<br>Homestead Valve Mfg. Co.<br>Honestead Valve Mfg. Co.<br>Honestead Valve Mfg. Co.<br>Hon Ash Machinery Co., Inc.<br>Houdry Process Corp.<br>Hubbert & Son, Inc., B. H.<br>Hubbert & Son, Inc., Co.<br>Industrial Process Engineers.<br>Industrial Steels, Inc.<br>Industrial Steels, Inc.<br>International Engineering Inc.<br>International Engineering Inc.<br>International Minerals & Chemical Corp.<br>International Nickel Co.<br>Steel Products, Inc  | 224<br>436<br>190<br>278<br>318<br>382<br>211<br>434<br>307<br>280<br>436<br>191<br>221<br>259<br>363<br>164<br>424<br>398<br>89<br>391<br>439  |
| Harper Co., H. M.         Hays Corporation         Heineken, W. P.         Helicoid Gage Div. American Chain & Cable         Hendrick Mfg. Co.         Hicks & Son Co., Inc., S. D.         Homestead Valve Mfg. Co.         Hooker Electrochemical Co.         Horn Ash Machinery Co., Inc.         Houdry Process Corp.         Hubbert & Son, Inc., B. H.         Hubbert action for the state of t | 224<br>436<br>190<br>278<br>318<br>382<br>271<br>434<br>307<br>280<br>436<br>191<br>221<br>259<br>363<br>164<br>424<br>398<br>89<br>391<br>439<br>242<br>406  |
| Harper Co., H. M.<br>Hays Corporation<br>Heineken, W. P.<br>Heilcoid Gage Div. American Chain & Cable<br>Hendrick Mfg. Co.<br>Hocker Electrochemical Co.<br>Hooker Electrochemical Co.<br>Hooker Electrochemical Co.<br>Hooker Electrochemical Co.<br>Horn Ash Machinery Co., Inc.<br>Houdry Process Corp.<br>Hubbert & Son, Inc., B. H.<br>Huber Inc., Frederick.<br>Industrial Steels, Inc.<br>Industrial Steels, Inc.<br>Industrial Steels, Inc.<br>Industrial Steels, Inc.<br>Industrial Steels, Inc.<br>International Engineering Inc.<br>International Graphite & Electric Corp.<br>International Ninerals & Chemical Corp.<br>Jackson & Church Co.<br>Jacoby, Henry E.<br>Jackins Bros.  | 224<br>436<br>190<br>278<br>318<br>382<br>2211<br>434<br>436<br>191<br>259<br>363<br>363<br>164<br>426<br>391<br>439<br>242<br>406<br>327<br>177  |
| Harper Co., H. M.         Hays Corporation         Heineken, W. P.         Helicoid Gage Div. American Chain & Cable         Hendrick Mfg. Co.         Hicks & Son Co., Inc., S. D.         Homestead Valve Mfg. Co.         Hooker Electrochemical Co.         Hon Ash Machinery Co., Inc.         Houdry Process Corp.         Hubbert & Son, Inc., B. H.         Hubbert & Son, Inc., B. H.         Hubbert Inc., Frederick.         Industrial Steels, Inc.         Industrial Steels, Inc.         Inderstillea         Infernational Engineering Inc.         International Graphite & Electric Corp.         International Mickel Co.         Jackson & Church Co.         Jarkson Stres.         Jackson & Church Co.         Jarkins Bros.         Jarkus Gage & Valve Co.         Johns-Manville  | 224<br>436<br>190<br>278<br>318<br>382<br>211<br>434<br>307<br>280<br>436<br>191<br>221<br>257<br>363<br>363<br>164<br>424<br>424<br>424<br>439<br>89<br>391<br>439<br>242<br>406<br>327<br>175<br>343  |
| Harper Co., H. M.         Hays Corporation         Heineken, W. P.         Helicoid Gage Div. American Chain & Cable         Hendrick Mfg. Co.         Hicks & Son Co., Inc., S. D.         Homestead Valve Mfg. Co.         Hooker Electrochemical Co.         Horn Ash Machinery Co., Inc.         Houdry Process Corp.         Hubbert & Son, Inc., B. H.         Hubbert a Son, Inc., B. H.         Hubbert a Steels, Inc.         Industrial Steels, Inc.         Industrial Steels, Inc.         Indestrial Steels, Inc.         International Graphite & Electric Corp.         International Graphite & Electric Corp.         International Minerals & Chemical Corp.         Jackson & Church Co.         Jackson & Church Co.         Jackson & Gage & Yalve Co.         Johns-Manville       .298,         Keasbey & Mattison Co.         Keander Corp.       Letter  | 224<br>436<br>190<br>278<br>318<br>382<br>271<br>434<br>307<br>280<br>436<br>191<br>221<br>434<br>307<br>280<br>436<br>436<br>191<br>221<br>557<br>363<br>164<br>424<br>427<br>398<br>891<br>439<br>242<br>439<br>242<br>439<br>343<br>843<br>843<br>843  |
| Harper Co., H. M.         Hays Corporation         Heineken, W. P.         Hellcoid Gage Div. American Chain & Cable         Hendrick Mfg. Co.         Hicks & Son Co., Inc., S. D.         Homestead Valve Mfg. Co.         Horn Ash Machinery Co., Inc.         Houdry Process Corp.         Hubbert & Son, Inc., B. H.         Huber Inc., Frederick.         Industrial Steels, Inc.         International Graphite & Electric Corp.         International Graphite & Electric Corp.         International Minerals & Chemical Corp.         International Nickel Co.         Jackson & Church Co.         Jackson & Ghurch Co.         Jackson & Ghurch Co.         Jackson & Gage & Valve Co.         Johns-Manville         Veasbey & Mattison Co.         Keasbey & Mattison Co.         Kellongo, M. W. Co.  | 224<br>436<br>190<br>278<br>382<br>211<br>382<br>211<br>382<br>211<br>259<br>363<br>382<br>164<br>434<br>398<br>89<br>391<br>164<br>424<br>436<br>327<br>173<br>343<br>89<br>391<br>343<br>89<br>391<br>343<br>89<br>391<br>89<br>391<br>89<br>391<br>89<br>393<br>89<br>391<br>89<br>391<br>89<br>393<br>89<br>394<br>394<br>395<br>89<br>394<br>395<br>89<br>394<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>395<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>89<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>397<br>80<br>30<br>397<br>80<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30 |
| Harper Co., H. M.         Hays Corporation         Heineken, W. P.         Helicoid Gage Div. American Chain & Cable         Hendrick Mfg. Co.         Hicks & Son Co., Inc., S. D.         Homestead Valve Mfg. Co.         Hooker Electrochemical Co.         Hooker Electrochemical Co.         Houdry Process Corp.         Hubbert & Son, Inc., B. H.         Huber Inc., Frederick.         Industrial Steels, Inc.         Ingersoll Rand         Inffleo         International Engineering Inc.         International Graphite & Electric Corp.         International Minerals & Chemical Corp.         International Minerals & Chemical Corp.         International Nickel Co.         Jacsoby, Henry E.         Jackson & Church Co.         Jarks Bros.         Jarks Bros.         Jarkson & Gage & Valve Co.         Jenkins Bros.         Jarkan Wille         Keasbey & Mattison Co.         Kehoe Machy. Corp., Lester.         Kellogg, M. W. Co.         Kellogg, M. W. Co.         Kelly & Co.         Keny Mfq. Co., C. M.   | 224<br>436<br>190<br>278<br>382<br>211<br>434<br>307<br>436<br>434<br>434<br>434<br>434<br>434<br>434<br>434<br>436<br>436  |
| Harper Co., H. M.         Hays Corporation         Heineken, W. P.         Helicoid Gage Div. American Chain & Cable         Hendrick Mfg. Co.         Hicks & Son Co., Inc., S. D.         Homstead Valve Mfg. Co.         Hooker Electrochemical Co.         Horn Ash Machinery Co., Inc.         Houdry Process Corp.         Hubbert & Son, Inc., B. H.         Hubbert & Son, Inc., B. H.         Hubbert as Son, Inc., B. H.         Industrial Steels, Inc.         Industrial Steels, Inc.         Industrial Steels, Inc.         Industrial Graphite & Electric Corp.         International Graphite & Electric Corp.         International Minerals & Chemical Corp.         International Minerals & Chemical Corp.         International Minerals & Chemical Corp.         Jackson & Church Co.         Jackson & Church Co.         Jackson & Church Co.         Jackson & Church Co.         Jarkins Bros.         Jarkins Bros.         Jarkson & Church Co.         Jackson & Church Co.         Jackson & Church Co.         Jackson & Church Co.         Jackson & Church Co.         Jarkins Bros.         Jerifrey Manufacturing Co.         Jerduson  | 224<br>436<br>190<br>278<br>382<br>211<br>434<br>307<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>437<br>439<br>89<br>391<br>439<br>242<br>406<br>327<br>343<br>891<br>173<br>343<br>8391<br>8391<br>8391<br>8391<br>8391<br>8391<br>8391<br>839  |
| Harper Co., H. M.         Hays Corporation         Heineken, W. P.         Helicoid Gage Div. American Chain & Cable         Hendrick Mfg. Co.         Hicks & Son Co., Inc., S. D.         Homestead Valve Mfg. Co.         Hooker Electrochemical Co.         Hooker Electrochemical Co.         Hooker Electrochemical Co.         Hondrick Mfg. Co.         Horn Ash Machinery Co., Inc.         Houdry Process Corp.         Hubbert & Son, Inc., B. H.         Huber Inc., Frederick.         Industrial Steels, Inc.         Industrial Steels, Inc.         Indersoll Rand         Infiltonal Graphite & Electric Corp.         International Graphite & Electric Corp.         International Minerals & Chemical Corp.         Jackson & Church Co.         Jackson & Gage & Valve Co.         Jackson & Achy. Corp., Lester.         Kelley & Mattison Co.         Keabey & Mattison Co.         Keaunee Mfg. Co.,  | 224<br>436<br>190<br>278<br>382<br>278<br>382<br>211<br>434<br>434<br>434<br>438<br>434<br>191<br>221<br>221<br>221<br>221<br>221<br>221<br>221<br>221<br>225<br>363<br>363<br>371<br>424<br>439<br>889<br>371<br>343<br>343<br>242<br>4406<br>327<br>343<br>889<br>324<br>242<br>4436<br>438<br>89<br>324<br>242<br>4436<br>438<br>89<br>327<br>83<br>343<br>89<br>322<br>242<br>436<br>436<br>242<br>89<br>322<br>116<br>436<br>436<br>242<br>89<br>321<br>116<br>436<br>436<br>436<br>242<br>221<br>116<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>43   |
| Harper Co., H. M.         Hays Corporation         Heineken, W. P.         Helicoid Gage Div. American Chain & Cable         Hendrick Mfg. Co.         Hicks & Son Co., Inc., S. D.         Homestead Valve Mfg. Co.         Homestead Valve Mfg. Co.         Horn Ash Machinery Co., Inc.         Houdry Process Corp.         Hubbert & Son, Inc., B. H.         Huber Inc., Frederick.         Industrial Steels, Inc.         Indential Steels, Inc.         International Graphite & Electric Corp.         International Graphite & Electric Corp.         International Minerals & Chemical Corp.         International Nickel Co.         Jackson & Church Co.         Jackson & Ghurch Co.         Jackson & Ghurch Co.         Jackson & Gage & Valve Co.         Johns-Manville         Veasbey & Mattison Co.         Kealley, O. G. & Co.         Keilogg, M. W. Co.         Keiley & Co., C. M.         Kewaunee Mfg. Co.         Keiley & Co., C. M.         Kewaunee Mfg. Co.         Kieley & Mueller Inc.   | 224<br>436<br>190<br>278<br>382<br>278<br>382<br>211<br>434<br>434<br>439<br>280<br>436<br>436<br>191<br>225<br>363<br>343<br>343<br>978<br>89<br>391<br>434<br>327<br>839<br>343<br>439<br>242<br>4439<br>242<br>4439<br>2432<br>439<br>8378<br>343<br>343<br>242<br>4439<br>242<br>4439<br>439<br>242<br>4439<br>439<br>242<br>4439<br>439<br>242<br>4439<br>439<br>242<br>4439<br>439<br>242<br>4439<br>439<br>242<br>4439<br>439<br>242<br>4439<br>439<br>242<br>4439<br>242<br>4439<br>4439  |
| Harper Co., H. M.         Hays Corporation         Heineken, W. P.         Helicoid Gage Div. American Chain & Cable         Hendrick Mfg. Co.         Hicks & Son Co., Inc., S. D.         Homestead Valve Mfg. Co.         Horn Ash Machinery Co., Inc.         Houdry Process Corp.         Hubbert & Son, Inc., B. H.         Huber Inc., Frederick.         Industrial Steels, Inc.         Ingersoll Rand         Inffleo         International Graphite & Electric Corp.         International Minerals & Chemical Corp.         International Nickel Co.         Jackson & Church Co.         Jackson & Church Co.         Jackson & Church Co.         Jackson & Manufacturing Co.         Jarkins Bros.         Jarkins Bros.         Jarkins Bros.         Jerking Maufacturing Co.         Keabew & Mattison Co.         Keabew & Mattison Co.         Keabew & Mattison Co.         Keabew & Mattison Co.         Keiloog, M. W. Co.         Keilog, M. W. Co.         Keilog, M. W. Co. <t< td=""><td>224<br/>436<br/>190<br/>278<br/>318<br/>382<br/>211<br/>434<br/>307<br/>280<br/>436<br/>191<br/>221<br/>280<br/>436<br/>191<br/>221<br/>280<br/>436<br/>191<br/>221<br/>363<br/>379<br/>371<br/>343<br/>391<br/>424<br/>435<br/>242<br/>432<br/>778<br/>371<br/>343<br/>89<br/>971<br/>343<br/>89<br/>391<br/>80<br/>242<br/>6<br/>322<br/>222<br/>277<br/>80<br/>164<br/>436<br/>436<br/>55<br/>55<br/>55<br/>55<br/>55<br/>55<br/>55<br/>55<br/>55<br/>55<br/>55<br/>55<br/>55</td></t<>  | 224<br>436<br>190<br>278<br>318<br>382<br>211<br>434<br>307<br>280<br>436<br>191<br>221<br>280<br>436<br>191<br>221<br>280<br>436<br>191<br>221<br>363<br>379<br>371<br>343<br>391<br>424<br>435<br>242<br>432<br>778<br>371<br>343<br>89<br>971<br>343<br>89<br>391<br>80<br>242<br>6<br>322<br>222<br>277<br>80<br>164<br>436<br>436<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55<br>55  |



## ... NOW we spend this...."

(Typical report from D-I System users)





A lot of water users are now getting specification water at far less cost than ever before. Many who formerly spent from 65c to \$8.00 per 1000 gallons for distilled water are now getting water that meets their exacting requirements at only 2c to 20c per 1000 gallons. They are making these savings whether they use a few gallons of water an hour or millions of gallons per day. They have installed Dorrco De-Ionization Systems.

WHO ARE THESE D-I SYSTEM USERS?

Here are a few of the industries now making substantial water-cost savings with Dorrco D-I Units:

Food Processing Dye Making Cosmetics Metal Working Chemical Manufacture Pharmaceuticals Pulp & Paper Ceramic Ware, etc....

#### HOW DO THEY USE IT?

The Dorrco D-I System is being used effectively for such purposes as:

Removing simple hardness Decreasing Bicarbonate alkalinity Reducing total solids Metal recovery from waste water

1429

HOW CAN YOU GET FULL FACTS? The D-I System is another result of Dorr research into better industrial processing methods. Dorr service extends from analysis in the field to supervision of erection and initial operation. A Dorr engineer will gladly give you detailed information on the D-I System as applied to your process. There is no obligation. Phone, wire or write your nearest Dorr office.

NEAREST OFFICE

| LIUNINGO  |
|---|
| THE DORR COMPANY, ENGINEERS   |
| NEW YORK 22, N.Y 570 LEXINGTON AVE.<br>ATLANTA 3, GA WILLIAM-OLIVER BLDG.<br>TORONTO 1, ONT |
| RESEARCH AND TESTING LABORATORIES<br>WESTPORT, CONN.<br>SUGAR PROCESSING                    |
| PETREE & DORR DIVISION<br>570 LEXINGTON AVE., NEW YORK 22, N.Y.                             |

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

ALL INQUIRIES

RESEARCH

ADDRESS

ENGINEERING

TO

OUR



• Willson Over-All Rubber Goggle for heavy duty mechanical and chemical occupations. Snug fit assures protection from dust and acid splash. Five screened and baffled indirect ventilating ports prevent lens fogging.



• Resilient innerrim provides cushion against impact. Super-Tough\* lenses are easily replaceable when they become pitted or scratched. Two-piece headband adjustable for size.



• Ample room to wear over prescription glasses. Goggle rests lightly on face for perfect comfort. Triangular shaped lenses permit wide range of vision. Nose rest gives added protection.



For help with your eye-protection problems, get in touch with your Willson distributor or write directly to Willson Products, Inc



## ADVERTISERS IN THIS ISSUE

| Lawler Co.       43         Lawrence Mach. & Pump Co.       22         Layne & Bowler, Inc.       32         Lesife Co.       31         Lindstrom, L. O. B.       31         Linkshelt Co.       42         Linkshelt Co.       42         Lithtaloys Cerp.       42         Lithtleford Bros. Inc.       24         Loeb Equipment Supply Co.       43         Lubriplate Div. Fiske Bres. Refining Co.       15         Lukens Steel Co.       17         Lunkenheimer Co.       64  | 442043424090            |
|---|-------------------------|
| Machinery & Equipment Corp. of N. Y.       43         Marco Co., Inc.       354         Marco Co., Inc.       354         Mason Neilan Regulater Co.       364         Mason Neilan Regulater Co.       37         Master Elec. Co.       37         Mathieson Alkali Works       20         McGraw-Hill Book Co.       25         McGraw-Hill Book Co.       26         Mercler-Robinson Co.       26         Merler Scale Mfg. Co.       46         Merla Glass Products Co.       46         Metral Hydrides Inc.       36         Michigan Sheel Casting Co.       41         Michigan Sheel Co.       41         Michigan Steel Co.       41         Miller, Inc., I.       42         Missouri State Dept. of Resources & Development       17         Monarch Mfg, Works, Inc.       12         Morris Machine Works       12         Morris Machine Works       12         Morse Chain Co.       40         Mortis Machine Works       12         Mortis Machine Works       12         Mortis Machine Works       12         Mortis Machine Works       13         Morise Paper Mills Co.       30 | 57561868547892857 62722 |
| Nash Engrg. Co.       315         National Airoil Burner Co., Inc.       328         National Annealing Box Co.       250         National Bearing Div. American Brake Shoe         Co.       53         National Box Lumber Co.       252         National Box & Lumber Co.       222         National Carbon Co. Inc.       229         National Engineering Co.       485         National Lead Co.       333         Nazareth Steel Fabricators, Inc.       324         Newberry Mfg. Co.       439         Niagara Alkali Corp.       248         Northern Blower Co.       212         Northern Blower Co.       223         Ohio Injector Co.       343         Ohio Injector Co.       344         Ohio Injector Co.       345  |                         |
| Oldbury Electro-Chem. Co.       262         Oronite Chemical Co.       255         Overland Candy Corp.       438         Owens-Corning Fiberglas Corp.       499         Pangborn Corp.       347         Parks Cramer Co.       294         Parker Appliance Co.       273         Patherson Fdry. & Mach. Co.       412         Peerless Pump Div. Food Machy. Corp.       450         Pennsylvania Crusher Co.       268         Pennsylvania Flexible Metallic Tubing Co.       241         Pensacola, Florida       302         Perry Equipment & Supply Co.       438         Perry Liferida       304         Perry Equipment & Supply Co.       438         Permutit Co.       439   |                         |
| Plaudler Co.       147         Pfizer & Co.       127         Philadelphia Gear Works, Inc.       271         Photoswitch Incorporated       21         Photoswitch Incorporated       51         Picker X-Ray Corp.       207         Pittsburgh Coke & Chemical Co.       277         Pittsburgh Plate Glass Co. Columbia Chemical Div.       81         Pittsburgh Lectrodryer Cerp.       58         Power Regulator Co.       438         Powers Regulator Co.       430         Prater Putvarizer Co.       300         Precision Thermometer & Instrument Co.       395         Precision Scientific Co.       402         Premier Mill Corp.       402         Pressed Steel Tank Co.       64         Pristoard & Co.       402  |                         |
| Protor & Schwartz, Inc.       245         Proportioneers, Inc.       142         Prulccat Laboratories, Inc.       372         Pulverizing Mach. Co.       228         Pyrene Mfg. Co.       236         Quaker Oats Co.       410         Randolph Laboratories, Inc.       298         Raymond Pulverizer Div., Combustion Engrg.       14         Reading-Pratt & Cady Div., American Chain       340         Reilly Tar & Chemical Corp.       198         Reichhold Chemicais, Inc.       350         Reilly Div.       340         Reilly Engravet & Co.       340         Reilly Tar & Chemical Corp.       198         Reinhold Chemicais, Inc.       350   |                         |
| Republic Steel Corp   |                         |

| Reynolds Metals Co  | - 321  |
|---|--|
| Richardson Scale Co   | 373  |
| Roots-Connersville Blower Corp  | . 49   |
| Roper Corp., G. D   | 218  |
| Rossville Chemical Co.  | . 375  |
| R-9 Products Corp<br>Rowan Controller Co  | . 202  |
| Ryerson & Son, Inc., J. T.  | 154  |
| St. Pagis Pages Co  |  |
| Sarco Co., Inc  | e-187<br>. 323:  |
| Schultz-O'Neill Co  | 212  |
| Selas Corp. of America  | 403:   |
| Sharples Corp   | 378-   |
| Shepard Miles Crane & Hoist Corp  | 266.   |
| Sivyer Steel Casting Co.  | 2481   |
| SKF Industries, Inc.  | 351  |
| Socony-Yacuum Oil Co., Inc  | 275  |
| Solar Aircraft Corp.  | 346  |
| Sparkler Mfg, Co.   | 258  |
| Sperry & Co., D. R.   | 414  |
| Sprout, Waldron & Co  | 165  |
| Standard Conveyor Co  | 172  |
| Stashops, L. M.   | 438 :  |
| Stanhope, Inc., R. C<br>Stauffer Chemical Co  | 436  |
| Stearns Magnetic Mig. Co  | 148  |
| Stephens-Adamison Mfg. Co   | 439  |
| Stokes & Smith Co   | 308:   |
| Storms Harvey Eq. Co  | 406  |
| Strong, Carlisle & Hammond  | 283  |
| Sturtevant Co., B. F.   | 8-69   |
| Sturtevant Mills Co   | 366.   |
| Sun Oil Co  | 213:   |
| Superior Equipment Co   | 435  |
| Syntron Co  | 192  |
| Tahar Instrument Coun   | 254  |
| Taber Pump Co.  | 294  |
| Taylor Forge & Pipe Works   | 39   |
| Texas Co.   | 72   |
|   |  |
| Texas Gulf Sulphur Co<br>Thermal Syndicate Ltd  | 62·<br>271:  |
| Texas Gulf Sulphur Co<br>Thermal Syndicate Ltd<br>Thomas Flexible Coupling Co   | 62<br>278;<br>331.   |
| Texas Gulf Sulphur Co<br>Thermal Syndicate Ltd<br>Thomas Flexible Coupling Co<br>Thompson Clock Co., H. C<br>Thompson Co., J. Parker  | 62 <sup>-</sup><br>278;<br>331.<br>306.<br>436   |
| Texas Gulf Sulphur Co<br>Thermal Syndicate Ltd<br>Thomas Flexible Coupling Co<br>Thompson Clock Co., H. C<br>Thompson Co., J. Parker<br>Timken Roller Bearing Co., Roller Bearing Div.  | 62 <sup>-</sup><br>278;<br>331,<br>306,<br>436<br>173  |
| Texas Gulf Sulphur Co<br>Thermal Syndicate Ltd<br>Thomas Flexible Coupling Co<br>Thompson Clock Co., H. C<br>Thompson Co., J. Parker<br>Timken Roller Bearing Co., Roller Bearing Div.<br>Titeflex Inc<br>Traylor Engrg. & Mfg. Co  | 62:<br>278:<br>331.<br>306.<br>436<br>173<br>178:<br>371   |
| Texas Gulf Sulphur Co<br>Thermal Syndicate Ltd<br>Thomas Flexible Coupling Co<br>Thompson Clock Co., H. C<br>Thompson Co., J. Parker<br>Timken Roller Bearing Co., Roller Bearing Div.<br>Titeflex Inc.<br>Traylor Engrg. & Mfg. Co<br>Traylor Engrg. & Mfg. Co<br>Trox Finite & Machine Co.  | 62'<br>278;<br>331,<br>306,<br>436<br>173<br>178:<br>371<br>166,<br>270  |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Ltd.         Thomas Flexible Coupling Co.         Thompson Clock Co.         Thompson Co.         Jamba Signa Co.         Thompson Co.         Thompson Co.         Thompson Co.         Thompson Co.         Thompson Co.         Thompson Co.         Timken Roller Bearing Co.         Roller Bearing Co.         Traylor Engrg. & Mfg. Co.         Troy Engrie & Machine Co.         Tube Turns Inc.       2nd Co.   | 62<br>278;<br>331,<br>306,<br>436<br>173<br>178;<br>371<br>166,<br>270<br>over,  |
| Texas Gulf Sulphur Co.         Thermal Syndicate Ltd.         Thomas Flexible Coupling Co.         Thompson Clock Co.         Thompson Co.         James Flexible Coupling Co.         Thompson Co.         Timken Roller Bearing Co.         Roller Engrg.         Mfg. Co.         Trey Ior Engrg.         Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Co         Union Achartas & Bubbas Co.  | 62<br>278;<br>331,<br>306,<br>436<br>173<br>178;<br>371<br>166,<br>270<br>over:  |
| Texas Gulf Sulphur Co.         Thermal Syndicate Ltd.         Thomas Flexible Coupling Co.         Thompson Clock Co.         Thompson Co.         J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Titeflex Inc.         Traylor Engrg. & Mfg. Co.         Troy Engrine & Machine Co.         Tube Turns Inc.         2nd Cc         Union Asbestos & Rubber Co.         Union Bay State Chemical Co.   | 62'<br>278;<br>331,<br>306,<br>436<br>173<br>178;<br>371<br>166,<br>270<br>over,<br>61'<br>299'  |
| Texas Gulf Sulphur Co.         Thermal Syndicate Ltd.         Thompson Clock Co.         Thompson Clock Co.         Thompson Co.         Jamba Silphur Co.         Thompson Co.         Timken Roller Bearing Co.         Roller Bearing Co.         Traylor Engrg. & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         Union Carbide & Carbon Corp.         Union Carbide & Carbon Corp.   | 62<br>278;<br>331,<br>306,<br>436<br>173<br>178;<br>371<br>166,<br>270<br>over,<br>61,<br>299,<br>379-<br>434  |
| Texas Gulf Sulphur Co.         Thermal Syndicate Ltd.         Thompson Clock Co.         Thompson Clock Co.         Thompson Co.         James Flexible Coupling Co.         Thompson Co.         Thompson Co.         Thompson Co.         Thompson Co.         Thompson Co.         Thompson Co.         Timken Roller Bearing Co.         Roller Bearing Co.         Traylor Engrg. & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         33, 289,         Union Standard Equipment Co.         Uniot States Gauge Co.   | 62'<br>278;<br>331,<br>306,<br>436,<br>173<br>178;<br>371<br>166,<br>270<br>0ver;<br>61'<br>299'<br>379'<br>434<br>268-  |
| Texas Gulf Sulphur Co.         Thermal Syndicate Ltd.         Thompson Clock Co.         Thompson Clock Co.         Thompson Co.         Jamba Silphur Co.         Thompson Co.         Thompson Co.         Thompson Co.         Thompson Co.         Thompson Co.         Thompson Co.         Timken Roller Bearing Co.         Traylor Engrg. & Mfg. Co.         Trey Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         Union Standard Equipment Co.         United States Gauge Co.         U.         S. Industrial Chemicals.         United States Steel   | 62<br>278:<br>331.<br>306<br>173<br>178:<br>371<br>166<br>270<br>57<br>434<br>268<br>7-20<br>57  |
| Texas Gulf Sulphur Co.         Thermal Syndicate Ltd.         Thompson Clock Co.         Thompson Clock Zo.         Thompson Co.         James Flexible Coupling Co.         Thompson Co.         Thompson Co.         Thompson Co.         Taylor Engrg.         Parker.         Traylor Engrg.         Mfg. Co.         Troy Engrne & Machine Co.         Troy Engine & Machine Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         Union Carbide & Carbon Corp.         United States Gauge Co.         U. S. Industrial Chemicals.         U. S. Stoneware Co.   | 62'<br>278;<br>331.<br>306.<br>173<br>178:<br>371<br>166.<br>270<br>270<br>270<br>270<br>270<br>270<br>270<br>270<br>270<br>270  |
| Texas Gulf Sulphur Co.         Thermal Syndicate Ltd.         Thompson Clock Co.         Thompson Clock Co.         Thompson Co.         Thompson Co.         Thompson Co.         Timken Roller Bearing Co.         Roller Bearing Co.         Roller Bearing Co.         Traylor Engrg. & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         United States Geuge Co.         United States Geuge Co.         United States Geuge Co.         U. S. Stoneware Co.   | 62-<br>278;<br>331;<br>306;<br>436<br>173<br>178;<br>371<br>166;<br>270<br>57<br>379-<br>434<br>268;<br>79-<br>256   |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Timfefication         Tray Ior Engrg. & Mfg. Co.         Traylor Engrg. & Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Co.         Union Asbestos & Rubber Co.         Union State Carbon Corp.         Union States Gauge Co.         U. S. Industrial Chemicals.         U. S. Stoneware Co.         Van Range Co., John.         Victor Chemical Works.  | 62-<br>278;<br>331;<br>306;<br>436<br>173;<br>178;<br>371;<br>166;<br>270;<br>57;<br>79;<br>256;<br>249;<br>   |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Traylor Engrg. & Mfg. Co.         Traylor Engrg. & Mfg. Co.         Traylor Engrg. & Mfg. Co.         Troy Engine & Macchine Co.         Tube Turns Inc.         2nd Cc         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         Junion Standard Equipment Co.         U. S. Industrial Chemicals.         U. S. Stoneware Co.         Van Range Co.         Victor Chemical Works.         Virginia Smelting Ce.   | 62'<br>278:<br>331<br>306-<br>436<br>173<br>371<br>166<br>270<br>yver<br>270<br>57<br>79-<br>256<br>249<br>-20<br>57<br>79-<br>256<br>249<br>45  |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Titteflex Inc.         Traylor Engrg. & Mfg. Co.         Traylor Engrg. & Co.         Troy Engine & Machine Co.         Tube Turns Inc.       2nd Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.       33, 289,         Union Standard Equipment Co.         United States Gauge Co.       10.         U. S. Industrial Chemicals       12         U. S. Stoneware Co.       14         Victor Chemical Works.       15         Virginia Smelting Ce.       16         Virginia Smelting Ce.       17   | 62'<br>278:<br>331:<br>306-<br>436<br>173<br>178:<br>371<br>166:<br>270<br>99:<br>379<br>434<br>268:<br>79:<br>256<br>249:<br>79:<br>79:<br>256<br>249:<br>312:<br>445:<br>161   |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Titteflex Inc.         Traylor Engrg. & Mfg. Co.         Traylor Engrg. & Co.         Troy Engine & Machine Co.         Tube Turns Inc.       2nd Co.         Union Asbestos & Rubber Co.         Union Standard Equipment Co.         United States Gauge Co.         U. S. Industrial Chemicals         U. S. Stoneware Co.         Van Range Co. John.         Victor Chemical Works.         Virginia Smelting Ce.         Vulcan Iron Works.         Wall Colmony Corp.  | 62:<br>278:<br>331:<br>306:<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>436  |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Tirteflex Inc.         Traylor Engrg. & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Cc         Union Asbestos & Rubber Co.         Union Asbestos & Rubber Co.         Union Asbestos & Rubber Co.         Union Standard Equipment Co.         United States Gauge Co.         U. S. Industrial Chemicals.         Vul. S. Stoneware Co.         Victor Chemical Works.         Viking Pump Co.         Viking Pump Co.         Viking Chemical Sco.         Walkan Iron Works.         Walkan Iron Works.  | 62<br>278:<br>331<br>306<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>436<br>43  |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Tirmken Roller Bearing Co., Roller Bearing Div.         Tirmken Roller Bearing Co., Roller Bearing Div.         Traylor Engrg. & Mfg. Co.         Traylor Engrg. & Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Cc         Union Asbestos & Rubber Co.         Union Asbestos & Rubber Co.         Union Asbestos & Rubber Co.         Union Standard Equipment Co.         Unistrial Chemicals.         U. S. Industrial Chemicals.         U. S. Stoneware Co.         Victor Chemical Works.         Viking Pump Co.         Viking Pump Co.         Vulcan Iron Works.         Wall Colmony Corp.         Waiworth Co.         Warens Steam Pumm Co.         Warens Steam Pumm Co.         Warens Steam Pumm Co.  | 622<br>278:<br>331.<br>306.<br>436<br>173<br>178:<br>371<br>178:<br>371<br>166.<br>270<br>57<br>79.<br>256<br>57<br>79.<br>256<br>57<br>79.<br>256<br>57<br>79.<br>256<br>249.<br>57<br>79.<br>256<br>249.<br>161<br>169.<br>384<br>4451<br>169.<br>384.   |
| Tasas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co.         Thompson Clock Co.         Thompson Co.         Thompson Co.         Timken Roller Bearing Co.         Timken Roller Bearing Co.         Traylor Engrg. & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         Jala State Chemical Co.         Union Carbide & Garbon Corp.         Jalasta Equipment Co.         United States Gauge Co.         U. S. Industrial Chemicals.         U. S. Stoneware Co.         Victor Chemical Works.         Victor Chemical Works.         Vilcian Iron Works.         Wall Colmony Corp.         Wall Colmony Corp.         Wall Colmony Corp.         Walworth Co.         Warens Steam Pump Co., Inc.         Wallington Sears Co.  | 622<br>278:<br>331.<br>306.<br>436<br>436<br>173<br>178<br>371<br>178<br>371<br>166<br>270<br>57<br>57<br>79<br>434<br>268<br>57<br>57<br>79<br>256<br>57<br>57<br>79<br>256<br>249<br>57<br>79<br>256<br>249<br>245<br>161<br>169<br>384<br>445<br>169<br>384   |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co.         Thompson Clock Co.         Thompson Co.         Thompson Co.         Thompson Co.         Timken Roller Bearing Co.         Raine Co.         Traylor Engrg. & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Cc         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         33, 289,         Union Carbide & Garbon Corp.         34, United States Gauge Co.         U. S. Industrial Chemicals         U. S. Stoneware Co.         Victor Chemical Works.         Victor Chemical Works.         Vilcian Iron Works.         Wall Colmony Corp.         Wall Colmony Corp.         Walworth Co.         Waren Steam Pump Co., Inc.         Waliman Engineering Co.         Wing Ingo Sears Co.         Welling Corrucation Co.         Waliman Engineering Co.   | 622<br>278:<br>331:<br>306-<br>173:<br>178:<br>178:<br>178:<br>178:<br>178:<br>178:<br>178:<br>178   |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co.         Thompson Clock Co.         Thompson Co.         Thompson Co.         Timken Roller Bearing Co.         Raine Co.         Traylor Engrg. & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Cc         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         33, 289,         Union Carbide & Garbon Corp.         34, 200 Constraint Co.         United States Gauge Co.         U. S. Industrial Chemicals         U. S. Stoneware Co.         Victor Chemical Works.         Victor Chemical Works.         Vilcion Standering Ce.         Vulcan Iron Works.         Wall Colmony Corp.         Wall Colmony Corp.         Walwork Co.         Walman Engineering Co.         Waliman Engineering Co.         Weiling Corrugating Co.         Weiling Corrugating Co.         Weiling Corrugating Co.         Walwork Co.         Walwork Co.         Walwork Co.         Walwork Co.         Walwork Co.     <  | 62;<br>278;<br>331;<br>306;<br>173;<br>178;<br>371<br>166;<br>270;<br>299;<br>379;<br>270;<br>299;<br>379;<br>426;<br>57;<br>79;<br>256;<br>249;<br>374;<br>426;<br>57;<br>79;<br>226;<br>2249;<br>312;<br>426;<br>426;<br>426;<br>426;<br>426;<br>426;<br>426;<br>42  |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co.         Thompson Clock Co.         Thompson Co.         Thompson Co.         Timken Roller Bearing Co.         Raine Roller Bearing Co.         Traylor Engrg. & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         200 Curino Asbestos & Rubber Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         33, 289,         United States Gauge Co.         U. S. Industrial Chemicals         U. S. Stoneware Co.         Victor Chemical Works.         Victor Chemical Works.         Victor Chemical Works.         Vilan Iron Works.         Wall Colmony Corp.         Wall Colmony Corp.         Walwork Co.         Walman Engineering Co.         Weiliman Engineering Co.         Weiliman Engineering Co.         Wiegand Co., Edwin L.         Williams Pat & Crush. & Pulv. Co.  | 62;<br>278;<br>331;<br>306;<br>173;<br>371;<br>178;<br>371;<br>178;<br>371;<br>176;<br>270;<br>270;<br>270;<br>270;<br>270;<br>270;<br>270;<br>274;<br>270;<br>270;<br>270;<br>270;<br>270;<br>270;<br>270;<br>270   |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Ltd.         Thompson Clock Co.         Thompson Clock Co.         Thompson Co.         Thompson Co.         Timken Roller Bearing Co.         Trinken Roller Bearing Co.         Traylor Engrg. & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Cc         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         33, 289,         Union Carbide & Carbon Corp.         34, 284         U. S. Industrial Chemicals         U. S. Stoneware Co.         Van Range Co.         Viriginia Smelting Ce.         Vuicon Iron Works.         Viting Pump Co.         Viriginia Smelting Ce.         Wall Colmony Corp.         Walworth Co.         Wall Colmony Corp.         Wallor Steas Co.         Wellman Engineering Co.         Welling Corrugating Co.         Welling Corrugating Co.         Wilton Products, Inc.         Wiltion Products   | 62:<br>278:<br>331:<br>306-<br>173:<br>371:<br>178:<br>371:<br>178:<br>371:<br>178:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270   |
| Tasas Gulf Sulphur Co.         Thermal Syndicate Ltd.         Thompson Clock Co.         Thompson Clock Co.         Thompson Co.         Thompson Co.         Timken Roller Bearing Co.         Timken Roller Bearing Co.         Traylor Engrg. & Mfg. Co.         Treatron Tube Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Co.         Union Asbestos & Rubber Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         33, 289,         United States Gauge Co.         U. S. Industrial Chemicals         U. S. Stoneware Co.         Viriginia Smelting Ce.         Viking Pump Co.         Viriginia Smelting Ce.         Wall Colmony Corp.         Wall Colmony Corp.         Wall Colmony Corp.         Wallor States Co.         Weilington Sears Co.  | 62:<br>278:<br>331:<br>306:<br>436<br>173:<br>371:<br>178:<br>371:<br>178:<br>371:<br>178:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270  |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Tray Titeflex Inc.         Tray Dray Taylor Engrg. & Mfg. Co.         Tray Tigne & Macchine Co.         Troy Engine & Macchine Co.         Tube Turns Inc.         2nd Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         Junion Standard Equipment Co.         United States Steel.         U. S. Industrial Chemicals.         United States Steel.         U. S. Stoneware Co.         Van Range Co., John.         Victor Chemical Works.         Virignia Smelting Ce.         Vulcan Iron Works.         Wall Colmony Corp.         Wail Maren Stear Pump Co., Inc.         Weilington Sears Co.         Weilington Sears Co.         Weiling Corrugating Co.         Weiling Corrugating Co.         Weiling Corrugating Co.         Weiling Sons, Inc.         Williams Pat. & Crush. & Pulv. Co.         Williams Pat. & Crush. & Pulv. Co.  | 62:<br>278:<br>331:<br>306:<br>436<br>173:<br>371:<br>178:<br>371:<br>166:<br>270:<br>57:<br>57:<br>57:<br>57:<br>57:<br>57:<br>57:<br>57:<br>57:<br>57  |
| Taxas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Tirkeflar Inc.         Tray Traylor Engrg. & Mfg. Co.         Troy Engine & Macchine Co.         Uube Turns Inc.       2nd Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         Junion Standard Equipment Co.         United States Gauge Co.         U. S. Industrial Chemicals.         United States Steel.         U. S. Stoneware Co.         Van Range Co.         Victor Chemical Works.         Viting Pump Co.         Virginia Smelting Ce.         Vulcan Iron Works.         Wall Colmony Corp.         Waiworth Co.         Waren Steam Pump Co., Inc.         Welgand Co., Edwin L.         Willington Saars Co.         Welegand Co., Edwin L.         Willings Part. & Crush. & Pulv. Co.  | 62:<br>278:<br>331:<br>306:<br>436<br>173:<br>371:<br>178:<br>371:<br>178:<br>371:<br>166:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270  |
| Tasas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Tirnken Roller Bearing Co., Roller Bearing Div.         Trive Engra. & Mfg. Co.         Tray Traylor Engra. & Mfg. Co.         Tray Traylor Engra. & Mfg. Co.         Tray Engine & Machine Co.         Tube Turns Inc.         2nd Cc         Union Asbestos & Rubber Co.         Union Standard Equipment Co.         United States Gauge Co.         U. S. Industrial Chemicals         United States Steel.         U. S. Stoneware Co.         Van Range Co. John.         Victor Chemical Works.         Virginia Smelting Ce.         Vulcan Iron Works.         Wall Colmony Corp.         Walworth Co.         Waran Steam Pump Co., Inc.         Weigand Co., Edwin L.         Willington Saars Co.         Weiling Corrugating Co.         Williams Pat. & Crush. & Pulv. Co.         Williams Pat. & Crush. & Pulv. Co.         Willians Products. Inc.         Williant Products. Inc.         Worthington Pump & Machinery Corp.   | 62:<br>278:<br>331:<br>306:<br>436<br>173:<br>371:<br>166:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>27 |
| Tasas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Tray Traylor Engrg. & Mfg. Co.         Traylor Engrg. & Co.         Tube Turns Inc.         2nd Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         33, 289.         Union Standard Equipment Co.         Unistates Gauge Co.         U. S. Industrial Chemicals         Unistates Gauge Co.         U. S. Stoneware Co.         Van Range Co. John.         Victor Chemical Works.         Virignia Smelting Ce.         Vulcan Iron Works.         Wall Colmony Corp.         Waiworth Co.         War Assets Administration.         Waren Stearn Pump Co., Inc.         Welgand Co., Edwin L.         Wilfley & Sons, Inc.         Wilfley & Sons, Inc.         Wilfley & Sons, Inc.         Wilfley & Sons, Inc.  | 62:<br>278:<br>331:<br>306:<br>436<br>173:<br>371:<br>166:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>27 |
| Tasas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Tray Traylor Engrg. & Mfg. Co.         Traylor Engrg. & Mfg. Co.         Traylor Engrg. & Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         Junion Standard Equipment Co.         United States Steel.         U. S. Stoneware Co.         Van Range Co. John.         Victor Chemical Works.         Virignia Smelting Ce.         Vulcan Iron Works.         Wall Colmony Corp.         Waiworth Co.         War Assets Administration.         Waren Steam Pump Co., Inc.         Weilington Sears Co.         Weiling Corrugating Co.         Weiling Corrugating Co.         Wilfley & Sons, Inc.         Wilfley & Sons, Inc.         Wilfloor Pump & Machinery Corp.         Wilfloor Products. Inc.         Worthington Pump & Machinery Corp. <tr< td=""><td>62:<br/>62:<br/>62:<br/>62:<br/>62:<br/>62:<br/>62:<br/>73:<br/>73:<br/>73:<br/>73:<br/>74:<br/>74:<br/>74:<br/>74:<br/>74:<br/>74:<br/>74:<br/>74</td></tr<> | 62:<br>62:<br>62:<br>62:<br>62:<br>62:<br>62:<br>73:<br>73:<br>73:<br>73:<br>74:<br>74:<br>74:<br>74:<br>74:<br>74:<br>74:<br>74   |
| Tasas Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Tray Traylor Engrg. & Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         33, 289,         Union Standard Equipment Co.         United States Steel.         U. S. Stoneware Co.         Van Range Co. John.         Victor Chemical Works.         Virginia Smelting Ce.         Vulcan Iron Works.         Wall Colmony Corp.         Waiworth Co.         War Assets Administration.         Wallen Sears Co.         Weagand Co., Edwin L.         Wilflams Pat. & Crush & Fulv. Co.         Wilflams Pat. & Crush & Fulv. Co.         Wilflams Pat. & Crush & Fulv. Co.         Wilfloon Pump & Machinery Corp.         Wilfl   | 62:<br>62:<br>62:<br>62:<br>62:<br>62:<br>62:<br>73:<br>73:<br>73:<br>73:<br>74:<br>74:<br>74:<br>74:<br>74:<br>74:<br>74:<br>74   |
| Tears Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Timken Roller Bearing Co., Roller Bearing Div.         Tirteflex Inc.         Traylor Engrg, & Mfg. Co.         Union Carbide & Carbon Corp.         Union Standard Equipment Co.         United States Seage Co.         U. S. Industrial Chemicals         Victor Chemical Works.         Victor Chemical Works.         Victor Chemical Works.         Virighia Smelting Ce.         Vulcan Iron Works.         Wall Colmony Corp.         Waiworth Co.         Waren Steam Pump Co., Inc.         Wailfon Steam Pump Co., Inc.         Willighton Sears Co. <t< td=""><td>62;<br/>62;<br/>62;<br/>64;<br/>64;<br/>64;<br/>73;<br/>74;<br/>74;<br/>74;<br/>74;<br/>74;<br/>74;<br/>74;<br/>74</td></t<>                                  | 62;<br>62;<br>62;<br>64;<br>64;<br>64;<br>73;<br>74;<br>74;<br>74;<br>74;<br>74;<br>74;<br>74;<br>74   |
| Tease Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Tirteflex Inc.         Traylor Engrg, & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engrg, & Mfg. Co.         Troy Engre, & Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         33, 289,         Union Standard Equipment Co.         United States Gauge Co.         U. S. Industrial Chemicals         U. S. Stoneware Co.         Van Range Co. John.         Victor Chemical Works.         Virignia Smelting Ce.         Vulcan Iron Works.         Wall Colmony Corp.         Walworth Co.         Waren Steam Pump Co., Inc.         Weilington Sears Co.         Weilington Sears Co.         Weilington Sears Co.         Weilington Sears Co.         Weilington Products Inc.         Wiltien Regineering Co.         Wiltien Products Inc.         Wiltien Products Inc.         Wiltien Products Inc.  | 622<br>622<br>278:<br>331:<br>306-<br>173:<br>371:<br>178:<br>371:<br>178:<br>371:<br>166:<br>579-<br>256:<br>279-<br>256:<br>279-<br>256:<br>279-<br>256:<br>279-<br>256:<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>269-<br>269-<br>269-<br>279-<br>256:<br>269-<br>279-<br>256:<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>257-<br>256:<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>269-<br>26 |
| Tease Gulf Sulphur Co.         Thermal Syndicate Itd.         Thompson Clock Co., H. C.         Thompson Co., J. Parker.         Timken Roller Bearing Co., Roller Bearing Div.         Tirteflex Inc.         Traylor Engrg, & Mfg. Co.         Trent Tube Mfg. Co.         Troy Engre, & Mfg. Co.         Troy Engre, & Mfg. Co.         Troy Engre, & Mfg. Co.         Troy Engine & Machine Co.         Tube Turns Inc.         2nd Co.         Union Asbestos & Rubber Co.         Union Carbide & Carbon Corp.         33, 289,         United States Gauge Co.         U. S. Industrial Chemicals         Yan Range Co. John         Victor Chemical Works.         Viking Pump Co.         Virginia Smelting Ce.         Yulcan Iron Works.         Wall Colmony Corp.         Walworth Co.         Waren Steam Pump Co., Inc.         Weilington Sears Co.         Weilington Sears Co.         Weilington Sears Co.         Weilington Sears Co.         Waren Steam Pump Co., Inc.         Weilington Products. Inc.         Willion Products. Inc.         Willion Products. Inc.         Willion, Inc., Thomas C.  | 622<br>622<br>278:<br>331:<br>306-<br>173:<br>371:<br>178:<br>371:<br>178:<br>371:<br>178:<br>371:<br>178:<br>371:<br>178:<br>371:<br>178:<br>371:<br>186:<br>2770:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>270:<br>2 |



## A Chemico Plant assures efficient production..recovery..concentration

For more than 30 years, CHEMICO has specialized in developing processes and building plants for the production, recovery and concentration of sulphuric and other mineral acids.

A large percentage of the world's acid plants have been designed and erected by CHEMICO. Many of the advances in acid plant processes have been originated by CHEMICO. Backed by unequalled resources, CHEMICO technologists are recognized as the leading authorities in this field.

These are some of the reasons why "CHEMICO Plants are Profitable Investments". Your inquiry is invited without charge or obligation.

PROFITABLE INVESTMEN

CHEMICAL CONSTRUCTION CORPORATION EMPIRE STATE BLDG., 350 FIFTH AVE., NEW YORK 1, N. Y. European Technical Repr.: Cyanamid Products, Ltd., Berkhamsted, Herts., England Cables: Chemiconst, New York



CC-102

CHEMICAL & METALLURGICAL ENGINEERING • APRIL 1946 •

CHEMICO PLANTS are

445



## **Eliminates Manual Balancing**

The self-balancing Centralized Reading Indicator pictured above is as modern as jet propulsion.

The operator merely touches the desired switch. The instrument does the rest, leaving his hands free to log readings.

Time between readings is limited ONLY by human ability to pick off a reading. Compare this time to that required to read an outmoded manual balance indicator, designed when shaving mugs were on every barber shop shelf.

The Brown Centralized Reading Indicator is unique for other reasons, too.

The electronic "Continuous Balance" principle delivers sensitivity previously unheard of. Fancy being able to read one part in twenty-four hundred!

BROWN Electronik

The ElectroniK is totally unaffected by vibration mount it on a drill rig if it suits your purpose.

The ElectroniK utilizes circular instead of reciprocating motion. Components move only when the scale is changing position. Specify the Brown Precision Indicator for that post-war cracking unit.

Specify it, too, for your present processes. Utilizing the same wiring and thermocouples, it readily replaces old-fashioned instrumentation.

For information write THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Co., 4478 Wayne Avenue, Philadelphia, Pa. Offices in all principal cities. Toronto, Canada—London, England—Stockholm, Sweden —Amsterdam, Holland.

POTENTIOMETERS

• APRIL 1946 • CHEMICAL & METALLURGICAL ENGINEERING