



Podbielniak, Inc.

Brochure No. 10

CONTAINING AN "ALBUM" OF
PODBIELNIAK INSTALLATIONS
PHOTOGRAPHED AT PLANT SITES.

*We Invite You
To Visit Us
When In Chicago*

FIVE-MINUTE TAXI RIDE FROM CENTER
OF LOOP, AND EASILY ACCESSIBLE BY
AUTOMOBILE, BUS OR STREET CAR LINE.



PODBIELNIAK, INC. 341 EAST OHIO STREET, CHICAGO 11, ILLINOIS

39 · PARK STREET · MAYFAIR · LONDON · W · 1 · TEL · GROSVENOR 6671

With Mr. George Meier's Compliments and Regards.

Extraction Efficiency Unexcelled

Podbielniak

COUNTER CURRENT

CENTRIFUGAL MULTI-STAGE CONTACTORS & SOLVENT EXTRACTORS



for contacting of LIQUIDS containing Suspended SOLIDS and LIQUID-LIQUID SYSTEMS

- Mixing
 - Washing
 - Clarifying • Neutralizing
 - Decolorizing • Acid Treating
 - Chemical Reacting • Solvent Extraction
- one to 15 counter-current stages . . . including reflux and two-solvent fractionation

for a Variety of Industries

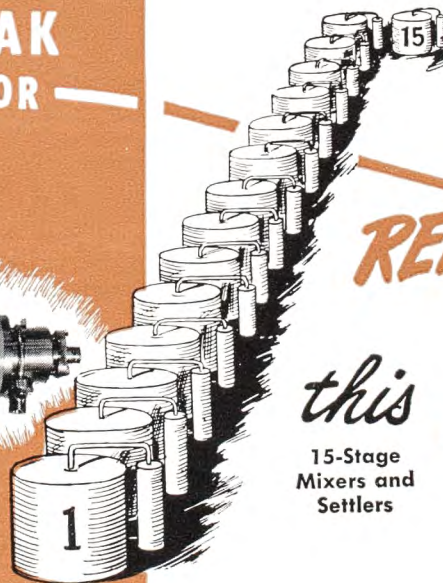
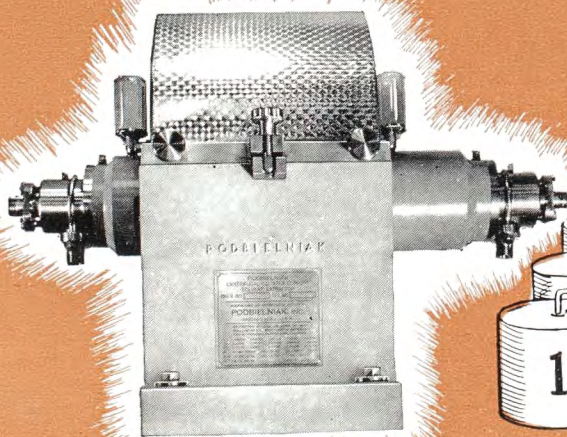
FRUIT JUICES AND EXTRACTS
 DRUG EXTRACTS
 BEVERAGES
 LACQUERS AND DRYING OILS
 SOLVENTS
 LEATHER
 FATS AND GLYCERIN
 WOOL SCOURING
 NUT AND SEED OILS
 SYNTHETIC DETERGENTS
 INK
 GERMICIDES AND INSECTICIDES
 COAL TAR DERIVATIVES
 METALLIC SALTS

SYNTHETIC FIBER
 PHARMACEUTICAL
 HORMONES AND VITAMINS
 BIOCHEMICAL
 BREWERIES
 WINERIES
 DRY CLEANING
 SOAP
 DYES
 MEAT BY-PRODUCTS
 PLASTICS
 ANTIBIOTICS
 PYROLIGNEOUS LIQUORS
 WASTE SULPHITE PULP

PETROLEUM
 PETROCHEMICAL
 ESSENTIAL OIL
 INSULATING OIL
 VEGETABLE OIL
 PAINT AND VARNISH
 FISH OIL
 FOODS
 DAIRY
 PULP AND PAPER
 LATEX
 CHEMICAL
 ACETIC ACID
 THIOGLYCOLIC ACID

GRAPHICAL COMPARISON OF PODBIELNIAK CENTRIFUGAL MULTI-STAGE, LIQUID-LIQUID, SOLIDS HANDLING, COUNTER-CURRENT CONTACTORS vs. Corresponding Gravitational Towers and Mixer-Gravity Settlers, or Mixer-Centrifugal Separators.

ONE PODBIELNIAK CENTRIFUGAL CONTACTOR



REPLACES

this
 15-Stage Mixers and Settlers

OR

this
 Gravitational Liquid-Liquid Column

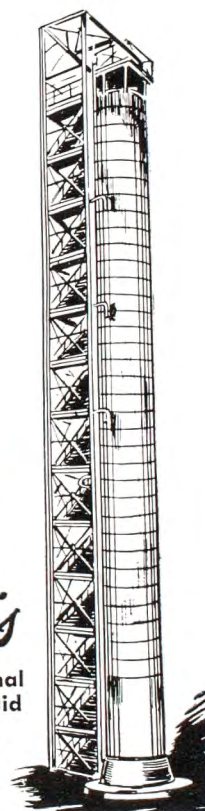
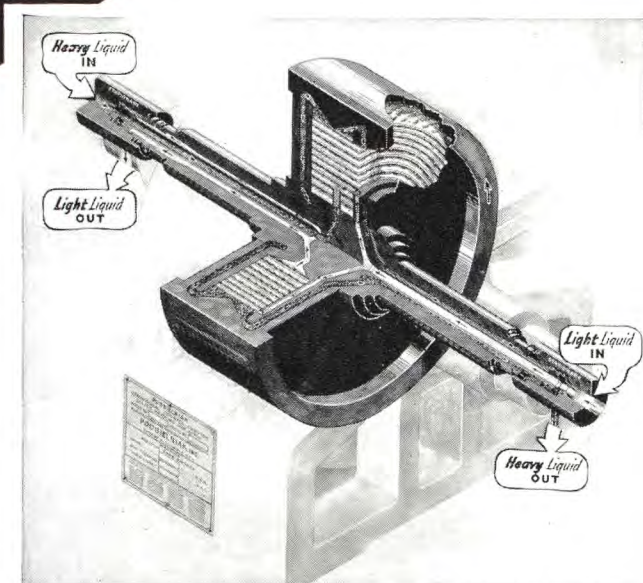


DIAGRAM Illustrating Flows Through CONTACTORS

2



The above diagram illustrates Continuous Multi-stage Counter-Current flows either through a liquid-liquid or a liquid-solids handling PODBIELNIAK CONTACTOR.

PRINCIPLE OF OPERATION

Liquid-Liquid Contactors are similar to gravitational mixer-settler or tower equipment such as illustrated on Page 1. The PODBIELNIAK Contactor may be visualized as a tray tower with the trays wrapped around a shaft, and then rotated to develop a centrifugal force field to replace the force of gravity. Liquid-Liquid contacting necessarily involves at least two incompletely miscible liquid phases, differing in density.

In the PODBIELNIAK Contactor the use of high centrifugal force (from 2000 to 5000 times gravity), permits very close "tray" or contacting element spacings, extremely effective mixing in combination with full centrifugal clarification and high liquid velocities. Liquids of as little as 0.015 specific gravity difference can be effectively contacted.

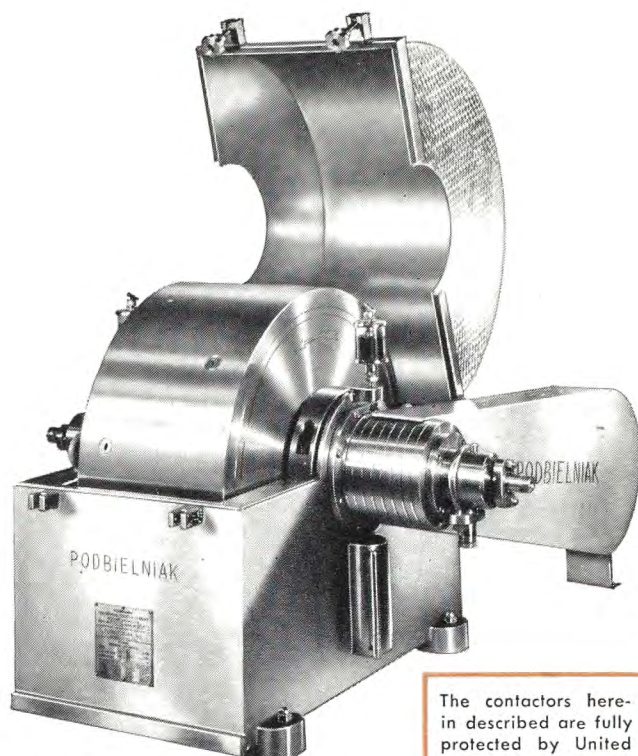
Liquid-Liquid Solids Handling and Self-Cleaning Type of Contactor. Referring to the above cutaway drawing, also illustrating the operation of a Contactor when the heavy liquid includes solids, the procedure is as follows:

(a) Light liquid is pumped into rotor periphery . . . (b) At the same time the heavy liquid containing solids is pumped near the center . . . (c) The light liquid proceeds inwardly, finally leaving through shaft center. A suitable back pressure regulator on the light liquid out stream controls the location of the principal interface within the rotor . . . (d) In the meantime, the heavy liquid, containing solids, travels through the rotor similarly to the light liquid but outwardly . . . (e) In order to preclude any solids settling, the internal construction of the Contactors is so designed to suit each individual installation in order to maintain the solids and heavy liquid carrier in controlled high velocity and turbulent flow throughout . . .

The degree of "solids handling" capacity has built-in features which renders the Contactor virtually self-cleaning during the operation, as well as making possible handling of outright slurries in many cases.

Descriptive literature on the Podbielniak Solvent Extractors and Contactors is available upon request. Our engineers will gladly respond regarding application of Podbielniak Contactors to specific processes.

Copyright 1952 Podbielniak, Inc.



SERIES 7000 PODBIELNIAK CONTACTOR—High-Stage (8-20). Capacity Range 1000 to 5000 g.p.h.

The contactors here-in described are fully protected by United States and foreign patents and pending patent applications.

FEATURES

MULTI-STATE COUNTER-CURRENT PERFORMANCE in one simple compact machine, with centrifugally clarified effluents.

HIGH CAPACITY AND EFFICIENCY relative to rotor size.

SMALL DENSITY DIFFERENCE LIQUIDS

as little as 0.015 sp. gr.

EASILY EMULSIFYING LIQUIDS

HIGH VISCOSITY LIQUIDS

effectively handled

LIQUIDS WITH SUSPENDED SOLIDS effectively contacted and extracted without solids deposition in rotor:

ONLY A FEW GALLONS LIQUID HOLDUP.

ONLY A FRACTION OF A MINUTE FOR LIQUID TO PASS THROUGH CONTACTOR. This entirely unique feature, possessed by no other counter-current liquid-liquid contactor makes possible effective handling of unstable or rapidly changing materials.

ONLY A FEW MINUTES TO REACH EQUILIBRIUM. Small batches handled effectively and continuously without intermediate mixed fractions.

SIMPLE AND COMPLETELY FLEXIBLE OPERATION. Flows, solvent ratio and interface position instantly changeable.

SOLIDS-HANDLING, CONTINUOUSLY SELF-CLEANING to a high degree, far more so than possible in any other liquid-liquid contacting equipment.

EASILY AND RAPIDLY STERILIZED AND FLUSHED of all deposits, without disassembly, with built-in inspection, sampling and cleanout devices.

INHERENTLY PRESSURE TIGHT TO 250 psig. or more; COMPLETELY CLOSED SYSTEM; NO LOSS OF SOLVENT OR MATERIALS by vaporization.

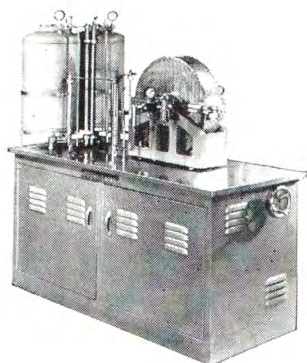
SUITABLE FOR OPERATION FROM BELOW 0°F. to ABOVE 250°F.

DESIGNED AND BUILT FOR UNINTERRUPTED INDUSTRIAL OPERATION.

AVAILABLE IN STAINLESS STEEL AND OTHER CORROSION RESISTANT ALLOYS.

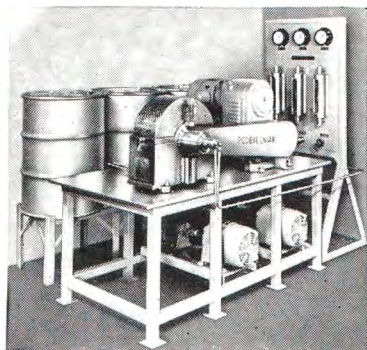
Contactors available in a variety of models designed for your specific process, ranging in capacity from a complete laboratory extraction plant of 500 cc per minute to intermediate and commercial size units to 25,000 gallons per hour.

Typical
MODELS



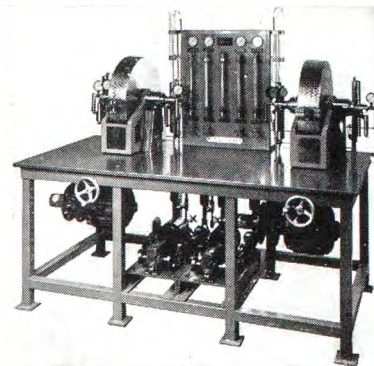
PUP—SERIES 5500 COMPLETE LABORATORY EXTRACTION PLANT

(a) Capacity 500 cc to 3000 cc/min. Stages 4-15. PUP includes explosion-proof variable speed drive, liquid feed tanks, rotameters, heat exchangers, pressured liquid supply tanks, pressure regulator, etc., all of Type 316 stainless steel. (b) Completely equipped for rapid multi-stage evaluation of liquid-liquid solvent extraction systems. (c) May be used in small scale pilot plant production (up to 3000 cc/min.) combined streams capacity. Data obtained with this assembly is extrapolatable to design of production size equipment.



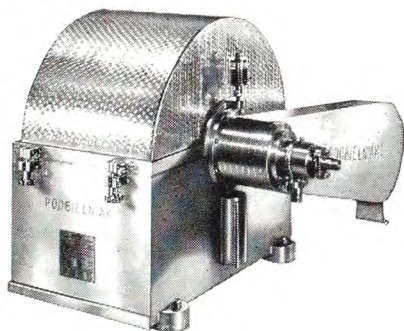
PILOT PLANT — SERIES 6000-6100 SOLIDS-HANDLING COMPLETE EXTRACTION PLANT

30 to 100 g.p.h. capacity, 5 to 15 stages. Completely assembled and mounted on a steel table. Equipment includes variable speed motor, rotameters, pressure regulators, heat exchangers, etc.



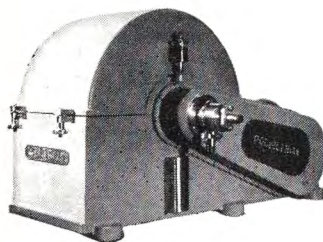
TWIN-PUPS — SERIES 5600 COMPLETE LABORATORY EXTRACTION PLANT

(a) 500 cc to 3000 cc/min., 4 to 15 stages per extractor. (b) Similar to Series 5500 except actually TWIN PUPS used; constructed to permit midpoint feeds for dual solvent and reflux fractionation. Equilibrium reached within a few minutes; rapid sampling.



PRODUCTION MODEL EXTRACTOR — SERIES 9000

Capacity range 1500 to 6000 gals./hr., stages 3 to 12. Otherwise similar to Series 900—both types of machines may be constructed to provide either controlled "mild" mixing of easily emulsifiable liquids, or maximum capacity with moderate stages.

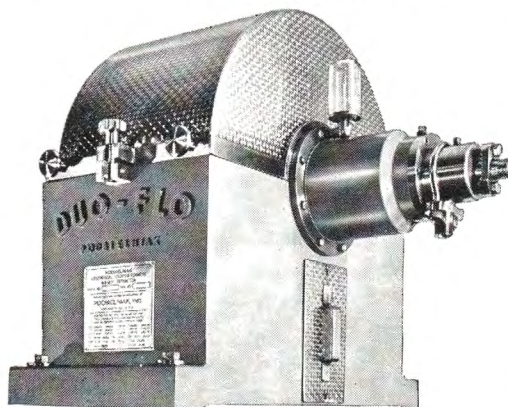


HIGH CAPACITY PRODUCTION EXTRACTOR — SERIES 900

(a) Capacity range 1000 to 15,000 gals./hr., depending upon specific design and system, stages 3 to 12. (b) Similar to other extractors of this type, it has solids-handling and continuous self-cleaning features; available in carbon steel, stainless steel, and other metals. (c) Either a multiple conductive V-belt drive or a silent chain drive is offered. (d) Extractor is particularly applicable to petroleum and bulk chemical manufacturing processes.

DUO-FLO EXTRACTOR — SERIES 2000

(a) Available in a wide range of sizes for low and medium stage applications up to 25,000 g.p.h. combined streams. (b) A unique construction for "solids-handling" makes possible use of this extractor for suspended solids such as wax, vegetable or animal tissues, fermentation mycelia carrying liquid systems for which removal, washing, neutralization, etc. are required. (c) Highly simplified design and low first cost result in efficient use of this equipment in those solvent extraction applications not requiring highest possible degree of counter-current contacting. (d) Theoretically — a neutralization washing requires only one equilibrium stage; in practice, intensive counter-current contacting is required for efficient neutralizing or washing, etc., hence the special need for the DUO-FLO.

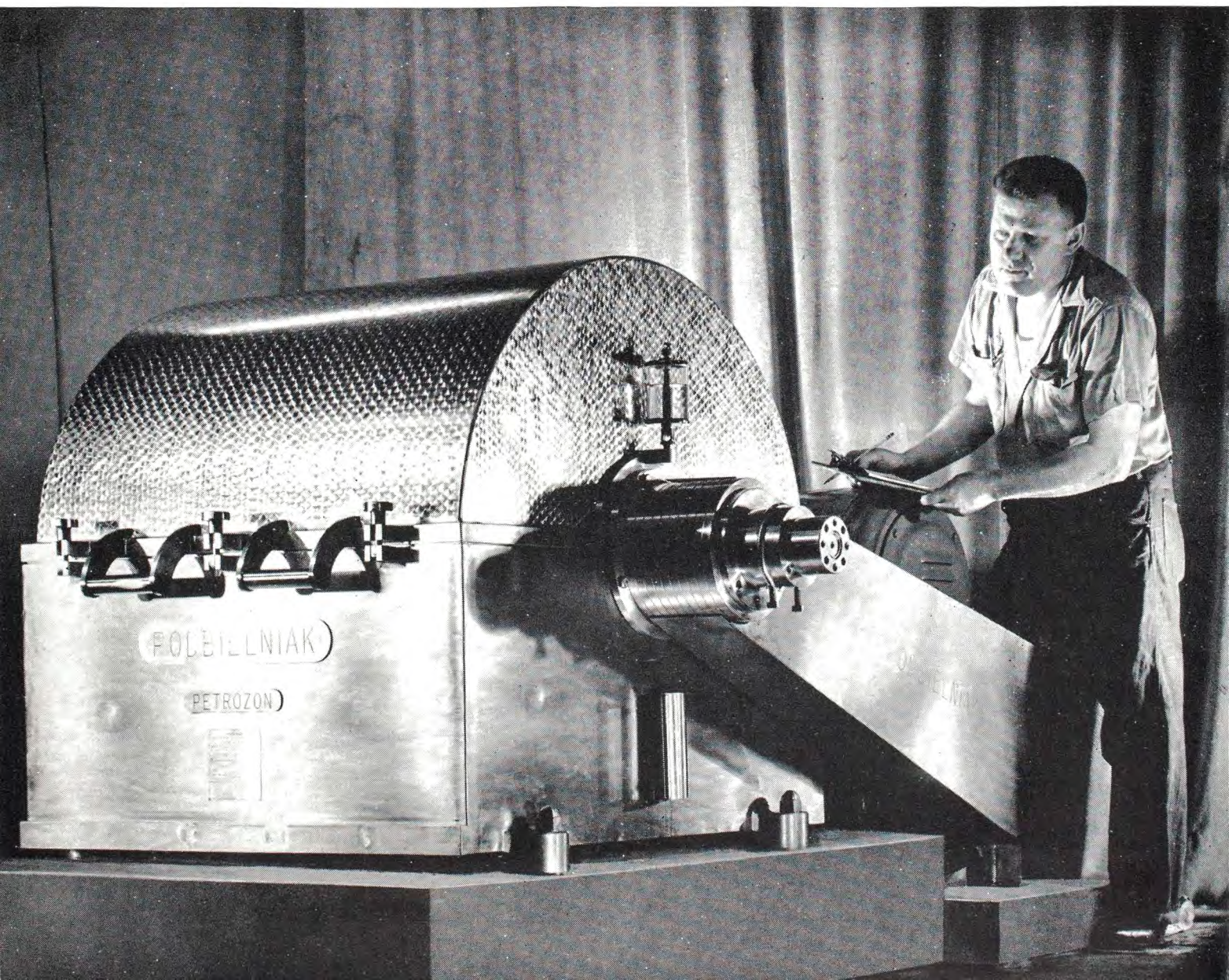


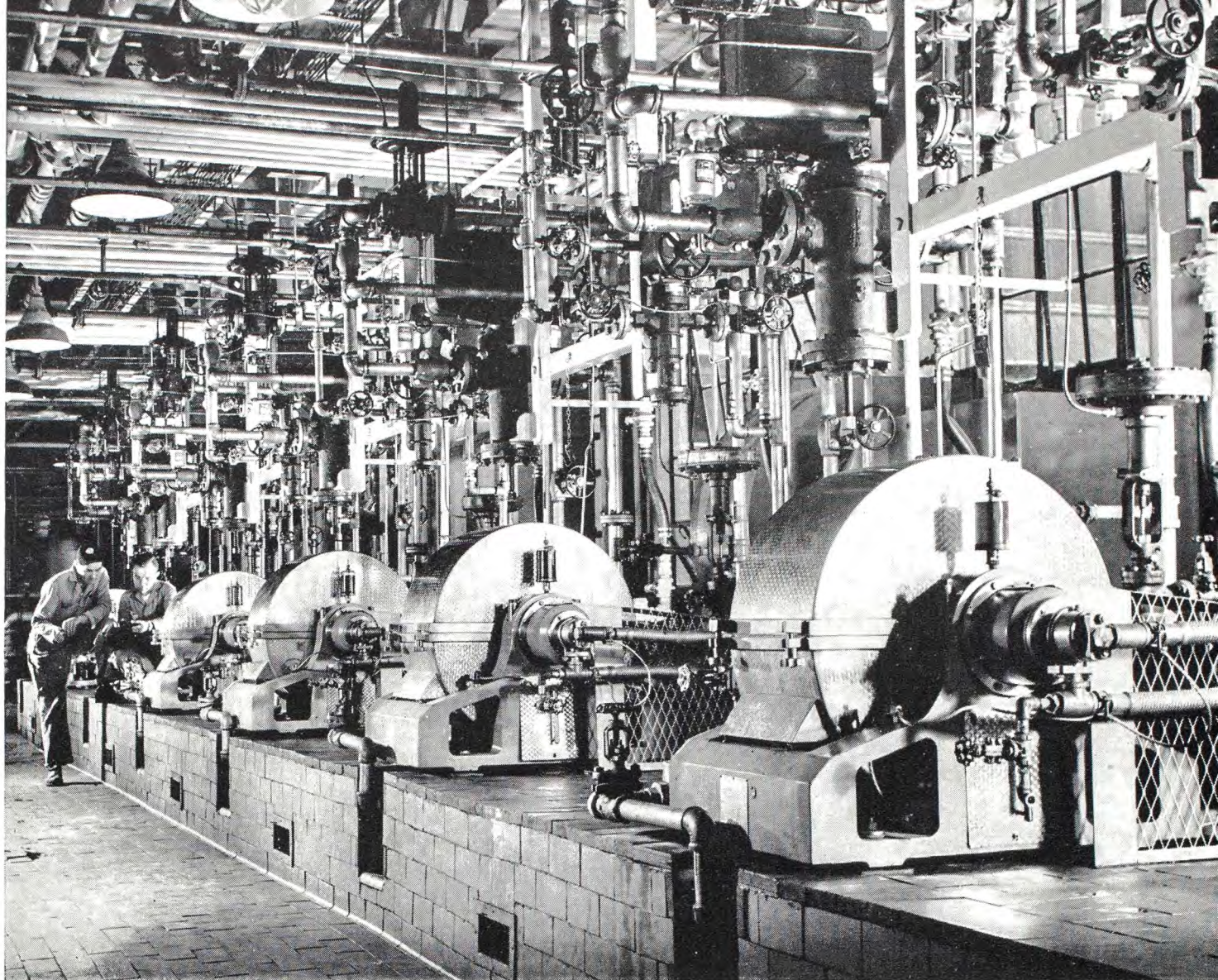
AN ALBUM

of Podbielniak centrifugal counter-current solvent extractors operating in a variety of leading industries

Photographs by Robert Yarnall Richie taken at plant sites through the courtesy and cooperation of our customers.

THE **"PETROZON"** — MULTI-STAGE CENTRIFUGAL SOLVENT EXTRACTOR — 25,000 GALLONS PER HOUR CAPACITY DESIGNED FOR USE IN THE PETROLEUM INDUSTRY. SERIES 9650.





E. R. Squibb & Sons

NEW BRUNSWICK, NEW JERSEY

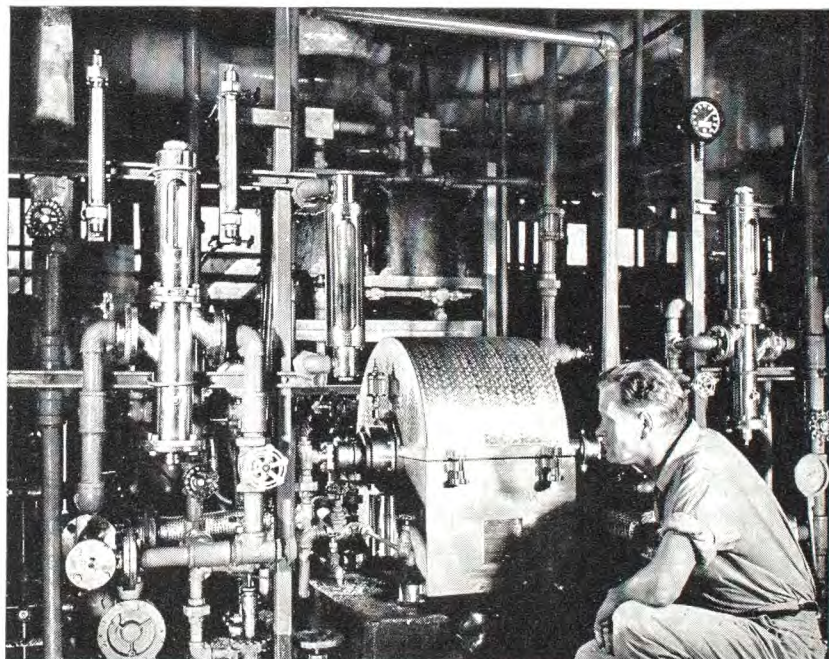
LIQUID-SOLIDS HANDLING SOLVENT EXTRACTORS WHICH ARE A PART OF THE PENICILLIN EXTRACTION TRAIN AT THE NEW BRUNSWICK PLANT.

Abbott

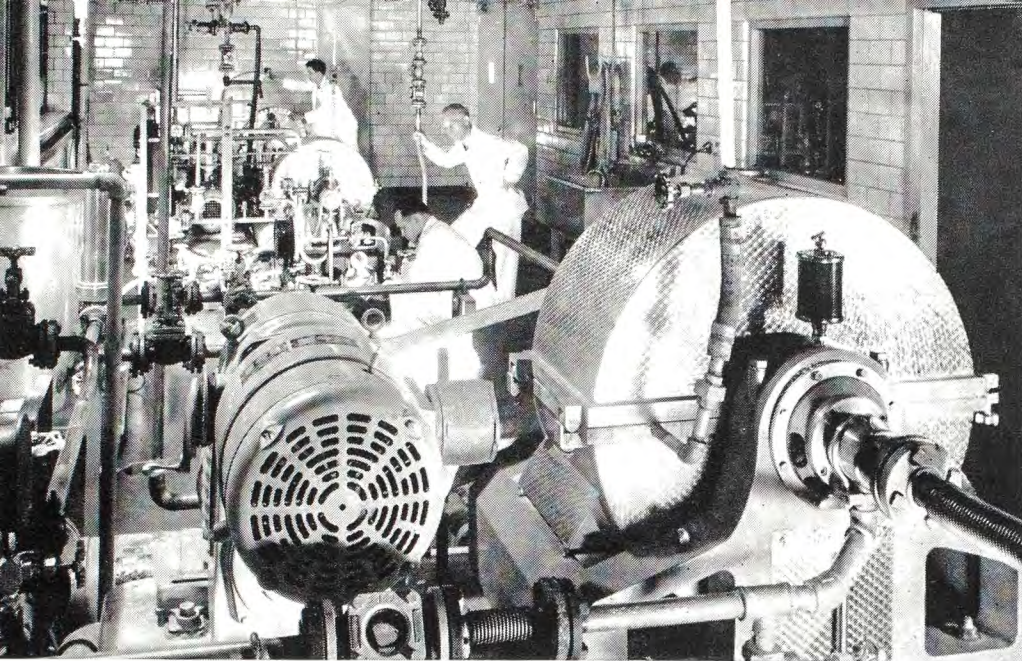
Laboratories...

NORTH CHICAGO . . . ILLINOIS

CENTRIFUGAL SOLVENT EXTRACTION OF ANTIBIOTICS.



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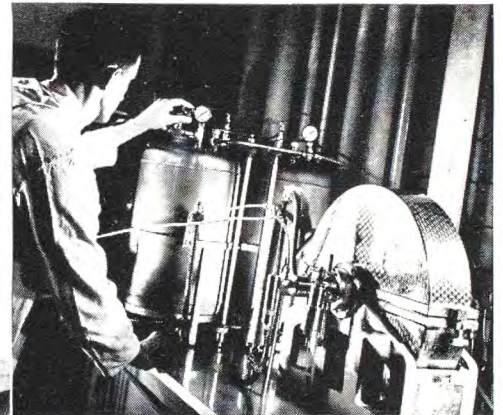


CENTRIFUGAL SOLVENT EXTRACTORS PROCESSING CHLOROMYCETIN WHOLE BROTH (FERMENTATION PROCESS).

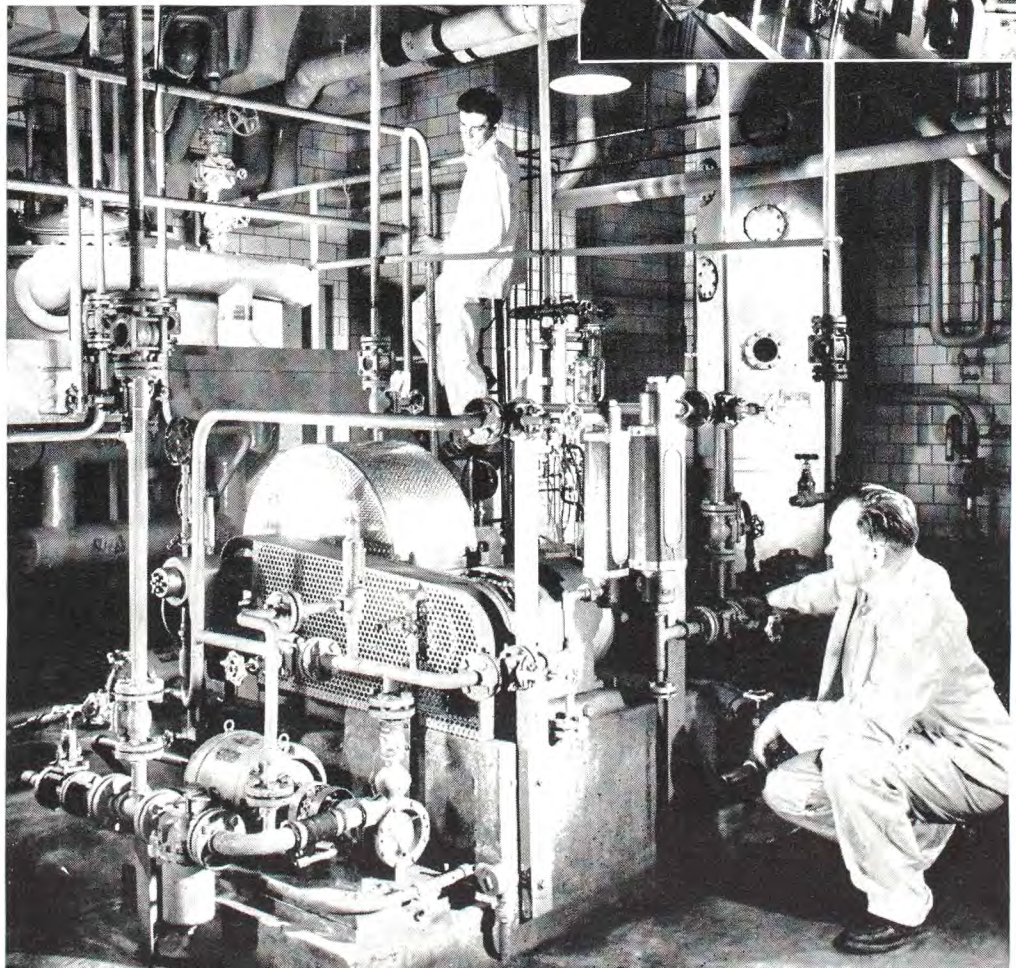
PARKE, DAVIS & CO.

DETROIT MICHIGAN

CENTRIFUGAL SOLVENT EXTRACTOR FOR INVESTIGATIONAL PURPOSES.



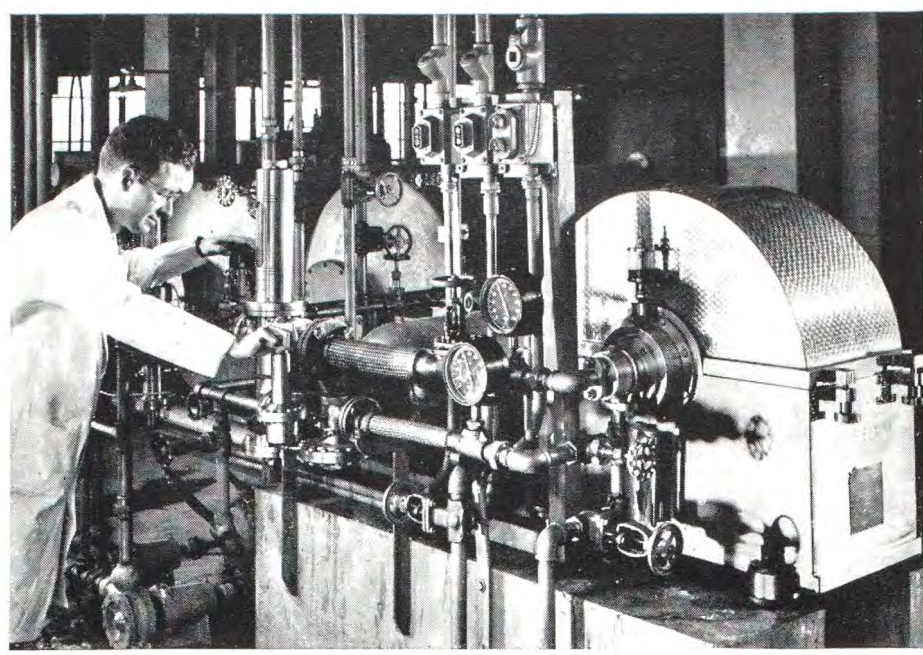
CENTRIFUGAL SOLVENT EXTRACTOR PROCESSING PENICILLIN.



Sharp & Dohme, Inc.,

WEST POINT . . . PENNA.

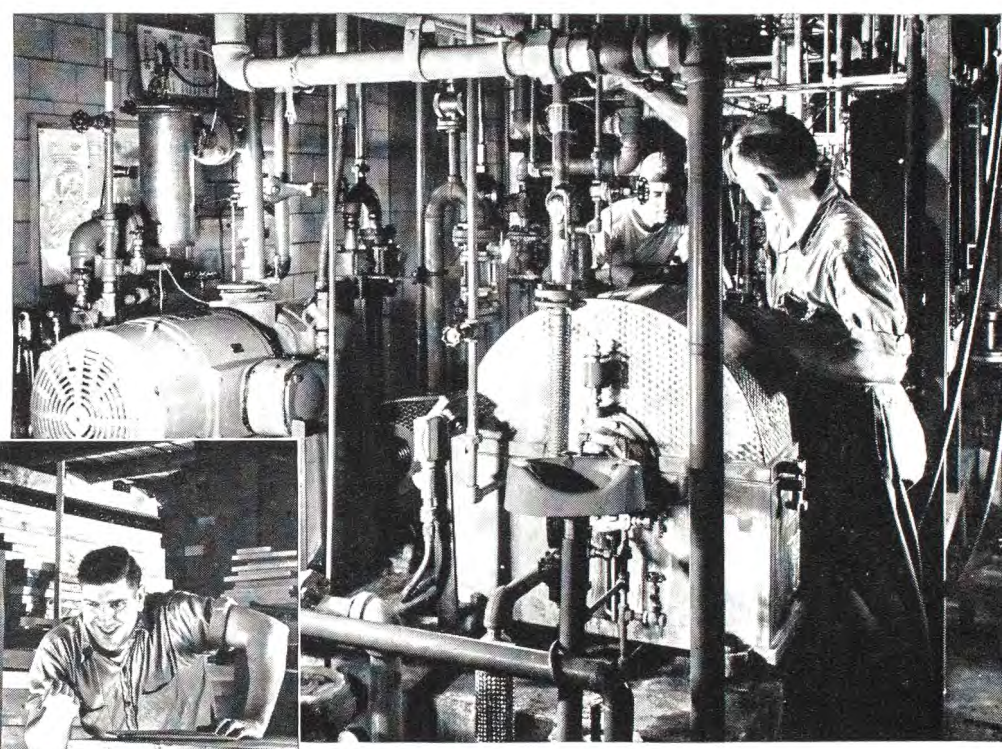
SYNTHETICS PLANT USING A CENTRIFUGAL SOLVENT EXTRACTOR (APPLICATION NOT DISCLOSED).



Heyden Chemical Corporation

PRINCETON . . NEW JERSEY

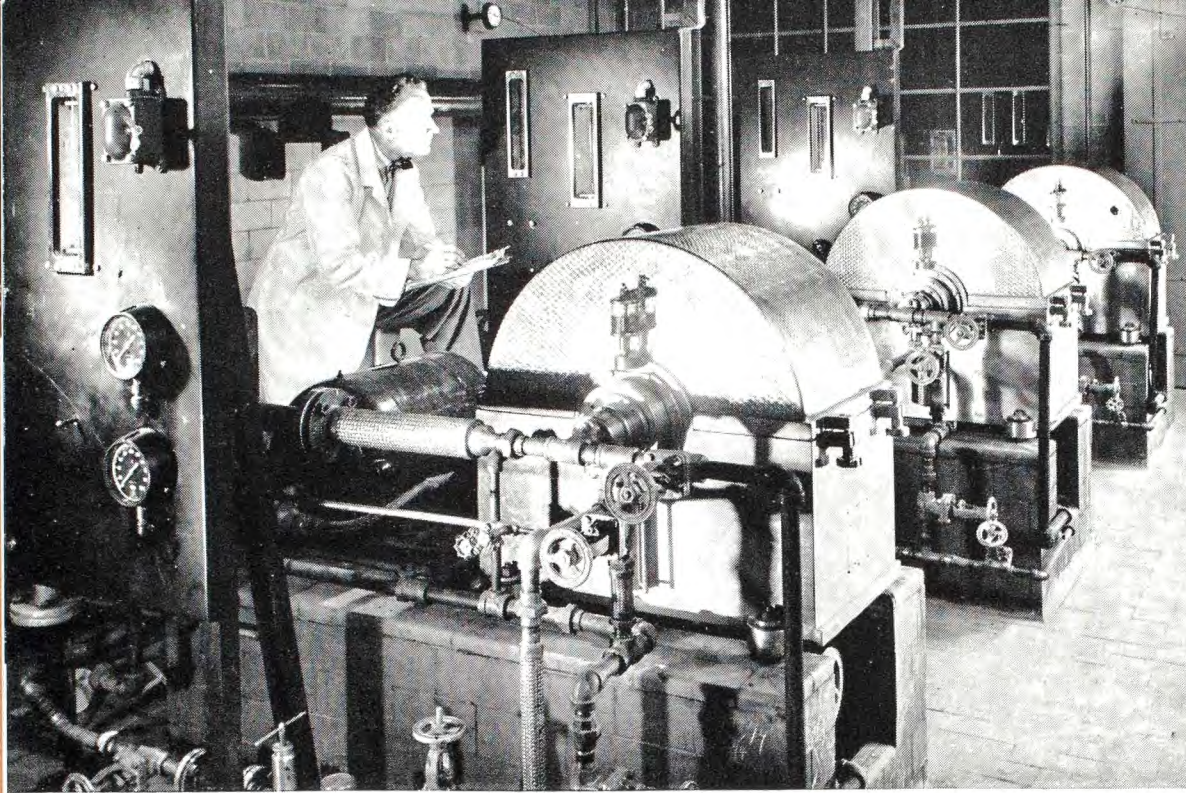
CENTRIFUGAL SOLVENT EXTRACTION IN ANTIBIOTICS PLANT.



The Texas Company

PORT ARTHUR TEXAS

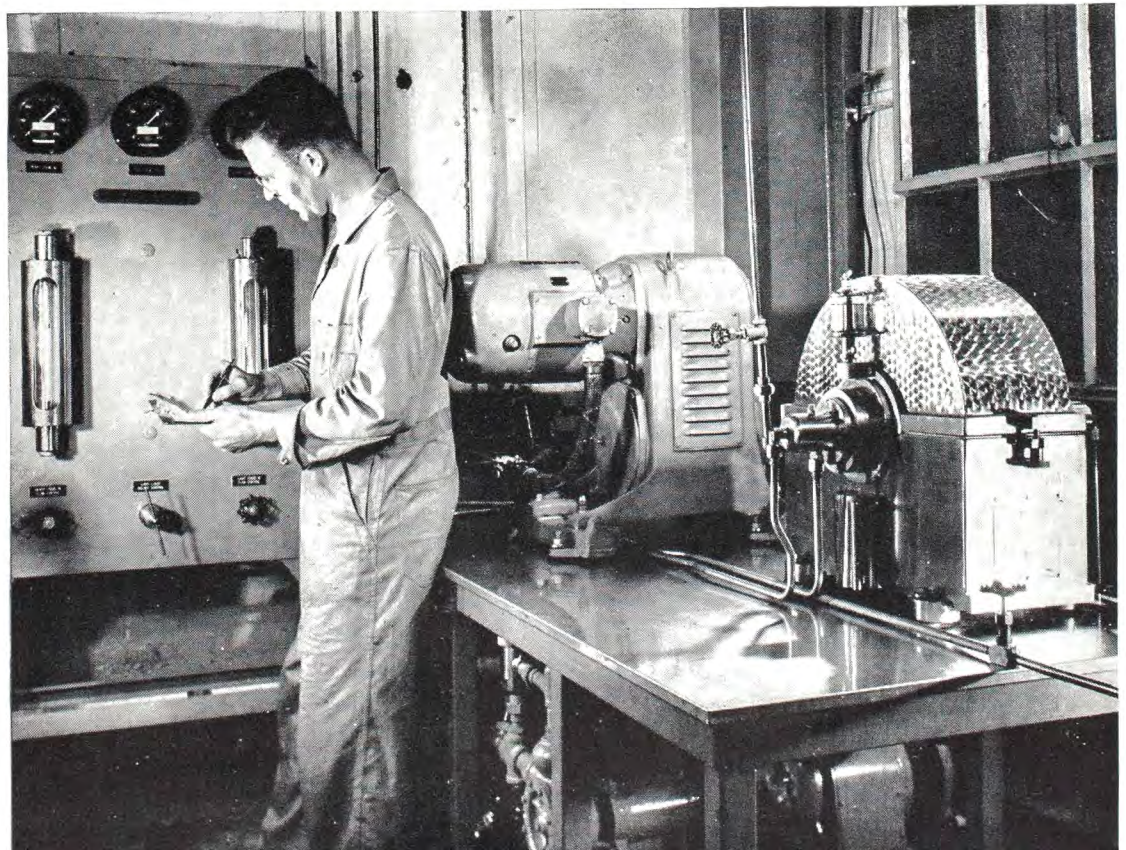
CENTRIFUGAL SOLVENT EXTRACTOR BEING PREPARED FOR SHIPMENT TO THE TEXAS COMPANY FOR THE PURPOSE OF CARRYING OUT RESEARCH AND DEVELOPMENT WORK IN PETROLEUM REFINING.



Hercules Powder Company

WILMINGTON DELAWARE

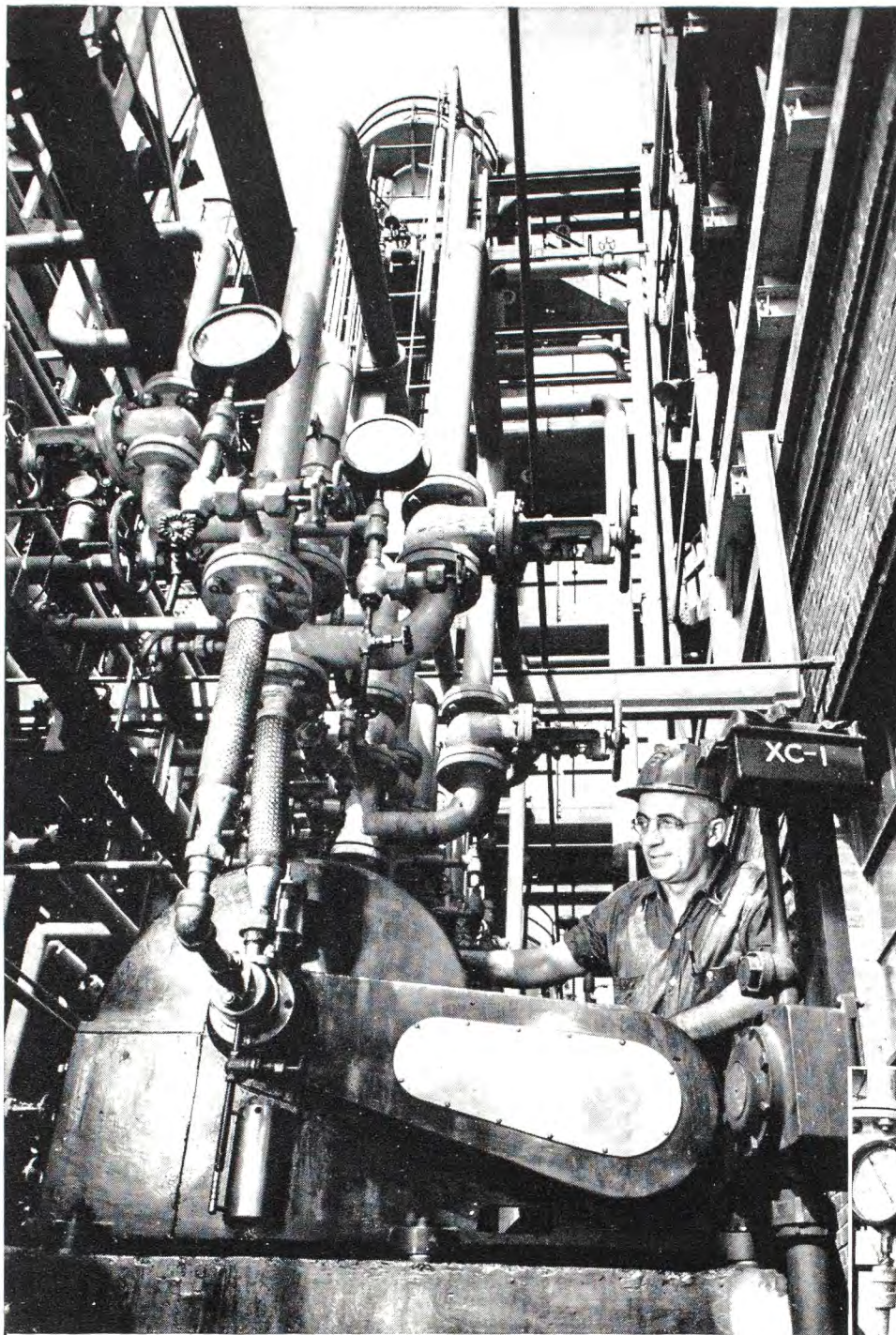
CENTRIFUGAL CONTACTORS FOR GENERAL PILOT PLANT WORK, I.E., FOR PROCESS DEVELOPMENT AND FOR RECOVERY OF LARGE SAMPLES OF RESEARCH CHEMICALS AS MAY BE NEEDED. AMONG THE SPECIFIC APPLICATIONS HAVE BEEN TESTING OF VARIOUS SOLVENTS FOR ACETIC ACID RECOVERY AND ROSIN REFINING BY SOLVENT EXTRACTION.



Wyeth, Inc.

WEST CHESTER, PA.

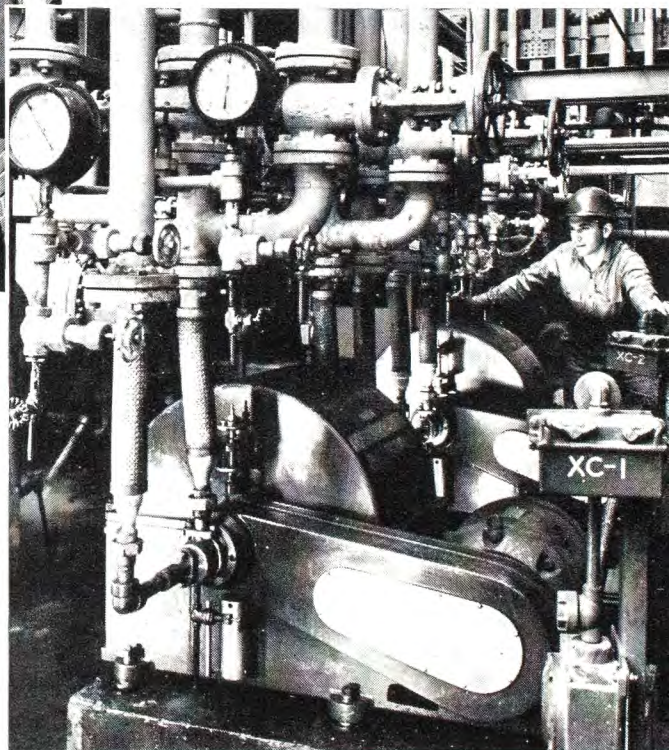
CENTRIFUGAL SOLVENT
EXTRACTOR TRAIN
PROCESSING PENICILLIN.

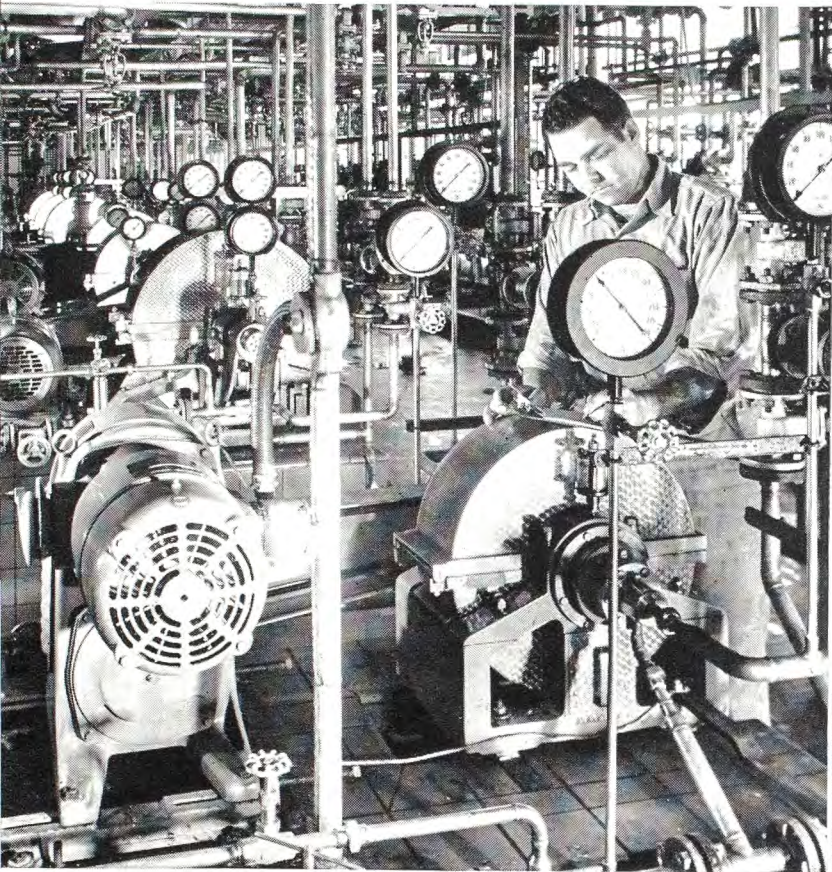


Sun Oil Company

MARCUS HOOK REFINERY, PA.

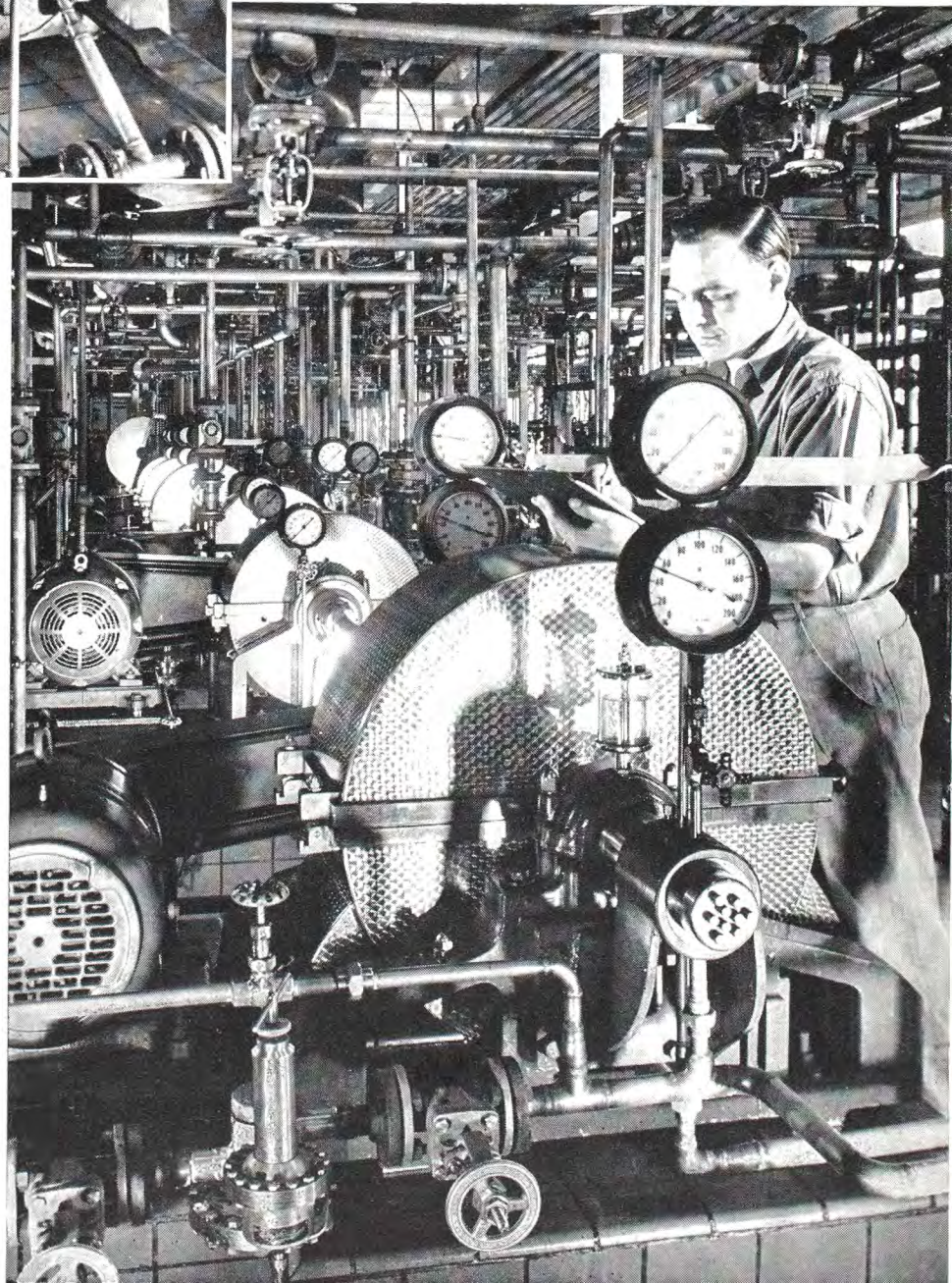
TWO VIEWS OF CENTRIFUGAL CONTACTORS SHOWN IN OPERATION ON FURFURAL SOLVENT EXTRACTION OF LUBRICATING OIL WITH CONVENTIONAL EXTRACTION TOWER IN THE BACKGROUND.





Chas. Pfizer & Co.

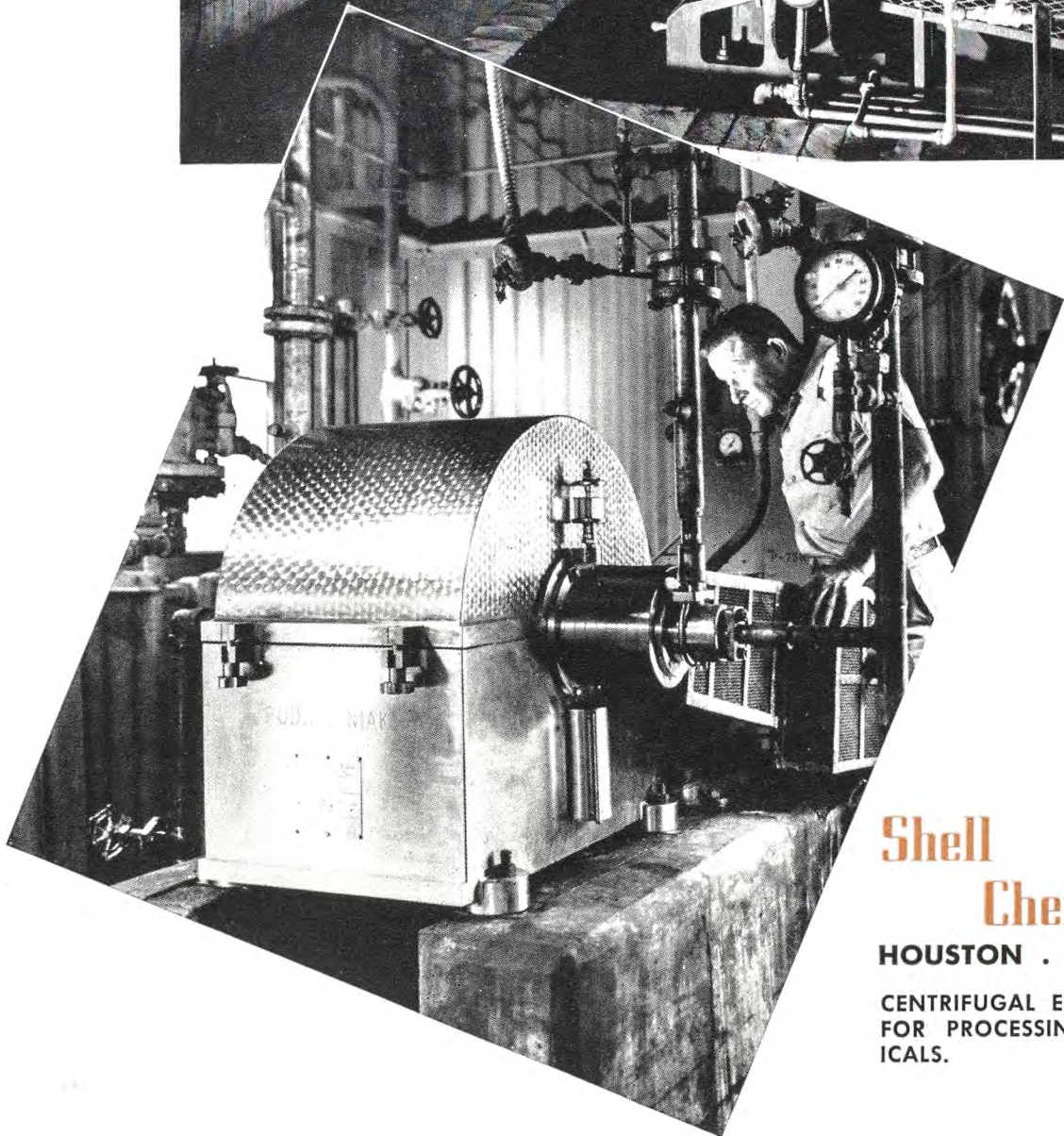
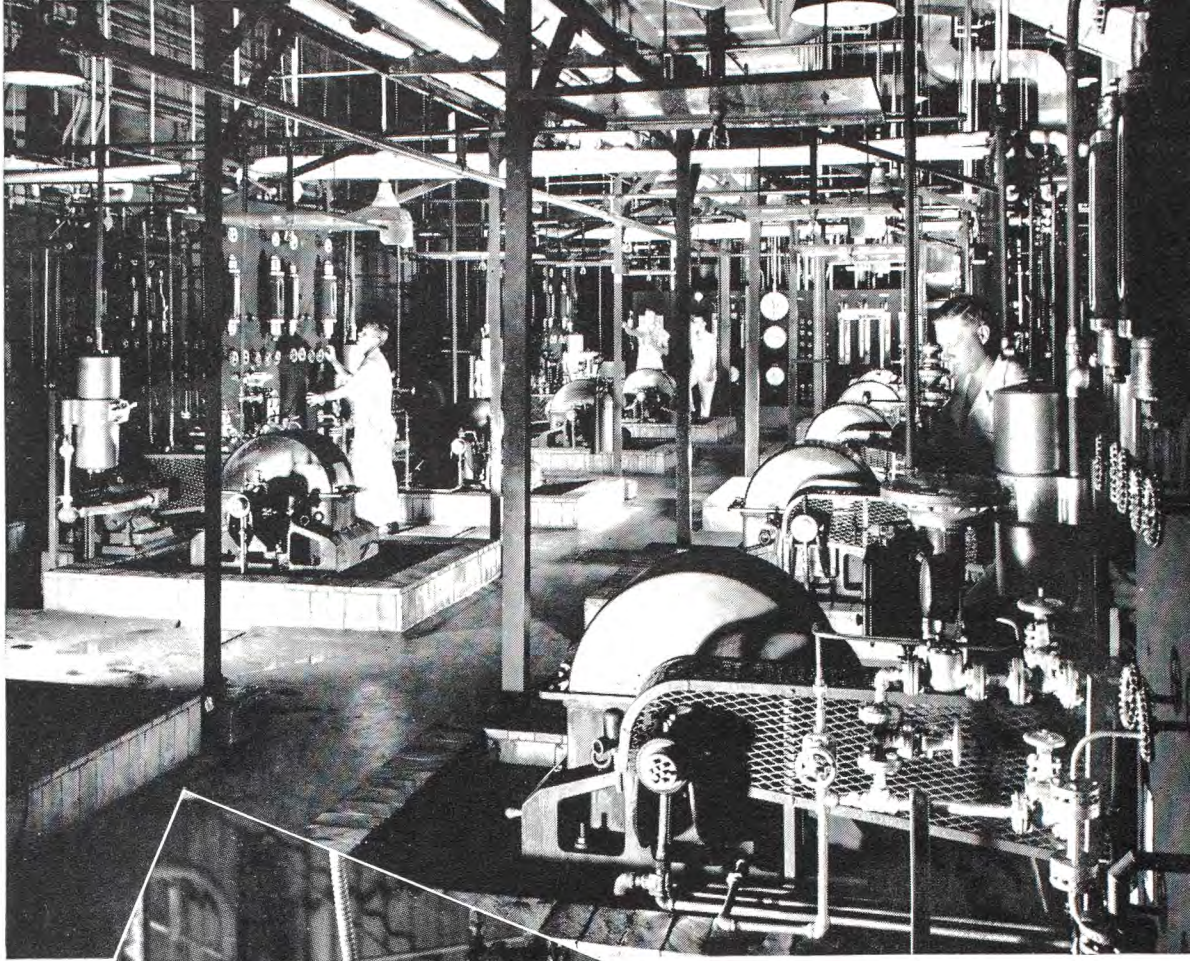
A BATTERY OF CENTRIFUGAL SOLVENT EXTRACTORS USED IN PROCESSING ANTIBIOTICS.



Eli Lilly & Co.

INDIANAPOLIS,
INDIANA

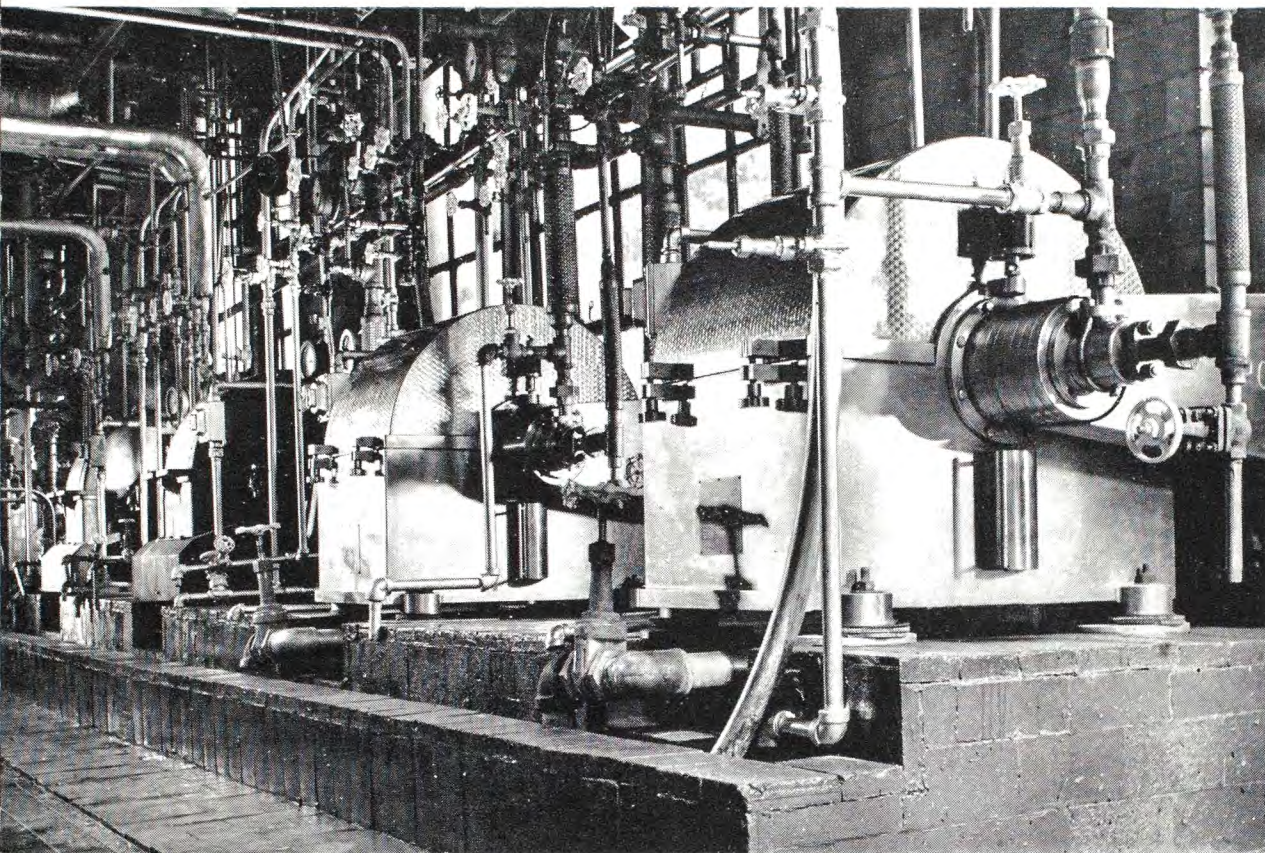
PLANT VIEW OF
CENTRIFUGAL SOL-
VENT EXTRACTORS
PROCESSING ANTI-
BIOTICS.



Shell Chemical Co.,

HOUSTON TEXAS

CENTRIFUGAL EXTRACTORS USED
FOR PROCESSING PETRO-CHEM-
ICALS.



Commercial Solvents Corp.,

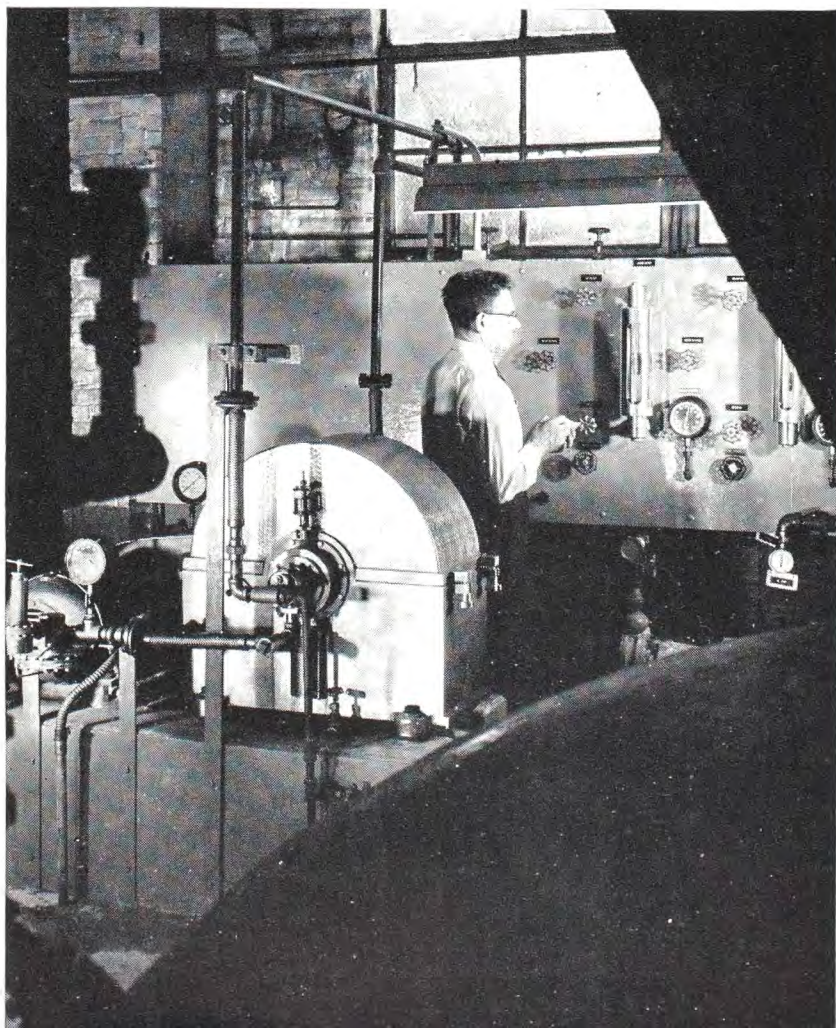
TERRE HAUTE . . . INDIANA

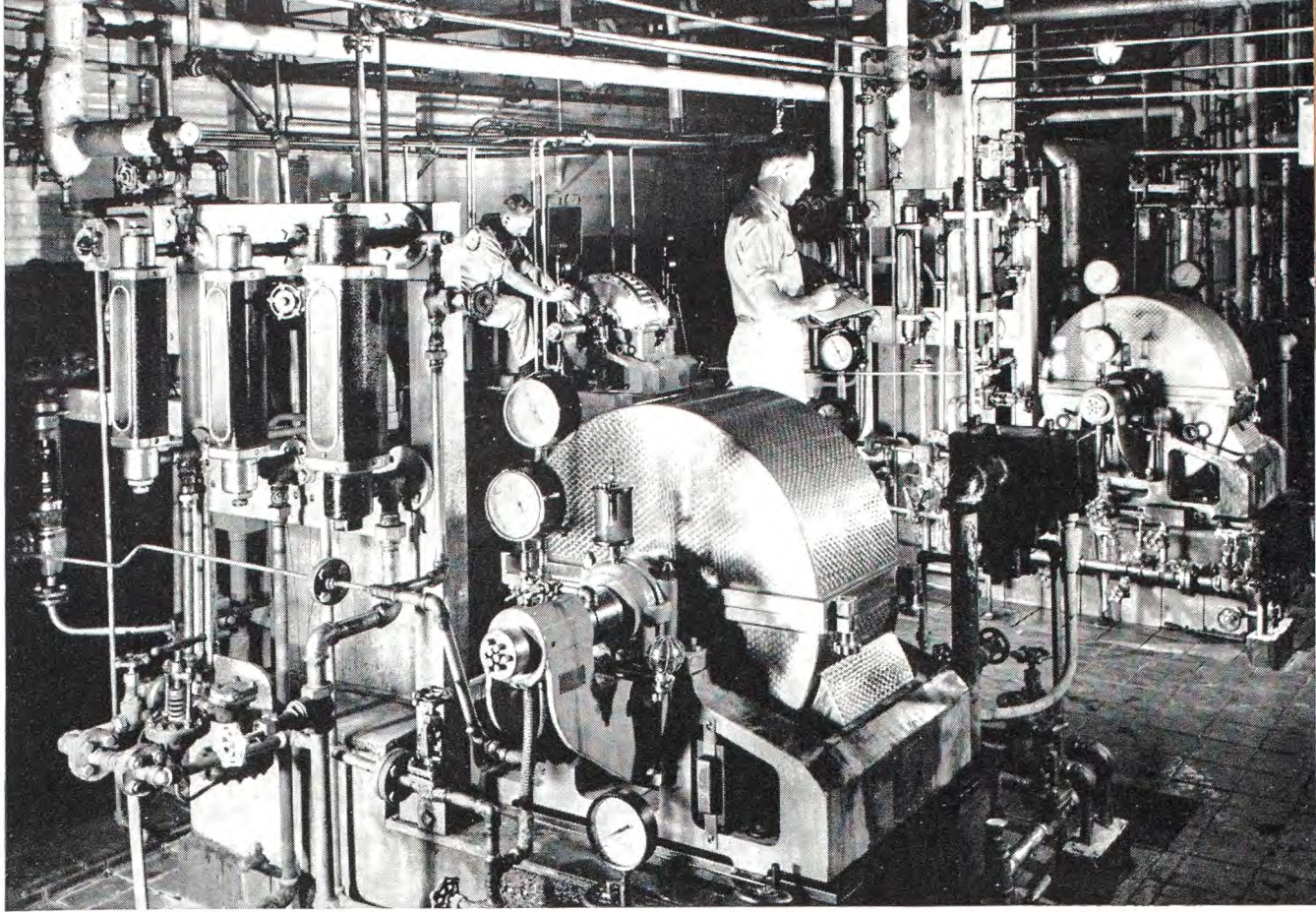
CENTRIFUGAL SOLVENT EXTRACTORS
USED FOR PROCESSING BACITRACIN
PENICILLIN, AND OTHER ANTIBIOTICS.

Celanese Corp. Of America

NEWARK . . . NEW JERSEY

CENTRIFUGAL EXTRACTION UNIT USED
FOR SOLVENT EXTRACTION OF CHEM-
ICALS.

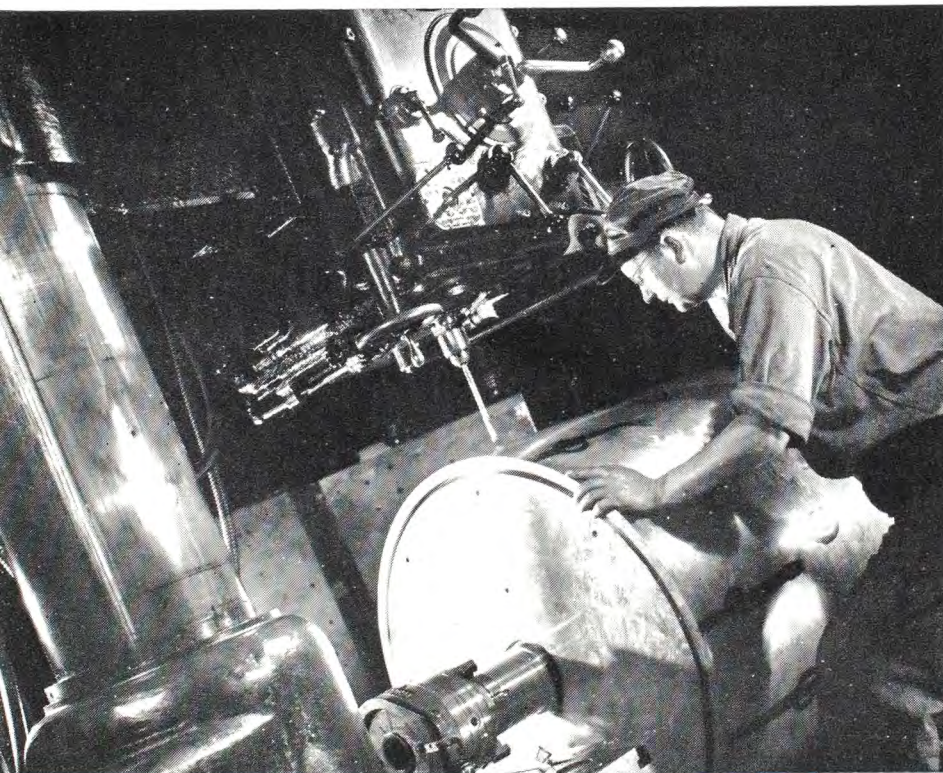




**Schenley
Laboratories,**

LAWRENCEBURG . . INDIANA

**CENTRIFUGAL SOLVENT EXTRACTORS
PROCESSING PENICILLIN.**



Podbielniak Plant,

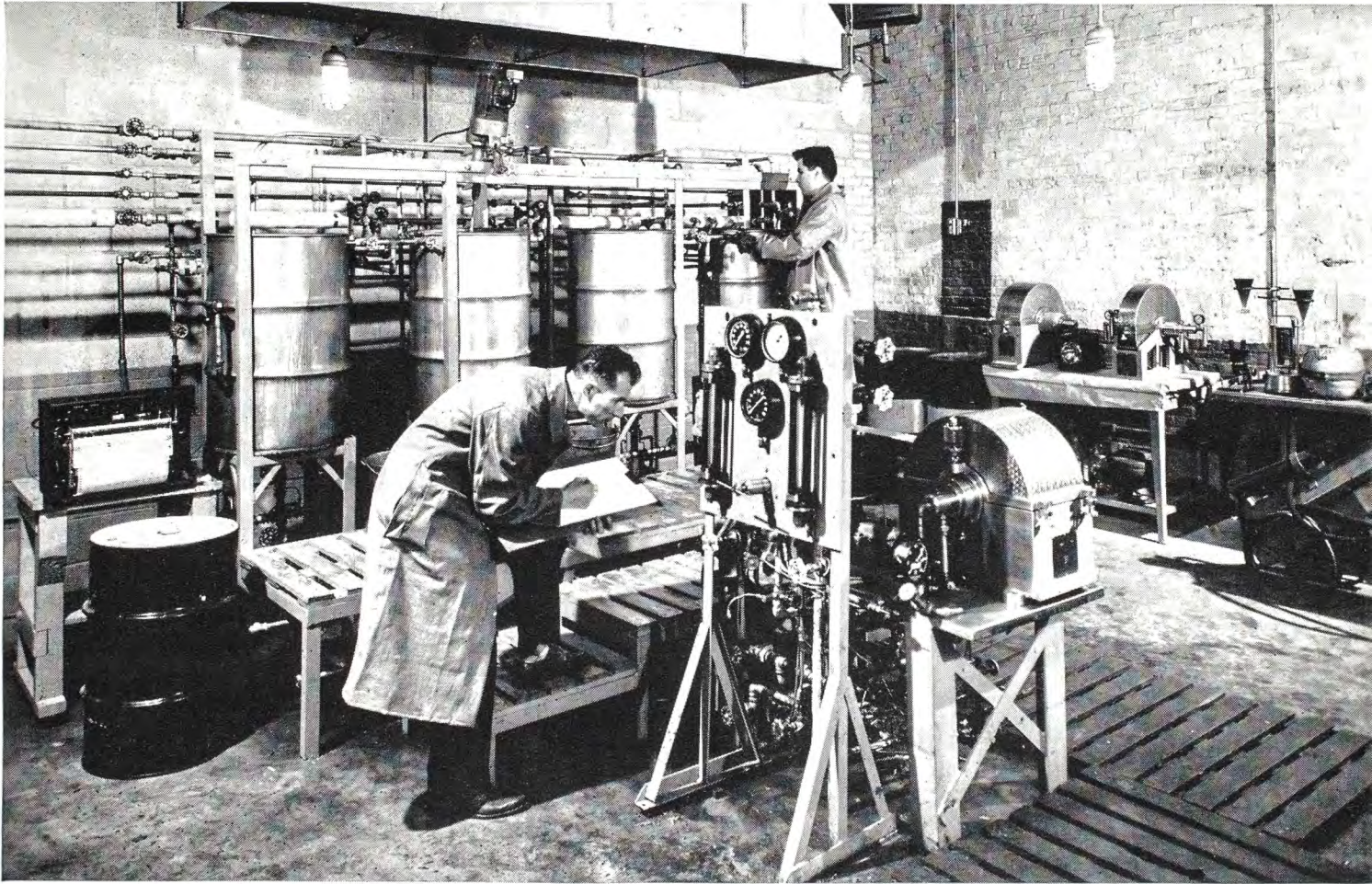
CHICAGO ILLINOIS

**CLOSE-UP VIEW OF CRAFTSMAN MA-
CHINING A CENTRIFUGAL SOLVENT
EXTRACTOR ROTOR ASSEMBLY.**

We Invite YOU

... to our new Podbielniak Centrifugal Contactor Testing Laboratories

UNIQUE FACILITIES FOR INVESTIGATING AND PILOT TESTING OF LIQUID-LIQUID AND LIQUID-SOLID CONTACTORS ON EXTRACTION PROCESSES AND MATERIALS



We offer a completely equipped pilot and chemical testing laboratory for performance evaluation and chemical tests on customers' materials and process conditions.

These laboratories are fully equipped for a wide range of centrifugal and solvent extraction tests, including low and high temperatures; corrosive or inflammable liquids, with the necessary laboratory distillation, volumetric and other sample evaluation tests.

Bring your samples
We offer two unique services!

To assist those using or investigating solvent extraction processes, we offer a new type of service.

Write for blank questionnaire in order that we may be able to determine whether or not your materials can be processed through any of our centrifugal contactors.

A completely equipped PILOT TESTING LABORATORY for short-time performance evaluation tests on customers' specific materials. Centrifugal contactors of varied construction may be mounted upon the "Master Test Stand" to determine the most suitable design for specific materials.

Laboratory and Pilot Centrifugal Contactors are available for study of any and all liquid-liquid and liquid-solid contacting processes in our laboratories.

It is possible, that on the basis of adequate test data, thus obtained on specific materials, we may be able to develop production size units for you on a performance guarantee basis. We can handle almost any capacity from 500 cc./minute to 25,000 gals./hour.

SERIES 400 PODBIELNIAK

AUTOMATIC PILOT AND FRACTIONATING PLANT

Fractioneer

Introducing
Fractioneer

GENERAL DESCRIPTION

THE FRACTIONEER is a completely engineered pilot and small scale production fractionating plant.

Batch charges from 5 to 100 gallons; distillation pressure from 5 mm. abs. to 300 psig.; reflux ratios to 100-1; temperatures from below -50°F (depending on coolant available) to above 350°F . Column diameter up to 12"; efficiency up to 50 or more theoretical plates.

Its basic design is such that many modifications from the standard may be varied with flexibility to suit the individual application.

SUGGESTED APPLICATIONS

Petroleum Crude Oil Evaluation
Essential Oil Separation and Purification
Motor Fuel Fractionating and Blending Tests
Pilot Investigation of Distillation Processes
Fractional Distillation of Small Production Batches of Chemicals
Final Purification of Quality Grade Distillable Chemicals

FEATURES

Novel Forced-Circulation Vaporizer

Speeds distillation; improves fractionating characteristics; invaluable for processing heat-sensitive materials.

New High-Efficiency "OCTA-PAK*" Packing!

For high plates with low column height, high capacity with low pressure drop. Especially effective for vacuum fractionation.

Completely Engineered Assembly

All distilling components designed for matched function and for simplest support, piping and assembly; instruments and electric controls, etc., mounted on control panels; little assembly is needed by customer; plant is semi-portable.

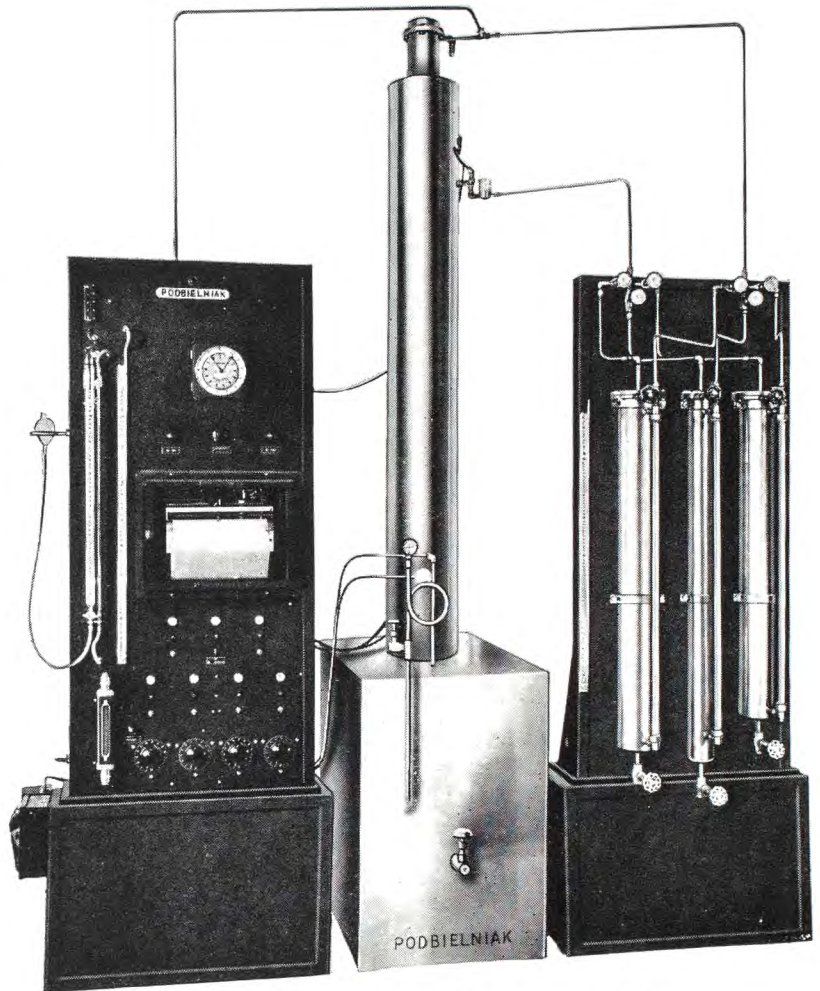
Automatic Heat Input, Reflux Ratio and Cooling Control; Multiple Temperature Recording Potentiometer; Vacuum Control; Safety Interlocks and Signals.

Custom-Tailored to Exact Requirements, following laboratory or pilot distillation tests in Podbielniak laboratories on customers' materials.

Explosion-Proof Construction.

Stainless Steel or Other Corrosion-Resistant Metals.

*Refer to description of Column Packings on following page



View of a "Fractioneer*" Distilling Plant

FORCED CIRCULATION VAPORIZING SYSTEM

This circulation vaporizing system is an innovation in this type of apparatus and a necessity for the vacuum distillation of heat-sensitive essential oils, high-boiling petroleum fractions, etc. A specially fitted centrifugal pump circulates charge liquid heated (hot water, steam or Dowtherm) at very high velocity and circulation ratio, to effect instant low temperature heating and flash vaporization, and to disengage low-boiling fractions for more effective fractionation. This heating system also makes possible a great reduction in time necessary to heat up the apparatus from start, and to bring it to equilibrium and operating conditions.

**Patent pending

Write for information

OCTA-PAK
HELI-PAK

RANDOM

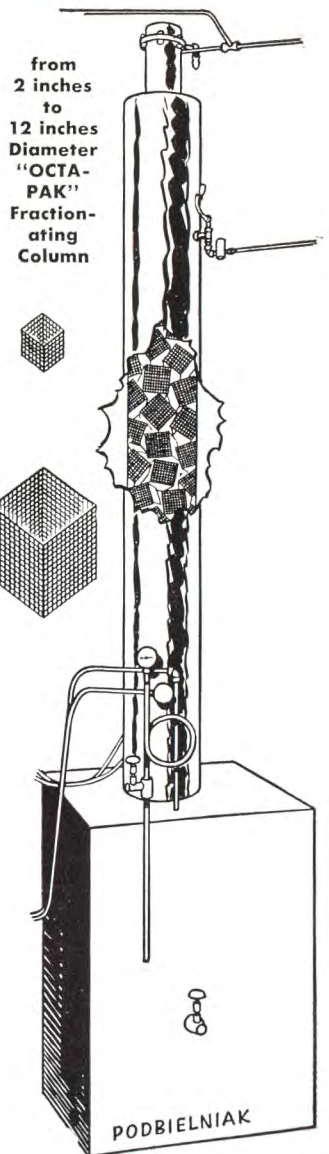
HIGH EFFICIENCY COLUMN PACKINGS

For all Fractionating Columns - 1/2" to 12" Diameter

MYRIAD MECHANICAL SPONGELETS THAT POUR LIKE SUGAR!

See the RANDOM Type, high efficiency column packings, "HELI-PAK" and "OCTA-PAK" in the above ALEMBICS, or in the FRACTIONEER shown on the preceding page. Both the "HELI-PAK" and "OCTA-PAK" column packings herein illustrated are scientifically engineered for effective contacting of vapor and liquid through capillary distribution with dimensions adjusted on the basis of exhaustive distillation tests for optimum balance of *H.E.T.P.*, Capacity, *Hold-Up* and *Pressure Drop*. Packings are non-tangling, easily removable from columns, and their performance is not sensitive to exact manner of pouring into column. Available in any standard or rare metals.

Up to 6 inches Diameter "HELI-PAK" Fractionating Column



FEATURES

"HELI-PAK"* Wire Coil Type

THREE SIZES: (A) 0.035" x 0.070" x 0.070"; (B) 0.050" x 0.100" x 0.100"; (C) 0.092" x 0.175" x 0.175", for 5 to 150 mm. column diameter range.

H.E.T.P. as low as 0.2", lowest and smallest reported for any random packings; permits use of short columns of adequate plates.

HIGH EFFICIENCY FACTOR, (Distilling rate ÷ Holdup per Plate) for superior analytical and all-around performance.

LOW PRESSURE DROP, less than 0.7 mm. H₂O per plate, important in vacuum fractionation.

LOW COST

Both the RANDOM Type "HELI-PAK" and the "OCTA-PAK" are lower in cost than any other available high-efficiency packings, on a per plate and performance basis. In particular, the "OCTA-PAK" offers outstanding economy both in lower cost per liter and in making possible substantial reduction in column height as against less efficient packings.

Please write for complete information on the "HELI-PAK" and "OCTA-PAK" packings herein described; also on our integral "HELI-GRID" packing (8 mm. to 30 mm. dia.) and our laboratory fractionating columns and complete analytical apparatus not illustrated.

*Patents and patents pending

"OCTA-PAK"* Wire Screen Type

TWO SIZES: 0.200" and 0.300" for column diameters 2" to 12".

H.E.T.P. proportionate to packing size, but compares favorably with all other random packings of similar dimensions.

AMPLEY STRONG to withstand loading in tall large diameter columns and frequent handling.

BALANCED HIGH CAPACITY, low H.E.T.P., and Low Pressure Drop, making it specially suitable for vacuum fractionation down to as low as 3 mm. abs. Hg.



Symbol of
PODBIELNIAK



CENTRIFUGAL CONTACTORS