

FILE NAME: Gardner Denver (GD)

DATE: 1946 Jan

DOC#: GD006

DOCUMENT DESCRIPTION: Trade Journal - Southern Power & Industry

SOUTHERN POWER AND INDUSTRY

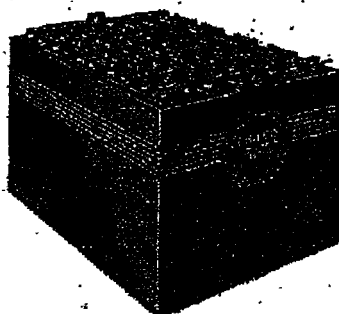


ELECTRIC TRUCKS
PALLETIZED LOADS
PHILCO BATTERIES

SOUTHERN DIVISION OFFICE
915-101 Marietta Street Bldg.
Atlanta, Ga.

Sales Agents in
New Orleans • St. Louis • Dallas
El Paso • Houston • Bluefield

Big Three in War and Peace!



Now that wide war-time experience with unit loads has proved battery-powered electric trucks the most flexible, safe, cost-saving equipment for handling materials and finished goods—make this knowledge pay off! Go the whole way by powering your electric trucks with the amazing new Philco "Thirty", the high capacity battery that gives 30% longer life! It will save you money. Write for the new Philco "Thirty" specification catalog.

Philco Corporation, Storage Battery Division, Trenton 7, New Jersey

PHILCO FOR 50 YEARS A LEADER
IN INDUSTRIAL STORAGE BATTERY DEVELOPMENT

Why Worry about Lubrication?

8 Balanced Design Features

OF RELIANCE SERIES C MOTORS

1. Protecting enclosures keep out dirt, chips, oil, excess moisture.
2. Steel stators for strength.
3. Thirteen-step winding treatment, for minimum stator protection.
4. Pressure cast aluminum rotors provide trouble-free windings.
5. Heavy shafts, heavily designed for added strength.
6. Improved bearing lubrication affords real protection to bearings and windings.
7. Optional lead outlet arrangement permits machine working with elimination of conduit box.
8. Flange and foot type brackets offer alternative methods of machine application.

● Reliance Series C Motors are designed and precision built to make it *absolutely impossible to grease them wrong*. On the vast majority of applications, these factory lubricated motors continue to operate *for years* with no additional lubrication whatsoever. In cases where unusual conditions make occasional attention necessary—or if it is your practice to lubricate at regular intervals—undergreasing or overgreasing make no difference. Write for Bulletin C-118 which tells the whole story—and specify Reliance Series C Motors to forget lubrication worries.

RELIANCE ELECTRIC & ENGINEERING CO.

1057 Ivankoe Road  Cleveland 10, Ohio

Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville • Houston • Indianapolis • Knoxville • Los Angeles • Minneapolis • New Orleans • New York • Philadelphia • Pittsburgh • Portland, Ore. • Rockford, Ill. • St. Louis • San Francisco • Seattle • Syracuse • Washington, D.C.

RELIANCE^{AC}_{DC} MOTORS

SOURCE POWER & EFFICIENCY is published monthly by W. E. Smith Publishing Company, Dallas and Atlanta, Ga., U. S. A. Subscription Rates: United States and Possessions, \$1.00 per year; Canada, \$1.50 per year; Foreign Countries, \$2.00 per year. Entered as second-class matter of the Post Office at Dallas, Tex.

LIBRARY OF
Methodist University
TEXAS

Something new is being added.

to make the *Nalco* System
of water treatment an even
greater service to industry

Not content with the world's finest and most modern water treatment laboratories... Nalco is now enlarging its research and laboratory facilities to make the Nalco organization even further advanced in the science of water treatment.

New technological and manufacturing processes springing up in this postwar era are bringing with them new problems in water treatment... *Nalco will be ready to help you solve these problems!*

Keeping well ahead of your water treatment problems has always been an aim of the Nalco organization. Our trained engineers and chemists and our entire research and laboratory facilities are at your disposal. Just ask for a Nalco survey... we will do the rest.

NATIONAL ALUMINATE CORPORATION

6226 West 46th Place • Chicago 36, Illinois
Canadian inquiries should be addressed
to Aluminat Chemical Ltd., 556
Bathurst Ave., Toronto, Ont.

Nalco — The System of Scientific Water Treatment for all industry

BUILDING CONVEYOR

BELTING

TAKES BOTH

Know-How AND Follow-Through

THE BUILDING of a Republic conveyor belt is a specialized job, calling for skill, workmanship and experience. Each belt is virtually "tailor-made." While rubber, reinforcing components and construction details are specified previously by Republic technologists, according to service requirements, the actual belt-building has its variations, too, and is equally important. On the expertness of belt-builders depends the "follow-through"—the proper alignment of fabrics so the belt will run true, the care in location of seams, the sealing-in of the reinforcing carcass for protection against moisture, and other on-the-spot factors of construction. For whatever purpose a Republic Conveyor Belt is built, you may be sure of this "tailor-made" value. Consult the nearby Republic Distributor on your next installation.

REPUBLIC RUBBER

DIVISION
LEE RUBBER & TIRE CORPORATION
YOUNGSTOWN, OHIO

REPUBLIC INDUSTRIAL PRODUCTS
DIVISION
1000 W. 10TH ST.
YOUNGSTOWN, OHIO



WE RECOMMEND REPUBLIC RUBBER

FOR ALL YOUR RUBBER NEEDS
AND TUBES
AND TUBES
AND TUBES
AND TUBES



SALES AND SERVICE
A DIVISION OF
LEE RUBBER & TIRE CORPORATION
YOUNGSTOWN, OHIO



SOUTHERN POWER AND INDUSTRY

Editors—

Francis C. Smith,
Eugene W. O'Brien.

Southeastern Editor—

Hunter R. Hughes, Jr.

Production Mgr.: W. R. Cogler
Managing Director: E. W. O'Brien

Business Representatives

R. L. Rogers, 18 East 48th St.,
Room 1804, New York 17,
N. Y.—Phone, Plaza 8-2288
Helen R. Holliman, 26 Bowdoin
St., Cambridge, N. Y.—Phone
So. Orange 2-3484
Maynard L. Durham, 61 Cortlandt
St., Buffalo 16, N. Y.—
Phone, Amherst 6522
A. M. C. Smith, 240 Auditorium
Building, Cleveland 14, Ohio
—Phone, Cherry 7802
P. D. Johnson, 188 North
Michigan Ave., Chicago 3,
Ill.—Phone, Central 4121
J. B. Chappell, Auditorium Bldg.,
427 West 5th St., Los Ange-
les, Calif.—Phone, Tucker
6522
Hunter R. Hughes, Jr., 1841 Kil-
buck Bank Bldg., Dallas,
Texas.—Phone, Central 7672

Annual Subscription—\$1.50
Canada—\$1.50; Foreign \$2.00

Published Monthly by

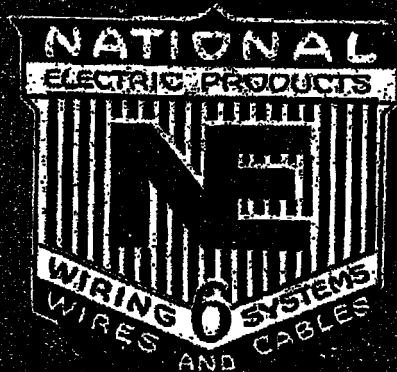
W. R. C. SMITH
PUBLISHING CO.

Published also at: *Electric, Elec-
trical News, Southern Electrician,
Southern Automotive Journal.*

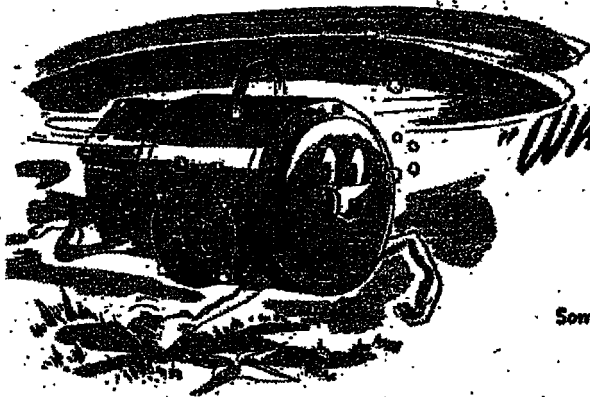
W. J. Rooks, President; H. P.
Smith, Executive Vice-President;
H. W. McAllister, Vice-President;
E. W. O'Brien, Vice-President;
A. M. C. Smith, Vice-President;
J. C. Cook, Vice-President; G. A.
Sharpless, Treasurer; A. H. Rob-
erts, Secretary.

Editorial and Executive Offices

GRANT BUILDING
ATLANTA, GEORGIA



National Electric
PRODUCTS CORPORATION
Pittsburgh 22, Pa.



"What! Build a Motor to Run Underwater for 90 Days?"

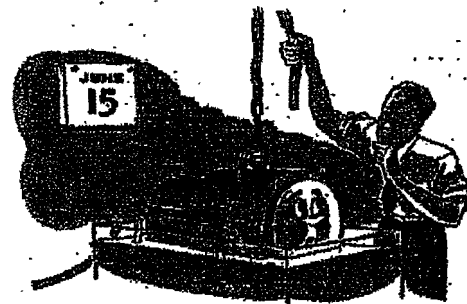
Some said "Impossible!" But the Navy insisted, "We want a motor that likes water so well, it'll run in 25 feet of it for 90 days. What's more—it's got to be lighter, more compact than standard motors."



No diving suits allowed! Biggest problem was water-proof, pressure-proof casings. Cast-iron wouldn't do — too porous. So we turned to fabricated steel — tough, durable — and lightweight too!



Then we found that fabricated parts could be successfully welded together to assure water-tightness. For proper magnetic characteristics, we decided to use field yokes of one-inch rolled steel.



Things look better! We reinforced end-housings, double-checked insulation, made sure exposed parts were leak-proof. Nothing left to do but put our baby in the test-tank, check it regularly, and hold our breath.



90 days later—we took a good look. Motor still running and not a drop of water inside! That called for a short cheer and wide smiles all around. Mass production of these motors followed.



There's a More! Every time Allis-Chalmers engineering solves special motor problems, we discover new ways to build better standard motors for you. **ALLIS-CHALMERS**, MILWAUKEE 1, WIS.

A 1927

Wait 'til you see the NEW

ALLIS-CHALMERS MOTORS!

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

WHERE TO GET IT

And How to Do It

—INDEX OF HELPFUL BOOKLETS, BULLETINS, REFERENCE LITERATURE—

Cooperating with leading manufacturers of equipment and supplies, SPI makes available for the asking, without cost or obligation, the following valuable bulletins, booklets, handbooks and catalogs.

Check the list, fill in Coupon, mail to SOUTHERN POWER & INDUSTRY. (Coupon on page 12)

This service restricted to those interested in the operation or design of Industrial, Power and Service Plants.

STEAM PLANT . . . FURNACES, BOILERS, STOKERS, BURNERS

10 **BURNER ASHES PROPORTIONS**—Booklet 34 1/2 pages—Describes the practical way to control and burning in steam boilers by using ash. —NATIONAL ENGINEERING CO., Dayton, Ohio.

13 **FUELVENUE FUEL**—Guides for 105 pages—Describes the various systems for burning pulverized coal. —Symposium on pulverized coal firing and its influence on the design of furnaces. —AMERICAN POWER & LIGHT CO., 100 Madison Ave., New York, N. Y.

23 **DUST IN INDUSTRY**—Bulletin SP-4 4 pages—Describes the control and collection of dust in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

27 **COAL GRINDERS**—Bulletin SP-5 40 pages—Describes the various types of coal grinders and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

39 **STOKERS**—Bulletin SP-6 15 pages—Describes the various types of stokers and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

48 **STEAM TURBINES**—Bulletin SP-7 100 pages—Describes the various types of steam turbines and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

49 **STEAM TURBINES**—Bulletin SP-8 100 pages—Describes the various types of steam turbines and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

75 **TURBINE AND GEAR FURNELATION**—Bulletin SP-9 100 pages—Describes the various types of turbine and gear furnelation and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

95 **DUST CONTROL**—Bulletin SP-10 100 pages—Describes the various types of dust control and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

FANS, PUMPS, COMPRESSORS, HEATERS, HEAT TRANSFER

151 **CENTRIFUGAL PUMPS**—Bulletin SP-10 100 pages—Describes the various types of centrifugal pumps and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

152 **PUMP FURNELATION**—Bulletin SP-11 100 pages—Describes the various types of pump furnelation and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

153 **TURBINE PUMPS**—Bulletin SP-12 100 pages—Describes the various types of turbine pumps and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

156 **AIR COMPRESSORS**—Bulletin SP-13 100 pages—Describes the various types of air compressors and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

157 **STEAM CONDENSERS**—Bulletin SP-14 100 pages—Describes the various types of steam condensers and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

159 **WATER HEATERS**—Bulletin SP-15 100 pages—Describes the various types of water heaters and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

160 **WATER HEATERS**—Bulletin SP-16 100 pages—Describes the various types of water heaters and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

172 **PUMPS, COMPRESSORS, TUBES**—Bulletin SP-17 100 pages—Describes the various types of pumps, compressors, and tubes and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

177 **HEAT EXCHANGERS**—Bulletin SP-18 100 pages—Describes the various types of heat exchangers and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

179 **HEAT EXCHANGERS**—Bulletin SP-19 100 pages—Describes the various types of heat exchangers and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

184 **WATER HEATERS**—Bulletin SP-20 100 pages—Describes the various types of water heaters and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

INSTRUMENTS, METERS, CONTROLS, REGULATORS

245 **PIZZOZZI**—Literature describing various types of instruments, meters, controls, and regulators. —PIZZOZZI CO., 100 Madison Ave., New York, N. Y.

254 **MAQUET**—Literature describing various types of instruments, meters, controls, and regulators. —MAQUET CO., 100 Madison Ave., New York, N. Y.

255 **TEMPERATURE REGULATORS**—Bulletin SP-21 100 pages—Describes the various types of temperature regulators and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

256 **WATER HEATERS**—Bulletin SP-22 100 pages—Describes the various types of water heaters and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

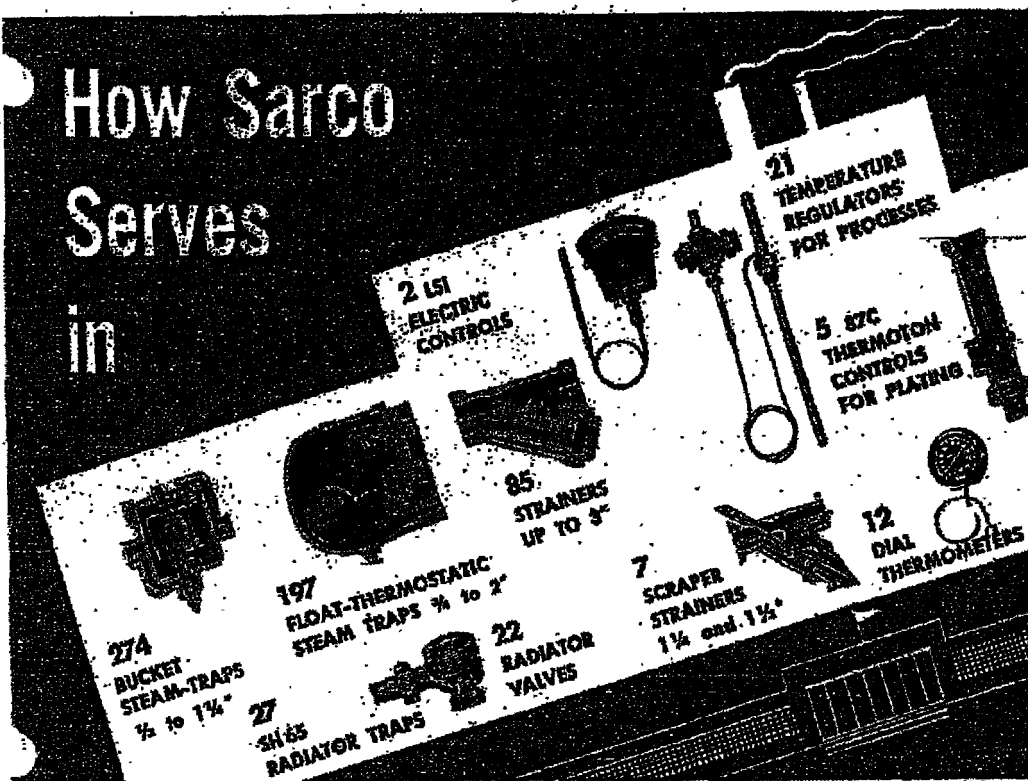
257 **WATER CONDENSERS**—Bulletin SP-23 100 pages—Describes the various types of water condensers and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

258 **WATER HEATERS**—Bulletin SP-24 100 pages—Describes the various types of water heaters and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

259 **CONTROL VALVES**—Bulletin SP-25 100 pages—Describes the various types of control valves and their use in industry. —American Power & Light Co., 100 Madison Ave., New York, N. Y.

Continued on Page 10

How Sarco Serves in



THE MODERN FACTORY

Here is a typical case with no name mentioned, because it is a defense plant. The industrial company and their contractor decided to standardize on Sarco for all steam traps and temperature control because in their years of experience in connection with many other jobs, there was no other line as broad and versatile and as reliable.

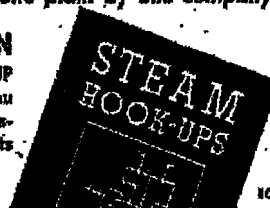
The illustration above shows the extent to which eight different but related Sarco products were used in this one plant, and the wide range of sizes required. Team work in operation was obviously secured.

Other advantages of standardization with Sarco are:

Ease of inspection and cleaning without disturbing the piping. Small number of spare parts required in stores. Ease of obtaining duplicates for additions or extensions, and the knowledge that all parts were made in one plant by one company.

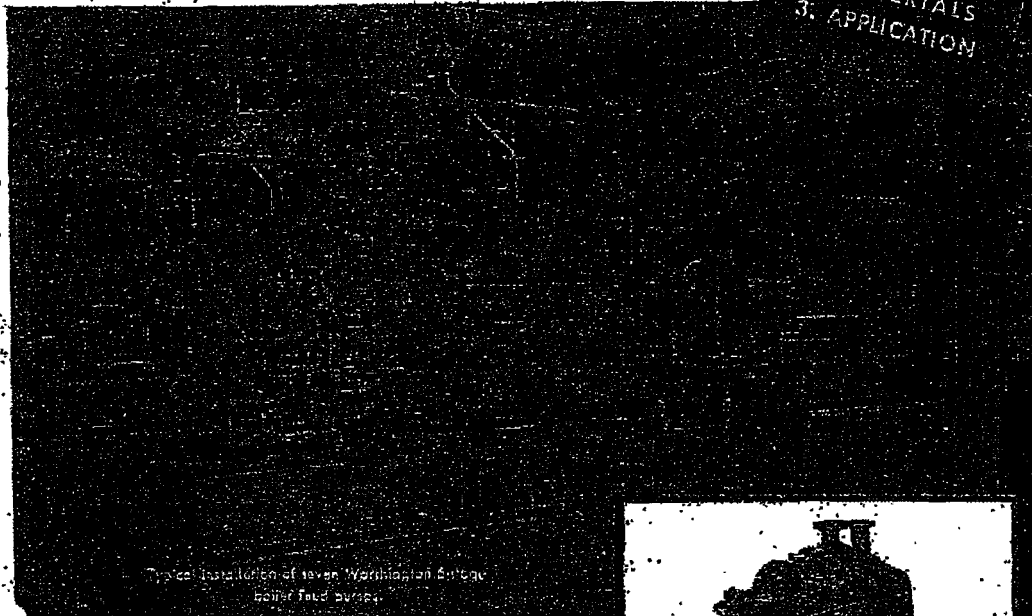
WHEN YOU PLAN

get the Sarco HOOK-UP BOOK which will show you how completely and satisfactorily Sarco products can serve your plant.



WHY WORTHINGTON HIGH-PRESSURE PUMPS excel in all three . . .

1. DESIGN
2. MATERIALS
3. APPLICATION



Typical installation of several Worthington centrifugal boiler feed pumps.

1. DESIGN—Worthington has longer experience in manufacturing high-pressure centrifugal boiler feed pumps . . . has acquired unique constructive ideas from power-plant operating engineers. That's why you'll find such superior design features in Worthington high pressure boiler feed pumps as: a balancing device construction that minimizes wear; bolted ring-type pressure joints; impellers shrunk on the shaft; oversized Kingsbury thrust bearings.

2. MATERIALS—Worthington has greater facilities for research. That's why you'll find the right materials in Worthington high-pressure boiler feed pumps: stainless steel for internal parts—to prevent destructive corrosion and erosion; forged steel casings—tested and proved by years of power plant operation.

3. APPLICATION—Worthington Pump Application Engineers are thoroughly versed in every phase of applying the most complete line of boiler feed pumps for high or low pressures—capacities from 50 to 3500 GPM . . . pressures from 50 to 2500 PSI. That's why Worthington will fit the right feed pump to your feed cycle.

For further details on Worthington High-Pressure Boiler Feed Pumps . . . or for an appointment with a Worthington P.A.E.*, write us or telephone the nearest of our 36 district offices. You'll find



AS EASY TO DISMANTLE AND ASSEMBLE AS A SPLIT-CASE PUMP

Complete rotor assembly of Worthington High-Pressure Boiler Feed Pump can be withdrawn *in place* on a portable assembly truck without disturbing suction or discharge piping connections. Simplifies inspection, replacement or repair of internal parts.

that there's more worth in Worthington. Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.

*Pump Application Engineers



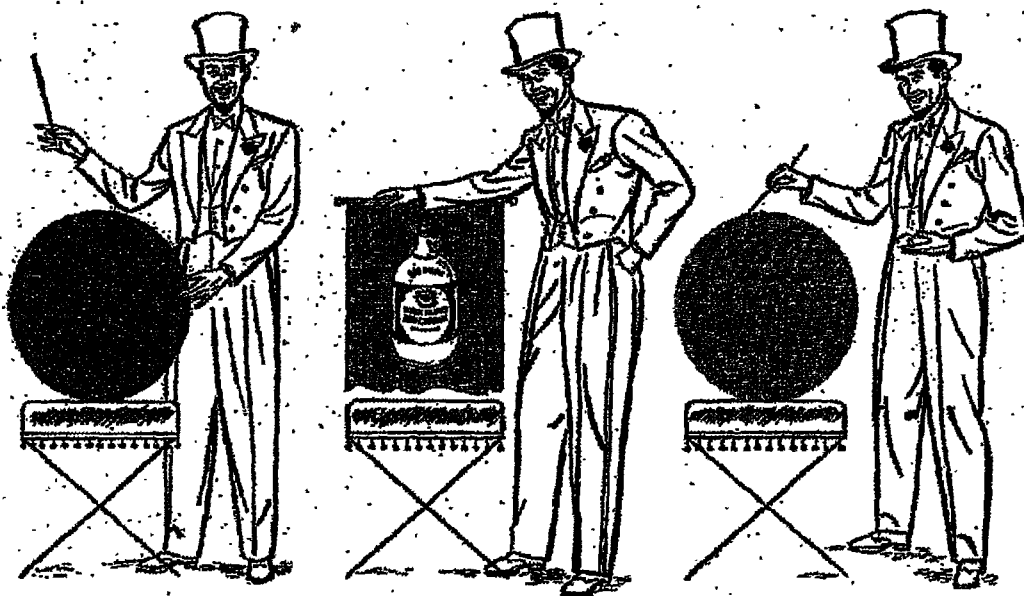
WORTHINGTON



THE WORLD'S
LARGEST
MANUFACTURER
OF
PUMPS

For Boiler Feed Service Capacities from 50 to 3500 GPM Pressures from 50 to 2500 PSI	For Hot-Water Service Capacities from 50 to 3500 GPM Pressures from 50 to 2500 PSI	For Boiler Feed Service Capacities from 50 to 3500 GPM Pressures from 50 to 2500 PSI	For Hot-Water Service Capacities from 50 to 3500 GPM Pressures from 50 to 2500 PSI	For Boiler Feed Service Capacities from 50 to 3500 GPM Pressures from 50 to 2500 PSI	For Hot-Water Service Capacities from 50 to 3500 GPM Pressures from 50 to 2500 PSI

Now you see it... Now you don't



What you see is a close-up of rust formation, Industry's \$100,000,000 annual toll. What you *don't* see is its quick elimination with CITIES SERVICE RUST REMOVER.

Converting your rust liability into profit isn't magic... it's made possible by Cities Service Rust Remover—an effective product—proved in scores of industrial plants. Easy to apply—inexpensive—can be used over and

over again with little waste.

Once you have cleared your machined parts of rust, the next step is to protect them against further rusting. Then you will want one of the Cities Service Anti-Corrodes to provide an impenetrable film that really protects. One of our Lubrication Engineers will be glad to help you select the right one. Write, wire or phone our nearest office or...

Cities Service Oil Co.
Room 557, 70 Pine Street, New York 5, N. Y.

Gentlemen: Please send me full information on Cities Service Rust Prevention Plan.

Name

Title

Company

Address

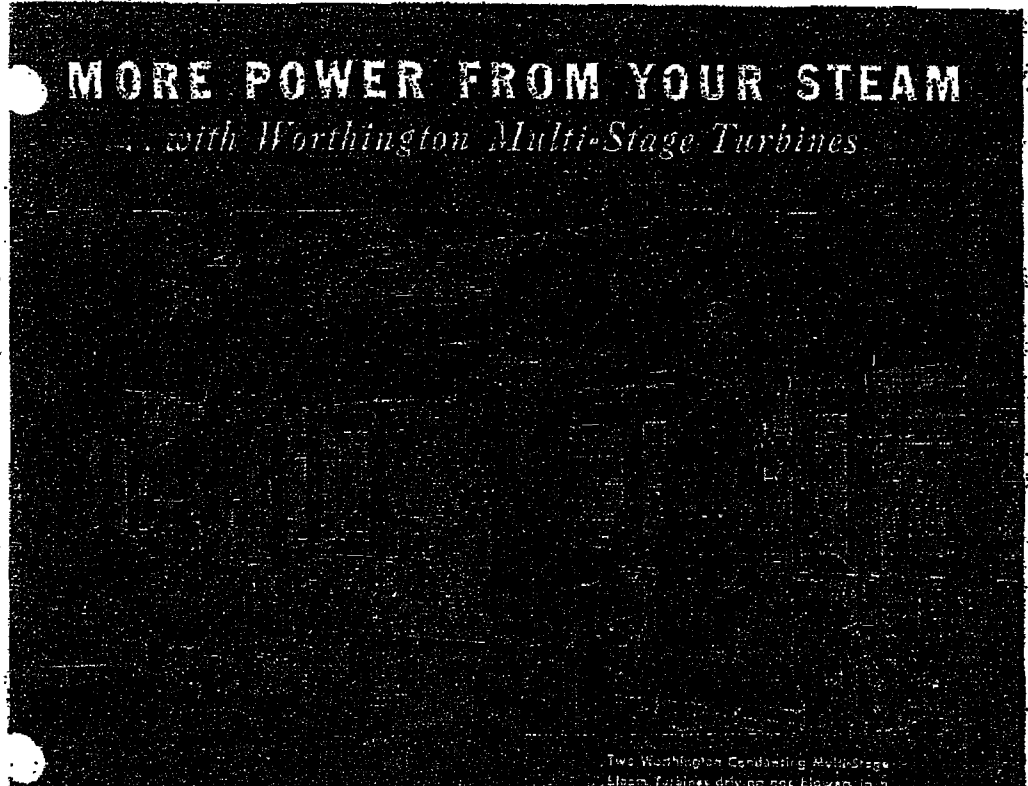
City State

**MAIL THIS COUPON
TODAY**



MORE POWER FROM YOUR STEAM

with Worthington Multi-Stage Turbines



Two Worthington Condensing Multi-Stage Steam Turbines driving gas blowers in a large utility.

You will want to investigate Worthington Multi-Stage Steam Turbines for either condensing or non-condensing service. Worthington's familiarity with all phases of steam power and specialized knowledge of Steam Turbine engineering account for *low maintenance and smooth, dependable economic operation.*

Low steam consumption is inherent in the design of these turbines, built in sizes from 100 HP to 10,000 HP for operation on high or low pressure steam and for speeds up to 9000 RPM. For full descriptive literature, write *Worthington Pump and Machinery Corporation, Harrison, N. J.*

WHO USES THEM?

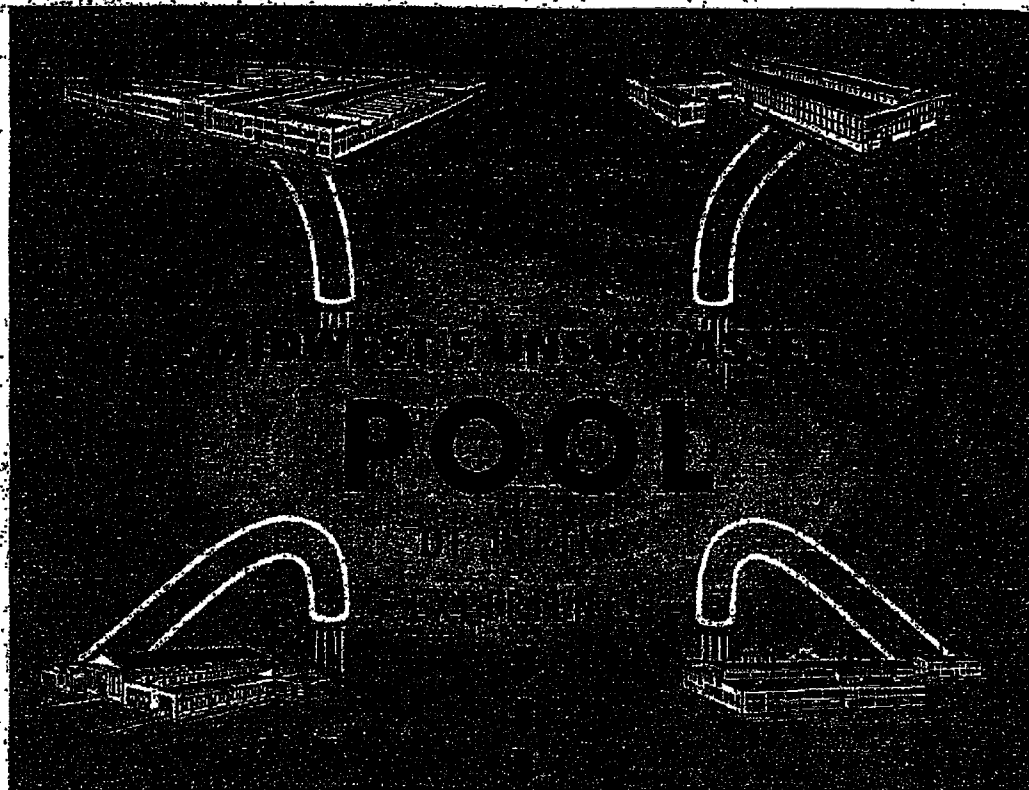
Worthington Multi-Stage Steam Turbines—condensing and non-condensing types—are now driving blowers, generators, pumps, line shafts, refrigeration compressors, air-conditioning units, paper machines, cane shredders, etc. Data that proves *there's more work in Worthington* is available on request.

WORTHINGTON



**A GREAT
TEAM
IN
STEAM**





ASSURES the User BETTER PIPING

Continuous interchange of experience data and manufacturing information between Midwest's four pipe fabricating plants results in a pool of piping experience that is unsurpassed by any other organization.

Each plant is fully equipped to do a complete job of pipe fabricating—is staffed by piping experts of long experience and high qualifications. Each plant is always striving to improve its product. A friendly rivalry acts as a stimulant.

Information on new processes and techniques, solu-

tions to unusual piping problems, and generally useful data are exchanged between these plants. One plant will develop an improvement in welding procedure for a difficult alloy . . . another will build a new fixture for saving time in welding . . . etc. For many years this exchange has been building up an unsurpassed pool of piping experience and "know how."

This is just one of several reasons why Midwest can do a better piping job for you . . . whether you want a simple bend or piping for an entire plant installed without divided responsibility.



**4 PLANTS ARE
BETTER THAN 1**

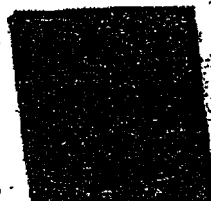


"My high Rust I. Q.* protects metal equipment!"

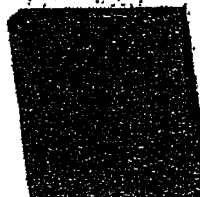
*Inhibitive Quality

Steel Block Test proves Eagle Super "66"
is rust-inhibitive!

Here is how one steel block looked after being imbedded in a regular insulating cement during the test period. Note the extent of the rust. Such corrosion also occurs on iron and steel equipment whether heated or cold.



The other steel block looked like this after being imbedded in Eagle Super "66" for the same test period. Note absence of rust. This shows how effectively the rust-inhibitive qualities of Super "66" can protect your heated equipment.



As shown by steel block test above, Eagle Super "66" ... in addition to doing an unsurpassed job of insulating ... actually inhibits rust! This means that hard-to-replace heated metal equipment will be better protected as well as more effective if given a coat of this unique plastic insulation.

High Efficiency Results from "Springy Ball" Structure

Eagle Mineral Wool, principal ingredient of Eagle Super "66," is made up of springy pellets containing countless dead air cells, providing highly efficient insulation. "Springy Ball" structure, created by these resilient pellets, is retained after the insulation dries, thus preserving its extremely low thermal conductivity for year-after-year heat savings.



An easy-to-use, all purpose insulation

Eagle Super "66" gives exceptional protection, and can be easily applied with equal effectiveness to almost any shape or size surface. It withstands a full range of temperatures to 1800° F., and if not used at temperatures above 1200° F., can be removed, remixed and reused! Dry coverage is

unusually high ... cost per sq. ft. is less than most insulating cements and blocks.

To guard Eagle Super "66" from outside damage, we recommend Eagle INSULSEAL ... a tough, weatherproof coating that resists scuffs and bumps. Trowels on—dries to a hard finish. Withstands up to 450° F.

Other Eagle Industrial Products include:

Eagle Swithchak (black). A prepared, asphaltic base, anti-condensation compound.

Eagle Drycite (white). A dry, ready-to-mix, anti-condensation compound.

Eagle "43" Finishing Cement. A hard, white finish coating for all types of indoor insulation within a range of from 70° F. to 800° F.

FREE MANUAL! Gives case examples of how industrial insulation effects large fuel savings. Includes Heat Loss Estimate Sheet for your use. Write for your copy.



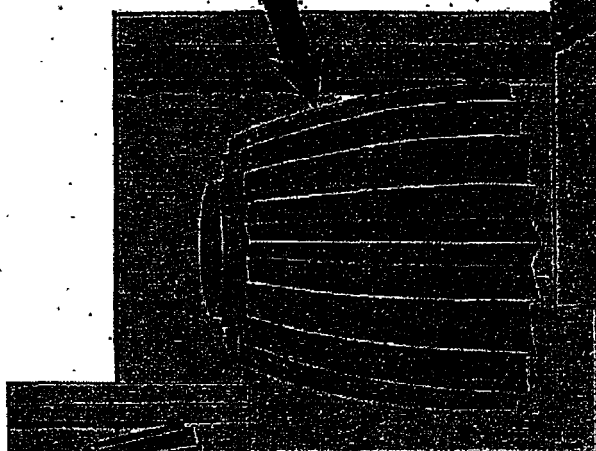
EAGLE-PICHER INSULATIONS High and Low Temperature

Made by THE EAGLE-PICHER COMPANY • CINCINNATI (1), OHIO

Eagle Super "66" Insulating Cement • Eagle L-1 and M-2 Felt • Eagle Superemp Block • Eagle Blankets • Eagle Pipe Covering
Eagle Insulcoat • Eagle Loose Wool • Eagle Insulstic • Eagle Swithchak • Eagle Drycite

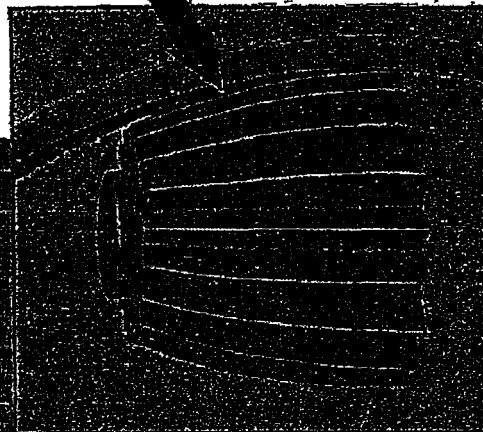
CROWN CUTTERS do a better job

IN STRAIGHT TUBE

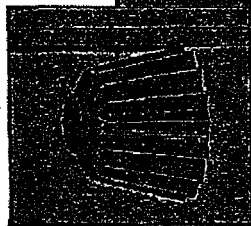


At left, the new type cutter in a straight tube. The curved edge of the cutter permits more of its surface to contact the tube and avoids point contact.

IN CURVED TUBE



Above, the crown cutter in a curved tube naturally and easily conforms to the curve of the tube. More cutting surface is made available on a crown cutter.



WITH FORMER DESIGN the sharp edge at the rear of the cutter was the only part to meet the tube wall.



Improved cutter design for ELLIOTT *Lagonda Type* TUBE CLEANERS

Rounding the teeth of front cutters removes all possibility of sharp corners scoring tubes, particularly in curved tubes. This cutter is now standard in all Elliott cutter heads using a 1 in. or larger cutter. Except for the rounded center section, the cutter is the same in dimension as the straight sided cutter formerly used, and will be supplied on orders for cutter replacements.

"TRACKLESS", TOO—cutter teeth are so spaced as to avoid striking the same point in repeated rotation inside the tube. At each revolution a tooth attacks a point slightly in advance of the former point, removing all deposit and preventing gear design in the tube. Another safeguard protecting tube inner surfaces.

For up-to-the-minute developments in tube cleaning, come to Tube Cleaning Headquarters, Elliott Tube Cleaner Bulletin on request.



ELLIOTT Company

Lagonda Division • SPRINGFIELD, O.
Plants at: JEANNETTE, PA. • RIDGWAY, PA.
SPRINGFIELD, O. • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES

Better because it's Seatless

Why has this blow-off valve become "standard" in over 12,000 boiler plants? Why is it today the universal choice of leading engineers for new boiler installations?

The answer is in the engineering reason behind the valve. It is **SEATLESS**. There is no seat to score, wear and clog with mud, scale and dirt.

Power plant operators hailed this seatless-design valve more than 25 years ago when it was first introduced. It eliminated a source of continual trouble and expense common with conventional type blow-off valves.

Since then constant mechanical and metallurgical research, aimed to meet new and more rigid service requirements, has made improved Yarway Seatless Blow-Off Valves the last word in insurance against boiler blow-down troubles.

See Yarway Blow-Off Valves, hear the seatless principle explained by Lowell Thomas in Yarway's color motion picture "There Is An Engineering Reason." It's available without charge for group showings. Write today.

Roger A. Martin, Southern Rep.
YARNALL-WARING COMPANY

Bone Allen Bldg.,

Atlanta 3, Ga.

YARWAY

BLOW-OFF VALVES

SOUTHERN POWER & INDUSTRY for JANUARY, 1946

HIGH PRICED COAL

Paradoxical—but it can be done with **C-E** Spreader Stokers

All coal is relatively high priced these days and much of it — that which is more easily available — is poor in quality. Paradoxically enough, it is possible to produce low-cost steam with these relatively high-priced, poorer-grade coals. It all hinges on having equipment that will burn them efficiently, and without operating difficulties.

In the final analysis, management is concerned with the cost of coal only insofar as it affects the cost of steam. In general, low steam costs are achieved chiefly through the use of proper fuel burning and steam generating equipment, intelligently operated.

Many plants, all over this country, have found the answer to lowered steam costs by installing C-E Spreader Stokers. This versatile stoker gives an excellent account of itself with almost any grade of coal, thus permitting the plants where it is installed a free choice in the matter of coal selection and enabling such plants to take advantage of any price changes in the coal market.

Why not make your plant independent of the uncertainties of coal price and production—present and future—by installing the service-proved C-E Spreader Stoker? It is a long step in the direction of low steam cost.

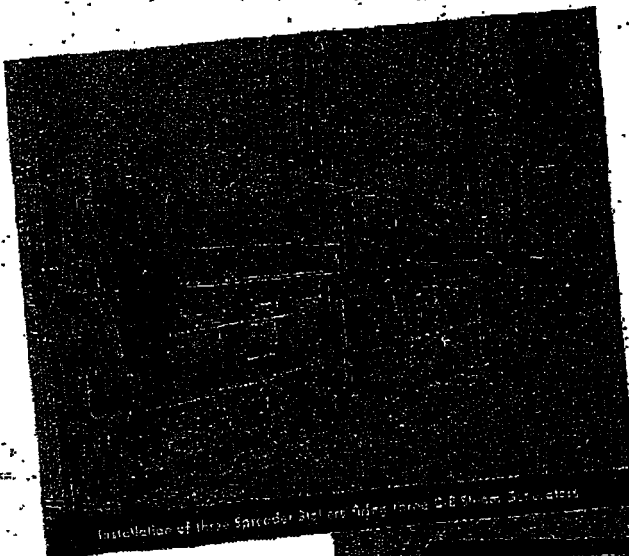
A-778



C O M B U S T I O N

C-E PRODUCTS INCLUDE ALL TYPES OF GRINDERS, FEEDERS, POLYMERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

LOW COST STEAM



Approximate application range of CE Spreader Stoker — 150 boiler hp to largest units suitable for stoker firing. Simple, rugged construction. Hopper, feeding and distributing mechanism, variable-speed drive and motor are contained in a compact unit. Rotating spreader blades feed coal into furnace by crisscrossing streams which insure uniform distribution. Fines are burned in suspension and the rest of the coal is burned on a grate — stationary or dumping type. Grate surface is zoned for regulating air admission and to facilitate cleaning. Adapted to limited space conditions. Easy operation. Low maintenance.

THE SPREADER STOKER PAYS FOR ITSELF OVER AND OVER

In an average installation the cost of coal used in a year exceeds many times the initial cost of a CE Spreader Stoker. Moreover, its first cost is soon absorbed by its saving in coal cost — an economy cycle repeated throughout its many useful years.



ENGINEERING

200 MADISON AVENUE, NEW YORK 16, N. Y.

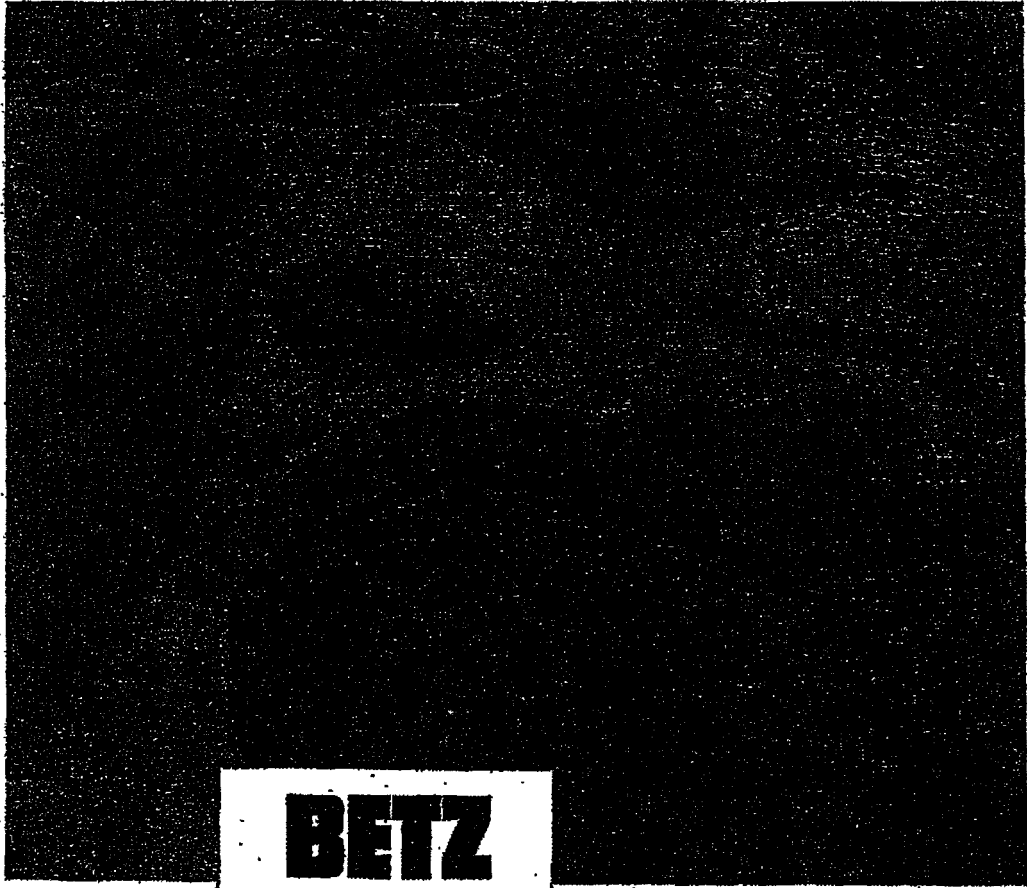
Put Your Water Problem up to Betz...

It has often been said this is an age of specialization. As a matter of standard practice modern industrial management seeks the assistance and guidance of engineering specialists for the solution of operating and production problems. In the field of water conditioning, in particular, supervision by skilled specialists is a "must." The organization of W. H. & L. D. BETZ with a nation-wide staff of engineers and chemists is prepared to assist you in those problems involving boiler feed water...cooling water...process water...industrial waste disposal...and sewage disposal.

Your water problem can be solved by Betz. Here, in one organization you will find all of the facilities and services so necessary to insure you against the hazards of incorrectly conditioned water.



WRITE TODAY for our free booklet giving complete details on the formation and methods for prevention of boiler scale. You will be interested in such specific topics as the mechanics of scale formation—effect of boiler scale—internal chemical treatment—control of chemical treatment—and feeding of internal correctives. Ask for Bulletin 58-C. W. H. & L. D. BETZ, Cullisburgh & Werth Bldg., Philadelphia 24, Penna.

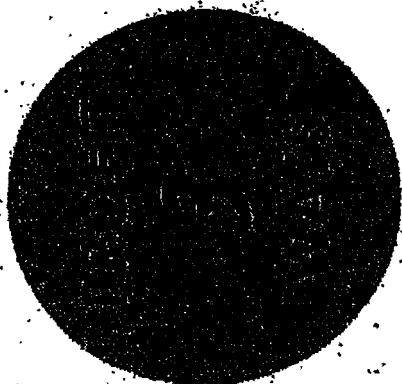


BETZ

BOILER WATER CONDITIONING • COOLING WATER CONDITIONING
INDUSTRIAL WASTE DISPOSAL

Cover photograph from the *Betz Indicator*, a monthly publication devoted to the chemistry and practical applications of water conditioning. The *Betz Indicator* will be mailed without charge at your request.

STEAM PLANTS



FROM BAILEY CONTROLS

● **Get More Steam Per Dollar**

- Save on fuel
- Save on maintenance
- Save on power for auxiliaries

Deliver Better Power Service

Reduce forced outages

Increase unit capacity

Maintain steam pressure on load swings

Insure adequate process steam

Prevent steam waste

Application to Your Plant

If you would like to have this 3-way profit of money saving, improved power service, and greater safety for your plant, call on your local Bailey Engineer. He will analyze your layout and make recommendations. He is in a position to help you secure the 3-way profit which results from the intelligent use of correctly selected and properly coordinated steam plant controls.

Insure Safer Operation

Reduce explosion hazard

Free operators to check any sign of trouble

Prevent excessive steam temperatures

Prevent water carryover and low water

Protect feed pumps at low rates

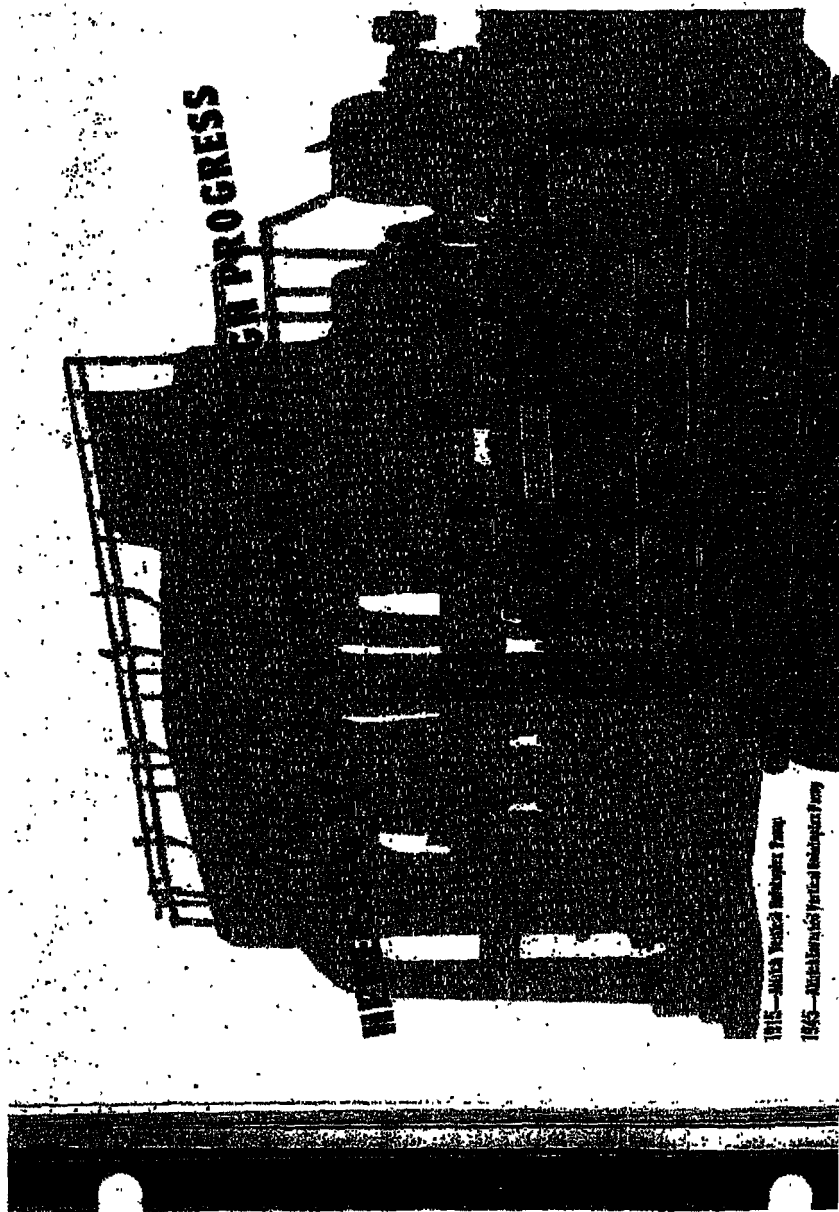
BAILEY METER COMPANY
1828 IVANHOE ROAD

CLEVELAND 10, OHIO

Controls for Steam Plants

COMBUSTION • PRESSURE
FEED WATER • LIQUID LEVEL
TEMPERATURE • FEED PUMPS

SOUTHERN POWER & INDUSTRY for JANUARY, 1946



1915—MEXICAN YACHTS IN MEXICO

1945—MEXICAN YACHTS IN MEXICO

When placed in operation thirty years ago, the Aldrich Vertical Quintuplex Pump was the best that money could buy. Weighing 50,000 pounds and covering 145 square feet of floor space it was an engineering achievement built to operate under severe conditions for many years. With only routine maintenance and repairs, this pump is still in operation. Little wonder that Aldrich pumps have a reputation for sound design and construction.

Today, Aldrich Inverted Vertical Quintuplex Pumps are being specified for similar service. Through Aldrich modern design, a pump of comparable capacity would show that weight is reduced almost 73% to 25,600 pounds and floor

space is reduced almost 83% to 25 square feet. These advantages reduce initial costs and operating expenses without sacrificing rugged, long-life construction.

Why not call on Aldrich engineers for assistance in the solution of your pumping problems? They have been doing this work for more than 40 years, and their specialized experience is available to you. Write to The Aldrich Pump Company, Allentown, Pa.

Representatives: Akron • Birmingham • Boston •
N. Y. • Boston • Chicago • Cincinnati • Cleveland
Denver • Detroit • Duluth • Houston • Jacksonville
Los Angeles • New York • Omaha
Pittsburgh • Portland, Ore. • St. Louis • San
Francisco • Seattle • Tulsa



CONTENTS— ONE STOKER THAT WON'T CLOG!

It's a fact! The A. Perfect Spread Stoker hasn't clogged yet. Even when your coal supply is wet or partially frozen, it feeds readily, steadily, through a foolproof mechanism to the reliable overthrow rotor that spreads a "perfect" fuel bed. Your fuel firing is safeguarded by the exclusive A. non-clog feature, your steam costs reduced because you get more steam from the very lowest grades of coal and solid fuels.

Designed simply from hopper to grates and fully automatic operation from a single low cost power source brings you greater combustion efficiency and new freedom from fuel worries and maintenance problems. Send for the A. Perfect Spread Stoker booklet and look into all the advantages to be gained by modernizing your boiler room now—with the only non-clogging stoker of its kind!

PERFECT SPREAD STOKER

IT'S SEASONED IN **EXPERIENCE**
NEW IN PERFORMANCE!

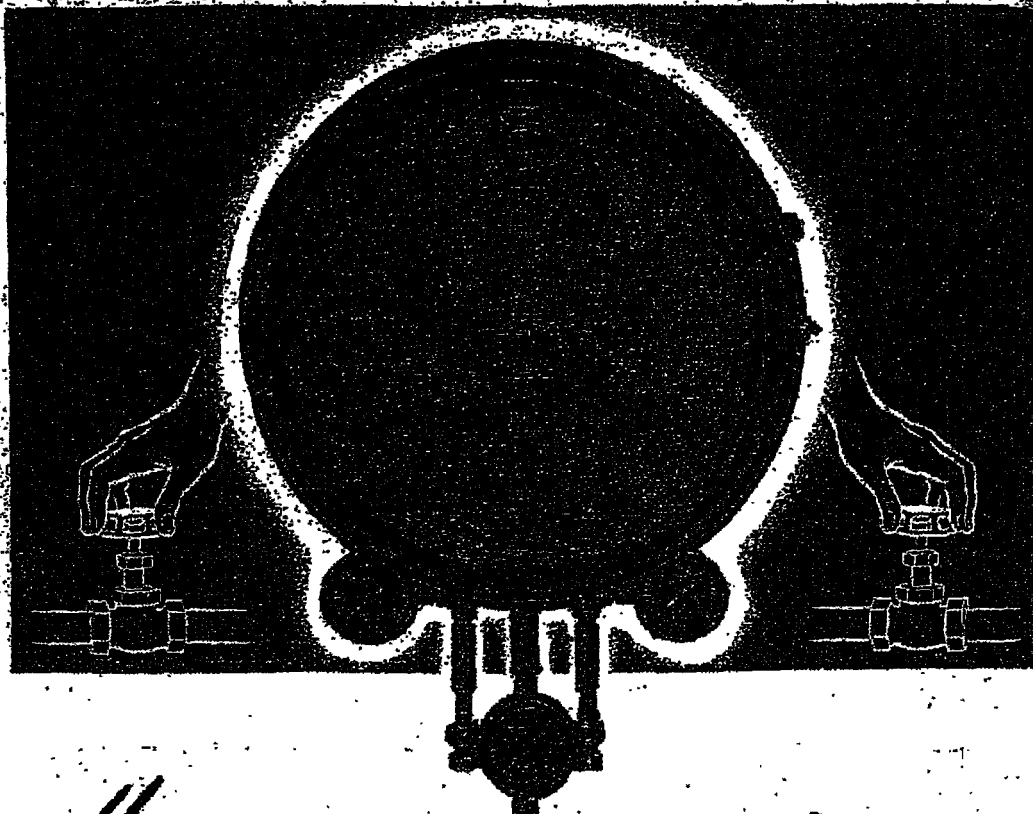
The Perfect Spread Stoker has a record of proved economy—in 15 types of industries—over a 17 year period!

Won't Clog on Wet Coal!

AMERICAN ENGINEERING COMPANY

2402 ARAMINGO AVE., PHILADELPHIA 22, PENNSYLVANIA

POWER & INDUSTRY for JANUARY, 1945



Here's "AMBIDEXTROUS" Control

THAT AUTOMATICALLY OPERATES TWO VALVES!

Wherever process temperature, pressure or humidity must be controlled by adjustments of two valves, the Foxboro Duplex Controller gives you two dependable, accurate "hands" that need no supervision. It combines 2 single-action valve control systems actuated by a single measuring system.

All you need to do is set the "high" and "low" indicators at desired points. The controller automatically "manipulates" one valve if the process condition reaches the high point; or the other valve at the low point.

What's more, both adjustments may be definitely fixed at specified degrees, percentages, or pounds-per-square-inch to maintain an exact differential between high and low points.

Typical advantageous uses of Foxboro Duplex Controllers are listed in the panel. Detailed information on their application to your problem may be obtained by sending a description of your process. Write The Foxboro Company, 166 Neponset Ave., Foxboro, Mass., U.S.A. Branches in principal cities.

TYPICAL APPLICATIONS

1. Dry Kilns - for humidity control. One "hand" of the Duplex Controller operates steam spray valve; the other adjusts the vent.
2. Air Conditioning - without supervision, a Duplex Controller accurately controls heating and cooling, or humidifying and de-humidifying.
3. Drying Bells (as in paper mills) - Foxboro Duplex Controller automatically controls two valves to utilize exhaust steam or live steam for greatest economy and uniform temperature.
4. Exothermic Processes, such as electrolysis and polymerizing. Through accurate control of 2 valves, Duplex Control automatically adds or removes heat to maintain constant temperature.

FOXBORO
INC. U.S. PAT. OFF.

**DUPLEX
CONTROLLERS**

SAFETY

Snap-on Tools

FOR PRODUCTION AND MAINTENANCE

Even where a skilled worker seems to "get along OK" with obsolete or ill-adapted hand tools, it is still a fact that the *right* tool for each job can make a big difference in productivity.

In plants reconvertng for peacetime production, *hand tools* are a factor too important to overlook. A check-up and tool replacement program *straight through the plant* involves small expenditure . . . does not interrupt production . . . and pays large and continuing dividends.

Snap-on offers a complete line of more than 3,000 tools for production and maintenance. Snap-on's nation-wide, direct-to-user tool service is available through 38 factory branch warehouses in key production centers. Write for the Snap-on catalog and address of nearest branch.



Snap-on Tools Corporation
2035-A 23rd Ave., Kenosha, Wis.

SPEED

PRECISION

POWER

ING OF THE OTIS TRADEM

To the millions of daily passengers on Otis elevators and escalators, the Otis trademark or name-plate means safe, convenient, energy-saving transportation.

To thousands of building owners and managers, the Otis trademark means the utmost in safe, efficient, economical elevator and escalator operation.

To Architects and Engineers, "Otis" means prompt, authoritative cooperation from any one of 245 local offices organized to render service based on the cumulative experience of the Otis Elevator Company.

For the finest in vertical transportation tomorrow, call your Otis representative today.

OTIS ELEVATOR COMPANY

Offices in all principal cities

GET YOUR STEAM UP ... AND CUT YOUR COSTS DOWN

(TODD BURNERS
HELP YOU DOWN)



POWER will be needed—and how—for industry's great program of post-war production! But, more than ever, power engineers must watch cost figures...figure out new economies.

Consider seriously therefore the question of *modernizing* your boiler room through the installation of Todd Oil or Gas Burners.

Savings up to 10%, on the one hand...increased power on the other... for Todd Burners' instantaneous response to fluctuating demands produces *more* steam on *less* fuel consumption!

You pay less for maintenance with Todd, too, because Todd Burners can be operated automatically to meet changing load conditions.

Whether you are producing power and heat for industrial, commercial, or marine purposes, investigate the efficiencies and economies of automatic Todd Combustion Equipment.

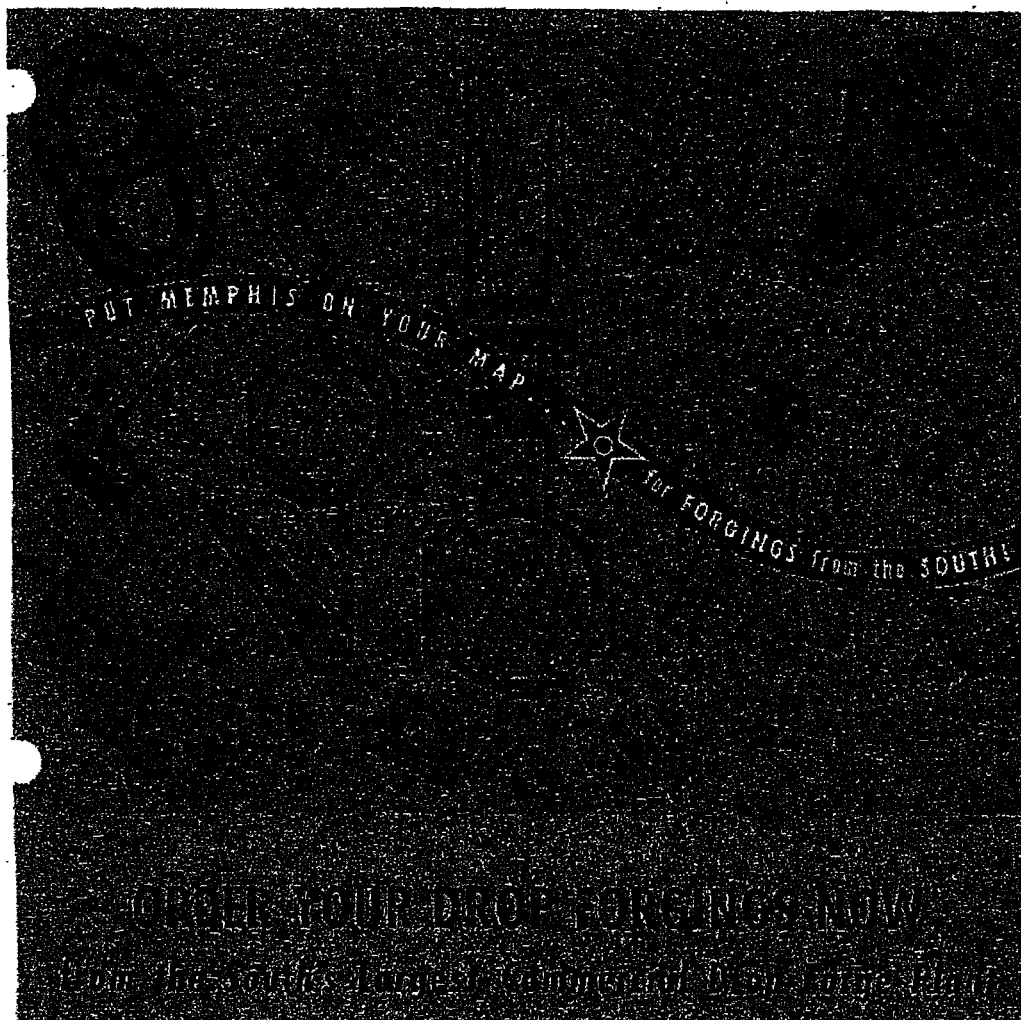
Todd specialists, like the deeply-experienced Todd organization itself, are ready to solve your liquid and gaseous combustion problems.

COMBUSTION EQUIPMENT DIVISION

TODD SHIPYARDS CORPORATION
601 West 26th Street, New York 1, N. Y.

NEW YORK, BROOKLYN, ROCHESTER, NORWICH, NEWARK, PHILADELPHIA, CHICAGO,
ST. PORTLAND, ME., BOSTON, SPRINGFIELD, MASS., BALTIMORE, WASHINGTON, DETROIT,
GRAND RAPIDS, TAMPA, GALVESTON, HOUSTON, MOBILE, NEW ORLEANS, LOS ANGELES,
SAN FRANCISCO, SEATTLE, TACOMA, MONTREAL, TORONTO, BUENOS AIRES, LONDON

TODD



Investigate the many advantages of having your forgings made in the South, by the South's largest Commercial Drop Forge Plant. Caine's unsurpassed facilities—complete die shop and "Know-How" resulting from years of experience—are now available to make your Steel Forgings—any type—any size from 1 oz. up to 30 lbs. Our Engineers are at your service. Write, Phone or Wire all inquiries to

★ DROP FORGE DIVISION **CAINE** *Steel Company*

526 Weakley Street • MEMPHIS, TENNESSEE • Phones 5-8422-3
To Better Serve the Nation from the South!

Extra Resistance to Oxidation and Rust

In severe tests, Garcoyle's D.T.E. Oil 197 has stood up longer than any other turbine oil. It is now in service in turbines ranging in size from 500 to 60,000 kw. Periodic inspections show freedom from oxidation deposits, and effective rust inhibition.

Superior Base Stock for Added Protection!

In Garcoyle's D.T.E. Oil 197, these extra qualities are added to a base stock that has itself an excellent turbine oil, possessing great resistance to oxidation and high lubricating value. The result: ideal for keeping up temperatures and pressures.

Conyon-Vacuum Oil Co., Inc.

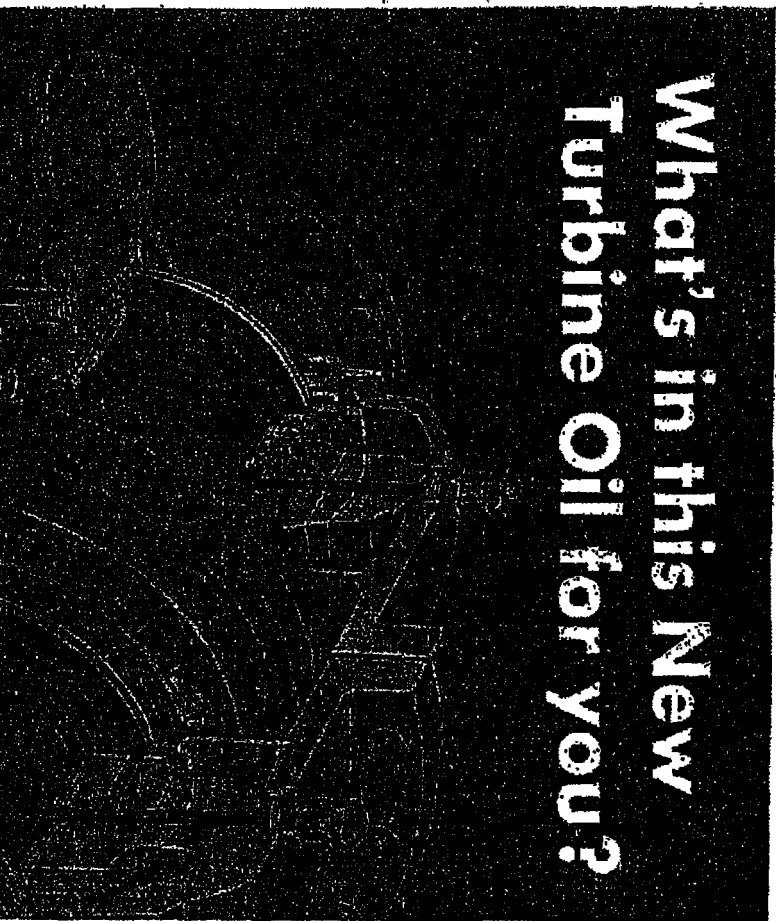
and Affiliates: Magnolia Petroleum Co. • General Petroleum Corp. of Calif.

TURN IN "INFORMATION PLEASE" - MONDAY EVENING, 9:30 EST. - 1935

SOUTHERN POWER & INDUSTRY for JANUARY, 1945



What's in this New Turbine Oil for you?



PROVIDING DOUBLE

Engineered Protection

on many important
boiler installations

Will automatically cut in a boiler whenever its pressure equals line-header pressure.

Will automatically isolate a boiler when its pressure—from any cause—is less than line-header pressure.

GOLDEN-ANDERSON

single acting

NON-RETURN

VALVES

Another dependable Golden-Anderson product—backed by nearly 40 years' experience in building high pressure flow control valves for the most difficult installations. The heaviest valves of their kind—engineered to prevent distortion or warping, hanging, chattering or spinning and to provide complete automatic safety in YOUR boiler room. Descriptive catalog on request.

GA

*Write for
descriptive
technical
catalog!*

GOLDEN-ANDERSON

VALVE Specialty Company

FULTON BUILDING • PITTSBURGH 22, PA.



Large illustration shows GARLOCK 150 Spiral. Inset: GARLOCK 200—Ring, cut to size. Coil form—GARLOCK 125.

QUALITY

Controlled for long Service

GARLOCK 150 High Pressure Steam Packing is tough, strong, dependable—because it is made from start to finish in the Garlock factory in conformity with Garlock standards of quality. Each ingredient and each operation are *quality controlled* through quality control. Result: a high pressure packing that gives long, economical service. For superior performance on piston rods of engines, pumps, compressors, expansion joints, etc., against steam pressures up to 300 lbs., specify **GARLOCK 150**.



THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Limited, Montreal, Que.

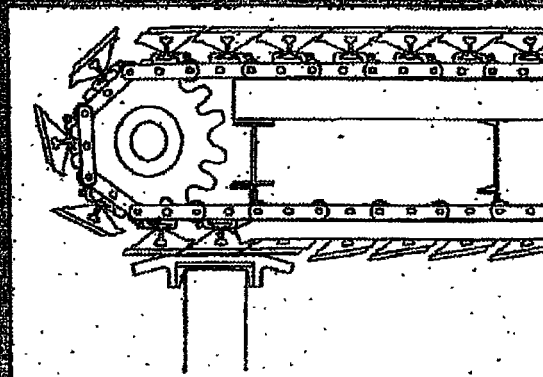
GARLOCK

10/22/76

Figure 1. The effect of the number of trials on the mean accuracy of the responses ($n = 10$) as a function of the number of items presented at once ($n = 6$). The error bars represent the standard error of the mean.

[illegible]

2. The second group of variables is related to the firm's size, measured by the number of employees, and the firm's financial performance, measured by the return on assets (ROA). The third group of variables is related to the firm's industry, measured by the industry dummies. The fourth group of variables is related to the firm's location, measured by the location dummies. The fifth group of variables is related to the firm's age, measured by the age dummies. The sixth group of variables is related to the firm's ownership, measured by the ownership dummies. The seventh group of variables is related to the firm's capital structure, measured by the debt to capitalization ratio (D/CAP). The eighth group of variables is related to the firm's profitability, measured by the profit margin (PM). The ninth group of variables is related to the firm's growth, measured by the growth rate (GR). The tenth group of variables is related to the firm's risk, measured by the risk rating (RR). The eleventh group of variables is related to the firm's innovation, measured by the innovation index (II). The twelfth group of variables is related to the firm's sustainability, measured by the sustainability index (SI). The thirteenth group of variables is related to the firm's social responsibility, measured by the social responsibility index (SRI). The fourteenth group of variables is related to the firm's environmental performance, measured by the environmental performance index (EPI). The fifteenth group of variables is related to the firm's governance, measured by the governance index (GI). The sixteenth group of variables is related to the firm's transparency, measured by the transparency index (TI). The seventeenth group of variables is related to the firm's accountability, measured by the accountability index (AI). The eighteenth group of variables is related to the firm's integrity, measured by the integrity index (II). The nineteenth group of variables is related to the firm's honesty, measured by the honesty index (HI). The twentieth group of variables is related to the firm's fairness, measured by the fairness index (FI). The twenty-first group of variables is related to the firm's justice, measured by the justice index (JI). The twenty-second group of variables is related to the firm's equity, measured by the equity index (EI). The twenty-third group of variables is related to the firm's freedom, measured by the freedom index (FI). The twenty-fourth group of variables is related to the firm's security, measured by the security index (SI). The twenty-fifth group of variables is related to the firm's stability, measured by the stability index (SI). The twenty-sixth group of variables is related to the firm's peace, measured by the peace index (PI). The twenty-seventh group of variables is related to the firm's harmony, measured by the harmony index (HI). The twenty-eighth group of variables is related to the firm's balance, measured by the balance index (BI). The twenty-ninth group of variables is related to the firm's order, measured by the order index (OI). The thirtieth group of variables is related to the firm's discipline, measured by the discipline index (DI). The thirty-first group of variables is related to the firm's respect, measured by the respect index (RI). The thirty-second group of variables is related to the firm's tolerance, measured by the tolerance index (TI). The thirty-third group of variables is related to the firm's patience, measured by the patience index (PI). The thirty-fourth group of variables is related to the firm's perseverance, measured by the perseverance index (PI). The thirty-fifth group of variables is related to the firm's determination, measured by the determination index (DI). The thirty-sixth group of variables is related to the firm's resolve, measured by the resolve index (RI). The thirty-seventh group of variables is related to the firm's courage, measured by the courage index (CI). The thirty-eighth group of variables is related to the firm's bravery, measured by the bravery index (BI). The thirty-ninth group of variables is related to the firm's valor, measured by the valor index (VI). The fortieth group of variables is related to the firm's heroism, measured by the heroism index (HI). The forty-first group of variables is related to the firm's gallantry, measured by the gallantry index (GI). The forty-second group of variables is related to the firm's chivalry, measured by the chivalry index (CI). The forty-third group of variables is related to the firm's nobility, measured by the nobility index (NI). The forty-fourth group of variables is related to the firm's magnanimity, measured by the magnanimity index (MI). The forty-fifth group of variables is related to the firm's generosity, measured by the generosity index (GI). The forty-sixth group of variables is related to the firm's philanthropy, measured by the philanthropy index (PI). The forty-seventh group of variables is related to the firm's altruism, measured by the altruism index (AI). The forty-eighth group of variables is related to the firm's selflessness, measured by the selflessness index (SI). The forty-ninth group of variables is related to the firm's unselfishness, measured by the unselfishness index (UI). The fiftieth group of variables is related to the firm's disinterestedness, measured by the disinterestedness index (DI). The fifty-first group of variables is related to the firm's impartiality, measured by the impartiality index (PI). The fifty-second group of variables is related to the firm's objectivity, measured by the objectivity index (OI). The fifty-third group of variables is related to the firm's fairness, measured by the fairness index (FI). The fifty-fourth group of variables is related to the firm's justice, measured by the justice index (JI). The fifty-fifth group of variables is related to the firm's equity, measured by the equity index (EI). The fifty-sixth group of variables is related to the firm's freedom, measured by the freedom index (FI). The fifty-seventh group of variables is related to the firm's security, measured by the security index (SI). The fifty-eighth group of variables is related to the firm's stability, measured by the stability index (SI). The fifty-ninth group of variables is related to the firm's peace, measured by the peace index (PI). The sixtieth group of variables is related to the firm's harmony, measured by the harmony index (HI). The sixty-first group of variables is related to the firm's balance, measured by the balance index (BI). The sixty-second group of variables is related to the firm's order, measured by the order index (OI). The sixty-third group of variables is related to the firm's discipline, measured by the discipline index (DI). The sixty-fourth group of variables is related to the firm's respect, measured by the respect index (RI). The sixty-fifth group of variables is related to the firm's tolerance, measured by the tolerance index (TI). The sixty-sixth group of variables is related to the firm's patience, measured by the patience index (PI). The sixty-seventh group of variables is related to the firm's perseverance, measured by the perseverance index (PI). The sixty-eighth group of variables is related to the firm's determination, measured by the determination index (DI). The sixty-ninth group of variables is related to the firm's resolve, measured by the resolve index (RI). The seventieth group of variables is related to the firm's courage, measured by the courage index (CI). The seventy-first group of variables is related to the firm's bravery, measured by the bravery index (BI). The seventy-second group of variables is related to the firm's valor, measured by the valor index (VI). The seventy-third group of variables is related to the firm's heroism, measured by the heroism index (HI). The seventy-fourth group of variables is related to the firm's gallantry, measured by the gallantry index (GI). The seventy-fifth group of variables is related to the firm's chivalry, measured by the chivalry index (CI). The seventy-sixth group of variables is related to the firm's nobility, measured by the nobility index (NI). The seventy-seventh group of variables is related to the firm's magnanimity, measured by the magnanimity index (MI). The seventy-eighth group of variables is related to the firm's generosity, measured by the generosity index (GI). The seventy-ninth group of variables is related to the firm's philanthropy, measured by the philanthropy index (PI). The eightieth group of variables is related to the firm's altruism, measured by the altruism index (AI). The eighty-first group of variables is related to the firm's selflessness, measured by the selflessness index (SI). The eighty-second group of variables is related to the firm's unselfishness, measured by the unselfishness index (UI). The eighty-third group of variables is related to the firm's disinterestedness, measured by the disinterestedness index (DI). The eighty-fourth group of variables is related to the firm's impartiality, measured by the impartiality index (PI). The eighty-fifth group of variables is related to the firm's objectivity, measured by the objectivity index (OI). The eighty-sixth group of variables is related to the firm's fairness, measured by the fairness index (FI). The eighty-seventh group of variables is related to the firm's justice, measured by the justice index (JI). The eighty-eighth group of variables is related to the firm's equity, measured by the equity index (EI). The eighty-ninth group of variables is related to the firm's freedom, measured by the freedom index (FI). The ninetieth group of variables is related to the firm's security, measured by the security index (SI). The ninety-first group of variables is related to the firm's stability, measured by the stability index (SI). The ninety-second group of variables is related to the firm's peace, measured by the peace index (PI). The ninety-third group of variables is related to the firm's harmony, measured by the harmony index (HI). The ninety-fourth group of variables is related to the firm's balance, measured by the balance index (BI). The ninety-fifth group of variables is related to the firm's order, measured by the order index (OI). The ninety-sixth group of variables is related to the firm's discipline, measured by the discipline index (DI). The ninety-seventh group of variables is related to the firm's respect, measured by the respect index (RI). The ninety-eighth group of variables is related to the firm's tolerance, measured by the tolerance index (TI). The ninety-ninth group of variables is related to the firm's patience, measured by the patience index (PI). The hundredth group of variables is related to the firm's perseverance, measured by the perseverance index (PI).

[illegible][illegible]

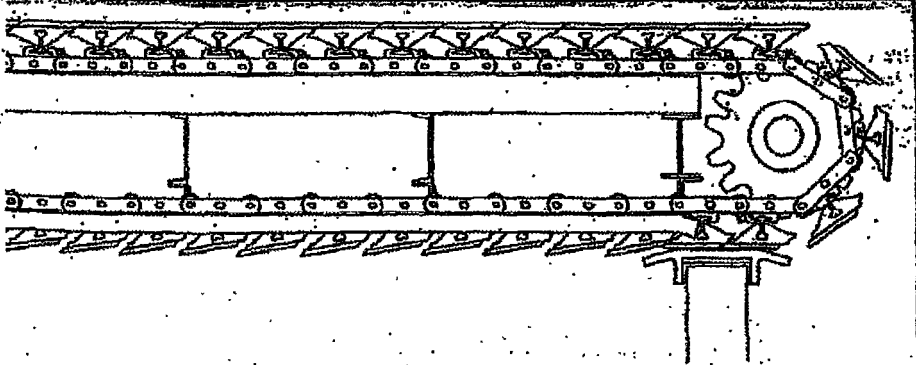
WORKS AT: FAIRMONT, WEST VIRGINIA
DETROIT, MICHIGAN

DISCHARGE GRATES

and built by

HOFFMAN

Engineers and Constructors of Discharge Grates and Sifters
Hoffman's Discharge Grates are built to last and are
the most efficient and reliable of any type of grate.



ENGINEERING COMPANY

OFFICES: Marquette Building, Detroit, Mich. Bell Building, Chicago, Illinois
154 Nassau Street, New York City Twenty-Two Marietta Bldg., Atlanta, Ga.
Agents in industrial centers

**BOILING WATER AT 38° F.
IN A ROSS DECALORATOR
IS A CASE IN POINT
FOR ALL INDUSTRIES AND POWER PLANTS**



Why does water boil at 38°F. in a Ross Decalorator? It boils because of the extremely low absolute pressure maintained by a Ross Three-Stage Steam Jet Ejector.

This low absolute pressure is maintained more dependably and economically than with any other type of vacuum pump.

It's a case in point for all industries and power plants, because this same Ross Ejector (single or multi-stage, operating with or without Ross inter and after condensers of the surface or barometric type) is one of the most simple, efficient and economical vacuum pumps for removing air, vapors or gases. This applies to the handling of many types of mixtures: wet or dry, slightly sticky or solid. Only

steam or water need be available for efficient operation. Little or no supervision and maintenance is required.

Consult Ross' engineers about the particular advantages of Steam Jet Ejectors in *power plants*: air removal equipment on surface or barometric condensers, and as pump primers; in *chemical, food and petroleum* industries for vacuum distillation, deodorization, deaeration, degasification, dehydration, concentration, evaporation, impregnation, vacuum packing and vacuum cooling. You will be furnished with information and recommendations based on long experience in these specialized fields.

Ross equipment is manufactured and sold in Canada by Horton Steel Works, Ltd., Port Hope, Ont.

ROSS

1445 WEST AVENUE

BUFFALO 13, N. Y.

Gulf Parvis Oil

**can help you put a new low ceiling
on your Diesel Maintenance costs!**

FOR OVER 15 YEARS Gulf Parvis Oil has been a leader in the lubrication of industrial and marine Diesels. Ask users why they prefer Gulf Parvis Oil, and their answer is something like this: "It stands up and helps keep our maintenance costs down."

Now modern petroleum technology has made possible a further improvement in

this quality oil! The new Gulf Parvis Oil has greater resistance to oxidation, longer life, and is nonfoaming!

In your Diesels, this top quality oil means less wear, longer Diesel life, and a new low ceiling on maintenance costs. For further information on the new improved Gulf Parvis Oil, mail the coupon or get in touch with your nearest Gulf office.

"Good lubrication with Gulf Parvis Oil helps us get maximum kw-hr. and low maintenance costs," says the Chief Engineer of this modern water and light plant.



Gulf Oil Corporation • Gulf Refining Company

Division Sales Offices:

Boston • New York • Philadelphia • Pittsburgh • Atlanta
New Orleans • Houston • Louisville • Toledo

Gulf Oil Corporation • Gulf Refining Company
3800 Gulf Building, Pittsburgh, Pa.

SP

Please send me, without obligation, complete information
on the new improved Gulf Parvis Oil.

Name _____

Company _____

Title _____

Address _____

SOUTHERN POWER & INDUSTRY SUPPLY CO.

639

RE-POWERED

at less cost than patchwork!

Load-center distribution system supplanting old. This system step-by-step will pay the full costs of replacement.

Like many older plants of moderate size, this one was saddled with an obsolete power distribution system. A recent rise in power requirements, necessitating extensive additions to the old system, brought the problem of replacement to a head.

A study by G-E engineers showed the wastefulness of extending the outdated 2-phase system with 3-wire feeders such as originally used. Instead, they suggested a *step-by-step plan* for converting to load-center power distribution. This conversion plan is paying its own way right from the start.

1. The immediate need for extra power is being met with a new G-E load-center unit substation. The customer saved 5 per cent on first cost alone by buying standard three-phase equipment for the expanded main service. The total cost of *all* the three-phase high-voltage feeders was less than the cost of just the low-voltage two-phase extension, had the need been met by patchwork.

2. Later, additional load-center unit substations will be installed, until the old system is entirely supplanted. Savings resulting from the 2½ to 5 per cent extra efficiency of the three-phase system will amount to \$2000 to \$4000 per year in power costs alone. This will pay off the costs of complete modernization at some 20 per cent per year.

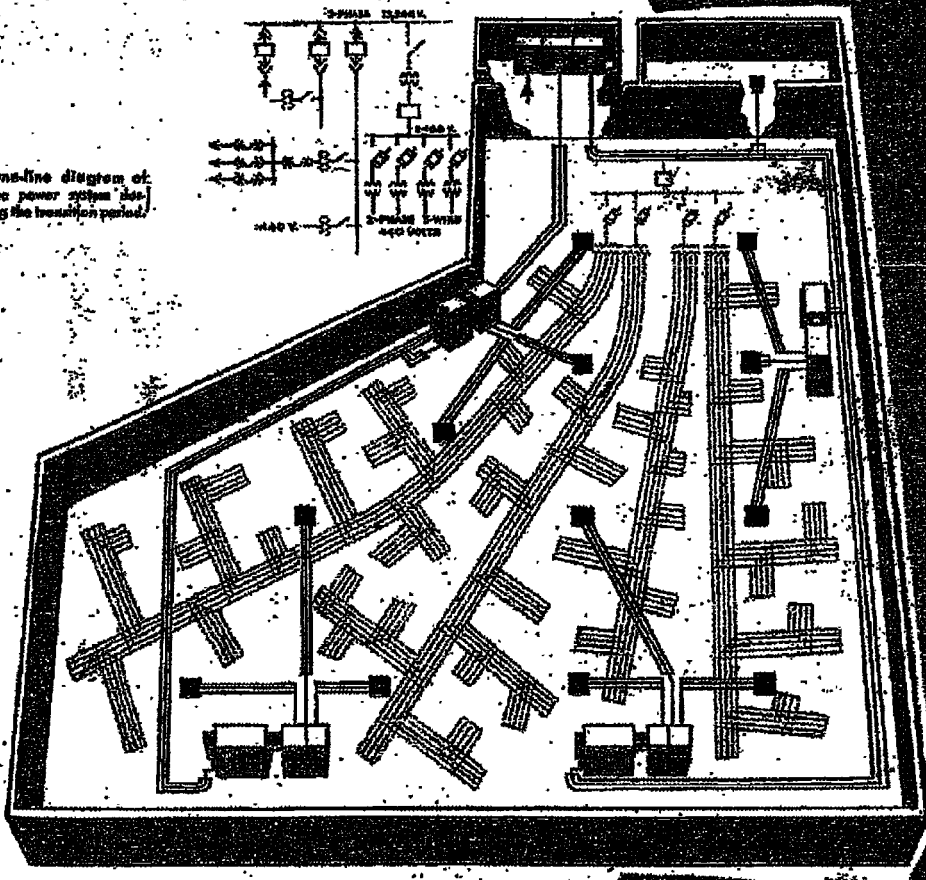
The changeover is being made without production shutdowns during installation of the three-phase system, or in the changeover from the obsolete system. The new system will be safer, and require less servicing time. When completed, the customer will have a power distribution system *engineered for growth*, whatever the extent of the plant's future power needs.

What does a check-up of your own power distribution system show as to voltage conditions, outages, maintenance costs, and restrictions on plant expansion? Perhaps modernization the load-center way can be planned so as to be fully self-liquidating. Ask your local G-E representative, or write for Bulletin GEA-3758. Apparatus Dept., General Electric Company, Schenectady 3, N. Y.

Load substations are easy to install; the use of "Pymat" or dry-type transformer sections, with safety metal-enclosed windings, permits them to be located on the factory floor adjacent to the load areas, up chimneys, or in basements without requiring a truck.

FOR GROWTH

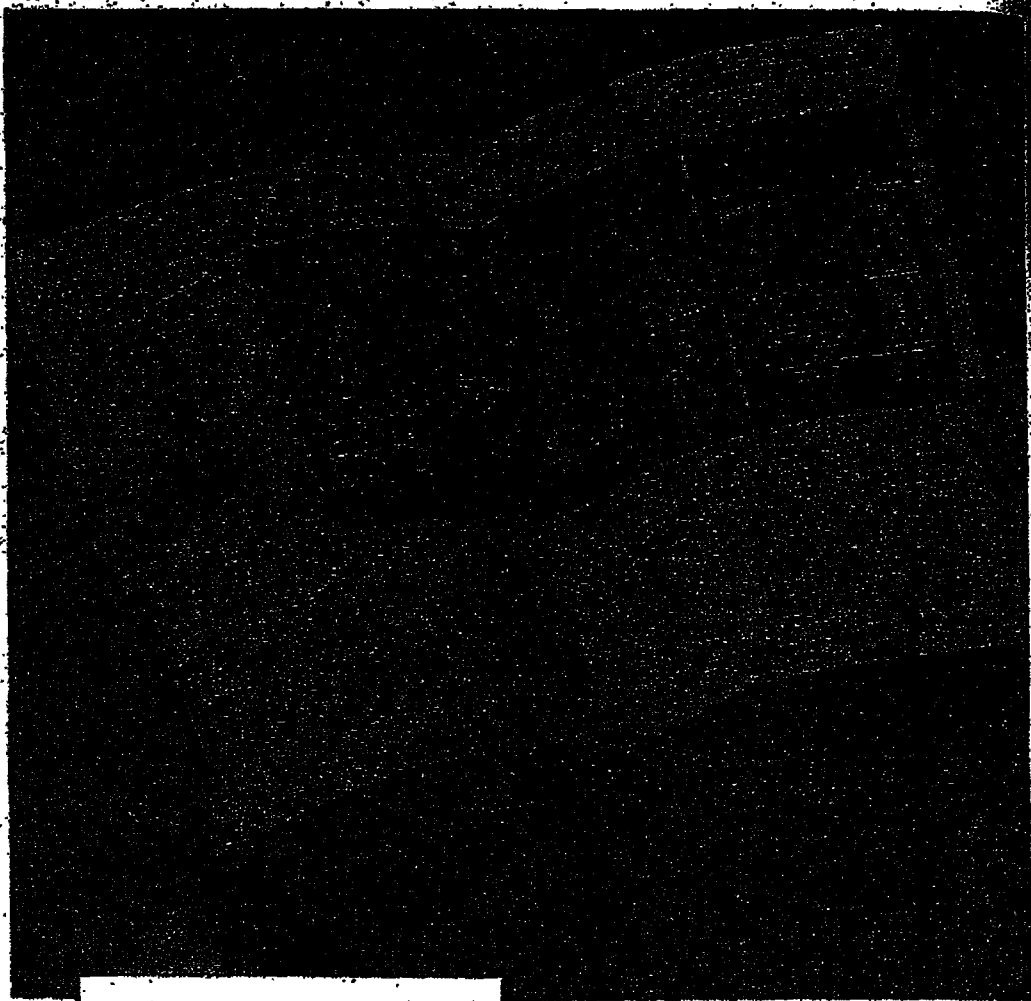
One-line diagram of the power system during the transition period.



New feeders (black) will replace the old feeders (yellow) and establish a simplified, modern distribution system.

GENERAL ELECTRIC

**LOAD-CENTER
POWER
DISTRIBUTION
SYSTEMS**



Always Try Chapman

Standard Lines

FIRST

No matter what your valve problem may be, it pays to look through the Chapman Standard Line *first*. Many valves that appear to be "specials" will be found in our regular production.

As new valves have been designed through the years, many of them have been added to our Standard Line. Included are many unusual types and sizes—in steel, iron and bronze alloys.

Should a special type of valve be required, Chapman engineers will be glad to help you develop it.

THE
CHAPMAN
VALVE MANUFACTURING CO.
INDIAN ORCHARD, MASS.

Timely Comments

Housing Shortage

and

Building Codes

construction. Engineering and construction are continuous processes, each cycle of events overlapping and influencing the next. Therefore, there is no stopping point, no place to clean the slate and start over.

The critical shortage in buildings is attributed to many causes, but none is more important or harder to quickly correct, than obsolete, meaningless building codes that exist all over the country. Revisions have not kept pace with changing methods and new materials, therefore progress in the building industry has been slower and less effective than in any other major industry.

While manufacturing, agriculture, transportation, and practically every other type of industry have been revolutionized in the past 25 years, building procedures have remained essentially primitive. Hand drawn individual plans, personalized specifications, poor choice of materials, hand sawing, hand nailing, hand brick laying—never any mass movement or standardization. These methods held back by unwise, civil authorities and protected by antiquated wording in building codes have delayed any real effort toward mass production. Compare what the buyer gets in a \$1000 automobile with a \$5000 house and you will see the difference in value.

Any law or any organized, control that tends to limit progress bids fair to help build up conditions such as are now evidenced by the housing shortage. The building trades have stood still and the rest of the world has moved forward, so there are not enough houses—the answer seems as simple as that.

Yes, there are other shortages too, but they are not critical shortages. And furthermore the other shortages will soon be relieved. But there is no immediate relief in sight on the housing situation. The industry is simply not adequate to the task. The cost of labor and materials exceeds the value to be returned in reasonable rents and investors do not care to build houses. Even hard pressed individuals go to extremes to avoid paying two prices for building a new home.

No immediate answer to so severe a situation can be expected; the nation will be inadequately housed for several years. But the matching of supply and demand can come much quicker if building codes are thoroughly studied and revised to allow sound use of mass production methods—prefabrication, pre-casting, sub-assembly, etc.—wherever they produce and, safe, attractive structures at a faster pace and cheaper price. Such code revisions will assure business leaders fair opportunity to compete in open markets, and then the needed revolution in the building industries will quickly come.

BASIC, errors or inadequacies in laws, codes, and regulations are costly in any event, but particularly so in cases where they affect engineering and construction.

Worker Opportunities

in

Nineteen Forty-Six

lishes it as a starting point—the day to initiate new programs, new procedures, house cleaning.

January 1, 1946, is particularly important because so many things have been put off until we could partially recuperate from the upsets of war.

Excuses in 1946 will not be so readily accepted. Haphazard performance will not fit well into carefully worked out plans. Discipline of working forces will be reinstated; the boss can hire a new man, two of them if necessary. And those lacking in punctuality and energy will find themselves compared unfavorably with eager, fearless young workers that are quite willing to deliver the goods in exchange for equitable wages, fair treatment, and a chance to advance.

Vendors too will feel a change in '46. Buyers will look the market over and place orders where quality is assured and deliveries are best. Even price will be important because cessation of war orders means more personal buying; and when spending one's own money, price is important. Dependability also will determine who gets the business. The buyer will not long continue to do business with vendors that make false promises or those that need to be continually prodded by mail, wire and phone.

The boss is going to want his share of time off. He will expect his assistants to assume leadership and carry on the job while he takes that long delayed fishing trip. And he will be looking for the kind of man that he can leave in charge with a clear conscience. This leads to excellent opportunity for the newer employee. The executives and supervisors who have long had their noses to the grindstone will be quick to appreciate ability of new employees, because in many cases the quality of civilian employees has been very low indeed.

Many completely new ventures will also be getting under way in '46. These also give opportunity to the returning service man. Here the opportunities will be particularly great in small plants if the employee can add a little capital to his labor in an effort to help nurture the new enterprise.

Forty six will be more conservative than hectic, because long studied plans will be implemented. There'll be less hurry, and more caution; but there will be activity. It will not be a do nothing year, or a put-off year. This will indeed be a year of opportunity for the newcomer to industry. There will be much to do, and employers will not look too critically at such characteristics as age, training, and physical fitness; they will gradually place more emphasis on loyalty, honesty, dependability, and willingness to take hold and use energy and initiative to produce a fair day's work.

ACTUALLY January 1 is not greatly different from any other day, but psychologically it is more important. Tradition est-

Special RailMaster 200
Crane with 2-way track
for drive.

American MonoRail RailMaster Crane feeds nation's largest anodizing installation

An American MonoRail two-way drive RailMaster Crane operates over six tanks that make up one of the world's largest anodizing installations. Special racks loaded with parts are lifted from one to another of five cleansing and rinsing tanks and then deposited into a chromic acid tank where the actual anodizing takes place. Some of the loads weigh as much as 3 tons.

American MonoRail RailMaster Cranes of extremely simple design are developed for handling loads up to 5 tons by manual operation or propelled by rubber wheel drive.

With thousands of installations to draw from, American MonoRail Engineers are well qualified to offer solutions involving overhead handling equipment. Consultation with these men will reveal why American MonoRail equipment was selected to serve the nation's largest industrial plants. This service is offered without obligation — we invite your inquiry.

Loaded rack on crane
ready for anodizing.



Solder Solder C-1
a 24 page booklet
on successful applica-
tions of American
MonoRail systems.

THE AMERICAN MONORAIL COMPANY

3108 ATHENS AVE. • CLEVELAND 7, OHIO

idea.

"Reconversion apparently will take care of itself but post-war operating problems most certainly will not. They are multitudinous in number and are small individually, but combined they spell trouble unless answers are found for them.

The Employee

"When we think of employee problems in the post-war years, we think of the returning servicemen. The problem of fitting in these developed men will be a serious one. We must get an adequate, sympathetic man or group of men to deal with them. They want earnest efforts, not lip service, in solving their readjustment problems and if we don't do it then others will do it for them.

"Our employees can cause our companies either to survive or fail. Improve all of your personnel. Never before have we needed as badly a well trained group of people intensely interested in the welfare of our companies. Teach them how you want your business conducted. We must show our interest in our customers, not just tell them of it.

The Customer

"The man who pays all the bills, the customer, is expecting more and more service of better and better quality. Later he is going to want it for less and less cost. It is going to, for our industry, to do that. We cannot.

The Company

"Management is faced with a few problems that are peculiar in that they affect the very existence of the company. One of these problems is the problem of territory. If you are to continue to expand and grow you are going to have to pick out a territory or area, lay claim to it, seize it and develop it. Somebody is going to develop America, especially the rural areas. Your management has to decide whether or not it is going to be you.

"Another serious complication is the referee playing in the game. I speak of Government regulation and competition. We have Valley Authorities, Department of Interior, Transmission Cooperatives and Rural Electric Cooperatives all interested in taking all or part of our business. Among others are the municipalities themselves that are often fighting and promoting unreasonable demands. The appalling thing about the entry of the Government into the electric power business is the apparent indifference of the average citizen.

"There is a challenge in all of these problems, however, and that is to think our way through them. I have unbounding faith in our utility business. We have weathered worse storms than this and if we keep level heads and stick in our thinking with reference to changes in policies and practices, I see no insurmountable difficulties."

Industry Speaks— Reconversion Problems and Opportunities

G. C. RAWLS

Vice President
Louisiana Power & Light Company

Speaking on:

RECONVERSION AND POST WAR OPERATING PROBLEMS before the Southern Electric Exchange, said in part:

"THE problem of reconversion is one that is individual. No two companies have the same problem and there is no general solution. A factor that is not to be underestimated is the ability of the industries that we serve to reconstruct themselves. Reserve capacity, curtailed wartime operations and part up commercial and residential demands will, as far as can now be determined, rapidly use up the electric facilities that have become

need better equipment for less money and there is only one way to get it and that is to keep after it. An excellent job has been done in production and the future is wide open for change. If it is no problem to cut the costs. The problem is to reduce the costs, but keep the quality of the service good.

"Find out what we are doing that customers don't like and stop it. Find out what customers like and try to do these things. We want customers that want our companies to serve them.

The Investor

"We are going to have investor problems. The investors are particularly interested in the tax problems of the company. The company is taxed and again, the investor has to submit to taxation on the same funds. We are hopeful of a more equitable arrangement. The investor must be kept in the frame of mind to be interested in putting additional money in the companies. Additional funds invested, mean more dividends. The only real solution to the problem is to forecast where we are heading. Budgets are generally what we make to describe from, but they do provide a means of plotting a course over a stormy sea.



TEXAS FIRE BRICK A New Plant with Modern Methods

By

Hunter H. Hughes, Jr.

Southwestern Editor



SOME 16 miles south of Tyler, Texas, in a town called Troup, General Refractories Company has built and is operating one of the most modern fire brick plants in the country. The plant has two outstanding features; all operations are under one roof, and it uses a continuous rather than a periodic kiln process. Neither of these features are unique, but together they represent the latest developments in brick making—a process that has changed but little through the centuries.

In August 1941, General Refractories started their Texas operation by purchasing the plant and equipment of the Malakoff Brick Company at Malakoff. This plant, which had been making face brick, was converted to a fire brick plant, but it had scarcely gotten into full production when a fire completely destroyed the plant. Thus, General Refractories' first experiment with Texas clays was cut short.

During the few months that the company had been located at Mala-

koff, they had made surveys through other clay regions in the state. They found excellent deposits in Smith County a few miles from Troup.

Building

With the discovery of this clay (a far better fire clay than had previously been found in Texas) General Refractories decided to build a new plant at Troup rather than attempt to reconstruct the burned plant at Malakoff. This decision having been made toward the end of 1942, it was much easier to decide to build a plant than it was to build one. Materials were, you will remember, rather scarce. However, there was found available a brick and steel building in lower Georgia that had been used to house a manufacturer of face brick during the Florida boom. A careful inspection showed this building to be in excellent condition and approximately the size desired. This building was purchased, dismantled, shipped and reassembled at Troup.

bled at Troup.

The building is of single story construction, 684 ft long and 100 ft wide. It is built of brick and steel supports and has a steel truss roof with a single sawtooth on each side to allow for vertical skylights. The roof itself, and the upper siding at each end is corrugated steel. Open sides permit a free flow of air, and even during a Texas summer, a reasonable temperature is maintained in the working area.

Manufacturing Process

The fire clay from which the bricks are made is taken from an open pit mine about five miles from the plant. Trucks carry the clay to the plant and dump it into a concrete storage bin at the extreme east end of the building. Alongside this bin is another similar bin for calcined clay (grug). This calcine is pre-burned clay and scraps of bricks. It has been found that the mixing of this calcine with raw clay produces a brick with ex-

FIG. 1. VIEW FROM RAW MATERIAL STORAGE BINS SHOWING DRY PAN GRINDER.



cellent physical properties.

From the storage bins the clay or calcine is dumped into a hopper that leads to the grinder. Clay and calcine are never ground as a mixture but are handled separately and mixed later. The material to be ground drops from the hopper onto a rubber conveyor belt that leads to the top of the dry pan grinder, there dropping onto the grinder pan where it is crushed between a large cast iron roller and the pan itself. The crushed calcine or clay falls through perforations on the periphery of the pan. A bucket elevator lifts this ground material to elevated vibrating screens that separate the large from the small particles. The powdered clay passes through while the larger particles fall from the end of the inclined screen back into the grinder.

The chute from the bucket elevator to the vibrating screen has an interesting feature. The calcine is quite abrasive, and in sliding down this chute, quickly wears through the metal bottom. To overcome this, the master mechanic welded small sheet metal baffles across the floor of this chute. They stand about an inch high and, consequently, act to stop the flow until a layer of powdered calcine builds up. Now, the calcine moves down over more calcine and we have a calcine against calcine movement rather than calcine against metal, and the chute bottom is protected against wear. Such an arrangement requires a slightly greater slope than one in which the material slides on metal.

The dry pan grinder is powered by a 50 hp, a-c, General Electric motor using a V-belt drive; the

motor is controlled by a G. E. relay. When the conveyor has delivered a sufficient weight of clay from the feeder hopper, the relay stops the motor driving the feeder belt. As soon as the weight of material in the dry pan grinder has been reduced, the relay closes, and the feeder belt delivers more material to the grinder. This means that the grinder is never over or under load but works with a fairly uniform amount of clay. A W. W. Sly, Mfg. Co. Dust Collector using a Clarage centrifugal fan collects dust above the grinder and makes this a relatively clean operation.

The vibrating screen is operated on direct current, a Tyler Thermionic Power Converter being used to rectify the a-c current. Material passing through this screen falls into a hopper from which it is again raised in a bucket conveyor

to the top of the installation where it empties into a horizontal screw conveyor that finally drops it into overhead storage bins. These metal overhead bins are arranged in series so that the conveyor may dump into any one of them. Several of the bins are for calcine while the others are for raw clay. One of these bins can be seen in Fig. 1. In this same photograph a traveling lorry can be seen beneath the bin. This is an electric lorry operating on a track that runs the full length of the bins. The operator moves back and forth taking the desired amount of calcine or raw clay from each bin, the material falling down into a weighing hopper on the lorry. When the desired quantities have been weighed, the lorry moves alongside a mixer and dumps the load into it.

The mixer is a special General



FIG. 2. THE BRICK FRAME OVERHEAD STORAGE BINS AND TRAVELING LORRY AT LEFT.

Refractory design that mixes the calcine and clay after they have been slightly moistened. It consists of a large metal pan about nine feet in diameter inside of which two, three foot diameter, rubber covered mullers turn, crushing and mixing the material between them and the bottom of the pan. The slightly damp mixture is removed from this mixer by a rotary steel scraper and drops onto a belt that conveys it to the top of the press.

The Press

The brick press is a standard, Model C, Chisholm Boyd & White, four mold press with changeable molds. It is operated through a V-belt drive from a 30 hp, 420 rpm. a-c, Crocker-Wheeler motor. Because of its low speed, this is an unusually large motor for its output. This press is shown in Fig 3.

Upon being removed from the press, the molded bricks are carefully stacked on cars that move down a track to a tunnel dryer.

Hand Made Brick

Before describing the movement of these bricks through the drying ovens, it might be well to go back and see what steps are required to bring special hand-made shapes to this same point in the process. All bricks of intricate shape or those needed in small quantities are hand formed. Ground calcine and clay, from the overhead storage bins are mixed in a mixer similar to the one that prepares the clay for the press, except that in this mixer the wheels are of cast iron rather than rubber rimmed. This difference is due to the mixture being much more moist for hand molding, and cast iron seems to handle such a wet material more easily. When the clay comes from this mixer it is about the consistency of wet putty. It is then formed into the proper size and shape by the use of wood or steel molds.

Naturally, even after the hand molding job is completed, the brick is wetter than those from the dry press. It is too wet to go into the drying tunnel and must be left out on the floor for several days. The portion of the floor on which these hand-made bricks are laid out has

quite an interesting feature. Under the concrete there is a series of ducts or passageways through which hot gases flow. These gases are a waste product from the kiln, and they may be vented about by a series of dampers so that only the part of the floor that has wet brick lying on it is heated. This heated floor, which is called the hot floor, speeds up the preliminary drying of the hand-made brick. The hot gases that move beneath the floor finally pass out a stack. If desired, the gases may be dampered so as to pass directly from the kiln to the stack when no brick are being pre-dried.

After this period of pre-drying, hand-made brick are stacked on flat cars and moved to the drying tunnel.

Drying Tunnel

The drying tunnel is about 8 ft. high and 7 ft. wide—just wide enough for one of the kiln cars and high enough to leave a little space for air movement above a loaded car. Each of these cars will hold 1350 standard 9 in. brick, the brick being carefully laid on a refractory bed in such a way that hot gases may pass between them. As a car is stacked, it is moved to a door at one end of the tunnel and is attached to a hydraulic ram. The car is gradually moved into the dryer by the pressure of the ram, the car pushing against all of the

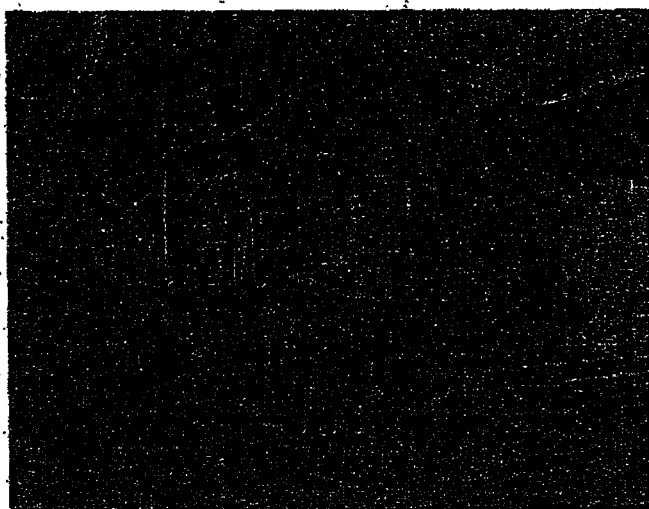
cars ahead and gradually ejecting the car at the other end of the tunnel. Eighteen cars are in this dryer at all times, a dried car coming out as a fresh load goes in. The heat for the tunnel is supplied by the waste gases from the main kiln. A steady draft is maintained by an induced draft fan at the entrance end and a forced draft fan at the point from which the gases are kled from the main kiln.

Tunnel Kiln

From the dryer the cars move but a few feet ahead on their track to come to the main kiln entrance. This is a tunnel kiln that makes possible continuous operation instead of the batch operation that is required by the usual dome shaped periodic kilns. The kiln consists of a tunnel 7 ft. wide, 8 ft. high, and 368 ft. long. The cars are pushed into the kiln by a hydraulic ram similar to the dryer's ram. Since the heat is so much greater in the kiln than in the dryer, a sand seal is used to confine the hot gases to the area surrounding the bricks and keep it off the wheels and chassis of the cars. This sand seal consists of a gutter on each side of the tunnel running its full length. A sheet of metal that will stand high temperatures extends from the bed of each car and bends so that it dips into the sand in the gutter. This cuts

(Continued on page 58)

FIG. 4. A LOAD OF BRICKS ENTERING TUNNEL KILN.



Automatic Arc Welding —

Automatic Arc Process Answers Demand for Tank Structures in Oil and Processing Industries

By R. M. Daniels*

AN indication of how the recently announced "Lincolnweld" process of automatic metal-arc welding is meeting wide acceptance as a production tool for industry is illustrated at Chattanooga Boiler & Tank Co., Chattanooga, Tenn. Here this new welding development is meeting a heavy demand for steel tanks and pipe needed for the chemical industries, for oil and gas storage and for miscellaneous industrial reprocessing.

Formerly welded by manual methods, the automatic "Lincolnweld" process is now turning out tank structures in less time, at lower cost and possessing better resistance.

The "Lincolnweld" set-up, headed to be one of the most efficient of its kind, consists of the automatic welding head, control box, wire reel and flux pick-up andopper, mounted on a 36-foot beam

as shown in the accompanying photo (Fig. 1).

Separate parts for the tank units are shear or flame cut, depending upon the thickness of the material specified, then rolled to shape, and the joints butted together with careful attention being given to proper fit-up.

Circumferential joints are hand welded on the outside, the inside head acting as a back-up for the automatic weld. (See Sketch, Fig. 2).

Longitudinal joints are automatically welded with 100 per cent penetration of the joint to a copper back-up strip positioned and held flush against the underside of the seam. (See Sketch, Fig. 3).

Material used for tank construction varies from 3/16-inch to 1-inch in thickness, and structures

*Welding Engineer, The Lincoln Electric Company, Cleveland, Ohio.

range from 18 inches to 12 feet in diameter and up to 33 feet in length.

The "Lincolnweld" carriage is adjusted to fit tank sizes by raising or lowering the beam by means of a chain and sprocket counterweight arrangement. Lateral movement is handled by a roller mounting, part of which may be

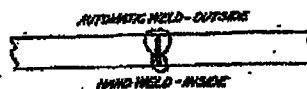
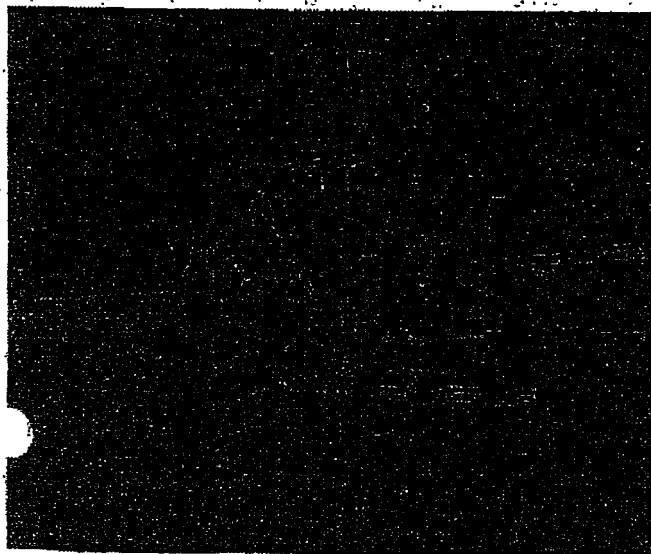


FIG. 2—CROSS-SECTIONAL SKETCH OF CIRCUMFERENTIAL JOINT SHOWING HAND AND AUTOMATIC WELD BEADS.



FIG. 3—CROSS-SECTIONAL SKETCH OF LONGITUDINAL JOINT SHOWING HEAD PENETRATION TO BACK-UP STRIP ON UNDERSIDE OF SEAM.

FIG. 1. WELDING LONGITUDINAL SEAM ON LARGE TANK UNIT BY MEANS OF "LINCOLNWELD" PROCESS OF AUTOMATIC WELDING. NOTE COMPACT MOUNTING ARRANGEMENT OF WELDING CARRIAGE AND FLUX RECOVERY UNIT.



seen in the accompanying photo (Fig. 1).

For automatic welding of the circumferential joints the welding carriage remains stationary while the work turns on a rubber-tired rotating fixture.

All automatic welding is done in single pass using 5/32-inch or 7/32-inch metallic wire electrode.

A noteworthy phase of this installation is the unique mounting of the flux pick-up unit on the standard "Lincolnweld" carriage. The fabricators modified the flux content of the hopper by shortening the original design to keep overall height of the unit to a minimum. Thus, the pick-up hopper dumps the reclaimed flux directly into the standard hopper, saving time and labor of frequent refilling by hand.

The entire set-up provides an excellent example of high speed production of these particular products manufactured by this Chattanooga firm.

Low Temperature Refrigeration



A discussion of minus 20 F to minus 120 F refrigeration; two and three stage compression; and a low temperature cascade system using Ethylene and Freon-22.

By

F. R. Zumbro and Terry Mitchell

Frick Company,
Weyersboro, Pennsylvania

THE accompanying illustration shows nature's most dramatic example of low-temperature refrigeration. While extinct for thousands of years, the bodies of prehistoric mammoths continue to be found in the icebergs and frozen swamps of Siberia.

It is an interesting fact that the coldest temperatures recorded on the face of the globe are not found at the North or South Poles, but are said to be experienced in the region around Verkhoyansk, in Northern Siberia, where the temperature in the middle of the fashionable winter season may go down to minus 90 F.

Temperatures used in refrigerating work can be divided into three parts. Temperatures between zero and plus 40 F have been used for so long that this may be considered the standard refrigerating range. The greatest fields for future development are undoubtedly in the regions above 45 F and below zero F. At the moment we might define the low-temperature refrigeration field as beginning with minus 20 F, where it first becomes worth while to use two-stage compression, and continuing through minus 120 F, which is as far as ordinary commercial practice now generally extends.

Types of Systems

If the compression ratio is around 3 to 1 or more, it usually pays to install a two-stage system

depending of course upon the size of the installation and the type of refrigerant. Where the temperatures go down still lower, three stages are used.

One of the largest 3-stage systems in the country is installed at the All-weather Laboratory, built for the U. S. Army. The job comprises a large high-temperature room, a huge stratosphere tunnel nearly 50 feet long, and a small test box. The fan in the tunnel circulates 100,000 cubic feet of air per minute over the finned coils, which are kept flooded by liquid ammonia with a pump. A large suction accumulator, placed beneath the coils, serves as a reservoir for the cold liquid and prevents slugging over into the suction line. The main suction pipe to the four-cylinder booster compressors is of 12 in. dia. The first-stage boosters have cylinders 15 in. by 10 in., and are driven at 360 rpm by 75-hp motors. Each 4-cylinder machine is rated at 19 tons refrigeration when carrying a suction pressure of 23 in. vacuum and discharging at 10 in. vacuum.

The two second-stage machines are 11½ by 8 compressors, each with two cylinders, driven at 480 rpm by 60-hp motors. These machines discharge at 40 lb gauge pressure into a pair of 7 by 7½, which form the third or high stage. They are driven at 400 rpm by 40-hp motors, making the total connected horsepower 350. Two small

shell condensers keep the final head pressure at 170 gauge.

The first-stage machines handle 13.1 lb of ammonia per minute, equivalent to 1173 cu ft. The second-stage machines handle 16.2 lb per minute, or 465 cu ft of gas actually pumped. The third stage has 22.54 lb in circulation per minute, or 183 cu ft. The steady increase in poundage results from the cooling of the gas and liquid between the stages. Being a test chamber, the tunnel is arranged to hold automatically any temperature between plus 100 F and minus 70 F. Direct-expansion cooling jackets are used on the machines of both the first and second stages. The ammonia liquid pump handles 10 gpm, which at minus 75 F corresponds to about 60 lb per minute, or nearly 5 to 1 when measured by the load requirements. A separate 3-stage set of compressors cools the small low-temperature test box. A 4 by 4 machine is used for pump-out service.

Ammonia was selected for this war-time job for several reasons: plenty of ammonia was readily obtainable; it was inexpensive, and losses from the charge would likely be small. As the low side operates at a vacuum there is very little danger to personnel from leakage. Manufacturers and operators are so familiar with ammonia equipment that special problems were minimized. It works well in stages, does not carry any

Friction losses in the pipe are low.

Freq-12 and Freq-22

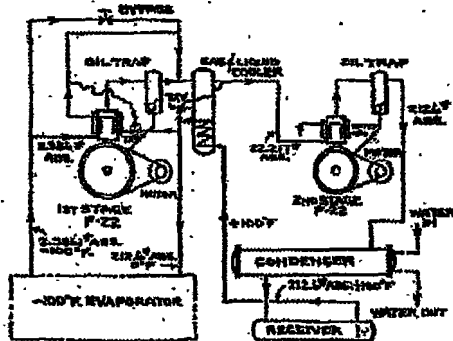
Freon-12 and Freon-22 have lately come into use for low-temperature work, and operate at a higher suction pressure on the first-stage machine than ammonia. The coldest temperature produced is minus 60 F., giving a suction pressure in the first-low vacuum: ammonia would hardly be useable at this low temperature. Note that an oil return trap was used in the discharge from each compressor. On all except the smallest jobs, the jacket of the first-stage compressor should be cooled with direct-expansion refrigerant. The liquid refrigerant in this case is chilled from a temperature of say plus 100° F. in the cooler shown at the center. Freon-22 is a comparatively new refrigerant, but one that works well in very low-temperature applications.

at minus 107° F. in a 2-stage
 m, it shows a volumetric ef-
 ficiency of 48.6 per cent at a com-
 pression ratio in the first stage of
 3.3. (Superheat, about 70° F.)

Table 1 gives a comparison of the number of cubic feet of ammonia, Freon-22 and Freon-12, which have to be handled in compressors to produce one ton of refrigeration at the temperatures shown at the left. Note that three-stage compression is recommended with ammonia beyond minus 50, and with other refrigerants beyond minus 30. Freon-22 has the smallest volume of any of the refrigerants shown, as seen as we pass about minus 15.

In Table 2 it is assumed that the saturated temperature in the evaporator is to be minus 40 F throughout. A complete study of this kind is very helpful in selecting the best refrigerant for any job. Allowance has been made for 10 degrees of superheat in each of the two stages.

Table 3 applies to Freon-12 at a discharge temperature of 109.5 F. It indicates total compression ratios for 1-, 2-, and 3-stage installations. As the suction temperature goes down, the total compression ratio changes from about 5½ to more than 60. With suitable stag-



FLOW DIAGRAM- 2-STAGE FREON-22 SYSTEM

FIG. 2. ARRANGEMENT OF A TYPICAL TWO-STAGE SYSTEM, SHOWING TEMPERATURES AND PRESSURES ENCOUNTERED AT VARIOUS POINTS.

TABLE I

Tables Showing Approximate Volume of Various Refrigerants Which Must Be Handled Per Minute In First Stage to Produce Low Temperatures

Sust. Temp.	Ammonia		Freon-22		Freon-12	
	Cu. Ft. Ton	No. of Stages	Cu. Ft.	No. of Stages	Cu. Ft. Ton	No. of Stages
-100	—	—	40.4	3	—	—
-86	—	—	28.0	3	48.4	3
-80	31.2	3	23.5	2	37.8	2
-70	21.7	3	16.85	2	26.2	2
-60	15.9	3	12.76	2	21.35	2
-50	12.51	2	9.22	2	18.20	2
-40	9.4	2	7.76	2	15.00	2
-30	7.2	2	6.28	2	12.80	2
-20	5.6	2	5.04	2	8.90	2
-10	4.4	2	4.31	1	6.69	1
0	3.5	2	4.19	1	6.62	1

TABLE 2

Comparison of Two-Stage Refrigerating Systems All at -46 F Saturated Evaporator Temperature

	Ammonia	Freon-12	Freon-22
Evaporator Press., Absolute	10.41 Lb.	9.32 Lb.	15.30 Lb.
Temp., Suct. to Booster	-30 F	-30 F	-30 F
Superheat in Suction Gas	10 F	10 F	10 F
Intermediate Press., Abs.	43.7 Lb.	34 Lb.	55.4 Lb.
Intermediate Temp., Saturated	13.0 F	18.0 F	17.5 F
Temp., Suct. to Main Comp.	23.0 F	23.0 F	27.5 F
Superheat to Main Comp.	10 F	10 F	10 F
Condenser Press., Abs.	200 lb.	128.5 lb.	200 lb.
Condenser Sat. Temperature	96 F	85 F	86 F
Gross CFM/TR, 1st Stage	15.23	20.85	11.7
REF/TR, 1st Stage	1.403	1.376	1.310
Temp. Liq. to Exp. Valve	40 F	40 F	45 F
CFM/TR, 2nd Stage	2.385	6.4	2.94
REF/TR, 2nd Stage	1.34	1.535	1.6
Vol. Eff., 1st Stage	65%	67 1/2 %	72%
Vol. Eff., 2nd Stage	80%	78%	76%

ing the ratio is kept well under 7. Figures for the cu ft per ton are of interest.

Table 4 compares seven different . be considered except in the case

of ammonia and of carbon dioxide. The suction pressures show why Freon-22, Ethane, or Ethylene are most suitable for temperatures of minus 100 and below. The critical points are worth noting. Propane at minus 100 operates at 23.43 in. of vacuum—similar to F-22.

Booster Compressor

A typical booster compressor is shown in Fig. 2. These machines all have a bore larger than the stroke and are built with either two or four cylinders. The shaft is equipped with a mechanical seal, which holds either pressure or

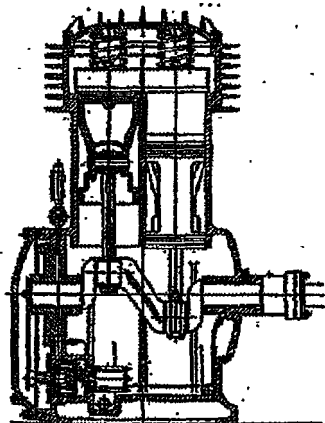


FIG. 2. SECTION THROUGH A TYPICAL BOOSTER COMPRESSOR.

vacuum equally well. The oil pump is driven by the chain shown at the left and together with a Cuno self-cleaning filter is below the level of the oil in the crankcase. Booster machines with four cylinders measuring 15 by 10 or 17 $\frac{1}{2}$ by 12 are becoming a common sight in large quick-freezing plants.

Cascade System

A cascade system has the low-temperature refrigerant condensed by another refrigerant. This was originally done with carbon dioxide and ammonia a good many years ago. In Fig. 3 the possible use of ethylene is shown for the first step of the cascade and Freon-22 for the second step, which is divided into two stages. Ethylene can produce temperatures below minus 150 while maintaining a pound or two of positive gauge

TABLE 3

Freon-12 Systems, 1, 2 and 3 Stages. Discharge 109.2 Deg. = 124.5 Lb. Gage

Temp. Deg. F.	Suct. Press. Abs.	Total Comp. Ratio	No. of Stages	Interm. Press.	Ratio Per Stage	Cu. Ft. Min./Ton
0	29.97	5.22	1	—	5.22	4.82
-10	19.20	6.48	2	49.2	2.55	6.68
-20	15.28	8.15	2	42.7	2.36	8.20
-30	12.02	10.35	2	38.7	2.32	10.30
-40	9.22	12.56	2	34.1	2.06	11.00
-50	7.125	14.45	2	29.3	4.15	11.3
-60	5.305	22.2	2	25.86	4.32	21.55
-70	3.971	25.95	2	22.50	5.31	28.2
-80	2.885	43.2	2	19.00	6.89	37.4
-90	2.054	60.6	3	10.10	2.5	48.4

TABLE 4

Properties of Low-Temperature Refrigerants

	Melting Point Deg. F.	Pressure for -100 F.	Critical Points Press. Gauge	Temp. Deg. F.
Ammonia	-107.36	27.4 in. Vac.	1651	271.2
Freon-12	-222.7	27.01 in. Vac.	567	222.7
Freon-22	-256.0	25.06 in. Vac.	701	204.8
Ethane	-289.0	16 lb. gage	712	89.5
Ethylene	-272.0	50 lb. gage	749	49.5
Propane	-300.8	23.43 in. Vac.	632	201.1
CO ₂	-69.9	7.52 lb. gage	1970	67.3

pressure, and can be condensed at minus 54.4 F and 228 lb gauge (9.8 cu ft per ton). It will give temperatures down to minus 176.8 F if needed. A fourth compressor, in the form of a low-pressure condensing unit, is used for cooling the liquid ethylene in the receiver to minus 30 F or thereabouts, when the rest of the system is shut down; this keeps the pressure in the ethylene piping within safe limits, as the system is pumped down before the machine is stopped.

One of the cardinal things in the design of a two- or three-stage system is the selection of motors of proper horsepower. There will be times when the load varies from the design conditions. Suppose we have a plant designed for minus 50 F and that during certain periods this level increases to minus 28 F. If the intermediate pressure in an ammonia two-stage system were 10 lb. under design conditions, the required horsepower on the booster compressor would be approximately 28.3 brake horsepower at minus 50 F saturated refrigerant suction temperature. If the suction pressure should go to

minus 30 F saturated temperature, the discharge pressure would increase to approximately 20 lb, requiring 36.3 brake horsepower or an increase of some 25%. Hence the applied horsepower should be in the neighborhood of 50% greater than the design horsepower.

The high-stage compressor should likewise have a factor of safety in its motor, depending upon the intermediate pressure; for the conditions here mentioned an increase of about 15% should cover the requirements. Furthermore, whenever synchronous motors are employed the starting torque and pull-in torque should be checked. It is suggested that whenever the duplex arrangement is employed, the starting torque be at least 50% and the pull-in torque 40%.

The port and valve areas of a booster compressor should be large in order to keep the pressure drops in the compressor at a minimum. This may be gauged by checking the properties of the refrigerant; for instance, with ammonia at minus 50 F a $\frac{1}{2}$ -lb drop in pressure corresponds to an increase in volume of gas of 9.5%. At minus 70 F the same pressure drop would in-

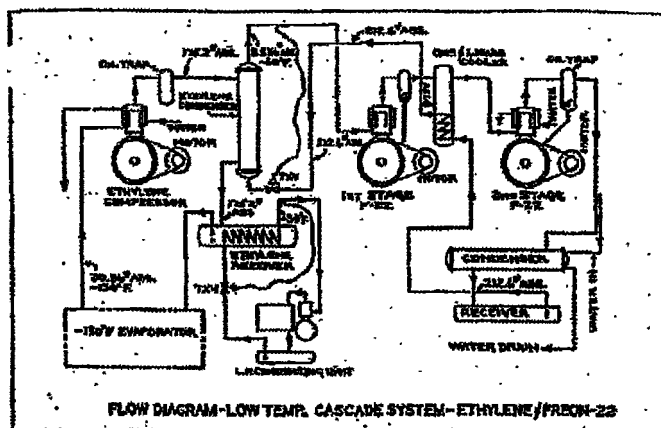


FIG. 3. A CASCADE SYSTEM USING FREON-22 IN TWO STAGES FOR CONDENSING ETHYLENE, WHICH IS KEPT WITHIN SAFE PRESSURE WHEN THE MAIN PLANT IS SHUT DOWN BY OPERATING SMALL MACHINE.

crease the gas volume 14%. At minus 80 F, 28%. Even at the higher temperatures it is important; for instance, at minus 50 F, 6.2%, at minus 40 F, 8.5%.

At low temperatures, the height of the liquid in the evaporator should be taken into consideration.

Some we have an ammonia evaporator 5 feet in height, and it is considered to have 50% of head or liquid level at a suction pressure corresponding to minus 60 F. The pressure at the bottom of the evaporator is 0.732 lb above the outlet pressure from the evaporator, which results in a temperature at the bottom of the evaporator coil of minus 58.5 F. At minus 80 F under like conditions, the temperature corresponding to the pressure at the bottom is minus 78 F or a loss of 7 F in temperature at that point. Of course this effect depends upon the design of the system. If an accumulator is employed, the liquid ammonia at the bottom of the coil, in the case of the first example, is minus 60 F so that it is in a sub-cooled condition. Under such conditions it means that in the design of the evaporator this temperature difference must be taken into consideration. At 20 F the temperature difference in the above example could be less than 1 F.

Frequently, in low temperature installations, recirculation of the refrigerant is employed in the low stage or evaporator in conjunction with an accumulator, the optimum

location of which is beneath the evaporator coil. The amount in circulation can be anything from slightly more than sufficient refrigerant to develop the duty to as much as four or five times the quantity evaporated. We often find a circulation of approximately two times the quantity is satisfactory; however, in most cases we prefer to use a larger amount, upwards to five times the quantity. The surge

tank or accumulator from which the refrigerant pump takes its suction has the refrigerant supply usually controlled by float level valves.

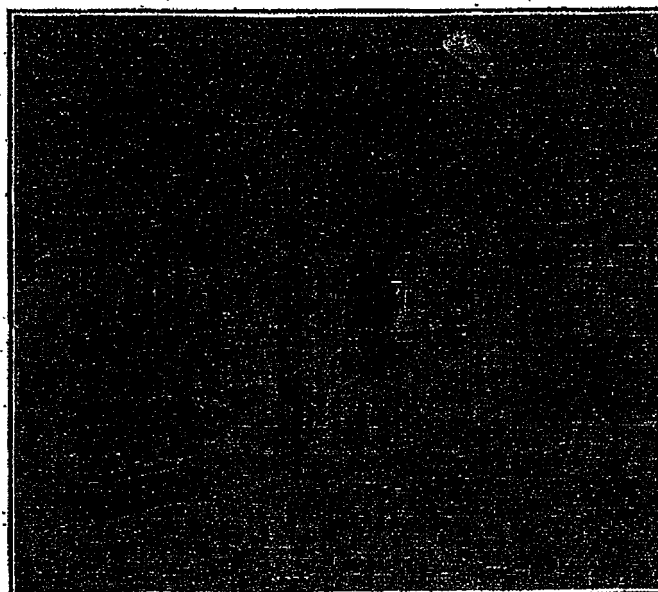
Low Temperature

For really low-temperature installations it is best to cool the jackets of the low-stage compressors by water or by refrigeration connected to one of the higher stages. At low pressure the poundage of gas handled is quite small, so that the heat entering the gas from the pipe line, or from conduction as it enters the compressor, may be quite high in proportion.

In this kind of work various fluids have to be cooled in the form of brines, or for low-temperature process work. We refer particularly to calcium chloride, ethylene glycol, and methanol. Cooling these materials to the lowest temperature levels at which they may be successfully handled necessitates a careful consideration of the viscosity of the fluid within the cooling range. For example, a 20% calcium chloride solution operating at a temperature level of around 10 F, if cooled to a range some-

(Continued on page 80)

FIG. 4. COMPLETE 3-ROOM TEST PLANT AT BENDIX RADIO DIVISION, TOWSON, MARYLAND—ONE OF THE MOST REMARKABLE LOW-TEMPERATURE INSTALLATIONS EVER MADE.



Music for Southern Industry

By

Hunter R. Hughes, Jr.

Southwestern Editor



TURNTABLE OPERATOR CHANGING DISCS AT THE INTERVAL SCHEDULED BY THE PROGRAMMING DEPARTMENT.

MOST of our Northern neighbors, when mentally picturing the beautiful South, hear darkies singing in the cotton fields or a banjo ringing through the moonlight before a cabin in the pines. The South, as they see it, is a land of sweet music.

Actually, they have things backwards. In the industrial South, there is no music, unless the drone and clank of machinery can be called music. The hum of a motor and the grind of a drill are music only to the ears of a conscientious maintenance man, and his trained ears too frequently hear discords. On the other hand, many Northern and Eastern industries greet their workers in the morning with real music designed to boost mo-

Music as a background for industrial activity has proven its benefits. Southern plants will soon be able to use it.

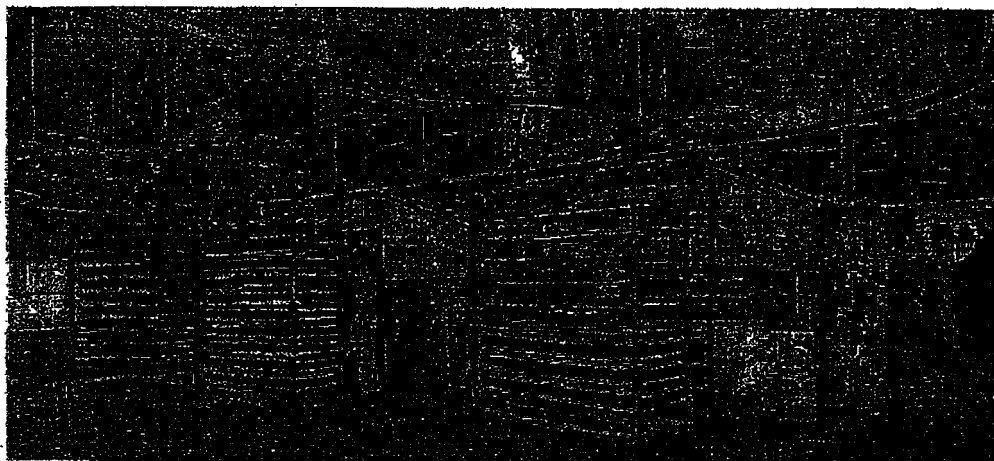
rale and make the working day more cheerful.

Music in industry is certainly not new. In fact it is old, established, and proven. Almost too old (to make a slight crack at our readers) to be used in so few of our progressive Southern plants. A thorough study of music in industry was made in England before the war. Results were report-

ed in *Fatigue and Boredom in Repetitive Work*, published by H. M. Stationery Office. This was followed by a paper by Professor Harold Burriss-Meyer which covered the studies made at the Stevens Institute of Technology.

Later, in 1943, the War Production Board made a national survey to determine the benefits of music in war industries. This survey

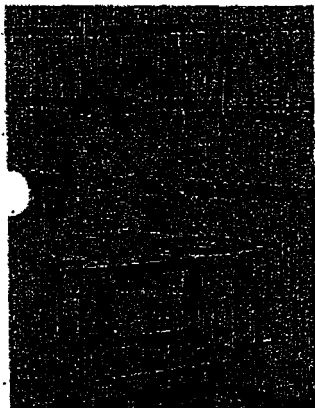
IN MRS. BAIRD'S BAKERY, DALLAS, THE EMPLOYEES ARE FURNISHED MUSIC THROUGH AN ARRANGEMENT WITH BUSINESS MUSIC, INC.



of 100 plants indicated that both management and labor were convinced that music accomplished remarkable results.

Benefits

What does a background of working music do for employees? The primary objects are to provide release from the boredom of industrial monotony and relieve physical and mental fatigue. Monotony is relieved because there is a continual change of background that might well be compared to the change of scenery that passes before the eyes of a train traveler moving through varying landscape. A movie thrown on a screen before the worker would relieve monotony in much the same way,



AN EXPERIENCED LIBRARIAN HANDLES THE EXTENSIVE MUSIC LIBRARY OF OVER 1,000 TRANSCRIPTIONS IN ONE LARGE BRANCH.

but most industrial work requires constant use of the employee's eyes, and a moving picture would be distracting rather than beneficial.

Few production workers use hearing as a part of their jobs. Therefore, music in no way distracts from the proper and concentrated use of the eyes or other parts of the body. In fact, it is a genuine aid. Without music the ears hear only the constant din of machinery. The tone is never changed. The effect of this monotony on the body is as fatiguing as a spot of red light shining in the eyes with never-changing brightness. There is a distinct analogy

Excerpts from Typical Industrial Program

8:15 A.M.

How Blue the Night
Mama Inez
When Irish Eyes Are Smiling
With a Song in My Heart
The Last Round-Up
Hallelujah
Take a Fool's Advice
Ac-Cent-Thu-Ate the Positive

12:15 P.M.

Fine and Dandy—Medley
On Wings of Song
Daddy
The Very Thought of You
Dark Eyes
Undecided
La Paloma
My Dreams Are Getting Better
All the Time

12:00 Noon

The Swan
Let Me Love You Tonight
Melancholy Baby
Three Little Words
My Wild Irish Rose
Somebody Loves Me

4:15 P.M.

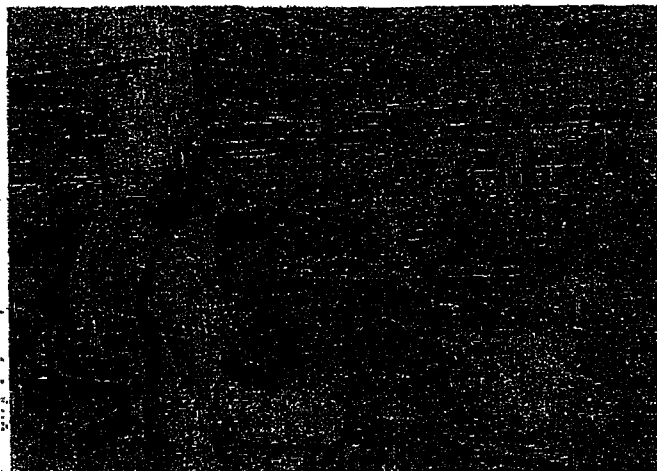
Out of This World
The First Love
Chris and His Gang
Mr. Haydn Gets Kip
Beautiful Lady
Los Timbales
Jersey Bounce

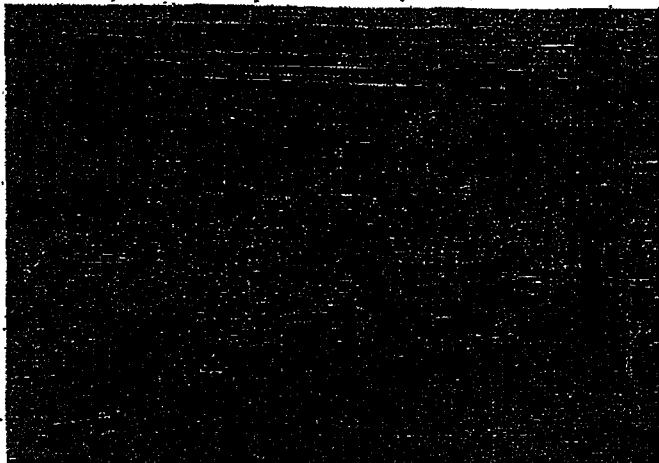
here. Our illuminating engineers have proved that glare and the wrong color of light will cause fatigue by actually draining vitamin B₂ from the body through the eyes. It is evident that the "glare" of a never-changing noise can have a similar drain on the reserve energy of a worker. The noise need not be loud to be unfavorable to working conditions. The comparative silence of continually clicking typewriter keys can be equally tiring. Music changes these tones, allows the ears to rest in much the same way that a man occasionally shifts his body from one position to another to rest different muscles.

All of these are proven facts. They have been proved not only in the laboratory but in the plant. Air Reduction, Bendix Aviation, Consolidated Shipbuilding, Leeds & Northrup, Otis Elevator, SKF, Sperry Gyroscope, Westinghouse, and hundreds of other industrial plants in this country and in England have found that industrial music helps to improve worker morale and increases production.

With a musical background there is less unnecessary talking among the workers, they find that the day passes more quickly, and there is less obvious anxiety in the wait for lunch hour, the wait for quitting time, and the wait for pay

SEWING ROOM OF HANDBS SPUNWEAVE, INC., DALLAS. NOTE SPEAKERS MOUNTED AGAINST CEILING.





THE PRESSING DEPT. OF THE ORIENTAL LAUNDRY IN DALLAS IS FURNISHED WITH AN INDUSTRIAL MUSIC PROGRAM.

day—the three big “waits” of every employee.

Most important of all, employees like music. In every survey they have indicated that it is a strong morale booster. Many plants have found that music, more than any other single thing, has aided employer-employee relations. Absenteeism drops, turnover is definitely cut down, and applications for employment actually increase. Unions give full support to the idea.

What Kind of Music?

Just any music will not do. It must be planned to fit the work being done. Muzak, a commercial distributor of industrial music, has found that one of three types of music will fit into most operations. They offer music for industry, for offices, and for public places such as restaurants or reception rooms. Industrial music is work music, not play music. It is arranged and specially programmed for busy plants. Office music is designed to soothe but it does not establish a work tempo. Music for public places, on the other hand, is entertainment music. Research men have spent years determining the proper type for the various places, and the choice of selections is now made in a scientific manner.

Facilities

While music may be had in any plant by the installation of a

phonograph and a suitable number of speakers, the simplest and best way to get good, properly designed programs is by using the facilities of a commercial firm set up to supply music from a central studio. This assures good re-

cordings and a scientific choice of titles. It also eliminates the hiring of a person to operate privately owned record equipment. The largest supplier of industrial music is Muzak. Their system is quite simple. They install speakers in your plant, connect the speakers to a special line installed by the telephone company, and plug these lines in to their studio outlets. A subscriber pays by the month for the service.

One of the reasons that this service has been so popular in the North and East and so neglected in the South is that until recently the only Muzak studio in the South was Florida Music Network at Miami Beach, and this was largely for the distribution of music for public places. Now, Business Music, Inc., has opened a studio in Dallas to serve industry in the Dallas-Fort Worth area, and another studio is opening in Houston. If these new distributors are successful, others will be established in the leading industrial centers of the South and Southwest.

How Much Heat Is Lost?

BACK in 1915 L. B. McMillan read an important paper before the A.S.M.E. entitled, “The Heat Insulating Properties of Commercial Steam Pipe Coverings.” The paper aroused unusual interest at the time, and subsequently it has proved to be of much value to the engineering world. One of the curves has often been used by this writer in various ways—Fig. 23 in the paper. Concerning that curve the author said, “. . . is perhaps the most valuable of all the results contained in this paper.”

The curve relates to the loss of heat from white canvas covered piping. To determine the heat lost from such piping, regardless of the thickness of the insulation, “place a thermometer under the canvas and another in the air 4 or 5 feet from the pipe.” Subtract the low temperature from the high and call the difference t . Then substitute in this formula:

$$H = \frac{390t}{328 - t}$$

where

H = the heat loss per square foot of outer surface covering, Btu per hour.

The above is a modification of the C. M. Sames formula which appeared in the discussion following the reading of the original paper. The “Sames formula” was based on the above mentioned McMillan curve.

Now for those readers who would like to compare the heat lost from covered piping with the greater heat lost from uncovered piping, a good rough figure, according to Gebhardt, is to use 3 Btu lost per square foot of pipe per degree F. difference in temperature. The difference in temperature in this case is the difference between the temperature of the hot gas or liquid or vapor within the pipe and the temperature of the air surrounding the pipe. To be sure the position of the pipe, its exposure to cold air currents, its size, etc., all have much to do with the actual heat loss, but for general computations 3 Btu is a good figure to use.

Arkansas Extraction Plant for the Oil Milling Industry

By Jane L. Gordon

MORE economical in electrical horsepower requirements than the present mechanical processes and requiring only limited operating personnel, an Allis-Chalmers Solvent semi-works scale Extraction unit for cottonseed oil recovery has just been adapted to the oil milling industry by the Delta Products Co., Wilson, Arkansas.

The experimental unit was originally designed for and first successfully adapted to the soybean industry. It is identical in design and detail with a 200-ton unit, and the capacity is sufficient to defi-

nately determine that the solvent processing will work efficiently in cottonseed oil recovery for the production of high quality products.

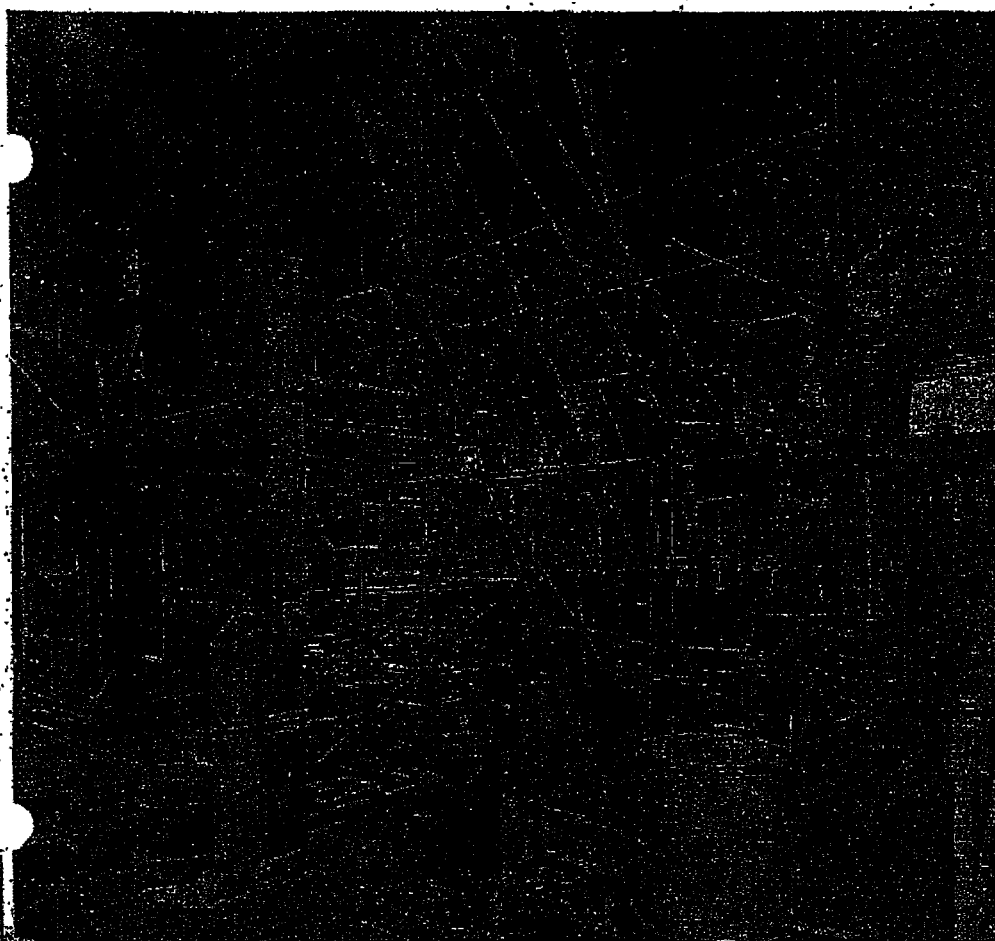
Operation

The extractor or contact chamber is constructed of many superimposed glass rings divided by steel partitions. The cottonseed meats are fed into the top and pass through by gravity while the solvent is introduced at the base of the Extractor and withdrawn at the top giving a counter-current flow effect. The mixture of oil and solvent discharges from the top

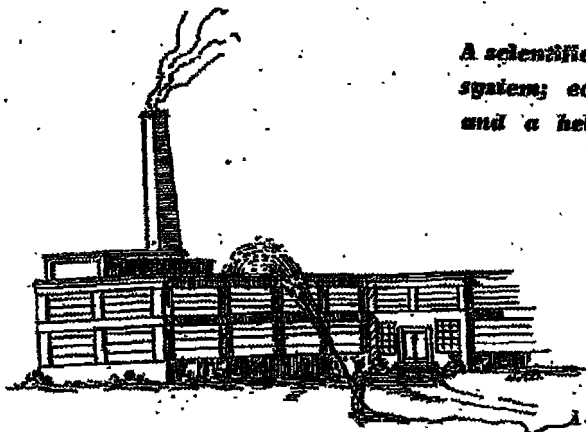
into a receiving tank with agitator. Passing through a filter the oil and solvent mixture flows into a large storage tank. It is pumped through a flash chamber and then a stripping column to remove the last trace of solvent from the oil. The meal is elevated by a drag and discharged into the drier to recover the solvent.

Wide Application

According to C. W. Hoover, general manager of the Wilson plant, the Solvent Extraction process of cottonseed will completely revolutionize the oil milling industry. This method of extracting oil can also be used by the mills for crushing soybeans and other oil bearing seeds or nuts, giving the South's cotton oil mills a wide application.



Automatic Roof Cooling



A scientific, automatic roof cooling system; economical in operation and a help in air conditioning.

By
Leonard M. Holder*

PICTURE a roof with hot steam coils overhead — yes, with steam on in the summer. Seems rather silly doesn't it but a roof at 150 F will produce temperatures under the roof of 130-135 F. One of the oldest principles of cooling is still in general use on the roofs of countless office buildings and manufacturing plants for the dissipation of heat from the sun's rays.

Insulation Insufficient

When insulation was brought into general use about seventeen years ago very broad claims were made for its effectiveness in preventing solar heat penetration of buildings. Some types of structures responded very favorably to this treatment, but other building owners, seeking greater cooling, devised a roof spray application to curb the sun's heat at its source—the roof of the building. It was found that when the spray was applied the roof did not get warm and consequently did not transfer appreciable heat down into the building.

In the summer of 1934 a standard designed roof spray system began to appear on the roofs of buildings in Washington, D. C., a city known for its very hot and humid summers. Initial installations were made on apartment buildings and hotels. Soon, thermal controls were adapted to roof cooling and the roof spray application became automatic, no water

being used when the roof temperature remained cool. Then, it did not take long to advance this type of building cooling to include manufacturing plants, theaters, motion picture studios, amusement halls and even residences. Today millions of square feet of roof area are kept cool by automatic means, using the sun's own heat to actuate the thermostat which controls the roof spray system.

Economical Operation

Since the relative humidity of the atmosphere is a prime factor of efficient evaporative cooling it is logical that the lower the relative humidity the more water evaporated. The systems are designed to apply water to roofs very sparingly, just enough to keep them moist so that evaporation is almost constant. This type of moisture application prevents the accumulation of water on the roof so there is no substantial run-off. Any excess will run to the sewer.

The spray heads used in this automatic cooling system have been designed to use as little water as possible and have a wide range of application. One gallon of water per minute (spraying intermittently) keeps 540 sq ft of roof cooled to a few degrees above wet bulb temperature. Controls have been improved to reduce water consumption to an absolute minimum.

*Manager, April Shivers Company, Washington, D. C.

The spray of water, which is very fine in character but not a mist, is in actual operation approximately one-third of the day while the sun is shining. This efficient and reliable control enables the system to keep 180 sq ft of roof cooled—not varying more than three degrees—for a ten hour day using about 50 gallons of water.

Modern automatic roof cooling systems are designed to spray all of the roof area. This is accomplished by the use of part circle coverages heads which are used along the edge of the roof, parapets, etc. These part circle heads are supplied in ¼ circle, ½ circle, and ¾ circle heads. Any portion of a roof not sprayed, will absorb a large amount of heat and tend to nullify or reduce the effect of the areas sprayed. Therefore, it is most important to insist on full coverage of the roof to be cooled. Figure 1 shows a typical spray head arrangement.

Water Supply

It is recommended that regular city water be used if available, and it is seldom necessary to increase the water pressure for a roof spray system. Another source is the waste water from air conditioning units. This water may be utilized by employing a connection to the waste line, and increasing the pressure by a small booster when required. When the air conditioning compressors are not running a by-

pass connection with suitable automatic valve to the city water supply can be used. The use of city water only, when the air conditioning equipment is not required to cool the building, is a very economical arrangement.

Water Consumption

The amount of water consumed (evaporated) depends upon the various factors which affect evaporation. These factors include (a) intensity of sun's radiation; (b) percent of relative humidity present in atmosphere; (c) the velocity of air currents; (d) the type of surface upon which evaporation occurs. Rough surfaces, slag, gravel, etc. tend to hold and conserve moisture.

Using the ideal water pressure of 12½ psi as operating pressure at the head, a full circle, twenty serration, 110 degree trajectory "April Showers Spray Head" will use .279 gpm and should be spaced on maximum of 15 ft centers in an equilateral-triangular formation. Basing the consumption of water on an average July day in Washington, D. C., with dry bulb at 90 F with 50 % relative humidity, the system working on flat slag roof will be "ON" approximately 30% of the total hours of sunshine and each full circle head will use 50.22 gallons per day for 10 hours operation.

Each head will cover an average of 173 sq ft for a rectangular roof. Using 10,000 sq ft of roof area as a base figure, a hot summer day will require about 2912.76 gallons of water. This would be a maximum requirement. Since there are many cloudy days, it would be more accurate to base water consumption on an average 8 hour day, or four-fifths of the above figure. Slightly more water is used for roofs which have no slag or gravel.

Many Benefits

Users of this automatic roof cooling system state that there is no appreciable increase in humidity above or about the building, and none whatsoever inside. The sprays above the roof fill the air with fine particles of water and actually cool thousands of cubic feet of air which falls (cooled air is heavier than heated air) around the

PERFORMANCE RECORD

April Showers Company Installation

From this continuous record for one month's operation, typical days when unusually high temperatures were experienced on the top floor (6th) have been selected, and compared with those of the floor below taken at the same time. These show very clearly the remarkable reduction of the temperature differentials between the top floor and the floor below, and the outside shade temperature.

Group I—System Not In Operation

Date	Maximum Outside Shade Temp. F	Inside Temp. F 5th Floor	Inside Temp. F 6th Floor	Excess in 5th Fl. Temp. F 5th Fl.	Excess in 6th Fl. Temp. F 6th Fl. v. Outside
Sat., July 6	76	78	88	12	12
Sun., 7	83	85	93	10	10
Sat., 27	91	88	97	10	6
Sun., 28	80	84	95	9	15

Group II—System In Operation

April Showers Automatic Roof Cooler Placed In Operation

Date	Maximum Outside Shade Temp. F	Inside Temp. F 5th Floor	Inside Temp. F 6th Floor	Excess in 5th Fl. Temp. F 5th Fl.	Excess in 6th Fl. Temp. F 6th Fl. v. Outside
Tues. July 9	91	87	88	1	-3
Wed. 10	87	86	87	1	1
Mon. 15	82	81	83	1	-0
Fri. 26	94	89	92	2	-2
Tues. 30	94	91	92	1	-3
Wed. 31	89	87	87	0	-2

Note particularly the contrast between Sunday, July 28, and Tuesday, July 30. When the system was not in operation, an outside maximum temperature of 90 F was shown, with a Wet Bulb Temp. of 87 F, which was about normal. On the sixth floor an inside temperature of 95 F was experienced, with 84 F showing on the floor below.

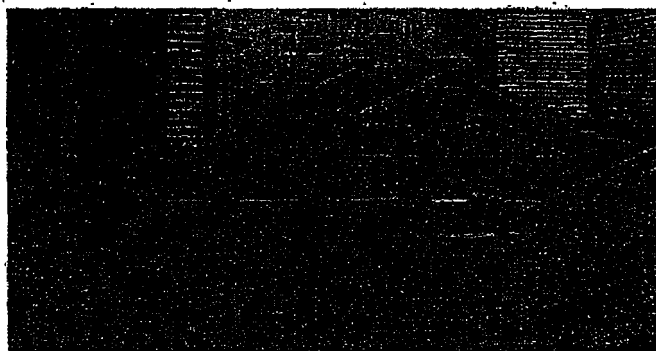
When System Was In Operation

Two days later, when the system was in operation, there was experienced one of the hottest days on record, taking all factors into consideration. A maximum Dry Bulb Temp. of 94 F, with a Wet Bulb of 89 F was recorded, giving one of the highest figures on record for the total heat in the air. In spite of this unusual condition, with Dry Bulb temp. 14 F in excess of those two days before, the inside temperatures of the top floor were no higher than before.

building and favorably influences temperature on the floors below. Another important benefit of roof cooling by automatic means is maintaining a constant temperature, which, during the heat of the day, does not vary more than three

degrees. This constant roof temperature is a direct means for prolonging the life of the roof, preventing the escape of volatile oils from the waterproofing, and preventing excessive expansion and contraction of physical equipment,

FIG. 1. U. S. TREASURY ANNEX BLDG., WASHINGTON, D. C.



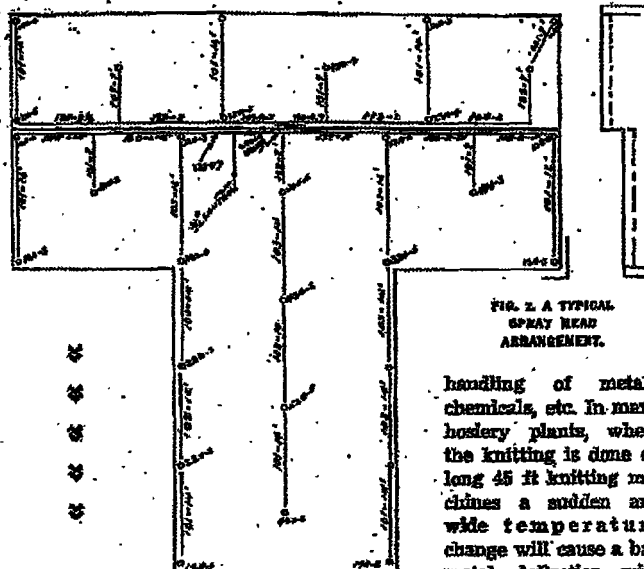


FIG. 2. A TYPICAL SPRAY HEAD ARRANGEMENT.

such as compressors, and other air conditioning equipment.

It is suggested that, in plants whose manufacturing processes require frequent air changes, the air ducts be placed on the roof to be sprayed along with the roof. In many installations such an arrangement of forced air ventilation has added greatly to the comfort and greater efficiency of the workers. Health is our greatest treasure and an employee who works in a cooled area can put out more per hour than when he is uncomfortable.

Many Applications.

Many plants have been air conditioned for commercial reasons such as holding tolerances, proper

handling of metals, chemicals, etc. In many hosiery plants, where the knitting is done on long 45 ft knitting machines a sudden and wide temperature change will cause a bad metal deflection with

the result that the needles fail to enter the small holes properly. In the winter with temperatures more evenly controlled no trouble ensues, but during the summer when inside temperatures may rise to 102-104 F and then drop suddenly due to a shower, considerable trouble results. An automatic roof cooling system cools sufficiently to prevent this and many other types of mill troubles.

The system does not increase the absolute humidity in the cooled area as is possible with evaporative cooling methods. Such a rise would be most troublesome in wood working or furniture plants. Your roof can be a cooling element rather than a summer superheating element.

Brick

(Continued from page 46)

off the heat and allows the car's bearings and wheels to operate in a reasonable temperature zone.

It is very important that an even draft be maintained at both top and bottom of the kiln. This is accomplished by using two centrifugal fans, one at the top and one at the bottom and balancing the draft. There is a tunnel under the kiln in which a man may move

about and repair any wheel or track trouble or remove fallen bricks from the right of way. A man working in this area is protected from excessive heat by the sand seal.

Burners

Six main burners in fire boxes and auxiliary burners serve each side of the kiln. They are placed about midway and fire directly onto the brick moving slowly past them. The natural gas burners are served by a 7 in. gas main with

1 1/2 in. downcomers to each burner. The temperature in this area is high. Thermocouples installed in this area indicate a temperature of about 2500 F.

Storage and Shipment

The finished brick is either stacked in the portion of the building reserved for storage or is loaded directly into a freight car for shipment. Incidentally, in spite of the old proverb, this is the only point at which straw comes into the process. In loading a freight car, straw is placed between each layer of brick to prevent shock and breakage.

The Product

The Troup plant's output is confined to two types of brick, a high heat duty brick sold under the trade name of RANGER and an intermediate heat duty called Troup. Both RANGER and TROUP bricks meet the A.S.T.M. standards for their respective grades. These standards require that high heat duty bricks have a fusion point about 3075° F and intermediate heat duty bricks have a fusion point above 2936° F.

The brick manufactured at Troup are part of about 300,000,000 brick a year that come from General Refractories' 22 plants. The main office of the company is in Philadelphia, and a district sales office is maintained in Houston. This Houston office not only serves the Southwest, but has made a number of sales in Mexico. L. L. Hitchcock, District Sales Manager, sees an excellent opportunity for increase sales in the rapid progress that Mexico is making toward industrialization. Obviously the Troup plant is nicely located to handle orders from below the border. The enormous industrial growth of the Texas-Gulf Area has brought about considerable demand for Refractories in that area.

Very few basic materials are manufactured or processed without in some way utilizing refractories. Hence, this modern refractory plant at Troup which makes available high grade refractory products in the Texas-Gulf industrial area will contribute greatly to the continued progress and industrial development of this area.

Safe Handling of Barrels

Moving and handling barrels, just as everything else, has safe methods which should be followed to prevent accidents. This careful analysis of one handling procedure will suggest safeguards and cautions for other handling jobs.

FIG. 1.

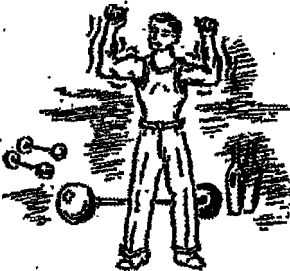


FIG. 2.



FIG. 3.



FIG. 4.



1. Keep in good physical condition. Barrel handling is strenuous work, therefore, a worker who is out of condition is more apt to cause an accident.

2. Safety shoes and leather gloves or mittens must be worn at all times when handling barrels.

3. When rolling a barrel keep your hands on the bilge or quarters. If your hand or finger is caught between the chime of a barrel and some other object, severe injury may result.

4. Keep feet and legs clear of moving barrels. Never roll a barrel toward another employee unless he is expecting it or facing you.

5. When stacking empty barrels, first lift the barrel to knee height, using the muscles of the legs and shoulders. Then, use the knees to boost the barrel to the higher level. Keep the back straight and erect.

6. There are two ways to up-end a barrel:

A. Squat at the head end of the barrel and place both hands under the lower chime. Keep the back erect, the head back, and the arms straight. Then lift, using the large muscles of the thighs.

B. Stand at the side of the barrel; place hands at opposite ends of the barrel, grasping the chimes. Rock the barrel once, laterally to splash the liquid, and then, using the splash to aid the operation, lift up on one chime and push down on the other. As the barrel comes up, remove the hand on the lower chime and get the feet and legs clear.

Never attempt to up-end a barrel by yourself unless you can do it with ease and it is no strain on you. If you are not physically able to up-end a barrel alone, do not try it, as a severe back strain and possible hernia may develop.

7. Always pull over a barrel when it is desired to lay it on its side. Reach across the barrel and grasp the chime on the side away from the body; then pull, and as

(Continued on page 80).

FIG. 5.

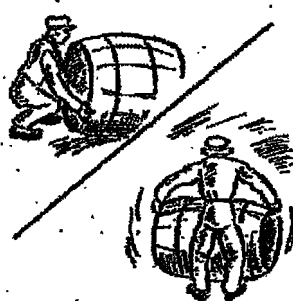


FIG. 6.



FIG. 7.



ELECTRONICS

A New Job for the Maintenance Man

The second in a series of articles to serve as a guide to the electronics maintenance man, applies the analysis of the basic units to motor controlling circuits.

By
R. C. Roetger

THE first article of this series in the December issue covered the general aspects of electronic circuit maintenance and illustrated how most of the equipment likely to be encountered in industrial plants could be separated, theoretically, into basic units comprising the signal system, signal amplifier, Thyatron or power stage, electro-mechanical stage and the power supply. This is shown diagrammatically in Figure 1.

The application of such an analysis to motor controlling circuits incorporating some or all of these system components is covered in this discussion.

In order that the maintenance engineer may work intelligently on such apparatus, it is essential that he have a thorough understanding of the principles involved. To this end the operation of more or less elementary circuits is described first followed by an account of a more detailed and generally applicable circuit.

Simple Control Circuits

Figure 2 shows a circuit used for the reversing operation of a d-c motor from an a-c source. The dotted lines indicate the breakdown into the system components. They are not discussed in "Output" to "Input" order inasmuch as a knowledge of the operation of the Thyatron stage, which is the heart of this and similar motor control circuits, is a prerequisite to the understanding of the remainder of the circuit.

The two positive grid Thyatrons (grid controlled rectifier tubes) which supply the direct current to

the motor armature are connected "back to back" so that, when they are conducting, one tube passes positive half cycles and the other negative half cycles of the a-c input. Consequently the polarity of the motor armature and the direction of its rotation is determined

FIG. 1. ELECTRONIC CONTROL SYSTEM UNIT DIAGRAM.

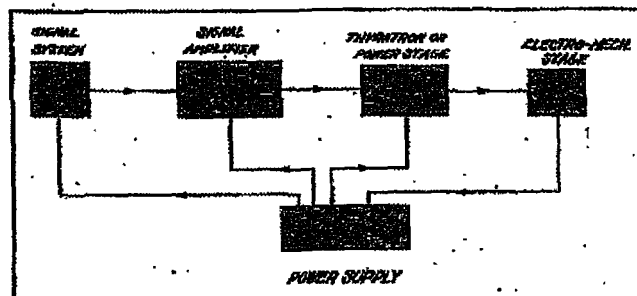
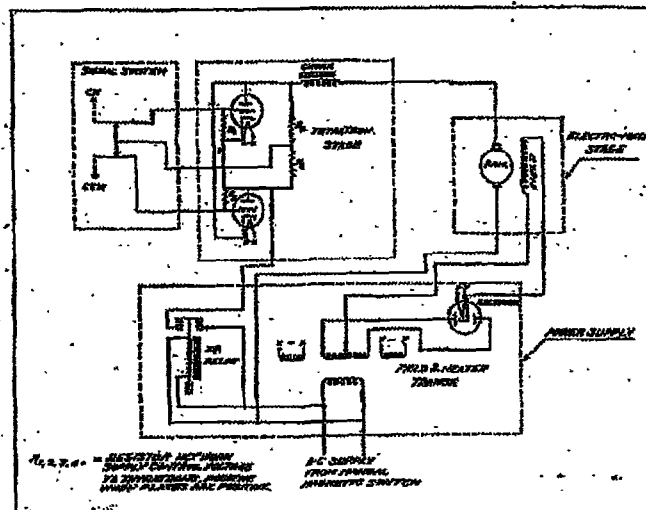


FIG. 2. ELECTRONIC MOTOR CONTROL REVERSING ON-OFF SYSTEM.



by which tube is conducting. This is illustrated schematically by Figure 3.

Power Supply

The power supply unit fulfills four requirements: it furnishes the Thyatron anode supply, excites the motor field with direct current, provides low voltage alternating current for the Thyatron heaters, and supplies a-c grid voltage for the Thyatrons. It should be noted that inasmuch as the "direct current" supplied to the motor armature is actually the pulsating voltage resulting from half-wave rectification its effective value is less than half the voltmeter reading. Consequently the anode potential will be about twice the rated value for the motor armature.

The time delay relay prevents application of the anode voltage before the cathodes of the Thyatrons have reached the proper operating temperature. This is necessary to prevent injury to the tubes. The required delay time varies for different tube types and is given in a manufacturer's literature.

Electro-Mechanical Stage

The electric motor is a d-c machine designed for reversing service. The field is separately excited and the winding is designed for the direct-current available from the power supply. The armature is designed for the current and voltage in the Thyatron cathode circuit.

Signal System-Signal Amplifier

In this control the "signal" to which the motor is to respond is initiated by a pair of manually operated normally closed push buttons or equivalent mechanically operated contacts. Such manual or mechanical operation of the contacts obviates the need for a signal amplifier inasmuch as there is sufficient power (force) available to actuate the light contacts. Obviously the contacts could be on a relay actuated by a signal amplifier receiving a signal from a photo cell or analogous signal source.

Operation

With the circuit energized and the time delay relay closed both Thyatrons are conducting by virtue of the grid circuit constants. This results in alternating current being applied to the motor and it remains at a standstill. The

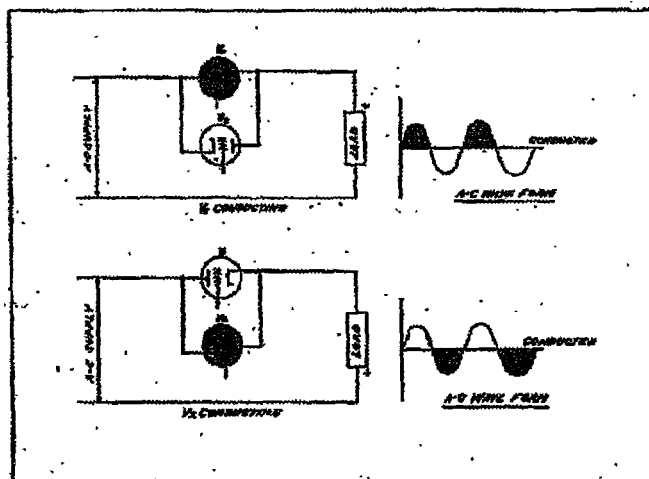


FIG. 3. BACK TO BACK THYATRON CONNECTION.

current is limited to a safe value by the reactance of the choke coil.

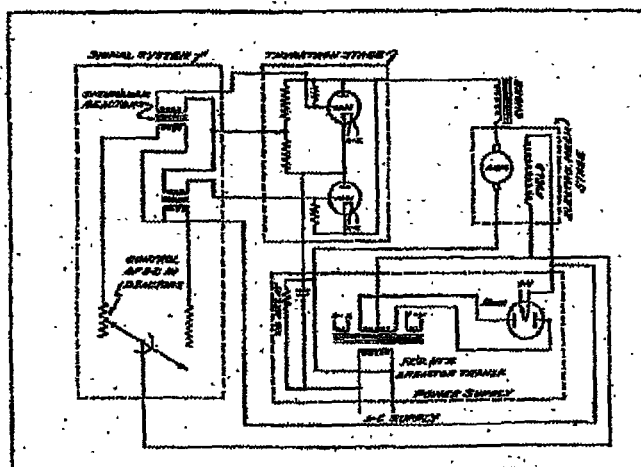
When one contact is opened the firing voltage is removed from the grid of the corresponding Thyatron and as they are supplied with alternating current it will cease to conduct on the succeeding half cycle. The motor will then rotate in the direction dictated by the Thyatron.

When the contact is again closed the motor will be brought to an abrupt stop or plugged by the resultant alternating current on the armature. Opening the opposite contact causes rotation in the opposite direction.

If the contacts were both normally open instead of normally closed, closing either one would still provide two-directional operation, but the motor would coast while both contacts are open. The extent of such coasting would however, be governed by the magnitude of the slip effect caused by the energized motor field.

Evidently this circuit provides only "start-stop" control. Infinitely variable two-directional speed control is provided by the slightly more complicated but similar circuit shown in Figure 4. This circuit employs phase-shift control of the Thyatrons, i.e., the signal circuit

FIG. 4. SPEED AND REVERSING CONTROL.



causes the grid voltage to lag the plate voltage by a variable amount. The amount of this lag governs the point on the cycle at which the Thyratrons begin to conduct and in turn the effective value of the voltage reaching the motor armature.

In the circuit shown, the phase shift is controlled by the two saturable reactors. The potentiometers vary the amount of direct current in the primaries of the reactors which in turn determines the effective inductance of the secondaries. It is this inductance which produces the phase shift between the grid and anode voltages and the attendant speed variation. (Note that both grid and anode are supplied from the same source just as in the preceding circuit.)

Here again the signal system is manual or mechanical. Obviously, however, it could be capacitive, photo electric, magnetic or any equivalent means. For example, the

d-c windings of the reactors could act as the plate load of an amplifier Pilotron and the current in them governed by the grid voltage applied to the Pilotron.

While it may be most important from the academic point of view, it is perhaps well to mention here that the "start-stop" circuit, Figure 2, would function equally well with a direct-current grid voltage. With alternating current on the anode the grid would regain control after every half cycle.

Likewise, a measure of speed control could be obtained by varying the d-c grid voltage but such a system is not as flexible as the phase shift method in that the firing cannot be delayed beyond the first quarter of a cycle.

Maintenance Considerations

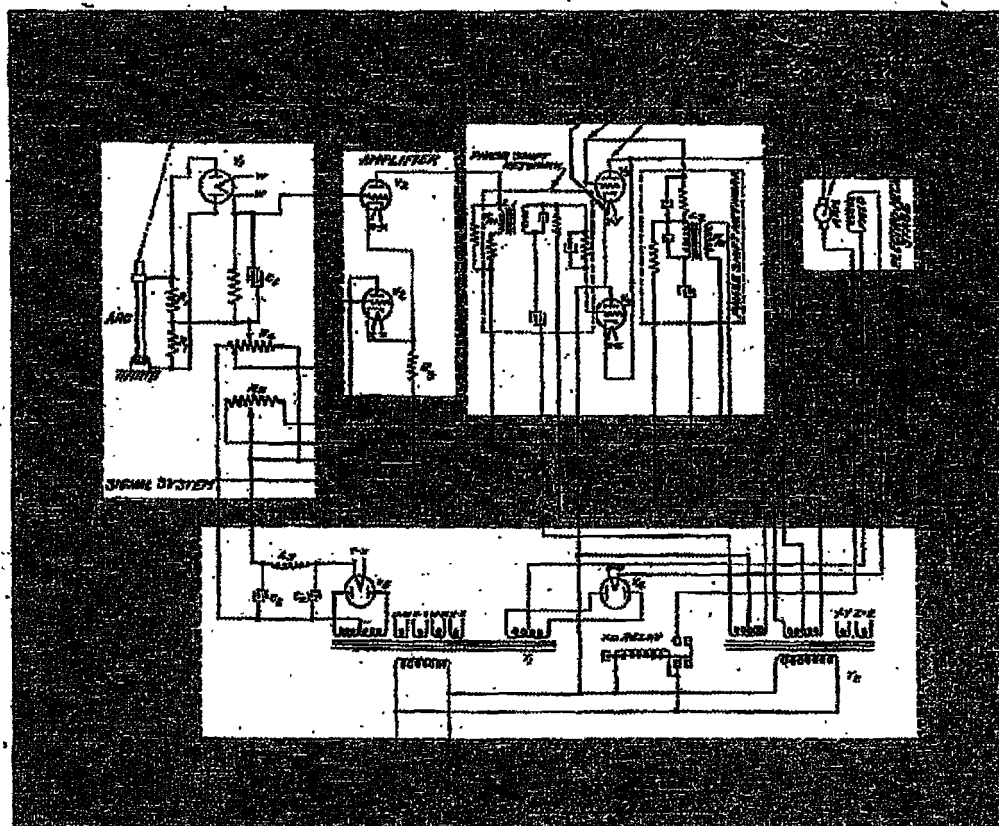
Little may be said regarding preventative maintenance in connection with the two circuits just described. Aside from keeping on hand a spare set of tubes and mak-

ing periodic checks on brush wear and contacts there is not much to be done. The contacts carry only the light grid circuit currents and no unusual trouble from them need be anticipated.

In case of actual failure to operate properly or at all, the Thyratrons should be checked first after ascertaining that the line voltage is reaching the control system. If the motor runs in one direction but refuses to operate in the opposite, the two Thyratrons should be interchanged in their sockets. If the motor will now run in the reverse direction, one of the Thyratrons is no doubt faulty and must be replaced.

On the other hand, should the Thyratrons fire but the motor fail to rotate, it is likely that the motor field is not energized either because of a supply failure or a short or open-circuited winding. Such a condition may be accompanied by an unusually brilliant discharge in the Thyratrons.

FIG. 3. ELECTRONIC AND VOLTAGE REGULATOR SYSTEM.



When neither Thyatron will fire and the cathodes appear to be properly heated the time delay relay and the grid circuit contacts, if any, should be checked. If the cathodes fail to heat it may, in rare instances, be due to a "burn out" but more often is caused by a lack of supply voltage.

At this stage of the trouble shooting, assuming that the difficulty has not yet been located, it would not be too unreasonable to suspect both Thyatrons and replace them. This, however, is not the safest procedure and rather than risk a new set of tubes, it is more advisable to make a complete check of circuit conditions. This should include the measurement of all voltages and currents and their comparison with those given on the manufacturer's wiring diagram or vacuum tube data sheets. A continuity test on all coils and resistors and a short check of capacitors will invariably lead to the source of trouble. Continuity tests should be made with an ohmmeter lest a short circuited low resistance coil be mistaken for a good one.

A point to be borne in mind is that the motors associated with electronic circuits are designed for higher voltages than equivalent motors in low impedance power circuits, and tests for grounds and insulation are proportionately more important.

The mechanical features related to the system must not be overlooked. A frozen motor bearing or a slipping shaft on a potentiometer can frequently give rise to misleading symptoms in the electronic circuit.

Advanced Control Circuit

Figure 5 shows a circuit used to control the speed and direction of an electronic motor used to feed the electrode in an automatic arc welding machine. The system is termed an arc-voltage regulator inasmuch as it is designed to hold the arc voltage constant by governing the distance between the electrodes and the work. This is accomplished by using the arc voltage as a signal controlling two Thyatrons which supply the power to the motor.

Reference to the dotted lines in Figure 5 will indicate a break-

down into the basic units of Figure 1. The circuit has been simplified to the extent of eliminating Start-Stop and Up-Down push buttons, etc., because these features present no maintenance problems other than those related to the usual electro-magnetic control equipment common to small motors and similar equipment.

The following description of the operation of the circuit may duplicate some of information in the manufacturer's instruction books; however, it is thought to be of educational benefit to those who, although not connected with this particular circuit, are responsible for analogous control systems.

Signal System

The signal which eventually "tells" the electrode feed motor what to do, i.e., stop, or move the electrode toward or from the work is derived directly from the arc voltage (which is to be held constant). The arc voltage (signal) impressed on resistors R1 is proportional to the length of the arc, being zero when the electrode touches the work and maximum when the arc is extinguished.

The signal is next passed through the rectifier tube V1 so that the circuit is applicable to either alternating or direct current arcs of either polarity. The output of the rectifier appears across resistor R2 and is proportional to the arc voltage. Capacitor C1 has a larger value when the control is used with a-c than with d-c arcs. Tube V1 is of the high vacuum type used in home radio receivers.

Signal Amplifier

The signal voltage is impressed on the grids of two triode amplifier tubes V2 (or a twin triode) which are also of the radio receiver type. The plate voltage is obtained from the power supply and the d-c windings of two saturable reactors, one controlling the grid of each Thyatron, form part of the plate load. Grid bias is developed by the algebraic sum of the voltage drop in resistors R3 and R4. The signal voltage is impressed on the grid A, while grid B is biased so that at maximum signal (arc extinguished) the tube is passing current through the primary of the satur-

able reactor L1 which controls the Thyatron for the "electrode down" direction of the motor. (Resistor R5 limits the amount of direct current in L1 and in turn the maximum downward speed of the electrode.)

Resistor R4 controls the bias on grid B and, as will be seen, the arc voltage.

The signal voltage on grid A governs the direct current in the saturable reactor L2 which controls the "electrode up" Thyatron.

The signal acts as negative bias, reducing the direct current in L2 until the related Thyatron ceases to fire. At the same time the current through R3 has decreased reducing the negative bias on grid B and increasing the current through the primary of L1 until its related Thyatron "takes over". The point at which this changeover occurs and consequently the arc voltage producing it, is determined by the setting of R4. In starting, the electrode will run down until it strikes the work and then recede until the preset arc voltage is obtained.

As the load on the motor is virtually constant no load compensation circuits are required.

In practice the variable resistors R4 and R5 are potentiometers mounted at the operator's station.

Thyatron Stage

The two Thyatrons, V3, are connected in the "back to back" circuit previously described. Phase shift control of the grids is employed and is obtained by means of the saturable reactors, a capacitor-resistor network, and the transformer T2. The inductance of the reactor secondaries causes the Thyatron grid voltage to lag the associated anode voltage. As the direct current in the reactor primaries is changed, the inductance of the secondaries and the phase angle varies and determines the firing point of the Thyatrons.

Electro Mechanical Stage

The comments on the motor in the first circuit described are equally pertinent to this one.

The power supply unit provides alternating and direct current for four purposes.

(Continued on page 73)

McMURTRIE AND HIS MODELS

Small scale models of his ingeniously designed "Flo-related" suites are used by R. H. McMurtie (left), head of the Huntingburg Furniture Company in discussing new applications of electronic heat with C. C. Brunleve, sales manager of the Thermex Division of The Girdler Corporation. "Flo-related" pieces enable the housewife to make a wide variety of pleasing combinations and arrangements and help overcome wall and space problems.



Dielectric Heating In Furniture Manufacturing

By W. H. Hickock*

High frequency dielectric heating cuts cost of production in furniture manufacture and achieves a better product.

NEVER has the furniture industry had a brighter outlook. Not only is the public's purse brimful of money, a good share of which will be spent for home furnishings, but manufacturers now have at their disposal a revolutionary method of curing glue lines. The new method, which speeds up

wood fabrication, improves the quality of the products and trims costs. This amazing new production tool is electronics—high frequency dielectric heating—first introduced industrially by the Thermex Division of The Girdler Corporation, Louisville, Kentucky.

There's no better way to illus-

trate the remarkable advantages offered by electronic heat in this field than to consider a specific example. R. H. McMurtie, the head of the Huntingburg Furniture Company, operates five plants in Indiana, three in Huntingburg and one each in Ferdinand and English. He spends much of his time in his compact, thoroughly equipped laboratory, where his extensive research activities have led to a long list of production short-cuts and have greatly expanded the firm's sales volume.

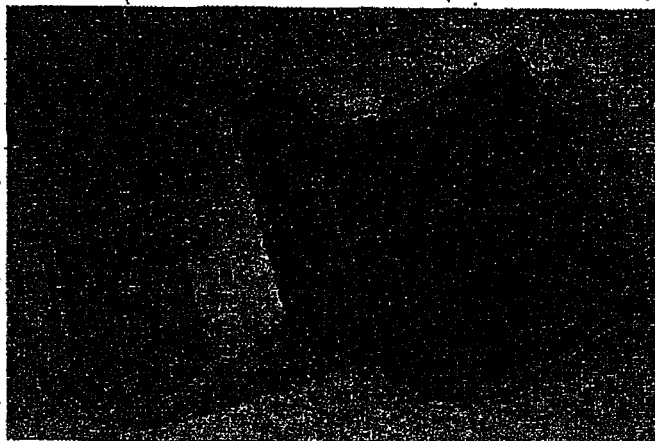
Accelerated Curing

The problem of accelerating the curing of glues in plywood and

*Director of Application Engineering, Thermex Division, The Girdler Corporation.

THESE WATERFALL SECTIONS SHOW THE IMPROVEMENTS MADE POSSIBLE BY ELECTRONIC HEATING.

At the left is a conventional waterfall, of 1/2" plywood, which requires a kerf, stiffness, drilling, screwing and gluing. At the right is McMurtie's waterfall, of 1/4" plywood, fabricated with high frequency equipment. It was made in an inexpensive wood mold at much lower cost, and it is structurally stronger.



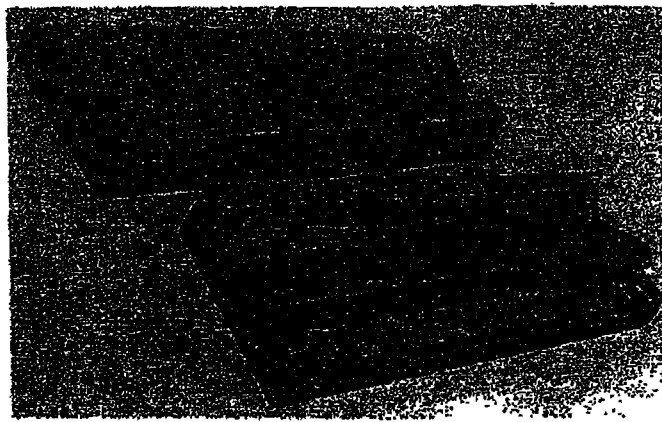
laminated wood parts had long fascinated McMurtre. A series of experiments convinced him that the answer lay in the application of high frequency heat, and he added a Thermax unit to his laboratory facilities. Soon, he was using it with highly interesting results in the fabrication of a waterfall bed foot and a waterfall bureau top. In the case of the bed foot, production costs tumbled 43%. This meant operational economies of \$160 a day. The production cost of the bureau top dropped 26%, with operational savings of \$112 daily.

There are four solid reasons why Thermax electronic heat made possible these economies:

1. The curing time has been drastically shortened.

2. The molds for the waterfalls are formed in the company's own shop, of laminated scrap stock. Conventional steam molds, which are both expensive and time-consuming to construct, are not needed.

3. Formerly, a kerf was required for the sweeping curves.



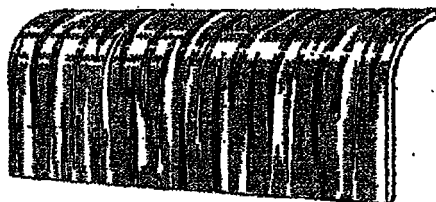
MOLDS MADE FROM SCRAP

A typical wood mold employed by McMurtre in the production of waterfalls with high frequency equipment. It was made of laminated scrap stock in the firm's own shop at a fraction of the cost of steam molds. The halves are overlaid with electrodes, which set up a high frequency field in the load when the Thermax power is switched on. (One electrode has been removed in order to give an unobstructed view of one half of the mold.) This quickly creates evenly distributed heat within the material itself and greatly reduces the time required for curing.

Now also the stiffener which was formerly required is entirely eliminated together with the drilling, screwing, and gluing operations which it made necessary.

4. Because the waterfalls have

PRODUCTION COST



WATERFALL BED FOOT

High Frequency Method *Old Method*
MATERIALS

5 sq. ft.
3/4" curved plywood \$1.05

5 sq. ft.
1/2" plywood \$1.30

2" x 2" x 54" stiffener .35

LABOR

Labor included in
cost of curved
plywood

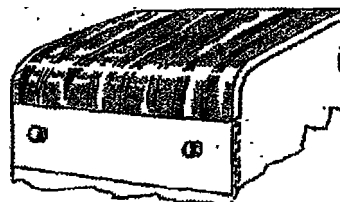


drilling screwing gluing .10

\$1.05

\$1.85

SAVING OF \$2.80 PER PIECE



WATERFALL BUREAU TOP

High Frequency Method *Old Method*
MATERIALS

3.7 sq. ft.
3/4" plywood \$.78

3.7 sq. ft.
1/2" plywood \$.95

LABOR

Labor included in
cost of curved
plywood



\$.78

\$1.06

SAVING OF \$2.28 PER PIECE

increased structural strength when set with electronic heat, 1/4" plywood is now being used instead of 1/2" plywood, and the pieces are far more stable.

Savings

The specific savings brought about by the use of heat supplied by high frequency equipment are revealed in the breakdown of production costs shown in the accompanying chart. The comparison shows that there is a net saving of \$.89 per piece for the waterfall bed foot — a saving of \$160 on each days production of 200 pieces. The saving of \$.28 per piece on the bureau top represents a total of \$112 a day on the production of 400 pieces.

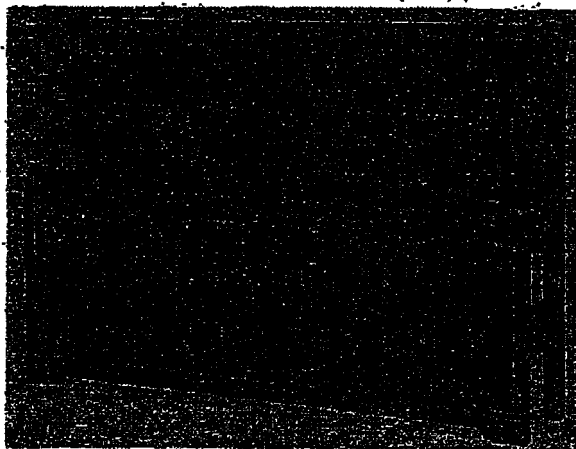
McMurtrie points out that, "The investment in high frequency equipment is so rapidly amortized that it presents no financing problem. Even the cost of large units can be recovered from the savings they make possible, in a matter of a few weeks or months." And he adds, "The opportunities for upgrading quality and lowering overhead with high frequency heat are just as numerous as your imagination is active."

With an eye on postwar markets, farsighted McMurtrie already has supplemented his Model 29X0 Thermix unit with the larger Model 195X and has drawn up plans for a plant exclusively devoted to high frequency fabrication.

High Frequency Operation

The Thermix unit itself is representative of the inventiveness, resourcefulness, and imagination that works industrial miracles. It consists mainly of mercury tube rectifiers and vacuum tube oscillator equipment with transformers, meters, relays, control devices, timers, and copper and brass circuit components—all contained in a steel cabinet. The whole is engineered, tested, and perfected under exacting laboratory and plant conditions.

When power is applied it sets up a high frequency field between the mold's two electrodes, and the molecular friction thus created within the wood fibres and resin particles causes the temperature of



COSTS CUT 43% BY HIGH FREQUENCY HEAT

The production cost of this waterfall bed foot was cut 43% with heat supplied by a Thermix high frequency unit, and its quality was sharply upgraded. Production cost of the head fell proportionally.

the load to rise quickly to the bonding and curing level.

Heat is generated uniformly within the material and at a speed never before attained, thus taking fullest advantage of all of the new resin glues and other heat-setting adhesives.

Surface hardening, scorching, and checking are eliminated. Temperatures at the center of the load are raised at exactly the same mo-

ment as temperatures near the outer edges thereby solving one of the woodworking industry's most troublesome problems. Moisture migration from a hot surface to a cooler center, an ever-present drawback in hot press fabricating and molding, also is eliminated along with the adverse effects on the product that such migration often brings about.

Notice

1945 S. P. I. INDEX

Now Available to Subscribers

If you keep your back issues of

SOUTHERN POWER & INDUSTRY

Write the Editors for a free copy of the 1945 Index showing a classified list of all articles carried.

Grant Building — Atlanta, Georgia

INDUSTRIAL HYGIENE

Control of Working Environment is Important

This third installment is a discussion of the working environment — its problems, their evaluation, and recommended control.

EVERY important factor influencing our lives and one which is given little consideration is the environment in which we work. The general environment dictates our requirements as to the clothes we wear, the food we eat, and to a certain extent our mode of living. The average individual will spend at least eight hours a day at some occupation. The remaining portion of the day is usually spent at home. It is obvious that two distinct problems of environment exist: the home or community, and the working environment.

There are certain safeguards thrown about the community as providing safe drinking water, proper sewage disposal, collection and disposal of other wastes including garbage, and immunization programs. The importance of these protective procedures in a community has been long recognized. Their accomplishment is measured in terms of reduced death rates from various communicable diseases. Some diseases which in the past have taken great toll of life

By N. V. Hendricks

Chief Engineer Industrial Hygiene
Service, Georgia Department
of Public Health

have by these methods been reduced to a point of minor significance. As civilization has progressed with an accompanying complexity in our living, the necessity for public safeguards in the community has been given more and more consideration. It is only through these approaches that the proper public health measures for the community environment can be applied.

For a number of years, consideration has been given to the development of certain methods by which the working environment of an individual may be modified or adjusted to more healthful working conditions. Many plant operations by the very nature of the materials processed and by the mechanics of the operation produce an atmosphere of toxic or

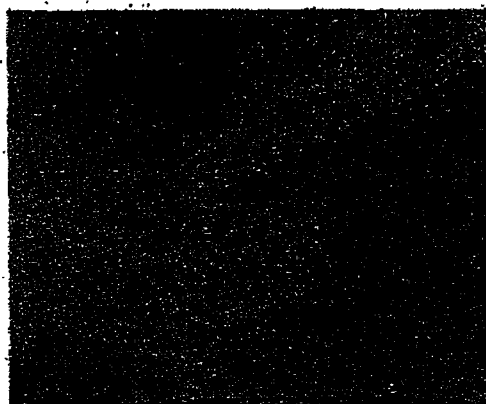
otherwise harmful substances. The final objective in any industrial hygiene program is the alleviation of health hazards incident to industrial operations by the use of scientific methods.

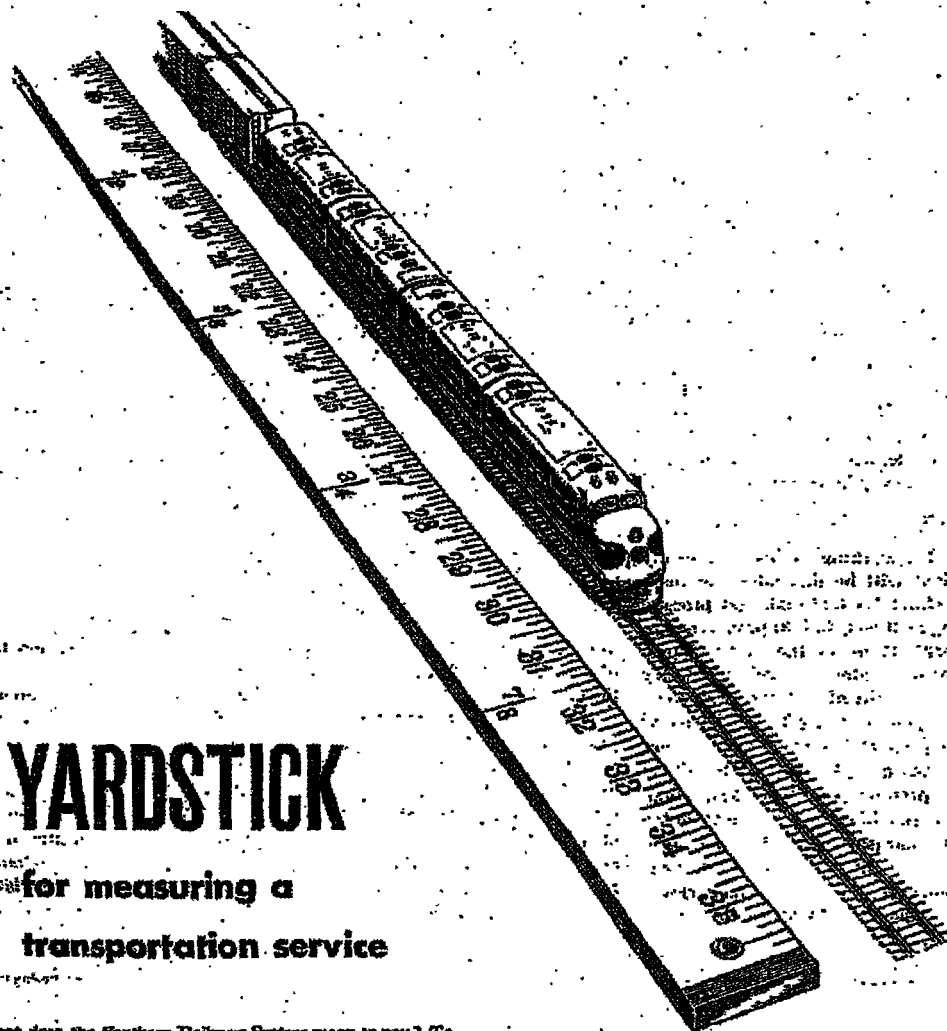
Occupational Diseases

Industrial operations require the use of many materials, some of which are toxic and produce harmful effects on individuals who are exposed to them. In addition, there are certain physical conditions which exercise harmful effects on the worker. The deleterious effects produced by these materials and conditions may, in a broad sense, be termed occupational diseases.

In some states, industry has been legally responsible for the effect on the worker which is brought about from such exposures. Where legal responsibility has been designated, codes or schedules have been established for a rate of compensation covering occupational diseases. Such codes vary from all inclusive laws to those which cover only specific occupational diseases.

BEFORE AND AFTER INSTALLATION OF VAPOR ABSORPTION SYSTEM IN MENGERIZING DEPARTMENT OF BLEACHING AND DYE WORKS.





YARDSTICK

for measuring a
transportation service

What does the Southern Railway System mean to you? To your community? To the Southland? Is there any way to measure the value of its service? Perhaps these questions will help provide a "yardstick"...

- Does the Southern handle *all* kinds of freight... and passengers, mail and express, too?
- Does it provide safe, dependable transportation, all year 'round, in any kind of weather?
- Does it buy large quantities of supplies and materials in the South?
- Does it give steady employment to large numbers of Southern men and women?

- Does it pay taxes which help to support your schools, police and fire departments, and other local governmental services?
- Does it constantly and vigorously promote the growth of the territory it serves?

Yes, the Southern Railway does *all* of these things! Thus, with this "yardstick" you may measure how well the Southern "Serves the South"... and how much this railway means to you, to your community, and to the future growth and prosperity of the greater, better Southland.

Ernest E. Harris
President

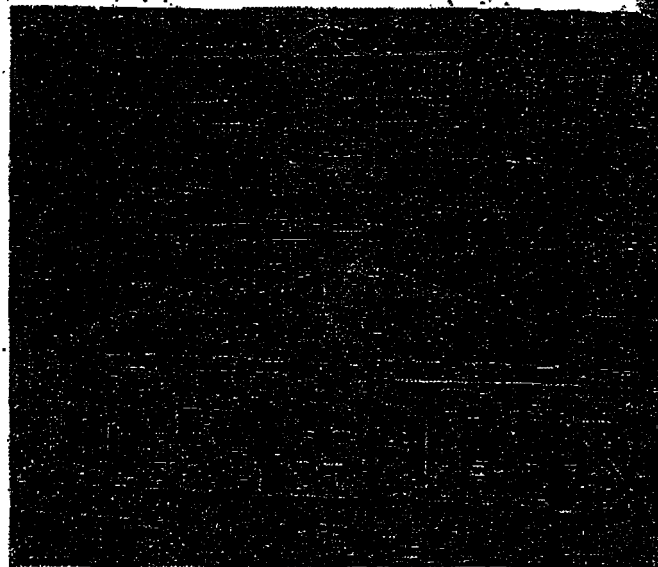


SOUTHERN RAILWAY SYSTEM

In considering the potential development of occupational diseases and the responsibility and cost incident, management cannot escape the fact that the condition of the working environment is an economic factor expressed in terms of the overall cost of production. Proper consideration to the status of the environment, in many cases, will directly lower the cost. Recognizing these facts, management should take every possible means of improving and controlling the working environment. For many occupational diseases there is no known medication and the logical method of control is the adjustment of the working environment in order that the exposure from which occupational diseases result may be removed.

Processing And The Environment

The working environment in any plant will be dependent on these factors: (1) materials, (2) processing methods, and (3) process equipment. Many of the raw and processing materials used in industry are specifically toxic, and toxic compounds are often liberated as by-products of certain operations. In any case, the type material and its presence in the working atmosphere will determine the existence of a hazard. Fortunately most processing materials are non-toxic. However, with many industries it is impossible to avoid the use of certain specific compounds which



FUME REMOVAL SYSTEM FOR EXHAUSTING FUMES FROM PICKLING TANKS.

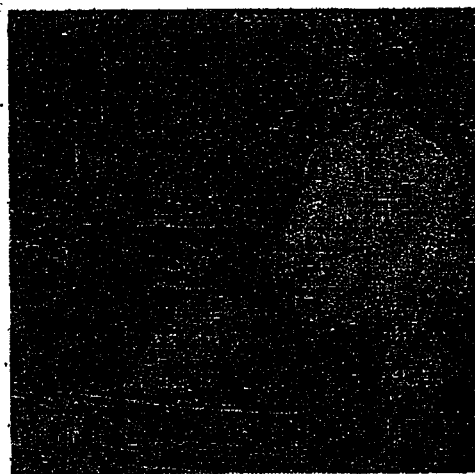
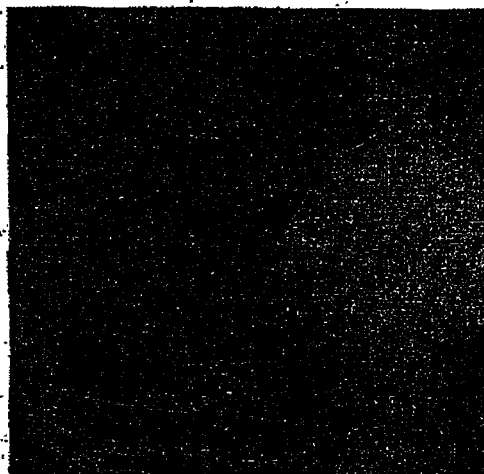
are known to produce harmful effects on individuals exposed to them.

The method of processing is important as it will determine the extent to which materials are dispersed into the working atmosphere. Important factors associated with process methods include: (1) temperatures required for various operations, (2) agitation and other mechanical details, and (3) specific operations where

by-products are formed and liberated.

Equipment plays an important role in determining dispersion since the design of such units may call for open or closed operations, rotation at high speed or close or frequent observation on the part of the operator. Specific design would determine the extent to which certain control installations such as local exhaust ventilation might be applied.

OPERATOR EMPTYING BAG OF CARBON BLACK INTO SANDHURST MIXER BEFORE AND AFTER INSTALLATION OF DUST AND FUME REMOVAL SYSTEM.



POWER INCREASED

FUEL SAVED

MAINTENANCE REDUCED

with

EFFECTIVE DIESEL LUBRICATION

TEXACO *Ursa* Oils do more than just an outstanding job of lubricating—they keep Diesel engines clean! This means they prevent varnish and sludge. Rings stay free and valves active. Pistons provide proper seal for full compression. *Ursa* Oils also prevent scuffing, greatly reduce wear, and have special properties to prolong the life of bearings, liners, rings and pistons. You can depend on trouble-free operation, lower maintenance costs.

The Texas Company, in step with improvements in Diesel engine design over the past thirty years, has developed a complete line of *Texaco Ursa* Oils

... one to meet the requirements of every type and size of Diesel.

On the basis of performance—all leading Diesel engine manufacturers approve *Texaco Ursa* Oils, and—

More stationary Diesel hp. in the U. S. is lubricated with Texaco than with any other brand.

Let Texaco Lubrication Engineering Service help you obtain the most efficient and economical operation from your Diesels. Just contact the nearest of more than 2300 Texaco distributing plants in the 48 States, or write: The Texas Company, 135 East 42nd Street, New York 17, N. Y.



STORE IN THE TEXACO STAR THEATRE WITH JAMES NELSON SUNDAY NIGHTS & METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

SOUTHERN POWER & INDUSTRY for JANUARY, 1946

THE ALCO FUEL

for high efficiency and economy

An Extended-Surface Heat Exchanger

Reconversion to peace is under way, and this new ALCO standardized product is a head start to conversion for industrial oil-burner installations.

The heavier-grade and less-expensive oils require preheating for proper atomization and efficient combustion.

Now offered for IMMEDIATE SHIPMENT FROM STOCK, this Alco Fuel Oil Heater offers these important features:

1. HIGH HEAT TRANSFER DUE TO:

Superior baffle design and arrangement.

2. SIMPLICITY OF DESIGN:

A single U tube expanded into removable cover plate.

4. STANDARD SIZES AND LENGTHS:

Six sizes of standard units provided. High-efficiency heat exchangers of any capacity can be built up from these standard ALCO 16" x 24" units.

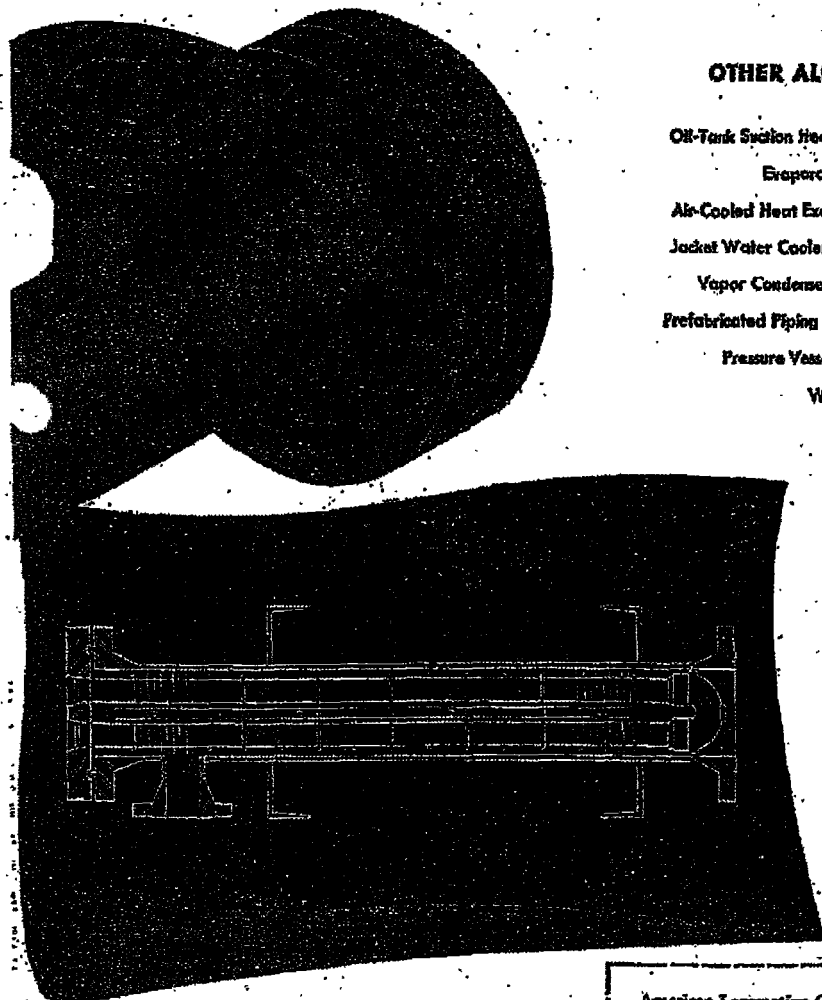
3. EASY TO CLEAN:

HUNDREDS USED DURING THE WAR, in a wide range of applications besides fuel-oil heating. Here are a few of many suitable applications:

1. Pre-heaters for oil refineries, natural gasoline plants, chemical plants. 2. Residuals exchangers. 3. Solvent plants. 4. Gas and air heaters. 5. Heaters for caustics, acids, alcohols and other chemicals. 6. Kerosene and gasoline heaters; propane vaporizers and superheaters. 7. Lube-oil coolers. 8. Quench-oil coolers. 9. Dun-Sol coolers. 10. Coolers for alkylation plants. 11. Gasoline and kerosene coolers.

OIL HEATER

in space...weight...cost...and maintenance



OTHER ALCO PRODUCTS:

Oil-Tank Section Heaters • Feed-Water Heaters

Evaporators • Reboilers

Air-Cooled Heat Exchangers • Lube-Oil Coolers

Jacket Water Coolers • Vapor Heat Exchangers

Vapor Condensers • Waste-Heat Boilers

Prefabricated Piping • Electric-Welded Steel Pipe

Pressure Vessels • Pipe-Line Filters

Weldments

Write for New Bulletin

A copy of the new ALCO Bulletin, No. 1036, describing and illustrating this new line of ALCO products will be sent you promptly, on request. Write for it today.



American Locomotive



ALCO PRODUCTS DIVISION

American Locomotive Company
Alco Products Division (S)
30 Church Street, New York 8, N. Y.

Please send me your new bulletin #1036, about the
Alco Fuel Oil Heater.

Name _____

Title _____

Company _____

Street _____

Environment Problems

Of importance to industry is the matter of controlling dust. Fortunately, there are relatively few types of dust which are specifically toxic. The more important from an industrial standpoint are silica, asbestos and finely divided salts of toxic metals, such as lead.

Silica and Dust

Exposures to free silica are more important from the standpoint of population exposed and deserve more consideration than those to asbestos dust. However, asbestos dust is just as toxic as free silica. Wherever sand or materials containing free silica are processed, exposure to the dust is likely to result. This is especially true in foundry operations, abrasive cleaning, blasting, and the like. Sufficient exposure to concentrations of free silica often results in the production of fibrotic growths in the lungs of the exposed individual. This condition is known as silicosis and is one of the prime disabling occupational diseases and has cost industry considerable sums of money for compensation.

Asbestos dust although specifically toxic, does not result in a numerically great number of exposures due to its infrequent industrial applications. However, in the production of asbestos cloth and other products, a serious problem of dust control is presented.

Certain heavy metals and their salts produce specific toxic reactions. Many industries employ lead and cadmium, and their application to plant operation usually results in the creation of an actual or potential exposure. Lead compounds are particularly important in such operations as the manufacture of storage batteries, printing industries, and the production of paints or pigments.

Gases

Gases are usually classified as either asphyxiant or irritant. Industrially the more important asphyxiants include carbon monoxide, hydrogen sulfide and hydrogen cyanide. Of these, carbon monoxide occurs more frequently. This gas is associated with the combustion of carbonaceous materials and is ex-

treinely toxic. On entry into the body it exerts an affinity for hemoglobin which is about 200 times the affinity of oxygen resulting in a tremendous decrease in the ability of the blood to carry oxygen and produces a condition of asphyxia.

The more common irritants found in industry include sulfur dioxide, chlorine, ammonia, and the oxides of nitrogen. Although these gases are extremely toxic, they are sufficiently irritating so that the individual exposed usually has some warning as to their presence. Under these conditions the worker can normally remove himself from the exposure before too much damage is done. However, these materials do occur frequently in industry and the importance of exposures to them should not be minimized.

Vapors

Vapors come from organic compounds both of the aliphatic and aromatic series. They play a tremendously important part in modern production and their number and use is limited only by the ingenuity of the chemist. They are used widely as degreasing agents, intermediates, solvents and cleaning compounds.

Most of these materials are excellent fat solvents, and on entry into the body tend to go to the nervous system. This is true of the aliphatic series, including distillates and petroleum. From the standpoint of pure toxicity, probably the most important of these materials would include hexol, its homologues and the chlorinated compounds. Sufficient exposure to these compounds results in chronic disturbance and in some cases disability.

Mists

Acid and alkaline mists are associated with plating, stripping and cleaning. Chromic acid mist is probably the most important of this class of material and results from electroplating, anodizing and similar operations. Exposure to such mists may result in perforation of the nasal septum, and if cuts or abrasions are present on the exposed parts, ulcers may develop.

Fumes

Fumes are usually associated with welding, cutting, or other operations where metals are heated to high temperatures. From an industrial standpoint, lead, zinc, and cadmium are probably the most important. Atmospheric fumes of this type are often found around pouring of brass, welding or burning of galvanized metal or on high temperature operations involving surfaces coated with lead bearing paint.

The physiological response to the inhalation of these materials may vary considerably. The less serious condition is known as metal fume fever which carries symptoms of zinc oxide. It is of short duration and no permanent tissue damage is done. The more serious conditions arise from the exposure to fumes or metals which are specifically toxic.

Physical Conditions

Physical conditions such as working positions, temperature, humidity and abnormal pressures, play an important part in the ability of the worker to produce. The correction of such conditions is primarily a problem of engineering and when given proper consideration will do much toward increasing production and lowering costs, through improvement of quality of the final production, reduction of spoilage, and increase in the final plant safety.

Evaluation of Environment

In order to properly evaluate the exposures in an industrial plant, a detailed engineering study and analysis is required. Such a study in the form of an industrial hygiene survey is a mechanical means by which the plant is observed department by department for the purpose of noting occupational hazards and unsafe practices so that they may be appraised. Such a survey should include a work analysis, analytical procedure rating of hazards, analyses of the hazards and recommendations for control.

The work analysis should be made by noting each and every job carried out in the plant, method of process, and hazardous conditions to which each worker

COMMON PROCESSING MATERIALS WITH SAFE CONCENTRATION AND PHYSIOLOGICAL SYMPTOMS

TOXIC MATERIAL	INDUSTRIAL USE	SAFE CONCENTRATIONS	PHYSIOLOGICAL RESPONSE
Acrolein	Organic synthesis; mfg. military gases; soap and varnish; fertilizer.	1.0 ppm	Irritation of skin and mucous membranes of eyes and respiratory tract; dyspnea, bronchitis.
Ammonia	Organic preparations; refrigeration; bleaching; dye and color mfg.; sugar refining.	100 ppm	Irritation of respiratory passages, cough, pulmonary edema, severe eye irritation, vesicle action on skin.
Aniline	Organic synthesis; dye mfg.; paint and varnish; disinfectants; explosives.	5.0 ppm	Muscular weakness, vertigo, cyanosis, fainting, nervous symptoms, loss of equilibrium, nausea, vomiting, diarrhea.
Arsenic Compounds	Paint and pigments; leather industry; insecticides; mining and smelting; dye and varnish mfg.	0.5 mg/M ³	Pain in stomach, vomiting, diarrhea, headache, gastric disturbances, skin diseases, loss of hair, weakness.
Bromine	Organic synthesis; dyes; bleaches; explosives.	1.0 ppm	Irritation of air passages, bronchitis, conjunctivitis, skin eruptions, discoloration of skin.
Benzol	Solvent; paint and varnish remover; dye; varnish mfg.; rubber industry.	100 ppm	Headache and vertigo, gastro intestinal disturbances, hemorrhagic injury to blood vessels, nervous system with changes in blood picture, injury to blood vessels, heart, liver, kidneys, etc.
Cadmium	Alloys; medicinal salts; electroplating; storage batteries; lead and zinc smelting.	0.1 mg/M ³	Loss of appetite, weakness, nausea, inflammation of the lungs, cough, presence of blood.
Carbon Disulfide	Solvent; mfg. viscose rayon; varnishes; insecticides; carbon tetrachloride.	20 ppm	Headache, vertigo, weakness, mental disturbances, irritation of skin.
Carbon Monoxide	Mfg. iron and steel; annealing; blanching; gas; film operations; smelting.	100 ppm	Headache, painfulness of eyeballs, flushing of temples, weakness, nausea, vomiting, increased respiration and pulse, collapse.
Carbon Tetrachloride	Solvent; mfg. cleaning compounds; dye; paint and lacquer industries.	100 ppm	Irritation of nose, throat and eyes, nausea, headache, vomiting, confusion, cardiac, injury to liver, dermatitis.
Chlorinated Diphenyls	Electrical equipment; lacquer mfg.; paints, varnishes.	1.0 mg/M ³	Acneiform skin eruptions, jaundice and atrophy of liver.
Chlorine	Organic synthesis; textile bleaching; water purification; chlorination.	1.0 ppm	Acute cardiac paralysis, burning, blistering, cough, hemorrhage, chronic pneumonia, nasal and bronchial catarrh.
Chloroform	Solvent for cellulose acetate, nitrate oils, fatty dry cleaning.	75 ppm	Headache, dizziness, blood changes.
Chromic Compounds	Dyeing, metallurgy; electroplating, printing; tanning.	0.1 mg/M ³	Bronchitis; bronchopneumonia, anemia, nephritis, ulcers of skin and mucous membrane, perforation of nasal septum.
Ethylene Dichloride	Organic synthesis; solvents; thinner for lacquers.	100 ppm	Irritation of eyes and nose, vertigo, unconsciousness and death if exposure is prolonged.
Formaldehyde	Organic synthesis; dyes; rubber goods; leather; synthetic resins and lacquers.	20 ppm	Irritation of mucous membranes, conjunctivitis, severe dermatitis, degeneration of liver.
Hydrochloric Acid	Leather industry; organic synthesis; dye stuffs; mfg. chlorides.	10 ppm	Coughing, bronchitis, destruction of teeth, necrosis of throat, vesicle action on skin.
Hydrogen Sulfide	Reagents; analytical chemistry; viscose rayon spinning; leather tanning; mining and smelting; paper mfg.	20 ppm	Conjunctivitis, exhaustion, pallor, pain in eyes, nose and throat; headache, convulsions, paralysis.
Lead	Chemical equipment; lead pigments; alloys; storage battery mfg.; insecticides.	0.35 mg/M ³	Weakness, pallor, loss of appetite, lead line, anemia, constipation, cramps, colic.
Mercury	Therm. mercury bulb, scientific instruments, chemical processing.	0.1 mg/M ³	Inflammation of gums and mucous membrane of the mouth, necrosis of the jaw, neuritis, tremor, lesions of the brain and heart.
Silica Dust (Free)	Foundries; stone industry; abrasive cleaning; bleaching.	5,000,000 P.P.C.F.	Fibrotic lung tissue, development of silicosis.
Sulfur Dioxide	Refrigeration; bleaching; cellulose; paper; mining and smelting.	10 ppm	Coughing, choking, laryngitis, bronchopneumonia, digestive disorders.
Sulfuric Acid	Fertilizers; refining, explosives; organic synthesis; leather; textiles; chemicals.	2.0 ppm	Acute and chronic bronchitis, bronchopneumonia, decay of teeth. On the skin, pain, edema and ulceration.
Toluene	Solvent; paint and varnish; organic preparations; dye and varnish; rubber industry.	200 ppm	Nausea, dizziness, headache, vertigo, gastro intestinal disturbances, injury to liver and nervous system.
Zinc	Metallurgy; galvanizing; brass foundries; smelting.	15 mg/M ³	Metal fume fever; irritation of respiratory tract, headache, nausea, chills, pain in limbs.

NOTE: P.P.C.F. = Parts of substance per million parts of air by volume.
 m.p.p.c.f. = Millions of particles of substance per cubic foot of air
 mg/M³ = Milligrams of substance per cubic meter of air.

is exposed. Toxic materials when present are investigated from the standpoint of the liberation into the atmosphere; physical state, whether or not the employee is required to be in the area where this material is dispersed, and the probable effect on the individual.

Analytical procedures usually include the collection of field samples and their analysis and the completion of other measurements when necessary. Atmospheric samples are collected from the breathing zone of the exposed worker and are taken in such manner as to be representative of average working conditions. Actual sampling and analysis of the atmosphere is the only scientific means by which a known exposure may be accurately evaluated. Some toxic materials make their presence known by odor and other properties, but these do not offer a means of determining their concentrations.

The rating of a hazard or exposure is a measurement to determine the degree of a condition and the effectiveness of existing control methods. Much work has been done in establishing safe permissible concentrations for some of the more common toxic materials. These threshold values offer a means of determining the extent of individual exposures. By an analysis of processing methods, rating of hazards and study of efficiency of existing corrective measures, a basis for adequate control procedures may be established. In most cases processing methods will determine the type control indicated.

Application of Data

When the industrial hygiene study has been completed and observations and data analyzed, it is necessary to translate this information into terms of specific control procedures. Unless these data finally result in corrective measures, a great waste of time and effort will take place. Although the plant or process engineer may not be primarily concerned with activities other than strictly processing, this individual should take advantage of information obtained through the industrial hygiene survey. In many cases, a study of environmental conditions under which a job is carried out will of-

fer the production engineer a means of increasing the efficiency of the particular operation.

The plant engineer should also be concerned with the industrial hygiene information because the control procedures applied will be based on an analysis of these findings. The design and installation of such control procedures as local exhaust ventilation should be worked out with the plant engineer in order that the final installation may be entirely consistent with processing requirements.

Control Procedures

Hazards associated with industrial operations can either be eliminated or reduced to harmless limits by the application of public engineering methods. Procedures for the control of such exposures usually consist of one of the following:

Isolation of the process. Frequently a job which is productive of dust or tends to disperse other materials into the work area can be removed and located at a point so that the liberation of such material will not contaminate the general working atmosphere. It is occasionally possible to close off individual operations so as to isolate them from other areas and control the exposure.

Substitution of non-toxic material occasionally offers a good method of alleviating specific exposures. Where toxic materials are used and it is possible to replace them with non-toxic substitutes, the exposure can be removed in the easiest possible way.

Wet methods can sometimes be applied. These are frequently used in the stone industry in drilling, crushing, and grinding. Where materials being processed must be kept in the dry state, this method is obviously eliminated.

Personal protective equipment offers an excellent control procedure where the exposure is infrequent or of a short duration. Where this type of equipment is used, care should be exercised in its selection in order that the equipment used be designed for the particular exposures. Only equipment which bears the stamp of approval of the U. S. Bureau of Mines should be purchased. Some exposures may be con-

trolled by means of general ventilation. By this procedure a sufficient amount of air is introduced into the work area to dilute the contaminant to a point below the toxic limit. This method has certain disadvantages, such as the handling of excessive amounts of air, and the failure to reduce concentrations of the material at its point of liberation. It is usually at or close to the point of liberation where real exposure occurs and general ventilation, in most cases, does not correct this situation.

Local exhaust ventilation offers the most effective and generally the most efficient means of controlling individual exposures. A hood or similar type of collecting device is located as close as possible to the point of liberation of the contaminant and sufficient air is handled in order to remove this material in such a manner that it is not dispersed into the work area. This type control should remove the material before it has an opportunity to come into the breathing zone of either the worker on the individual job or the workers in the surrounding area.

In considering the matter of local exhaust ventilation, it is highly essential that these installations be properly designed and engineered. In too many cases hoods and the entire exhaust systems are installed by mechanics or other individuals in the plant and no thought is given to their design or the principles on which they should operate. Unless such systems are based on good engineering design there is no assurance that the installation will operate in such manner as to control the exposure.

The next article of this series will cover organic solvents and similar industrial materials, their properties and uses as they influence the economical and health of the worker using them.

1945 INDEX

Available to Subscribers

If you keep your back issues
—write the editors for a
free copy of this Index.

See Page 66

HOW YOU CAN SIMPLIFY YOUR 1946 STEEL VALVE PROCUREMENT PROBLEMS

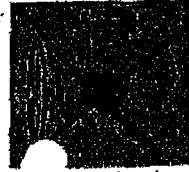
An Annual Report
to Steel Valve
Users

THROUGHOUT the war, steel valves were among the most critical of all common components and though the industry's capacity was expanded substantially, many types of steel valves are, and will continue for some months to be, very tight.

This time lag on deliveries depends upon size and type of valves. Production of large, cast steel valves is running behind schedule because of uncertain foundry production and labor conditions. Too, there is a substantial pump-up demand in certain civilian industries which were veritable, during wartime, to obtain the high priorities which were always required for steel valves.

HELP YOURSELF

You can simplify your 1946 steel valve procurement in several ways:



1. Avoid special, old designs. Standard valves are in continual production, whereas "specials" usually require engineering department time, extra pattern or die work, and special handling in the forge shop or foundry.

2. Anticipate your requirements and place orders early. While we are able to supply many sizes and types of standard valves out of stock shipment now, demands are often heavy that single orders may nearly wipe out the stock in one size or pressure class.

ORDER

CURRENT DESIGNS

You can also simplify your purchasing problem if you order from the most recent catalog. During the past year, we have issued three new catalog sections which should be in your Edward catalog file. We suggest that you write us for copies if you have not already received these catalogs:

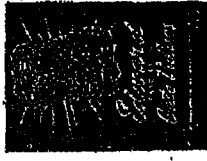
Catalog 12-B
Edward
New Return
Valves

Shows cross-section illustrations and descriptions for cast and forged steel non-return valves in

300 to 2500 lb. sp. classes. Maintenance hints, pressure drop data, pressure-temperature tables and other useful data are included.

Catalog 12-D
Edward
Blow-Off
Valves

Design detail for Edward blow-off valves with installation and operating suggestions.



Catalog 12-B
Edward
Gate Valves

Cast steel for service in acid and caustic. Descriptions and illustrations of the new, basically different Edward gate valve line.

NEW VALVE DEVELOPMENT

During the past year, Edward has continued its program of design improvements. Among the dozens of new development means introduced during the year, were these:

Redesigned bodies for further lowering the already remarkably low pressure drop through Edward non-return and stop valves.

The new Inter Lin Valve, a patented welded bonnet valve with an integral hard-faced seat, a hard-faced disk, bolted gland, bronze yoke bushing, one-piece bonnet and exceptionally low pressure drop.

Redesign of forged steel bodies of the Edward inclined stem type to reduce pressure drop through small globe valves to the point where it is comparable to flow through gate valves.

A new type of throttling valve, especially built for excessively service.

Pressure sealed bonnet connections for high temperature, high pressure valves.

We will be glad to give you detailed information on any of these developments which are of particular interest to you if you will drop us a line.

FUTURE PROJECTS

Edward laboratories and engineering departments have the largest backlog of new development projects in the company's history. In detail, we are working—with considerable success to date—on materials for extremely high and extremely low temperatures, so that we will be ready with valves for the several new technological processes coming which will require very high or very low operating conditions. We are continuing our extensive work in flow and pressure drop testing, incorporating our discoveries in modified designs as fast as they are proved. We are conducting research in high temperature bolting, new types of hard facing, new welding techniques and so on. To simply list current projects takes several pages of close typing.

A NEW NAME

January 1, 1946 is a significant date in the history of this Company. On that date, The Edward Valve Manufacturing Company, Inc., becomes, simply, Edward Valves, Inc. The old name has been recognized for the pioneering work the Company has done in steel valves, dating back to the turn of the century when the first Edward valves are built. The new name, we feel, is interesting with the Edward product and policies, developed through the years—functional, simple, direct, up-to-date.

So, from now on, we sign ourselves as, Edward Valves, Inc.

W.F. Crawford
President



Electronics

(Continued from page 68)

First, the electrode feed motor has a separately excited field which must be supplied with d-c. This is accomplished by means of a step-up transformer T1 and rectifier tube V4, another home radio high vacuum type.

Second, the plates of the signal amplifier tube must be provided with direct current and this requirement is handled by a second high voltage secondary on transformer T1, a "home radio" rectifier tube V6 and the filter network comprising capacitors C2, and choke coil L3.

Third, a-c grid voltage is supplied by the secondaries S1 and S2 on step down transformer T2.

Fourth, low voltage secondaries on transformers T1 and T2 furnish heater and filament current for the tubes.

A time delay relay prevents premature starting of the Thyratrons.

Maintenance

Maintenance problems are no different than those already discussed. Obviously, the additional tubes and related equipment render trouble shooting a bit more difficult.

All the tubes with the exception of the Thyratrons can be checked with radio service type tube testers. The Thyatron stage may be checked by interchanging the tubes as described for the other circuit. Lacking a tube tester the rectifiers in the power supply can be checked by measuring their output voltage. Operation of the signal amplifier will be indicated on a milliammeter inserted in the plate circuit, i.e., in series with the d-c winding of the saturable reactor.

If a general check of the tubes and voltages does not isolate the trouble step by step, tracing of the circuit is necessary. The first factors to be investigated are: does the arc voltage appear at the amplifier grid, does the plate current respond. If the current swing appears low compared to the characteristic curves, replace the tube if it has not been tested and found satisfactory. If it is not convenient

to use the arc voltage for these tests, an independent signal may be applied to the grid of the amplifier.

Action of the phase-shift network may be studied with a cathode ray oscilloscope. Impressing the plate voltage on the vertical plates and the grid voltage on the horizontal plates of the "scope", as shown in Figure 5, with the sweep turned off should produce an ellipse on the screen when there is no direct current in the primary of the related reactor. When the primary current is increased the ellipse should narrow down to a straight line as the two voltages approach the in

phase condition.

One other point worth looking into is the possible reversal of motor armature, field, or transformer connections evidenced by the motor running in the wrong direction or improper control.

No circuit element is unimportant enough to permit skipping over it when trouble shooting. If the maintenance man will be conscientious enough to isolate components and measure actual resistances not mere continuity, and check capacitors for "opens" as well as "shorts", he should have no trouble in running down troubles in circuits of this nature.

Experience a Great Teacher

Fireman Severely Scalded — A fireman was severely scalded by escaping steam from a blow-off pipe which had stripped its threads. Blow-off lines should be inspected carefully and at frequent intervals with particular attention to corrosion and oxidation of the metal.

Boiler Breaks Down, Plant Without Heat — A boiler was equipped with an automatic water feeder but lacked a drain valve through which dirt and sediment could be flushed from the float chamber. Sediment accumulated in the float chamber until it touched the float and when the water level went down the float could not move to its lowest position and open the feed water valve to the boiler. Automatic feeder float chambers should be fitted with drain valves and such valves should be opened up at least once each week to remove any sediment which may have accumulated.

Cast Iron Boiler Ruined — This boiler would still be on the active list instead of on the junk heap if the shut-off valve between the boiler and the automatic water feeder had been locked open or better yet, had been removed entirely. Some one shut off the hot-foam valve and the water went so low in the boiler that the sections were cracked when they became overheated.

Boiler Furnace Tube Ruptures.

Other Tubes Damaged — Water wall tubes will fail from overheating if any scale is allowed to form in them. Water wall tubes must be kept clean.

Steam Turbine Wrecked by Air — Oxygen in the steam severely corroded the lands of the dummy piston, overloading the thrust bearing which failed resulting in stripped blades, and ruined labyrinth packing. Deaeration of the feed water would have prevented such a costly failure.

Turbine Bearings Ruined, Oil Supply Shut Off in Error — A maintenance man was ordered to bypass an oil cooler and clean it. Instead of bypassing the lubricating oil around the cooler they shut the lubricating oil off completely.

Motor Ball Bearings Fail, Too Much Grease — High speed ball bearings should not be more than half filled with grease or the bearings will churn up the grease, overheat, and fail. Over-filling can be avoided by the purchase of tubes which contain just the right amount of grease for a ball bearing.

Workman Starts Fire in Refrigerating Plant — A pipefitter, making a soldered water pipe connection on a combined receiver-condenser, held his blow torch too close to a fusible disc located in the head of the condenser. It melted out and the escaping methyl chloride ignited.



Versatile... a Size for Every Application!

The Morflex is an all-purpose coupling for installations, large or small, has a range of sizes with capacities from 8 foot-pounds to 725 foot-pounds torque.

Morflex couplings, driving thru Neoprene blacuits, eliminate all contact between metal surfaces. With their inherent flexibility they reduce bearing wear, permit slight angular misalignment, ease thrust and too-

sional loads, isolate shock and vibratory impulses.

Engineered for tough, dependable service, they require no lubrication and are sealed against the effect of dirt, dust and weather.

Ask for more information. Call the Morse engineer or write Morflex Department, Detroit.



PROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES
MORSE *Roller and Silent* **CHAINS**
MORSE CHAIN COMPANY • ITHACA, N. Y. • DETROIT 6, MICH. • A BORG-WARNER INDUSTRY

Refrigeration

(Continued from page 51)

where in the neighborhood of minus 40 F has a decrease in transfer value of about 40%. The power required for pumping brines at extreme low temperatures must also be carefully watched.

We might point out here that the pressure drop in pipe lines, on well designed low-temperature systems, is low. For example, with Freon-22 at minus 100 F, the drop in pressure measured between the suction line and the intake port within a certain compressor showed a loss of only 0.06 lb.

Unusual Installation

A most unusual job is to be found in low-temperature test rooms of the Bendix Radio Division of Bendix Aviation, at Towson, Md. (Fig. 4). A heavy steel framework supports the doors and outer walls, while a lighter framework supports the stainless steel inner walls, floors and ceilings with which each room is lined. Foam-glass insulation, 12 inches thick on two of the rooms and 18 inches thick on the third, was applied. The machine room is in a pit below the three test rooms, no other space being available. Each room has an air lock just inside the door where people enter. Each room also has a very large door, 6 ft by 8 ft in the clear, for moving in heavy equipment.

Automatic controls of such efficiency were applied to this job that the temperature and humidity are held constant to a high degree of accuracy. The temperature stays within $\frac{3}{4}$ of one degree F, and the humidity within $1\frac{1}{4}$ per cent.

The room in the center is arranged to have a constant temperature of 122 F and a constant humidity of 95 per cent, maintained for as long as wanted. The switches controlling this room are merely marked "on" and "off".

The room at the far right is controlled by two program clocks, one for the temperature and one for the humidity. The range of temperature is from 68 F to 154.4 F; the humidity from 10 to 95 per cent. The clocks can be set so that any

given temperature and humidity will be held for a certain number of hours, then the controls will throw over to another set of conditions and later repeat the cycle. For that reason this is called the cycling room. It will also give varying degrees of temperature while retaining constant relative humidity. Or, the percentage of humidity may be varied while the temperature is held constant.

The third is the high-low-temperature room, and is capable of maintaining temperatures from plus 184 F to minus 76 F, or less.

Humidity is added to the air in the rooms by injecting moisture from nozzles with compressed air. At high temperatures and humidities it is practically raining, and the moisture is condensed on the body of the person entering the room, until it runs off in streams. The operator wears a bathing suit. Electrically heated clothes and the warmest flannel-lined outer garments of leather, complete with helmet and hood to prevent freezing of the eyeholes, are worn in the low-temperature room.

The controls first regulate the temperature in each room and later

adjust the humidity, or the conditions can be changed simultaneously. The refrigerating equipment runs continuously once it has been set, and the ultimate fine adjustment in temperature is obtained by adding electric or steam heat. This is indicated by the change in potential of electric current from a special thermostat. The controls are a combination of compressed air and electric apparatus installed by the Johnson Service Company. The Foxboro Company also worked with the others concerned in perfecting means of handling all these varied conditions by push buttons and switches, and in recording the results on roller strip charts. Transformers provide any voltage wanted, up to 30,000.

The refrigerating equipment consists of an 874 by 6 booster machine handling Freon-22, discharging through a gas-and-liquid cooler into a 7 by 7 compressor. The 7 by 7 can be operated independently on a shell and tube brine cooler; the cold brine is used in the cycling room. The total connected load on the two machines is 88 hp, but the cooling load runs between 4 and 6 tons.

Barrels

(Continued from page 59)

the barrel comes over, step aside to keep feet and legs clear.

8. When opening the door of a railroad car that is filled with empty barrels, be sure to stand to one side, as it is possible that a barrel may be jarred and fall to the ground.

9. Always stand clear of platform when barrel hoist is operating.

10. Report immediately to the plant First Aid Room and your superior any injury or illness, no matter how slight it may seem.

FIG. 2.

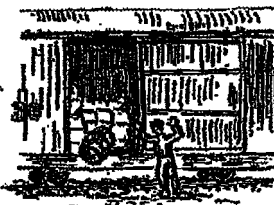
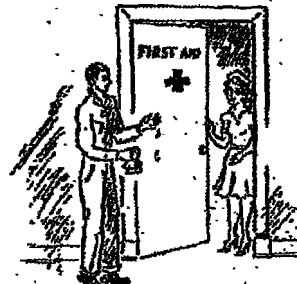


FIG. 4.



FIG. 10.



"Flexitallic"

REG. U. S. PAT. OFFICE



the Gasket that solves **BOLT TENSION PROBLEMS** ... and thus minimizes the most common cause of **GASKET FAILURE**

(1) Flexitallic Gaskets of balanced, spiral-wound construction are easier, quicker to install because bolt tension is automatically controlled by gasket yield. Tension gauges or similar devices are unnecessary.

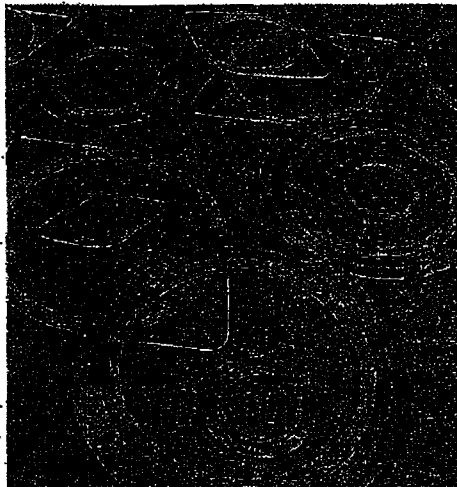
(2) Special on-the-job hand finishing of bolting surfaces is seldom necessary. Flexitallic spiral-wound construction is specifically designed to do what good gaskets are supposed to do — compensate for minor inaccuracies.

(3) No other gasket can surpass Flexitallic for precision manufacture balanced with service requirements for high or low temperatures, high or low pressures, gases, chemicals or other difficult operating conditions.

FLEXITALLIC GASKET COMPANY

Originators of Spiral-Wound Construction

1 & BAILEY STREETS, CAMDEN, N. J.



CUSTOM BUILT FOR ANY TEMPERATURE—ANY PRESSURE

Including the 2500 lbs. A. S. A. Series

The Great Game of Getting Ahead

(Fourth and Final Step)

Gain experience through the years and move forward to a better job. This article tells you what experience to gain and how to analyze your job.

By
Harry C. Walker

General Plant Training Supervisor
Southern Bell Telephone Company

WE have examined in the past three issues the needs of our job as foreman from all angles but one. After we become established in our job, there are many things we must learn as matters of experience. Our supervisors will expect us to move forward—in our job and perhaps to a bigger and better job. Let's look at some of the things we must gain in this manner.

1. You Will Learn How to Treat Your Men Fairly and Watch Their Interest

From the beginning of your foremanship, your desire has been to be fair and impartial with your men. However, being human, you have made some mistakes. As you grow in experience, you become more able to handle your men. You can better determine their needs and are better fitted to counsel and advise them.

The attitude of a supervisor toward his men, toward other supervisors, and toward the men to whom he reports is another set of relationships in which proper balance must be maintained. While, of course, there is a distinction in the way the average man relates himself to his supervisors and the way in which he handles his men, there are some supervisors who converse delightfully with what ever gods there may be, but deign but to spit upon the common clay. Another type of supervisor is the brooding hen type who puffs delightfully as his chicks browse about upon the job but whose feathers become unduly ruffled at the

approach of a stranger whether he be an inspector or a high executive. Again there are a few buck-passing supervisors who in function are little more than traffic cops directing this man to this particular supervisor on this ground of complaint and that man to that particular place where he can find an answer to his problems.

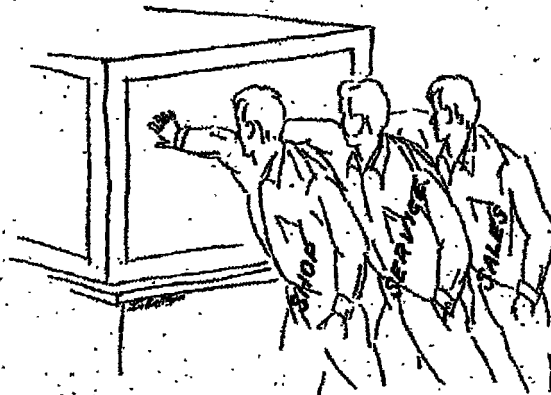
Actually these types and the other undesirable types of supervisors in industry are relatively small. The great majority of foremen and supervisors in industry strive earnestly to maintain a proper balance in their relationships with their own supervisors and with their men. With their men they have combined firmness with kindness and strive to maintain that type of discipline which makes punishment unnecessary. With their own supervisors they mingle respect with ease of approach, knowing that manage-

ment's recognition of their knowledge and ability makes mutual and understanding easy.

If we know ourselves and are able to use that knowledge to lead others in their thinking and behavior, if we can apply that knowledge and the control of ourselves in social relationships, if we can use it to draw other people to us and to help them solve their problems, then we have to a great extent mastered the greatest problem in our supervision—ourselves.

2. You Will Learn the Value of Good Human Relations and How These May Be Maintained

In your job as foreman, you will be afforded almost constant contact with the public and the people in other groups or departments. Through these contacts, you will have the opportunity to develop the ability to deal with these people in such a way as to



LET INGERSOLL-RAND

WORK FOR YOU!

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
COOL materials and workers
CUSHION pistons and recoil mechanisms
DISPLACE liquids and gases
DRILL rock and metals
DRY fabrics, paper rolls
FORM rubber, glass, and wood in moulds
HAMMER rivets, nails, chisels, forgings
HOLD liquids under pressure
LIFT by piston or air-motor hoist
INFLATE tires, pontoons
OPERATE all kinds of Air Tools
OXIDIZE materials in furnaces and converters
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
WHISTLE as an alarm or signal

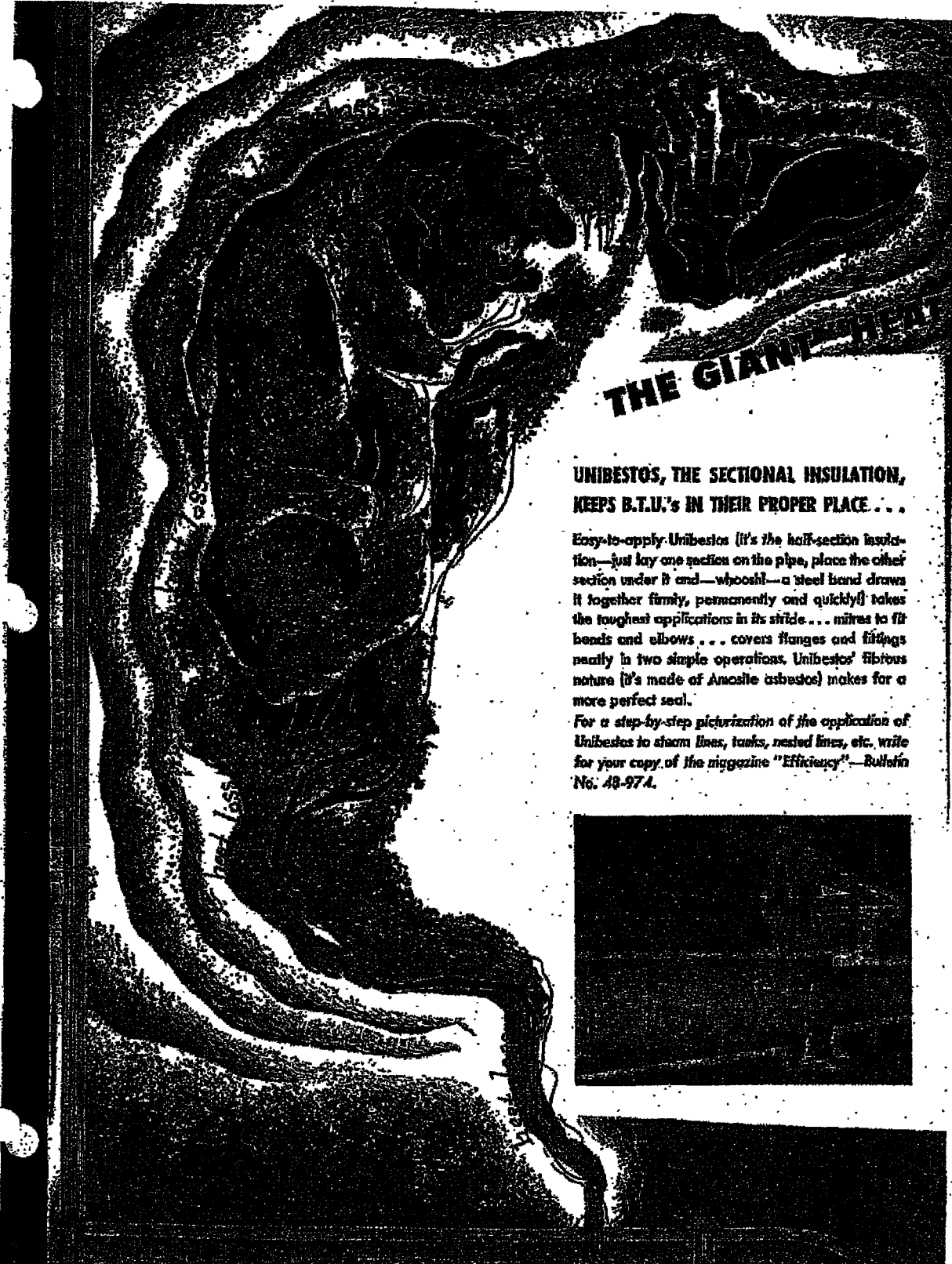
And a thousand-and-one other time- and money-saving jobs.

Ingersoll-Rand builds
and applies both
the COMPRESSORS
that generate the
AIR-POWER and the
TOOLS that use it

Ingersoll-Rand

11 BEDFORD SQUARE, NEW YORK 4, N. Y.

POWER & INDUSTRY
JANUARY 1946



THE GIANT HEAT

UNIBESTOS, THE SECTIONAL INSULATION, KEEPS B.T.U.'s IN THEIR PROPER PLACE . . .

Easy-to-apply Unibestos (it's the half-section insulation—just lay one section on the pipe, place the other section under it and—whoosh!—a steel band draws it together firmly, permanently and quickly!) takes the toughest applications in its stride . . . mitres to fit bends and elbows . . . covers flanges and fittings neatly in two simple operations. Unibestos' fibrous nature (it's made of Anselle asbestos) makes for a more perfect seal.

For a step-by-step picturization of the application of Unibestos to steam lines, tanks, nested lines, etc. write for your copy of the magazine "Efficiency"—Bulletin No. 48-974.



LOOSE

UNION ASBESTOS
MEANS PROGRESS IN INSULATION
AND RUBBER CO.

PLANTS: 1821 S. 34th Ave., Chicago, Ill. • Paterson, N. J. • New Bedford, Mass.

reflect credit upon yourself and your department or company.

In recent years industry has developed processes whereby faults are located and removed before they develop in normal operation. By making tests and imposing conditions upon equipment and machines which are in excess of normal operating loads, faults which would become troubles under normal operating conditions at some later date are developed and discovered. This procedure is sometimes known as preventive maintenance. It is also referred to as routine inspection or maintenance, since this type of work can be set up on a regular schedule and followed in a more or less routine manner.

The same sort of procedure can be applied to human relations.

Briefly, this can be done by the supervisory groups setting up definite schedules of investigations which, being on a continuing basis, will reveal to them circumstances which may develop into human problems under normal operating conditions. For example, in a case where the workman had not been trained in a new process, trouble might have been eliminated had the supervisory organization developed a routine whereby employees would be given definite training when processes are changed or new methods introduced. Whenever a new machine, or tool or method is introduced in the plant, the supervisory group should see to it that every employee who will handle these machines, tools and methods, is given definite training and that their understanding and ability insofar as these new things are concerned is such that they can use them without trouble. This is one very definite way in which human problems may be prevented.

If supervision is constantly on the alert, many potential human problems may be "nipped in the bud" before they develop into real ones.

3. You Will Learn How to Prevent accidents.

Experience gained in job planning, training and direction of men will assist you in foreseeing accidents before they occur and thus preventing them.

The Case of the Pros and Cons

John Smith, foreman, was a great believer in the principle that there are two sides to every question and that one side can be developed if the other side is brought out fully. Consequently, he follows the practice of taking the opposite view regardless of his personal viewpoint, in order to develop the facts on the other side of the question. He carried this belief to the extent that some of the boys said that they believed if they went in and asked for a decrease in salary, the boss would give them an increase just to prove that the other side of the question was right.

On this particular morning, Bill Brown, a workman, came in with a suggestion for improving the performance on a particular job that John Smith's men were doing. Bill had discussed this matter with his buddies and they suggested that he bring it in and discuss it with the boss since they felt that

next ascertained, Bill began to tell his story to the boss. He had rehearsed his story rather carefully and had it ready to present in a very logical manner. However, no sooner than he had started the general principle involved in his suggestion than John Smith gave three or four objections to the use of such a method. Bill did not argue with the boss as he held him in very high esteem; that is, he held his position in high esteem, so John Smith encouraged Bill to go ahead with the details of his plan. As Bill submitted each particular point in his detail, John would argue with him, pointing out that the detail would not work, that it was obsolete or that it involved some tool, piece of equipment or method that would make it uneconomical to use that particular way of doing the thing. Needless to say, Bill Brown left the boss's office very discouraged and in a very turbulent mood, since he felt sincerely that the idea which he had suggested was sound, reasonable and that it would be helpful on the job they were doing, if adopted.

This frame of mind was not helped to any great extent when about a week later, Bill Brown saw his method being used. Upon inquiry, he found that Mr. John Smith, foreman, had called the men in and explained this new method to them and asked them to use it on this particular job.

Comments

1. It does not pay to argue. A man convinced against his will is of the same opinion still.
2. It does pay to listen. Besides being courteous, we learn a lot that way.
3. It pays to give full credit for suggestions, etc. Full credit given means appreciation working both ways.



there was some merit in the suggestion. After being welcomed into the office and the nature of his busi-



Many occupations are more or less hazardous. Work done on platforms or close to moving equipment or machinery, on streets, and highways, and in a number of other places all have inherent dangers. One of the most important steps in the prevention of accidents must be taken before the work is started. This thought is substantiated by the fact that a large percentage of injuries are caused either partially or entirely by faulty supervision.

Unless a job is carefully planned in its entirety, it is possible that the more dangerous operations will

A JOB FOR AN EXPERT...

Only trained specialists
with modern facilities can
be safely entrusted with
prefabrication of complex
piping assemblies . . .

PREFABRICATION is the answer to complicated piping jobs—and the more complicated and difficult the job, the more important it is that you entrust it only to **Experienced Fabricators**, a seasoned expert like **Pittsburgh Piping and Equipment Co.**

All fabricated assemblies are designed by our Engineering Department in most specifications and code requirements. Working stresses are carefully calculated, to insure the most efficient utilization of materials for the pressure and temperature conditions involved.

The work is done by trained specialists, with every modern facility for bending, welding, creasing, corrugating, stress relieving, Van Brining, machining, heat treating and testing and inspecting.

The Laboratory complements the Engineering and Production Departments, by developing basic procedures and subjecting them to every known test. These procedures are applied, under laboratory control, to the fabricated assembly, and all materials are subjected to exacting tests to insure conformity to specifications and codes.

When you get your piping prefabricated by **Pittsburgh Piping & Equipment Company**, you are assured of it, of performance, and of long-life economy.

Pittsburgh Piping
AND EQUIPMENT COMPANY

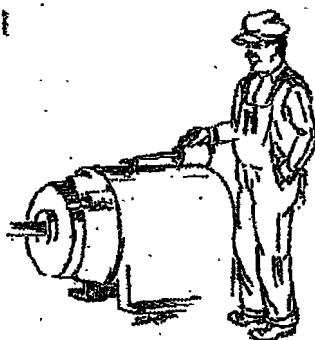
10 Perry-Third Street — Pittsburgh, Penna.

Manufacturing Plant
Members of American Iron and Steel Institute
1000 Union Deposit
212 West 42nd St. New York
and E. Terminal Station, New York

★ BUY VICTORY BONDS ★

SOUTHERN POWER & INDUSTRY for JANUARY, 1946

be overlooked. A thorough analysis is necessary to safety and unless a foreman knows where accidents may be expected he cannot arrange his duties effectively. Some operations are always more hazardous than others, and, in consequence, should be given extra supervision. Such a procedure may not prevent all accidents but at least it will show where to look for the greatest possibilities. It is most essential that a foreman be aware of the danger points and then if he has the proper attitude he will be on hand to direct the work and to notice carelessness or needs for training. In addition, he should remember that accidents seldom occur on jobs which are known to be hazardous; they happen on jobs thought to be easy.



4. You Will Learn the Ways and Means of Increasing Production

As you become more familiar with production methods, you will introduce these into your work, trying, adapting, improving, rejecting, discarding and seeking new ones.

In most industries provisions are made for the orderly and systematic testing and approval of ideas and devices which will later take the form of standard methods. Laboratory technicians and engineers devote their entire time to specialized branches of the industry in order to keep pace with the changing conditions and service demands made upon the industry.

However, most of the ideas and devices which are issued in the form of improvements to methods generally originate in the field under actual service conditions.

These are submitted as suggestions which are first considered as to their suitability and usefulness by specialists. Later they are given laboratory tests and finally field trials. If these ideas or devices survive these tests and trials, they are approved by proper authority and made a part of the standard methods to be used by the industry.

It can readily be seen that the foreman and his workmen have a great opportunity to contribute to the progress of the business by submitting any ideas or devices they may conceive on the basis of their field experience and problems.

Attention to Details

A real opportunity for the foreman lies in the improvement of a large number of small things which individually may seem not to amount to very much but which collectively will contribute substantial improvements to the industry. It is highly important that the foreman devote his effort to making the job work successfully on the basis of existing methods. When this has been done, the next step is to attempt to improve the methods themselves.

This matter of work methods need not necessarily be confined to the exact following of approved printed practices but may also be applied to the matter of job layouts and job economies applying to a particular piece of work or to a particular problem. On large or special jobs, such as the installation of large groups of apparatus, the foreman and his supervisor, along with the engineers, should determine beforehand the exact locations of each apparatus and all the other equipment needed to operate it. This and other things will permit the detailed planning of all the items necessary to the economical, safe and efficient use of manpower, materials, tools and equipment in completing the job in the least possible time.

There are several other things which supervision can do to introduce economies and improvements in work operations. For example, there may be many jobs now being done on an individual basis which can be done more economically on a mass production basis.

Certain groupings of apparatus might be made in the shop and common jobs of various work items done on a repetitive basis thus more economically than if all the work is done on an individual order basis.

The installation and construction of unnecessary apparatus and plant represent investment upon which little or no return will be made. Therefore, the foreman and supervisor should take production needs definitely into consideration when completing the plan for the job. Unless the production requirements are closely checked, apparatus may be installed with excessive unused equipment. Upon the basis of experience, certain groupings of apparatus and equipment may be developed which will minimize the installation of idle or unused equipment.

On this basis management can forecast more accurately the needs of the various foremen and make consequent plans and schedules for the procurement and economical distribution of these supplies.



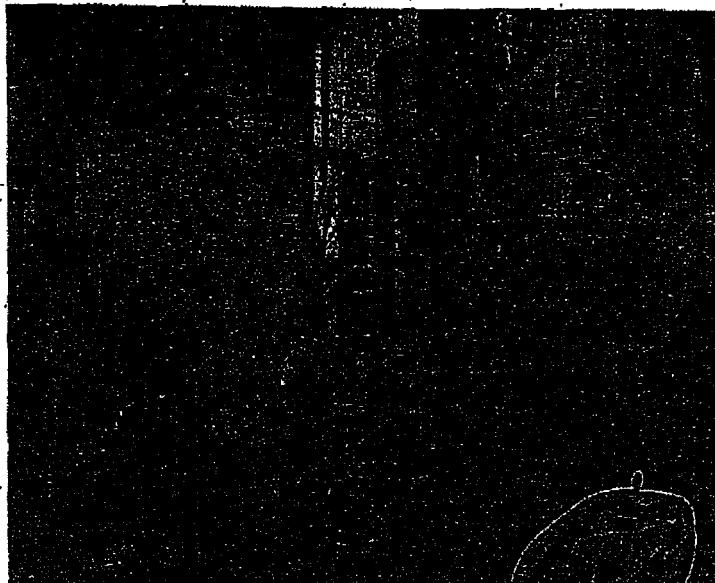
5. You Will Learn to Improve the Quality of your product

As you become more familiar with coordinating the various parts of your job, you will train your men to do better work on their assignments, thus contributing to the quality of the whole job.

Objectives and standards are set up by an industry in order that the plant will be constructed and maintained and production accomplished more economically and profitably. To accomplish this, every effort is made to do better work and to secure increased production, resulting in a more eco-

Says the Engineer:
"We Sure SPLIT HAIRS
with this one!"

Right: Boiler room in the plant of the Whiting Corporation, showing two of three pulverizer units feeding powdered coal to boilers. Link-Belt P.I.V. gear speed variators enable the engineer to adjust the feed to meet fluctuating demands for steam. Regulation is instantaneous and precise to a minute-fraction of a revolution per minute. Efficiency and economy of the plant is "immensely improved" since installation, states the engineer.



**Sensitive Combustion Control
 to Meet Varying Demand for Steam
 Achieved with Link-Belt P.I.V. Gear!**

Close-up view of drive regulator on Whiting pulverizer, shown removed, showing Link-Belt P.I.V. gear, set in position. Separate control wheel, connected to P.I.V. by roller chain, is also geared to large indicator dial.



To regulate the feed of powdered coal to boilers, in exact relation to load demands, pulverizers built by Whiting Corporation rely on Link-Belt P.I.V. speed variators. With this all-metal, positive and efficient device, the feed can be set instantly at any point, over a wide range.

Designers, builders and users of industrial machinery find P.I.V. gear units save power, time and material by giving quick, accurate timing of machines and processes. Data book 1874 gives full details and engineering data. Write for a copy, today!

LINK-BELT COMPANY

Atlanta Plant, 1118 Murphy Ave., S.W.; Dallas 1 Plant, 500
 Leffner St.; New Orleans 18, Balmaine 1, Houston 2,
 Washington 8, D. C.

Distributors Throughout the South.

2000-2

LINK-BELT P.I.V. GEAR
POSITIVE INFINITELY VARIABLE SPEED CONTROL

nominical operation of the business. This is done by a careful analysis of all the details connected with the job along with a continual study of the methods used by the particular organization and the results obtained throughout the entire industry. Active interest in the improvement of quality, quantity, and safety results must be indicated by the management before the supervisor, the foreman and the workman can be expected to become greatly interested in the matter.

Objectives and standards are tools of management which are used as an aid in improving job performance. They are definitely an aid to, but never a substitute for, supervision since supervision can secure a better improvement in performance by the use of approved objectives and standards. If the results obtained on any particular job are measured by the organizations, objectives and standards on a uniform basis, then they can be of value in pointing out the need, possibility, and method whereby improvements may be made. Through their use the foreman is able to find ways and means of bettering results, meeting objectives and living up to the standards set.

Objectives and standards are determined from averages based on very large volumes of work done under many varying conditions. It is recognized that certain jobs may be done by some groups under conditions which vary greatly from average conditions. Therefore, in making any comparison as to results, these abnormal conditions must always be considered, since any comparison which is based solely upon statistical data may play havoc with the morale of the working groups.

Any system or plan of measurement should be used solely to determine the cause of unsatisfactory job results in order that corrective measures may be applied and these results improved.

If the working groups which are compared with each other are such, such comparisons may be very helpful but as the size of these groups decrease, the volume of work affected is reduced and more attention must be paid to varia-

tions influencing results and more consideration to the analysis of individual performance and comparison.

A knowledge of and ability to handle the technical element of the job is a necessary qualification for any foreman. In addition the foreman should have a reasonable amount of experience together with the ability to learn in order that he might become a better supervisor on the job he now handles and be qualified for promotion to a larger job. The results he will obtain from his organization and their response to his direction will reflect directly his ability to handle men. The foreman's responsibilities should be considered from a standpoint of his entire job and in relation to all the people who are working under his supervision. If he fails to fulfill his responsibilities properly, the man under his supervision will suffer and conditions may develop in which the best results will not be obtained.



6. You Will Learn to Analyze

As you accumulate a background of experience, you will be able, more and more, to use this in your approach to new problems and situations. The factor of experience is of major importance in the ability to analyze.

In order to aid you in making an analysis of your job, we are giving you a general analysis or check list which may be of some help if it is applied specifically.

While it is recognized that any general analysis will be incomplete, the considerations answering the questions set forth will do much to assist you in doing your job more completely and more efficiently.

Before Starting the Job

- (1) Examine and analyze the work data, job order, service order or other conditions under which the job is to be done. These data should be checked for the following information:
 - (a) When the job is to be started and when it is to be finished.
 - (b) The amount of each item of material required for the job.
 - (c) The distribution of these supplies at various locations where the job is to be done, sufficient to make such distribution necessary.
 - (d) The number of men in each crew required to do the job.
 - (e) The amount and types of tools and equipment necessary to do the job.
 - (f) The location of the job and the arrangement of equipment to do the job.
 - (g) The relation of the job to
 - (1) Sources of supply.
 - (2) Facilities for men's rest and clothing.
 - (3) Transportation facilities.
 - (4) Hazardous conditions in relation to other jobs, and conditions existing on the job to be done.
- (2) Examine and analyze the locality of the job.
 - (a) Go over the job to determine from an examination of actual conditions all of the items set forth under (1) above.
 - (b) Observe carefully and make definite notes for future instructions to the men, the presence of all physical and electrical hazards which may be encountered during the job.
 - (c) Make all necessary contacts with other groups or departments in order that all conditions or service problems may be settled before the job is begun.
 - (d) Make all necessary contacts with other organizations in the business in order to promote the fullest type of cooperation between your unit and that of other supervisory.
- (3) Make your own plans for doing the job.
 - (a) Either order necessary material or set up a schedule for requisitioning such material.
 - (b) Check all equipment and tools to see that the necessary types and amounts of such equipment and tools are on hand to do the job.
 - (c) Inspect all tools and equipment to see that they are in condition to do the job.
 - (d) See that necessary copies of specifications and drawings, engineering data and other information are available or will be available when the job is begun.
 - (e) See if each man in your organization has been trained and instructed definitely and knows how to do the job and he will be expected to do safely, economically, and efficiently.

When Starting the Job

- (1) Make a checkup of all the items listed above immediately before starting up the job.
- (2) See that the men have a full understanding of the whole job to be done.
- (3) Go over the location of the job again and check for all possible hazards, public or customer relations, relation with other work units and the distribution of materials, equipment and tools and men.

While the Job is in Progress

Planning for Tomorrow

- (1) Check all materials, tools, and equipment necessary to do tomorrow's job: if on hand and properly distributed after the job location or on the truck.
- (2) Check your plans for tomorrow to see if you have laid out a full day's work for each man.
- (3) Check the orders, instructions, or directions which will be necessary to give each man.
- (4) Check all safety precautions necessary to be made and all safety warnings necessary to be given to the men or to the public.

At the Beginning of the Day

- (1) Direct or instruct each man in the work he is supposed to do, giving proper emphasis to all safety precautions and standard methods to be used.
- (2) See that supplies and materials are on hand or properly stocked to be transported to the job.

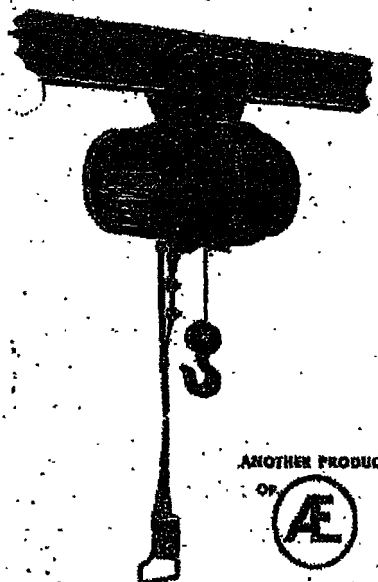
(Continued on page 128)



Get a 1/4 Ton Electric Hoist you don't have to coddle...Lo-Hed.

LO-HED ELECTRIC HOIST

Take the Load Off Your Shoulders



LISTEN, men, do you want a quarter-ton hoist that is a quarter-ton hoist? Or are you satisfied with a sissy-pants contraption that will whine the first time you have real lifting to do?

The Lo-Hed 1/4-ton hoist is a he-man's idea of a machine, every ounce of it heavy duty... equal in quality, workmanship and performance to the famous big Lo-Hed Hoists. Here's a hoist that will give you more full-load lifts in a day... a hoist you can even put on busy assembly lines without fear.

Send for the folder and compare every feature of a genuine Lo-Hed 1/4-ton with any other hoist of equal capacity.

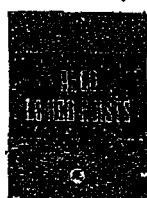
Weight—225 lbs. (Plain trolley),
195 lbs. (Bolt Suspension)
Motor—HEAVY DUTY hoist and
crane type with high start-
ing torque.
Gearing—HEAVY DUTY spur.
Lowering Brake—HEAVY DUTY
Weston automatic.
Electric Brake—FULL LOAD torque
capacity.

Control Pendant—HEAVY DUTY
Push Button Station.
Control Cord—HEAVY DUTY super
service rubber covered, reinforced
by pull cable.
Chassis—ALL HEAVY GAUGE pressed
steel.
Trolley—Special shockproof con-
struction.
Factor of Safety—5 at FULL LOAD.

ANOTHER PRODUCT



Lo-Hed Representatives in South and Southwestern States:
ATLANTA 3, Georgia . . . L. B. Bates, Jr., 214 Mathews Building Bldg.
BIRMINGHAM 3, Alabama . . . Harry C. Wood, Martin Building
HOUSTON 2, Texas . . . C. G. Forney, 517 W. & N. Building
JACKSONVILLE 2, Florida . . . Ward Eng. Co., Inc., 302 N. Main St.
OKLAHOMA CITY 6, Oklahoma . . . Russell M. Rice, 2215 N. Western Ave.
RICHMOND 5, Virginia . . . J. S. Felt, Jr. & Co., Transline Bldg.



AMERICAN ENGINEERING COMPANY
2402 Aramingo Ave.
Philadelphia 25, Pa.
Please send me without obligation: ☐ Your 1/4 Ton Lo-Hed
Hoist Folder, ☐ The complete Lo-Hed Hoist Catalog.
Name _____
Company Name _____
Address _____
City _____ State _____

Training Disabled Veterans

DISABLED War Veterans who seek opportunities for gainful peacetime employment will be heartened by information released as the result of a survey recently completed among the industrial policy-makers by the American Mutual Liability Insurance Company of Boston.

The survey was made in connection with a five point plan developed by the American Mutual in collaboration with other four-stake companies to assist industries in hiring disabled workers safely and productively. Querying plant officials and personnel directors in key industrial areas, the insurance company found that most manufacturing concerns are keenly aware that they may receive employment applications from considerable numbers of handicapped persons, and are laying their plans accordingly. Some concerns already have special departments set up to give returning servicemen specialized training before placing them in jobs suited to their physical and medical limitations. Other plants are studying their possible future openings to determine which jobs can be set aside for persons that have physical handicaps.

Some companies, it was learned, have employed considerable numbers of disabled workers to help relieve the scarcity of labor during peak war production. In these cases it was revealed that those with handicaps have proved above average from a standpoint of safety and general reliability, and show a lower record of absenteeism. Many by virtue of their disabilities have developed special skills that place their services in great demand in special kinds of work. Most concerns that made productive use of disabled labor during wartime indicated that it would become a permanent part of their recuperation plans.

As an example of what disabled veterans may expect in the way of cooperation from industry, the experiences of specific firms rep-

resenting different industrial areas are cited as follows:

A pump and farm machinery manufacturing concern in Peoria, Illinois, has purchased a 23-acre park along the Fox River, which it has converted into living quarters and a rehabilitation center for servicemen who wish to enter the employ of the company.

In addition, the management has instituted a special training program providing instruction in all branches of the company's manufacturing, servicing and sales departments. Scholarship are being awarded in nearby colleges and universities for ex-service employees who wish to continue their academic education. The G. I. Camp is equipped with a cafeteria, barracks, a library, game rooms, a swimming pool, outdoor sports facilities, and in general resembles a typical section of an Army Camp.

An electrical equipment factory in Detroit, with a successful record of employing disabled war veterans is now in the process of re-training medically limited and handicapped war veterans, along with able-bodied men. Their methods of selecting the applicant to the right job is reflected in an experience with a former employee following his return to work after heavy combat duty in the Pacific. Suffering from a form of war neurosis, this man was placed in his former occupation as a welder. Soon, however, it was found that

this one of the welding torch produced a condition, similar to one he had had while in the service, that he had undergone while fighting and thus aggravated his mental condition. After studying his case with medical aid, company officials induced him to change to a quieter and less trying job at which he has since proved successful.

A similar experience was had by a re-employed veteran in a New England plant. Due to the lack of a specific plan for studying the individual cases of returning servicemen, this man was placed in a job at which he was exposed to the same type of noise and vibration that had caused his medical discharge from the Army. As a result, he lost a hand in the operation of a large power press. Following the accident, the plant management began making special medical provision for discharged applicants. Benefiting by this one mistake, the company is now enjoying complete success with its postwar employment program.

A company in Philadelphia carries a staff of 300 disabled workers as a regular feature of its present and future labor program. Regarding that many of this staff will come from the ranks of ex-service men, the company has employed as a member of its Personnel Department, an Army Captain whose background in service was especially suitable to handling disabled workers both with regard to their selection and training and to their relations with the management and fellow employees.

Considerable thought is being given to jobs in each department of a silverware company in Connecticut that can be handled by disabled men. Impaired service men are being given every opportunity to find suitable employment with this company. In one instance a part time job was created for an Army captain who returned from the Pacific with an impaired

NOTICE

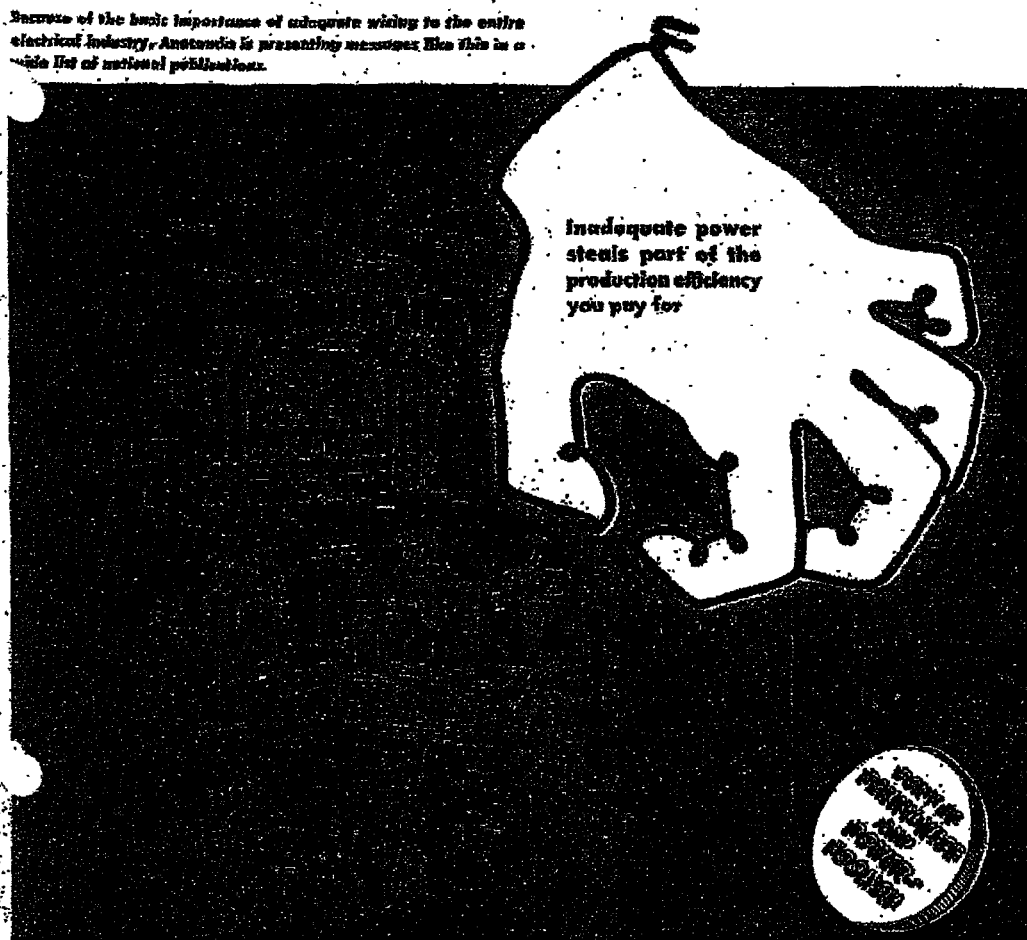
1945 S. P. I. Index

Now Available

Write for free copy to
SOUTHERN POWER AND INDUSTRY
Dept. 5145—Atlanta, Ga.

(Continued on page 96)

Because of the basic importance of adequate wiring to the entire electrical industry, Anaconda is presenting messages like this in a wide list of national publications.



Backward wiring handicaps advanced equipment

... Wire ahead

Don't **HORRIBLE** new, improved equipment for the sake of saving a few extra dollars worth of wiring.

Remember, to get peak efficiency from postwar production equipment wiring must come first—foresighted wiring to provide for greatly ex-

panded power needs to come.

Check your wiring plans now. Avoid costly alteration shutdowns later. Call in your consulting or plant power engineer, electrical contractor or power salesman. Hear what they say about the wisdom of soundly

planned wiring and service equipment. Anaconda Wire & Cable Company, Subsidiary of Anaconda Copper Mining Company. General Offices: 25 Broadway, New York City 4. Chicago Office: 20 North Wacker Drive 6. Sales Offices in Principal Cities.

✓ *Check your wiring plans before they check you!*



ANACONDA WIRE & CABLE COMPANY

Rope Service Pays Dividends

Here are some tips on how to get the safest and most economical service out of wire ropes.

By Russel Ralph*

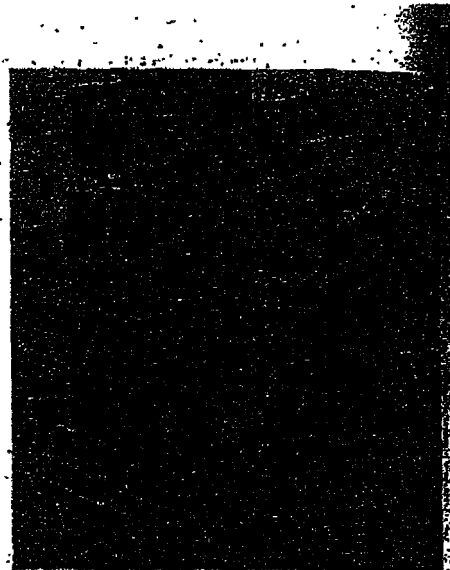


FIG. 1. RUSSELL RALPH POINTS TO A PREFORMED WIRE CABLE WHICH HAS JUST BEEN CLEANED, INSPECTED AND TREATED WITH A DRESSING.

IN our operations we use a great deal of wire rope. Good operation demands that we get the longest possible service from every foot of rope on the job. Ropes retired from machine use serve a second time as guys, guards, or general utility cables. To obtain the longest safe rope life we have adopted a wire rope program geared to the best economical operation.

Buying The "Right" Rope

In buying rope we are particularly careful to see that each rope ordered specifies the recommended size and type of construction. If a machine comes equipped with a $\frac{3}{4}$ " rope we see to it the replacement is of the same size and con-

struction.

We are ordering only preformed rope for machine use. We have found that the preformed gives us longer life on machines; and for its possible second use it is much the safer for workmen to handle. To date we have never had an accident due to handling worn preformed rope. We have also found that our machine operators seem to like it better.

Keeping a Rope Record

Each rope, when it arrives either for stock or the job, is entered in a running rope record file. The date ordered, date delivered, size and kind of cable, from whom purchased and the name of the manufacturer. Any particular information as to rope care or lubrication is also noted.

Other information includes date put on machine, reports of inspections, and all repairs and rope service charged against the cable. When the rope is retired or returned to headquarters for cleaning, repair and storage, all facts

are set down. If we find that the rope is serviceable for later use, a red tag is attached to the edge of the card. If the rope has been permanently retired for machine use, the date is transferred to another card with full details as to condition. The original card is then posted as to estimated work the rope has delivered as a machine cable. Against this life we estimate the cost of rope repair and service, including lubrications.

Keeping a rope record which gives the full history of each cable on the job requires some extra work but we have found it worth the trouble and of considerable value to us in buying the "right" rope. The value of any such case history depends on the length of time it has been kept and also the accuracy of all information posted.

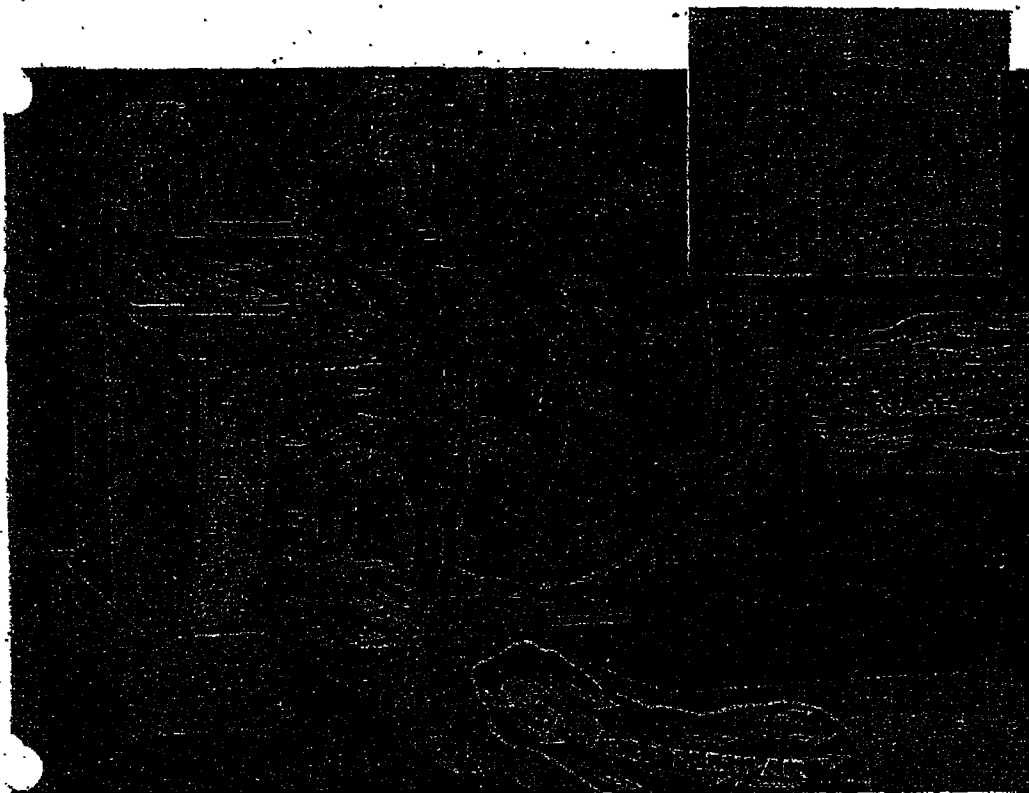
On-The-Job Rope Service

With each average unit in the field we have a four-man mobile repair shop. Daily rope inspections, cleaning, and lubricating, is handled by each machine operator. However, if a rope is to be cut back, ends switched, or otherwise repaired, it becomes the task of the repair crew. If a machine is being repaired on the job, the op-



FIG. 2. MACHINE OPERATOR FOR KAW PAVING COMPANY LUBRICATES HIS MACHINE DURING TEMPORARY LAYOFF. ALL ROPES ARE INSPECTED. BEFORE MACHINE GOES BACK TO WORK, ROPES ARE GIVEN AN "EASING-IN" RUN.

*Mr. Ralph owns and operates the Kaw Paving Company, with headquarters at Topeka, Kansas.



Gas turbine (turbo-supercharger) used on Cooper-Bessemer marine and locomotive diesels. Hot exhaust gases drive a centrifugal compressor which compresses fresh air, forcing it into the power cylinders to supply extra oxygen for the combustion of additional fuel.

This Successful Gas Turbine Is 10 Years Old

THE gas turbine is much discussed today as a potential source of efficient, economical power for the locomotives, aircraft, boats and power plants of the future.

Here is a gas turbine, designed and built for super-charging marine, locomotive and stationary diesels. For eight years, it has been working successfully on Cooper-Bessemer engines.

Known as a turbo-supercharger, its operation is readily understood from the diagram above. Turbo-charging increases the horsepower of a diesel up to 50% without adding to engine weight.

Lower-cost, more efficient power production has been a major objective of this Company for 113 years. When you order your Cooper-Bessemer diesel, gas engine or compressor, you can be confident that it represents the utmost in dependability, efficiency, economy, for a long life.



NEW YORK WASHINGTON HOUSTON DALLAS TULSA SHREVEPORT LOS ANGELES ST. LOUIS SEATTLE

POWER & INDUSTRY for JANUARY, 1946

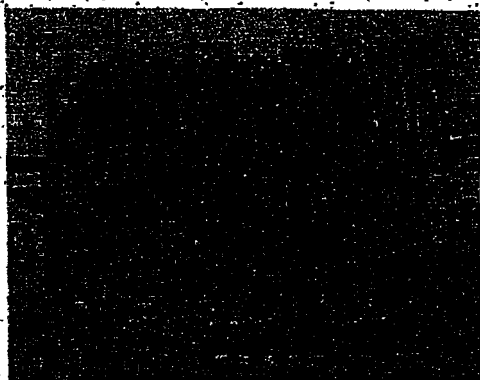


FIG. 3. THE WRONG WAY TO STORE RESERVE CABLES. AT KAW PAVING ALL ROPES ARE SERVICED, TREATED WITH A STORAGE PRESERVATIVE AND PLACED IN A SEALED ROOM AT THE WAREHOUSE.

erator helps with the work and at that time all ropes are cleaned, inspected, and lubricated. This fact is posted on the rope record with date and detailed information as to findings and what was done.

If the repair or rebuilding job on the machine includes building up sheave grooves or drum surfaces or other adjustments which would change the rope track, before the machine is used again the rope is given a new breaking-in run. While preformed rope requires less breaking than non-preformed, we have found it a good policy to allow the cable plenty of time to adjust itself to the machine. It adds to rope life and lessens the chance of a rope failure.

The additional time required and the cost of more frequent inspections and lubrications is small compared with the advantages gained: longer life, better machine operation, safer rope. There is an intangible gain also. We have found that when rope service and on-the-job machine maintenance is stressed, the operator has more confidence and will deliver more per hour.

There is also the safety advantage. An operator who has full confidence in his equipment (because he knows it is properly serviced) has fewer accidents.

Storage Care

All wire ropes going into storage are cleaned and inspected—whether retired from machine use or for repairs and later use on

another machine. Before ropes are placed in storage they are treated with a storage dressing. We use only factory recommended lubricants. We have found this the best policy.

Our rope storage room is sealed off from the rest of the warehouse. There is no chance for water or acid fume damage. Each reel carries a tag,

giving the ropes condition and from what machine it was taken, plus dates and file number.

We have frequently been asked if we thought the extra emphasis placed on rope care and service is worth the cost. It is good operation to make every foot of wire rope last the longest possible time, and deliver every safe hour of work that's in them. But to answer the question directly: Yes, we think our rope policy is worth the cost and trouble. We know that it is paying us dividends in more output per machine and in much longer rope life. We know that it is a big factor in holding down accidents. We expect to continue our rope service program.

FIG. 4. CABLES OPERATING OVER SHEAVE DRUM AND SHEAVES. WHEN DRUM SURFACE OR SHEAVE GROOVE IS WORN UP, CABLES ARE RUN THROUGH THE MACHINE FOR BREAKING-IN PERIOD BEFORE MACHINE IS RETURNED TO THE JOB.



Veterans

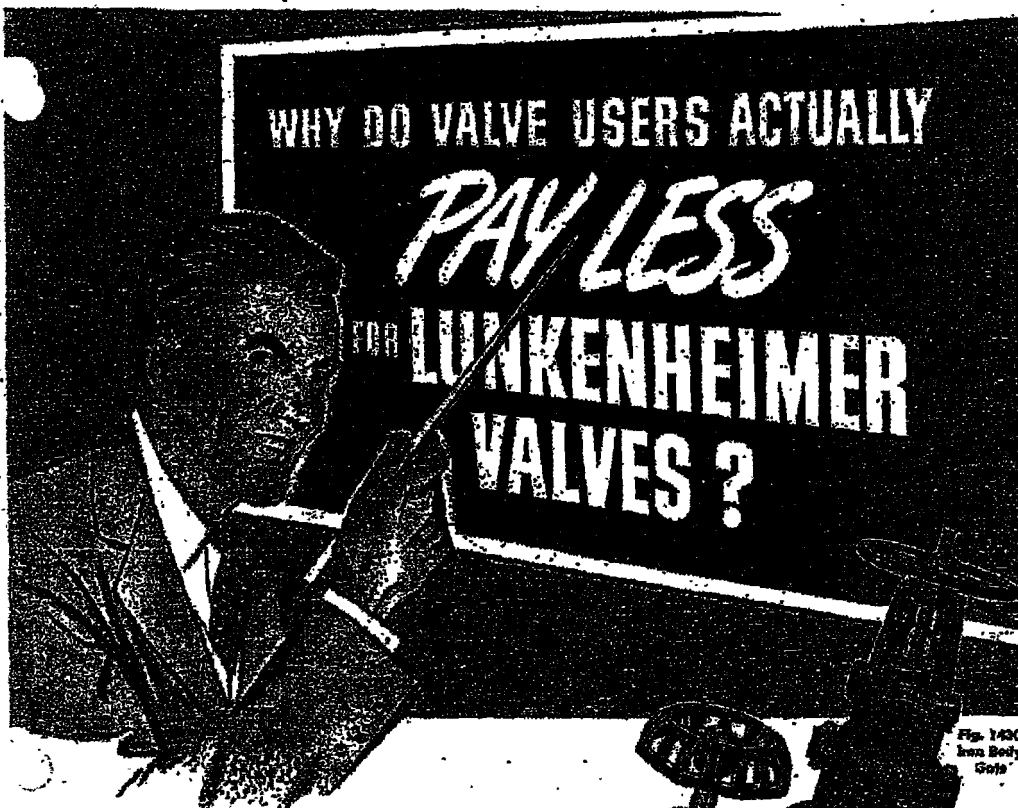
(Continued from page 22)

ment that permits him to work only a few hours daily. The guiding hand of the Company's Veterans' Employment Department is a former Army personnel classification officer who saw combat service in Europe, and is considered proficient at assisting ex-servicemen with their problems of civilian readjustment. The primary objective of his efforts is to place applicants in work that they desire and can do best. This company works in close harmony with local and state officials of the Veterans' Administration, attempting to fully meet the needs and recommendations of the bureau.

Walking through a North Adams, Massachusetts, radio parts factory, the visitor may observe workers with various physical handicaps performing their duties with absorbed precision. At one point during wartime production this factory had a payroll of more than 450 handicapped employees. The plant personnel manager firmly believes that the disabled are on a fully equal basis with other workers if they are permitted to select their own jobs. This is one of the Company's guiding principles in a program designed to hire varying numbers of disabled servicemen.

In the past disabled workers have made up an important part of the payroll of a small manufacturing concern in New York City, employing less than 500 men. Some of those employed during the war are now gone due to union seniority rules and replacements. Those still on the payroll, however, include an ex-soldier who lost a leg in Army maneuvers; a blind employee, and an ex-soldier who suffers occasional mental "black outs" due to "shell shock".

Other sources questioned in the American Mutual's survey show that the above concerns are typical of others in their respective industrial districts, both with respects to their past experience in employing disabled workers and to their coming plans for assisting returning disabled veterans to find suitable jobs in industry.



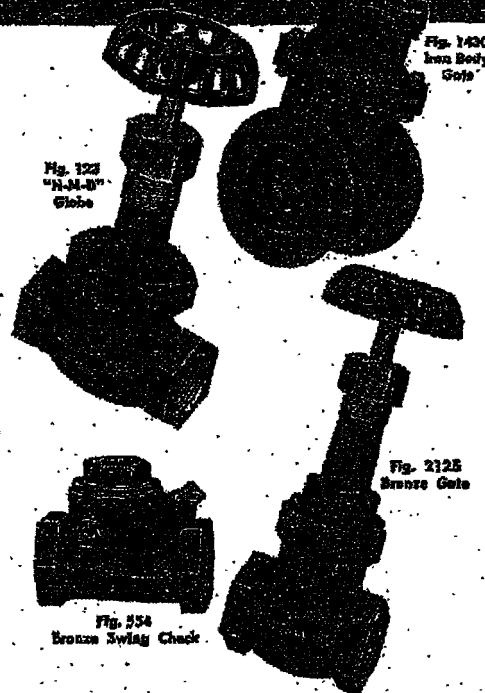
● It's a fact, that valve purchasers actually pay less for Lunkenheim Valves—because these quality-built Valves give definitely better service, longer service, more trouble-free and economical service.

Maintenance men everywhere know they can confidently rely on the superior performance of any product bearing the Lunkenheimer name—backed as it is by a tradition of highest quality and skilled craftsmanship.

THE LUNKENHEIMER CO., Cincinnati 14, Ohio, U. S. A. Offices: New York 13, Chicago 6, Boston 10, Philadelphia 7. Export Department: 31E-322 Hudson St., New York 13, N. Y.



YOUR LUNKENHEIMER DISTRIBUTOR plays a very important part in rendering the better valve service for which Lunkenheimer is noted. He is fully equipped and ready at all times to help you solve problems of valve maintenance or operation. Lunkenheimer Distributors are located in all industrial centers. There's one near you ... call him for your requirements.



LUNKENHEIMER VALVES

BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S. P. H. BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS

A History of Power

By Carl J. Eckhardt, Jr.*

The Direct Acting Pump Is Invented

Henry Rossiter Worthington

1817 - 1880

HENRY Rossiter Worthington was born in New York on December 17, 1817. His forebears had lived in America since 1649. The Worthington family sought in America the freedom and opportunity which, in its opinion, England no longer offered. His father, named Asa Worthington, was an engineer and miller. He had established a substantial business in New York. Inasmuch as Henry was the only son in the family, the father hoped that he would take an interest in this enterprise and ultimately take over the entire business. It is apparent, therefore, that the father was in a position to give his son advantages which many young engineering aspirants of his time could not hope to receive.

Henry Worthington, however, had a mind of his own. He was inclined to operate with independence and originality. Like his father, he possessed an exceptional aptitude for things of a mechanical nature. In one respect his development was much like that of John Ericsson—he became a highly skilled draftsman. He became an actual friend of John Ericsson's later in life. Worthington could see devices with his mind's eye and the nature of his intellectuality was such that he directed his thoughts into inventive channels.

At the time Henry Worthington reached young manhood, America stood at the threshold of a period of tremendous development—a growth which was to assume phenomenal proportions. Transportation systems were needed to make his dream of America become a reality. New transportation systems were needed upon the water as well as upon the

land. William Henry, John Fitch, James Rumsey, Oliver Evans, John Stevens, Robert Fulton and others

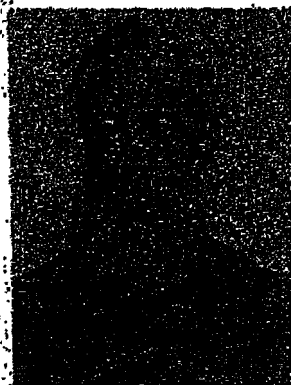


FIG. 1. HENRY ROSSITER WORTHINGTON.

had already devoted the best attributes of their natures to the solution of these critical transportation problems. The ambitions of America were about to be realized as Worthington reached a stage in his development in which he was in readiness to make his contribution. The State of New York had begun to develop its waterways. Yet the means of transportation upon its canals and streams were in a large measure crude and antiquated. Fertile minds began to grow concerned over the possibility of using steam actuated boats on the Erie Canal.

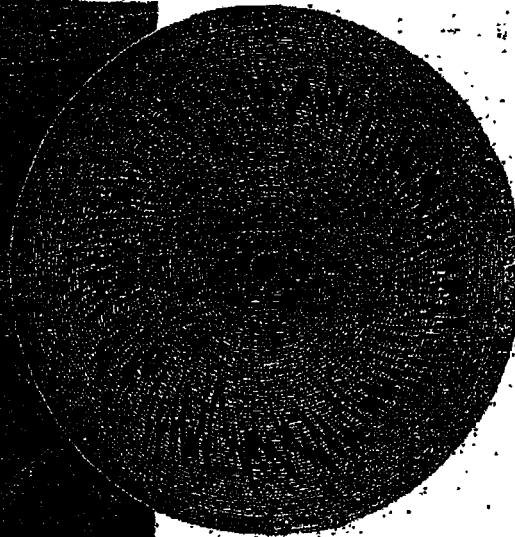
With financial assistance provided by his father, Henry Worthington began to devote himself to the experimentation which he regarded as being necessary to secure a basic un-

derstanding of the problems involved. The nature of his actual work appears to indicate that he had been of the experiences of William Symington in England. Symington had constructed the steam engine actuated boat, *Charlotte Dundas*, for the purpose of towing barges through the Irish canals. In the ultimate Symington suffered from the same lack of progressiveness on the part of the world in which he lived that had plagued so many of his predecessors and which was subsequently to plague so many of his successors. The officials of the company for which the *Charlotte Dundas* had been constructed feared that the agitation of the water by her paddle wheels would result in the erosion and ultimate destruction of the banks of the canals. Early accounts of Worthington's work in this field indicate that he experimented to determine the proper position of the propelling wheels and to determine the manner in which the water in the wake of the wheels might be directed toward the stern of the boat with greatest success.

The canal boat ultimately conceived by Worthington bore clean cut lines. This was a feature which was to be characteristic of so much of the equipment which he later designed in the course of a fruitful career devoted to engineering activity. His interests were diversified. The principal phases of work in which his interests manifested themselves related to hydraulics. He recognized the impracticability of designing a steam generating system in such a fashion that its boiler feedwater pump could be actuated only when the engine for which steam was provided was in operation. The marine engines of that time were arranged in this manner. Thus it frequently became necessary to resort to the use of hand operated auxiliary pumps when the water in the boiler or boilers reached an undesirably low level when the prime mover was idle. So Worthington conceived a steam actuated pump by means of which independent pumping action was made possible.

In 1838 Henry Worthington married Sara Newton. She was the daughter of Commodore Newton of the United States Navy. In the following year he actually constructed his first direct-acting steam pump. Operators of steam generating devices were, however, loath to relinquish their obsolete practices and to resort to the use of his revolutionary device. By a peculiar paradox the steam engine driven boats were not accepted for the service Worthington

*Professor of Mechanical Engineering, University of Texas.



This direct-operated COPES Flowmatic handles process loads ranging from 30,000 to 110,000 pounds per hour, as shown by above-flow chart on which full scale is 130,000 pounds per hour. This modern plant has three COPES Flowmatic and 425 gal. Riley boilers.

On fluctuating process loads

As the Plant Engineer expressed it: "It would be foolish to claim the water level is held constant on these rapid changes, for no regulator will take water away from a boiler when the sudden load comes on, as it would have to do to hold the level constant. The normal water level is at the center of the drum. As the load hits, expansion of the boiler water along with increase in gas fuel supply (combustion and pressure control) on a slight drop in boiler pressure again increases the volume of the water-steam content of the boiler and raises the level three or four inches, and will do this with no feed. This higher level is

held until the stored water is used up. On a drop in load and rise in boiler pressure, the level is held constant."

No matter how severe your loads—process or power, —COPES Flowmatic assures an always-safe boiler water level. Bulletin 429-A tells how and why. Write for it—your letterhead, please.

NORTHERN EQUIPMENT COMPANY

162 GROVE DRIVE, EME, PENNSYLVANIA

Feed Water Regulators, Pump Governors, Differential Valves, Liquid Level Controls, Reducing Valves and Desuperheaters

BRANCH PLANTS: Canada, England, France

Representatives Everywhere

GET CLOSER LEVEL CONTROL WITH THE FLOWMATIC

★ REGULATOR

had designed for so diligently despite that great progress appears to have been made. Worthington was now to undergo the test to which all had vouched whose intellectual capacity places them far in advance of their contemporaries are exposed—the upholding restriction imposed by previous legislation against steam driving craft boats became, in fact, so great that the Legislature of New York undertook to investigate the practicability of the changes brought against steam navigation. It was ably aided by Henry's and associates interest in the application of the use of steam, established modes of propulsion as well as horse drawn vessels.

The legislative investigating committee found that Henry Worthington had done an extremely valuable piece of work from every point of view. It awarded him a medal for his achievements. Yet it possessed the unmitigated audacity to direct him to relinquish his marine utility. Thus a propelling marine of a year was blighted under the pressure of unwarmed and undirected political stringency. Worthington's pump which had served marine steam engineering hydraulics for several years was removed in order that it might be applied for other services. The impulses by which Worthington was motivated were durable and his nature was such that he was not dismayed by the immediately undisturbed treatment which he had received.

In 1844 he patented his original pump idea which involved the use of a single acting water cylinder. He spoke of this device as "the first independent pump I had ever seen or heard of for boiler supply." In the same year he devised his first double acting pump. In the year which followed, namely, 1845, Henry Worthington became associated in business with William Baker. The purpose of their business was to build hydraulic machinery. Their beginning was not a very auspicious one, but the enthusiasm of Henry Worthington—the engineer—never lagged with the assistance of his father he sought to make helpful installations of his pumping devices. In the fall

made he succeeded in getting Captain Joseph Cresswell, who operated the steam engine driven vessel Bay State, to permit him to make an installation of his pump. It was installed that practically no importance was attached by the captain of this vessel to the 6" x 9" x 12" pump which Worthington installed. It was not until the usual means of pumping water into the hulls had failed that Worthington's pump was put to use. To the amazement of the captain of the vessel the pump operated in a remarkably satisfactory manner.

This satisfactory operation of his pump aboard the Bay State in 1845 appears to have inspired the successful expansion of his business in this city which followed. Worthington was immediately interested in the task of improving his devices as well as to the task of conceiving other new hydraulic devices. He invented his "double acting" water meter in 1850. Despite the fact that this device was soon to be replaced by more effective forms of water meters, it served in America as the progenitor of later devices which were to come into general use.

In the year last mentioned, Henry Worthington succeeded in selling two of his devices to direct acting pumps, to the United States Navy for installation aboard the U.S.S. Schoepstewick. The urge within him was, however, such that he could not hope to be satisfied by the experiences of merely installing devices which he had previously conceived. Progress of a tremendous magnitude was now made in the case of a pumping unit which he designed and constructed for installation aboard the steamship Schoepstewick. The design of this pump was such that it was provided with small flat spring loaded valves in multiple in lieu of a large single valve of a hinged nature theretofore used for or in the case of such pumping devices. With these new improvements it became reasonable to hope for the continuous operation of such pumps over extended periods of time. This contribution was very valuable of tremendous importance.

It was not long until Worthington's devices were attracting attention in Europe as well as in America. In 1853 his partner in business died. In the following year his shops, which were originally established in a small wooden structure near the Brooklyn Navy Yard, were moved to a new site on Van Brunt Street. Here this space available made possible the expansion of his manufacturing installations upon a more extended scale. It

was in 1854 that Worthington was called in the construction of pumps for municipal water works near Savannah, Georgia, was to be the first which had extent in the world for the conception of still greater and more revolutionary progress in the design and construction of pumping engines. These pumping engines of Worthington design were installed to meet this historic requirement. Each of these pumping engines possessed a capacity for pumping three hundred thousand gallons of water a day.

In the case of these pumps assigned a number of new ideas were incorporated. The compound steam engines were arranged in such a manner that the high pressure cylinder was placed within the low pressure cylinder. The plunger by which the water was displaced possessed a square cross-section rather than the conventional round section. The pump was placed in a horizontal position at the extremity of the water cylinder so that an extension of the rod actuating the water plunger was made to reciprocate the piston of the steam cylinder. The steam condenser was placed directly upon the water cylinder in order that the water being pumped might be used as a medium to condense the exhaust steam. The nature of the construction of these pumping devices was so substantial that they served the purpose intended for two decades.

In 1855, Worthington sought to overcome the deficiencies which were possessed by his initial water metering device. His new Worthington duplex water meter proved to be the most reliable. It was ultimately widely used. When it was found that his duplex water meter functioned with simplicity it was only natural that he should begin to think in terms of pumping units likewise possessing such a duplex nature. In the beginning he used two single direct acting pumps by placing their steam ends end to end. The steam valve of one unit was actuated by the valve rod of the other. Fortunately the advantages expected by Worthington were realized. Later he placed the two pumping units side by side and created an arrangement which proved to be so satisfactory that the basic idea has remained unchanged with the passage of many years. His first patent relating to his duplex pump was obtained in 1855. In the beginning this duplex feature was incorporated only in the construction of small units.

In 1859, Henry Worthington became a party to a very important

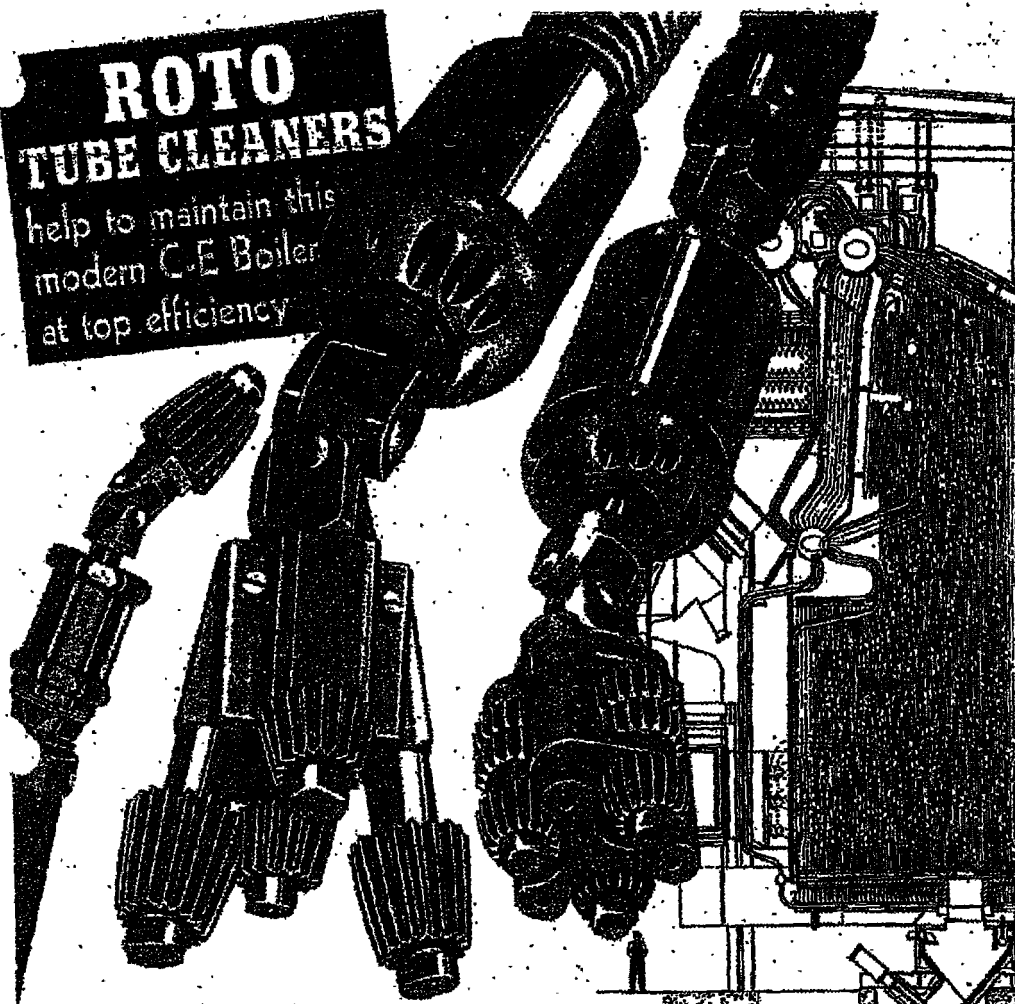


FIG. 2. EARLY WORTHINGTON PUMP.
ACTION PUMP.

Fig. 2. EARLY WORTHINGTON PUMP.
ACTION PUMP.

ROTO TUBE CLEANERS

help to maintain this
modern C-E Boiler
at top efficiency



ROTO TUBE CLEANER SPECIFICATIONS

For 2 1/2" x 3" curved water wall tubes (bifurcated), Roto Model 226 motor with pivot head shown at the left.

For 3" curved steam generating tubes and 3" curved water wall tubes, Roto Model 125 motor with 4-arm head.

For 3 1/2" curved water wall tubes, Roto Model 130 motor with wing-frame head.

One of four C-E Steam Generator Units installed in an eastern utility power station. Capacity, 500,000 lb steam per hr at 250 psi and 550° F.

The modern, highly efficient steam generator with its closely nested tubes having short radius bends calls for a modern tube cleaner capable of negotiating the curves. The huge steam generator illustrated was built by Combustion Engineering Co. for a public utility. Listed in the specifications is the Roto Tube Cleaner equipment furnished for this modern plant.

Since 1910 the Roto Division has specialized in tube cleaners for all types and sizes of tubular heat transfer equipment. Our complete stock of cleaners and accessories permits immediate delivery. Write, wire or phone.



ROTO Division of ELLIOTT COMPANY

145 SUSSEX AVENUE

NEWARK 1, N. J.

contact with agencies operating in behalf of the city of Charlestown, Massachusetts. The pumping unit approximating in this case a capacity of 5,000,000 gallons of water per day was the first large municipal pumping unit in which Worthington's duplex feature was incorporated. He had conceived and constructed his devices with such skill and proficiency that the firm, Henry R. Worthington, soon gained great renown, not in America alone, but abroad as well. By 1876 his equipment was so well known that a pumping unit of his design was selected to supply the water for the Centennial Exposition held in Philadelphia. This Centennial pumping engine attracted great attention and it deserved the approbation which it received. It delivered water at the rate of 6,000,000 gallons per day.

By the end of 1876 units capable of pumping 15,000,000 gallons of water per day had become a reality. Henry Worthington had by this time become recognized as one of America's leading engineers. He was not slow to assume his responsibilities as such. In 1878, the City of Boston ordered two pumping units each capable of pumping 25,000,000 gallons per day. Such units were needed for the purpose of pumping sewage. This task was one which certainly merited Worthington's skill and knowledge.

The *SCIENTIFIC AMERICAN*, A Weekly Journal Of Practical Information, Art, Science, Mechanics, Chemistry and Manufactures dated January 11, 1879, carried the advertisement shown in an accompanying illustration. The same issue of this publication contained the following information with regard to Worthington duplex pumping engines:

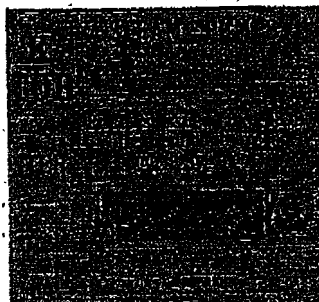


FIG. 2. WORTHINGTON ADVERTISEMENT IN SCIENTIFIC AMERICAN DATED FEBRUARY 1, 1879.

"The hydraulic works at South Brooklyn, N. Y., owned by Henry R. Worthington, the well known con-

structor of steam pumping machinery, are among the most extensive and complete of their class in this country. . . . At this establishment water works engines, condensing and non-condensing, of the largest size; air and circulating pumps for marine engines; stationary steam fire engines; boiler feed pumps; pumps for hydraulic pressure, and others especially adapted for oil pipe lines; water and oil meters; hydraulic cranes and hoisting machinery, etc., are constructed. . . . One of the most important features of the Worthington duplex steam pumping engine is the peculiar arrangement of valve motion, which prevents all noise or concussion action. . . . The one piston acts to give steam to the other, after which it finishes its own stroke, and waits for its valve to be acted upon before it can renew its motion. This pause allows all the water valves to seat quietly, and removes everything like harshness of motion. . . ."

The creative genius which Henry R. Worthington possessed was fortunately not confined to the construction of machinery. He was a leader among engineers. As such he was concerned about the welfare of engineers and about the establishment of a proper respect for the engineering profession throughout all communities in which such engineers practiced their profession. At the age of 62 years he undertook to gather other prominent and worthy engineers to discuss with them the formation of a society which would dignify their profession by establishing its rightful place in professional life of the land. A year later The American Society of Mechanical Engineers was founded. The position which this society has occupied in the field of engineering is so well known that its virtues need not be extolled here. The state of Henry Worthington's health was such that he was compelled to decline the presidency of this organization when it was established. The esteem in which he was held by fellow mechanical engineers was such that he was elected to the first Honorary Membership of this organization.

From the time at which he succeeded in selling his first pump for actual marine service in 1849, Worthington never lost faith in his ability nor did he ever cease to yearn to serve the people of his country in a useful capacity. In writing in 1874 of his initial successful venture in 1849 he stated, "From this, I date the success with which my business has been crowned." The warmth of the esteem in which he was held by fellow en-

gineers is revealed by an action of John Ericsson's shortly before Worthington's death. In presenting a token of his appreciation for the services rendered to his profession, Ericsson, himself an engineer of rare and sterling qualities, wrote to Henry R. Worthington as follows: "I regard your pumping engine as the greatest achievement in hydraulic engineering of our time."



FIG. 4. WORTHINGTON'S DUPLEX PUMP OF 1872.

In the course of his business career, Worthington had acquired two partners. They were Dauphine S. Hines and William A. Perry. When he had completed the design of the extraordinarily large pumping engines for the City of Boston, Worthington's active engineering experiences came to a conclusion. He retired—content



FIG. 5. LARGE WORTHINGTON PUMPING ENGINE.

to leave the business which he had founded and expanded so tremendously in the hands of his two partners in whom he had great confidence and upon whom he placed a great trust. The span of his life in retirement was not great, for Henry R. Worthington died upon his sixty-third birthday on December 17, 1880. Thus came to a conclusion the career of a great engineer and one of the country's principal mechanical benefactors.

BIBLIOGRAPHY

1. A History of the Growth of the Steam Engine—Robert H. Thurston
2. Pump Book—Worthington Engineers
3. A Short History of the Steam Engine—H. W. Dickinson
4. 100 Years—Worthington—Worthington Pump and Machinery Corporation

Wing Revolving Heaters for Hard-to-heat Buildings

Thorough Penetration, Uniform Coverage

The photographs shown on this page exemplify the type of industrial building where heating is a serious problem. Railway shops are notoriously hard to heat and the success with which Wing REVOLVING Unit Heaters have met this problem is an indication of their suitability for all types of industrial buildings regardless of heating difficulties.

Revolving discharge outlets give thorough, uniform coverage, circulating under and around obstructions, into far corners and repair pits, giving a sensation of

fresh, live, invigorating warmth to workers. And in Summer, with the steam turned off and the fans on, these same revolving outlets keep the air in constant, gentle motion, bringing relief and comfort on the hottest days.

Back view of Locomotive Shop of Northern Pacific Railway Co., Livingston, Montana.

Back of Building "Wing Revolving Unit Heaters"

L. J. Wing Mfg. Co. 164 W. 14th St., New York 11, N. Y.

Branches in Newark, N. J. and Montreal, Canada

Wing

REVOLVING UNIT HEATERS

Helping the MAN-IN-THE-PLANT

Readers are invited to send in hints, ideas, and suggestions.
Payment is made for each contribution published.

To Obtain Maximum Efficiency from Lighting

IF your light bill is \$1000 per month you can spend \$250 per month for cleaning with good soap and water and break even, not taking into consideration the savings in production cost directly traceable to good lighting. It is not uncommon for lighting fixtures to accumulate sufficient dirt, grease and grime in a period of a month, to reduce the effectiveness of the lamp by 25 per cent. Establish a definite system of cleaning lamps and fixtures.



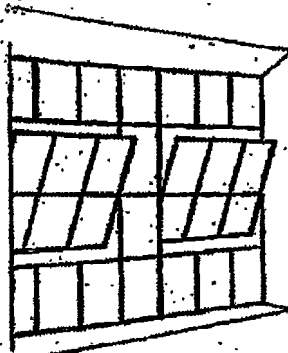
Never let lamps in out of the way places burn out before receiving attention. Either schedule their replacement if they are actually needed or have them removed entirely. You'll be surprised how many such lamps can be found in almost every manufacturing plant due mainly to production line changes.

Voltage drop should never be more than 2 per cent for lighting circuits. Lamps should not be operated at less than rated voltage. Periodic checks on lamp circuit voltage usually pay dividends in increased quality of product and increased output with less fatigue to the workers. The handiest instrument to chase down the trouble in such instances is an indicating voltmeter and this instrument is made even more practical by installing an ordinary screw plug on the meter cord. The voltage may then be taken at any lamp receptacle by merely screwing out the lamp and screwing in the plug.

M. P. CLOWSON (Ia.)

Maintenance of Steel Window Sash

STEEL window sash around most manufacturing plants and particularly in the vicinity of the power plant as well as on the power plant itself are subject to acids and subsequent corrosion.



Strange as it may seem the bottom portion of the sash seems to be effected before the rest probably due to the bottom being more directly subject to the elements. The next time you go out to inspect your buildings take particular note of the bottom of all steel sash and if corrosion is evident instruct that the sash shall be thoroughly scraped and wire brushed of all rust and then apply a good coat of corrosion resistant paint. There are any number of such paints on the market and the one to select will be one resistant to the acid or acids handled in the plant. Regardless of how remote the operations may be, fumes travel a long way. It may be sulphuric acid from the power plant stack.

W. ALLERTON (Fla.)

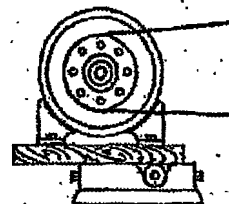
To Eliminate Trouble in Thread Taper in Tapped Holes

FREQUENTLY inspectors will reject parts due to excessive taper, sharpness and shallowness of the starting thread and the bottom thread in tapped holes, especially when such holes are tapped with a releasing holder. The trouble will generally be found in the wear of the holder. It is nearly impossible to produce a quality product when the tap holders are worn, resulting in a loose wobbly tap beyond reason. The chuck spindle is usually supported at both ends and when excessive wear occurs, wobble increases. The reversing gears wear rapidly due to the reverse speed being about twice the forward speed.

H. HOOKER (Ky.)

To Save Leather by Using a Pivoted Type Motor Base

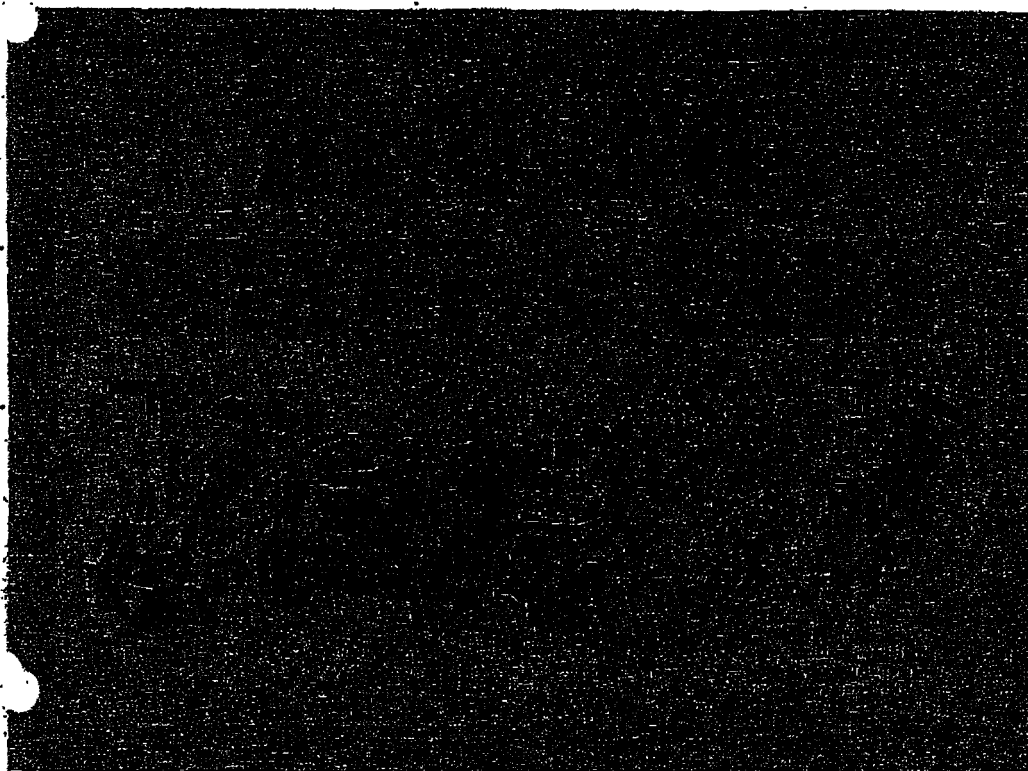
DID you ever stand around a plant and have your ear drums continuously bombarded by belt squeaks? Each one of those little noises means waste of power and waste of leather. A drive would undoubtedly be found in which no provision for automatic take-up had been made. A pivoted base for the motor trouble would, in most cases, save power and save



leather. When the load comes on, the motor "hugs into" the belt and when the load is relieved the motor just "lets up" on the belt. The pivoted base properly installed and maintained is just about the most intelligent kind of drive we know about and there are a number of excellent designs on the market.

R. C. CAMPBELL (Ala.)

THE WAY TO BETTER VALVES



During the last century, when the now ordinary valve types were being originated and patented, Pratt and Cady contributed, among others, such items as the slip-on disc for globe valves and the swing type of check valves. d'Este originated the piston internal pilot controlled regulator. This activity continuing to present times is illustrated by the bar stock valves originated by Reading-Pratt and Cady.

And when early in this century, a need developed for a valve material other than brass and iron and the available steel castings proved inadequate, Reading specialized and pioneered in the development of the art of producing steel pressure castings. That development has been continuous, particularly as the requirement for alloy steels has appeared and increased.

The way to better valves is to continue development.

Reading Cast Steel Valves and Fittings • Pratt & Cady Brass and Iron Valves
d'Este Automatic Regulating Valves • Hollowed Pressure Castings
READING-PRATT & CADY DISTRIBUTORS IN PRINCIPAL CITIES

ACCO

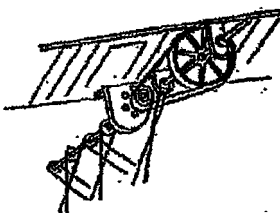


Reading, Pa. • Atlanta • Chicago • Denver • Detroit • Houston • Los Angeles • New York • Philadelphia • Pittsburgh • San Francisco • Bridgeport, Conn.

READING-PRATT & CADY DIVISION
AMERICAN CHAIN & CABLE

To Install an Efficient Group Drive

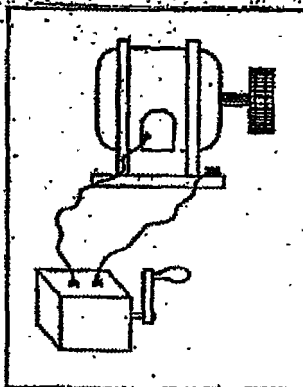
GROUP driving of machines is often taken to mean a system where you install a long-line shaft and then hang on all the machines you can possibly reach. This is erroneous. The efficient group drive may be one having two machines or a dozen, the number of machines being irrelevant. What actually counts is an intelligent grouping of machines for a given drive. For example there may be a clear cut group of machines forming a production line.



The line cannot produce unless all machines are operating and if one machine goes down they might as well all be down. A closer example can be found in the paper box industry where several machines form a group, the product going from one machine to another or in sheet metal strip plants where coils of sheet metal are punched and pass on through the heat treating operation without stopping. Irrespective of the initial cost of the motors, such machines could be operated from a group drive with higher power factor, and with less maintenance cost of driving units.

How to check motor Insulation Resistance

NOW that most plants have changed from war to peace time operations and many electric motors have continued, year after year to give out their full quota of power, it would be well to check each motor for insulation resistance and forestall future troubles. The easiest and quickest way to do this is by means of the megger (megohmmeter). Clip one terminal to the motor winding, after disconnecting it from service, and the other terminal to a suitable ground.

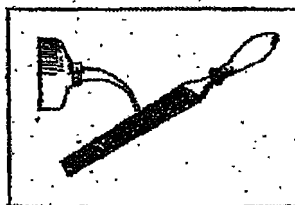


The frame of the motor is satisfactory but scrape away the excess paint and grease. The megger should read infinity for a bang-up insulation, but can go as low as 50,000 without too much danger in the immediate future. It will be well to earmark all low reading motors for an early cleaning and new insulation paint for the winding. If upon cleaning with motor cleaning fluid the resistance does not rise perceptibly the motor should be earmarked for a rewind job.

C. C. HERMANN

How to Keep File from Clogging

BRASS, aluminum and all non-ferrous metals clog the teeth of hand files very readily. Make up a solution of seven parts of paraffin and three parts of lubricating oil.

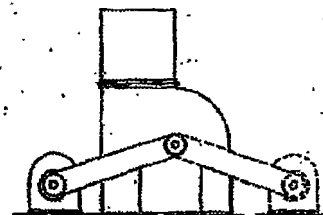


Keep this lubricant in a can on the bench and before starting to file brush a thin coat over the teeth of the file. The metal will free itself quite readily. Ordinary chalk can be used for the same purpose by merely rubbing the chalk on both sides of the file before using.

H. J. HARRISON (Ga.)

To Prevent Belt Slip in Fan Drive

THE air handled by a fan is roughly, in direct relation to its rpm, therefore belt slip is of importance in keeping the unit up to its maximum efficiency and the exhaust system operating per design. Very often belt slip is encouraged by thoughtlessly placing the motor on the wrong side of the fan so that the top strand of the belt is doing the pulling when the motor could have just as well been installed so that the bottom strand of the belt would pull the load. In

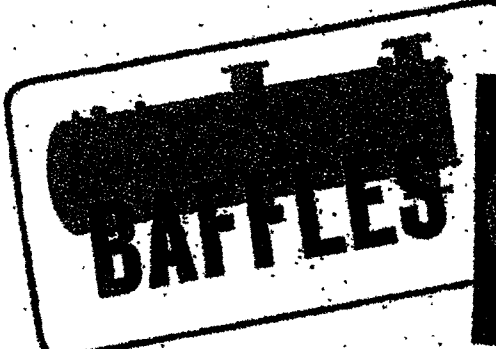


the latter case the loose strand of the belt serves to increase the arc of contact and, particularly if the drive is a step-up speed type, is an advantage at the motor pulley.

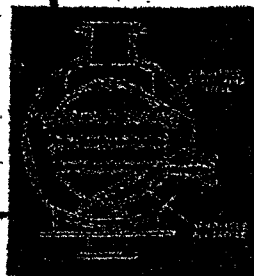
F. N. WINNER (La.)

Slow Motion Sometimes Pays Dividends

ACCCELERATION is the working ghost of maintenance. Many drives, cables, ropes, gears, and tire surfaces are ruined by too rapid acceleration of the load. Manufacturers of lift trucks calculate 10 pounds of extra load per ton for each 10 feet per second of acceleration. The total stress in a rope, cable or sling looks something like this: Total stress equals the load times the quantity found by dividing the rate of acceleration in feet per second by 32.2 and adding 1. It is obvious that the rate of acceleration need not be increased very much to greatly increase the total stress. Considerable time and maintenance would be saved by posting the limits of speed or otherwise place controls on the rate of acceleration of various devices in the plant. It pays



BAFFLES



ONE OF A
SERIES OF
ADVERTISEMENTS DE-
SCRIBING THE MANY
TYPES OF G-R HEAT
TRANSFER APPARATUS

... an important element of efficient **STAGE HEATER** design

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 of wear of tubes in the stage heaters you buy.

The baffle design and arrangement of G-R Stage Heaters are based on more than seventy-five years of experience in building closed water heaters. For example, the patented G-R enveloping steam baffle provides cross-over temperatures with superheated steam. This exclusive design not only permits heating the boiler feed water several degrees above the dry and saturated temperature of the extraction steam, but also is the only type of baffle that prevents the superheated steam from coming in contact with the heater shell, so as to prevent excessive expansion strains and possible warping.

The steam impact baffles, drain inlet baffles and air baffles, 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 in detail the various G-R designs for all pressures, temperatures, and plant requirements.

GRISCOM-RUSSELL

Pioneers in Heat Transfer Apparatus

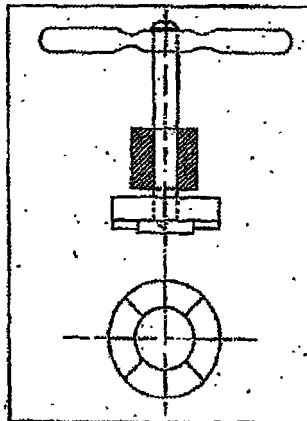
SOUTHERN POWER & LIGHTING CO. JANUARY 1941

to work within the safe limits of raising, lowering and moving equipment and if this is too slow have redesigns made to meet specific requirements.

C. C. HERMANN

How to Repair Leaky Water Faucets

IT is an easy matter to renew the composition disc in a water faucet when the leak is due to a worn disc but very often the brass seat is scored and replacing the disc is of little value. The method used by an old maintenance man is widely known but it may be well-



come information to some. First he called on the tool room foreman and obtained a small end mill of just the right diameter to pass through the valve body. He then had a handle put on the mill with a brass collar mounted on the stem. This brass collar was of a size to just fit the valve body opening. By placing this tool in the valve and turning carefully he was able to machine the seat and obtain a suitable seal between this and the composition disc.

C. C. HERMANN

Placing a Long Trolley Beam

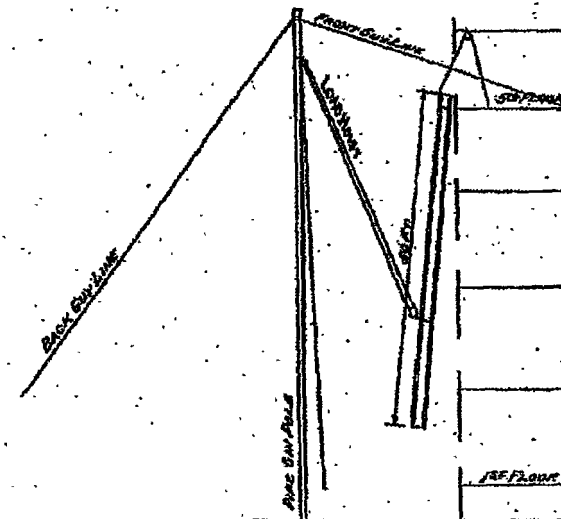
DURING process work in a large wood working plant, it became necessary to install a smooth trolley support beam up close to a fifth floor ceiling. The I beam, five-inch by fifty feet, had to be placed somehow, and it was highly desirable to have no roughness to trouble workmen later, so it was decided to place it in one piece. The fifty foot beam could

be bought and delivered on the ground outside the building readily enough, but how to get it placed was a problem. Two elevator shafts existed, but due to their small size, or to huge stock piles in the way, could not be utilized as entrance ways for such a long piece of steel.

Fortunately, one window existed which could be utilized for an entry way, as it was so placed that the piece could be pulled directly to place, thus avoiding concrete posts or other obstructions. If a way could be found to handle it at such a distance from the ground. It pulled in through the window directly, only about eight feet; could be gotten over the sill before the ceiling prevented further progress, so it was up to the boys to find some way to handle that long end which would be left hanging outside the window. Rope was in stock, also some two and one-half inch pipe, which when screwed together, made a fair gin pole for the light load which was to be handled. The pole was laid on the ground, with its lower end about twenty-five feet from the building, with a tieback rope to hold it fast, the pole lying at angle of ninety degrees to the building wall. One guy line was threaded up through the window opening, which had been stripped of its sash to facilitate easy handling; two

side guy lines with proper churugas were provided, similarly a back guy line. Next the load tackle was attached to top of the pole, all this being done on the ground, where the work was easily accessible. With all lines ready, a man at each guy line on the ground, and two or three inside the window, on good footing, the window gang hauled the pole vertical, and the ground crew made fast their lines, as did the men inside the window. Next, one end of the steel was pulled on top of the window sill and made fast; the hoisting block on the pole was attached to the outer end of the steel, and was then pulled up till the steel laid level. Next, the back guy line was slackened allowing the pole to lean toward the building, and so to carry the steel in through the window, with the help of the men inside until the load could be safely landed in its proper position.

Now the gin pole was let down again, almost exactly reversing the operation of hoisting it; the ropes were removed and all parts dismantled and stored, the whole operation requiring not over two hours. The beam was then hoisted against the ceiling, anchored there, and being as smooth as rolled, provided an excellent track, with no welded joints to line up or smooth off afterwards.



Science Looks Forward...



Michael Smith & others
University of California
Berkeley, predict
samples of comets
will be recovered by
the future.



200 tons of equipment
NASA's International
Space Station will be
new instruments and by
U.S. Space Company in
its orbital facility for
astronomy and other

In the protective quality of certain rubber compounds, U. S. Rubber scientists have found the answer to many of today's challenging industrial problems.

Rubber is the outstanding material for lining tanks, piping and process equipment used in handling acids and other "difficult" fluids for industrial processes.

Scientifically compounded, these rubber linings, called Permabond, are applicable to all sizes of equipment—in simple or complex shapes.

They not only protect metal tanks, pipes, valves and fittings against destructive corrosive action, but can also prevent contamination of chemicals being handled.

Permabond—one of the innumerable members of the "U. S." family of Engineered Rubber products—is aiding in many fields of endeavor... from the development of atomic power to the production of food, clothing, and other necessities of life.

Exhibits in "Science Links Tomorrow"—open series of lectures by the great scientists of America—at the Philadelphia-Sprinkling Program, 1285 Netherly Sunday afternoon, 2:00 to 4:30 P. M.

Standing Through Science

UNITED STATES RUBBER COMPANY

1220 AVENUE OF THE AMERICAS • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

SOUTHERN POWER & INDUSTRY for JANUARY, 1946

Adjustable Stop for Wire Stripping Machine

DEVELOPMENT of a metal adjustable stop which is used in conjunction with the cutting blades on a wire stripping machine for removing the shielding from co-axial cables has resulted in a considerable savings of scrap material at The Glenn L. Martin Company plants, Baltimore, Md.

In the method formerly used the cable was placed in the cutting slot and the blades closed around the cable from the top and bottom until they cut through the insulation which could then be stripped off at the end of the wire. Chief problem was that since the cutting machine was used on many sizes of cables, the depths to which the blades were permitted to cut was more or less a matter of guess work on the part of the operator. As a result, the cuts oftentimes were made too deep and the wire was sufficiently damaged as to make it unfit for installation purposes.

The new stop fixtures are now attached at the side of both the bottom and top blades of the stripping machines. They are designed with convex ends so that the edges of the fixture when closed form a



circle around the cable and prevent the blades from cutting any deeper than necessary into the insulation. Making them adjustable and in various sizes permits many kinds and sizes of cables to be cut.

Before the new stops were added, scrap material on smaller cables sometimes ran over fifty per cent. Now the scrap loss is entirely eliminated. In addition they have resulted in a savings of approximately fifteen hundred man-hours per year in eliminating rework necessary before this time, and experiments are under way to determine if the same idea, with changes and modifications, can be applied to other cutting processes.

Checking and Repairing Selenium Rectifiers

SELENIUM rectifiers usually consist of several stacks of selenium cells in series or in some other electrical arrangement to give the proper output current or voltage with a given a-c input. Their primary use is in furnishing small amounts of direct current in a primarily alternating current setup. They may also be used in relaying to provide a one way path for relay operation. Recently, lightweight, forced draft models have been designed for aircraft use, combining really remarkably light weights with high current capacities.

The construction of the individual cells makes them quite rugged and capable of being restacked easily without damage. Each rectifying element consists of a metal back plate on which the selenium

is deposited and heat treated. A low melting point alloy is sprayed over each element to contact the selenium barrier layer. The rectifying action takes place between the sprayed metal layer and the back plate and may be easily seen by using an ohm-meter and reversing the polarity while getting the resistance between the front and back of the plate. This suggests a method of testing the individual plates or cells. The author has found that if several cells in a good stack are measured in the high resistance direction they will have roughly the same resistance, the actual resistance as measured varying with the size and age of the plates.

To check a stack, it is only necessary to disconnect it and measure the high resistance direction

from plate to plate in the stack. Since usually the cells are in series, measuring from one plate to the next will give the resistance across one barrier. When measuring the individual cells it is necessary to disconnect the unit to prevent other voltages from feeding into the meter.

A stack which has been in service for considerable time may possibly have sustained surges and overloads which may have damaged some of the individual cells. If this is the case, these cells will show up as having very much less back resistance than the good cells in the stack. If, when checking the stack, a sufficient number of these damaged cells are found, it should be removed and replaced with a good stack. Since these stacks are quite expensive, when several of them have been taken out of service for damaged cells, it may pay to take them apart and restack them using only the good cells. When dismantling a stack, one should be careful to note exactly how the components go together, and if the stack has been paint sprayed after assembly, it may be necessary to use some paint remover on the sprayed metal side of the plate in order that the spring washers will make good electrical contact with the sprayed metal.

When testing a completed stack, it should be remembered that leakage in the reverse direction will not settle down immediately but will take from three to five minutes to come to the final value. This is due to the polarization of the selenium layer. The characteristics also change somewhat with the rising temperature as the test goes on. It is probably a good idea to let the test progress over a long enough period of time to let all of the plates have a pretty good workout at a voltage somewhat higher than that with which they will finally be used.

A. J. HUMPHREY (Tenn.)

BIBLIOGRAPHY

1. Hertz, E. A., Characteristics and Applications of the General Electric Company Selenium Rectifier Cells, AIEE Transactions October 1944, p. 624.
2. Reference Data for Radio Engineers, 1944, compiled and published by Federal Telephone and Radio Corporation, p. 72.
3. Tammack, J. E., Selenium Rectifiers and their Design, AIEE Transactions July 1943, p. 696.
4. Hertz, E. A., Selenium Power Rectifiers for A-C Aircraft Systems, AIEE Transactions August 1944, p. 595.

advertising. The eight men furnishing this new company have an aggregate of 40 years experience in rotometer engineering, an average of five years per man. The exact address of the company is the Brower Rotometer Company, Box B-1811, Lansdale, Pa. Harry H. Long will be chief British engineer in charge of specifications and calculations. He will be assisted by James Anthony and Joseph Decell who have had many years experience in specifying and calibrating rotometers. Edmund W. Altman will have charge of precision rotometer tube manufacture. Jack Birdsey will manage production and Lou Rosenblum will handle purchasing and accounting.

This company will specialize in rotometer flow rate measuring instruments designed to meet the difficult services and corrosive atmospheres encountered in the process industries. Their new meters have been so simplified that they will meet the high standard of up to twice its cost. Exact design improvements will appear in a succeeding issue of this magazine.

Texas Gulf Coast Representative For Fisher Governor

Edward Goetzman, Chairman, Marshalltown, Iowa, manufacturers of automatic road equipment, announces the appointment of the Fort-Swensen Company as its exclusive representative in the Texas Gulf Coast area, effective November 1, 1943. The office address is—804½ West 9th, Mesquite & Munsterchurch Building, Houston 2, Texas.

Kenneth L. Parler has been associated with Fisher Governor Company for more than twenty years, both as a member of the Marshalltown engineering and research staff and as a sales engineer in the field.

Since 1943 he has served in the Gulf Coast area from the Houston office and is well known to Fisher customers in that territory.

C. E. Swenson has had seven years' field experience in selling and serving Fisher control equipment. Prior to his affiliation with the Fisher organization, he spent several additional years in the automotive control field. For the past two years he has served the Fisher Company in the home office as sales engineer.

pointment. Mr. Singleton joined Alts-Clumbers in 1926 after receiving a B. S. degree in mechanical engineering from Alabama Polytechnic Institute. He was granted a leave of absence to work as a power plant engineer for a large Chicago firm in 1928, returned to the Alts-Clumbers Denver District office, and was made district office manager there in 1938. Mr. Singleton was transferred to the West Alts works as assistant to the manager of the steam turbine department in 1942 and became assistant manager seven months later.

Robins Converter Birmingham Office

Ronald Chavron, President, N. J., manufacturer of mechanical bearings machinery, recently announced the November first opening of new offices in the Brown-Mark Building, First Avenue and 21st Street in Birmingham, Alabama, to serve the fast growing industrial South.

Robins' Alabama headquarters is under the direction of Charles A.

(Continued on page 123)

News of the Month

Brooks Reinsmeyer Co. Organized

Bernard A. Brooks and seven associates, each with extensive experience in rotameter manufacturing and application, have organized the Brooks Reinsmeyer Company, a corporation capitalized at \$100,000.00. A factory has been acquired at Lumbale, Pa., and manufacturing has been started upon all types of rotameters for flow rate measurement and control.

Brooks is a graduate chemical engineer with a wide experience in chemical instrumentation and industries. For the past six years he has been vice-president of Fischer & Porter Co., in charge of sales and

Industrial Safety Service

Established in Atlanta, Georgia

An Insurance Survey Service has been established by Mr. THOMAS J. KENNEDY, Jr., at 1364 North Highland Avenue, N. W., Atlanta, Ga. Mr. Kennedy was formerly Chief Safety Engineer of the Bell Bomber Plant at Marietta, Ga.

The Industrial Survey Service provides a service to manufacturers and to private, public and governmental agencies in the control of waste and the preservation of the safety of persons and property. It offers technical hygiene control programs, general safety engineering surveys and safety consulting services.

Prior to his services with the Bell Aircraft Corporation, Mr. Knight was associated for twelve years as a Special Service Engineer with a large casualty insurance company. He is a Registered Professional Engineer, State of Georgia, a full member of the American Society of Safety Engineers, the American Industrial Hygiene Association, the Georgia Society of Safety Engineers, and the Georgia Section—American Industrial Hygiene Association.

As a result of extensive experience in the field and in the plant itself, both Mr. Fisher and Mr. Swenson are well qualified to meet the service needs of their territory.

Shogson Appointed By All-Chalmers

Mr. J. L. Shogson has been appointed manager for the 60 district offices of the All-Chalmers general machinery division's sales department, succeeds William C. Johnson, vice president.

Assistant manager of the steam turbine department prior to his ap-

New Equipment

Balanced Screw Pump
Quincy Pump Co., a division of E. K. Porter Company, Inc., Pittsburgh, Pa., announces new developments in its balanced quadruple screw pump.

Improvements are demonstrated by the new external bearing pump designed with bracket type anti-friction thrust and line bearings. Square yokes fitted with the three-point alignment problem and spacing washers are eliminated, providing free expansion of shafts for wide changes in temperature. Breakdown pre-loaded anti-friction bearings permit close running clearances between the body bore and the screws.



This new construction can be produced on all existing pumps without disturbing present type connections or location of the input.

The Quincy screw pump, the first positive displacement pump developed in America, has been progressively refined since its introduction in 1894. Designed for pumping various viscous liquids such as bunker C fuel oil, tar, rayon dope, lacquer, soap liquids, etc., it is also used in handling other liquids such as water, alcohol, and commercial solvents of various types.

New Brushes for "Hand-to-God" Jobs

The Cassey Manufacturing Co., 5901 Hamilton Ave., Cleveland, Ohio, announces a new series of power brushes and brush holders.



Utilizing a new principle of wire suspension under pressure and equipped with a variety of holding tools designed for use in drill presses, bench grinders and other special production and deburring tools and equipped with both grade, etched wire, the new power brushes are being used in cleaning the inside hole and copper bearings of Carnegie radiator parts in the roller parts factory, smelting and cleaning drilled holes in various engine parts; removing burrs from threaded tubes in roller arms; and in normal most powering operations.

There is a special 5/16 inch brush made of 110 nylon for a porcelain electrode cleaning operation.

Hand Technologies

The Grosse Scherer Company, 200 Lafayette St., New York 12, N. Y., announces its new precision hand technologies to enable engineers to accurately read the revolutions per minute of any revolving equipment. SCHERER Technologies operate on the centrifugal principle. The new models have five speed ranges covering an extremely wide range of speeds.

To change speeds, Scherer provides a knurled ring for speedy shifting. The four models are: Model A from 30 to 15,000 rpm, B from 45 to 18,000 rpm, C from 60 to 25,000 rpm and D from 120 to 45,000 rpm. It is thus possible to obtain the speed of generators, combustion engines, belts, elevators, transmission pulleys, power plants, textile machines, pumps, lathes, etc.

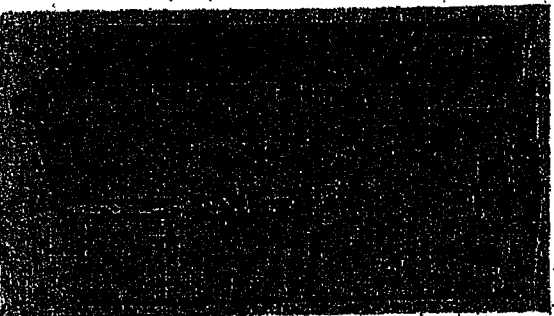
Scherer Technologies gain their extreme precision from the fact that each dial is individually calibrated for each instrument. The sheet results may be obtained and revolving shafts can be measured as close as 1 revolution per minute. In the Model A, the hand reads to 1 rpm, and readings of one revolution may be estimated. In the 100 to 400 range each graduation shows 5 revolutions, in 300 to 1200 ten revolutions, in the 1,500 to 4,000 range each line is 50 revolutions, while in the 5,000 to 12,000 range each graduation is 100 revolutions. Attachments are also provided to give feet per minute.

It is claimed by the manufacturers that with the precise graduations on SCHERER Technologies, much closer results can be obtained and production and profits increased by very small percentages, not possible with ordinary revolution counters that do not permit such close readings.

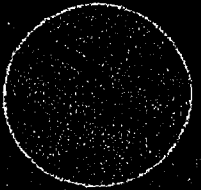
Low-Price Welder

The Lincoln Electric Company, Cleveland, Ohio, introduces a new low-price welder which is ideal for rural power lines and small shops and is said to overcome all the objectionable features of previous welders designed for this type of service.

The new unit, called the "Plant-Are-A-7" is for 250 volt, single phase power lines and meets the limited input requirements of rural utilities and RRA by a design of high efficiency



and high power factor. Current range is from 20 amperes at 25 volts to 180 amperes at 25 volts welding duty. This gives sufficient capacity for all types of jobs found on most farms or job welding shops. It will handle electrodes ranging from 1/16" to 5/32" diameter.



**ARE THE TWO BRONZE
SEATS (GROUND TO
A TRUE BALL JOINT)**

THESE two bronze seats, which have been ground to effect a true ball joint, distinguish Dart Unions from all others. Because of this perfect seating, a Dart will stay put—leak proof—indefinitely; yet may be uncoupled instantly when ever needed elsewhere. Body and nut are made of highest air-tight malleable iron—are practically unbreakable.

In length of trouble-free service, Darts are the least expensive unions to buy. Ask your supplier.

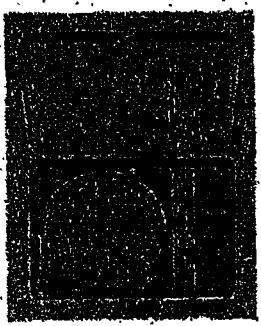


E. M. DART MFG. CO.
Providence, Rhode Island

DART
UNIONS

**Proportional Current Input
Controller**

THE ELECTRIC COMPANY, Watertown, 91, Conn., has recently developed a new electric type controller which combines a proportional current input controller and a recorder in one case. Designed to provide extremely

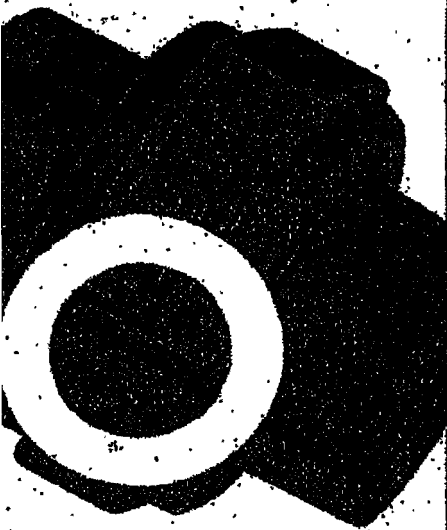


accurate control of electrically heated furnaces and ovens, this new instrument provides on-and-off type control with the advantages of positioning control.

A rising cam interrupts the flow of current to the heating coil or coils the duration of which is determined by the departure of the controlled temperature from the control point.

Complete details are given in Bulletin 191225 now available.

THE IMPORTANT PARTS!



NEW EQUIPMENT

New Carbon Dioxide Fire Extinguishers

THE B. F. GOODRICH COMPANY

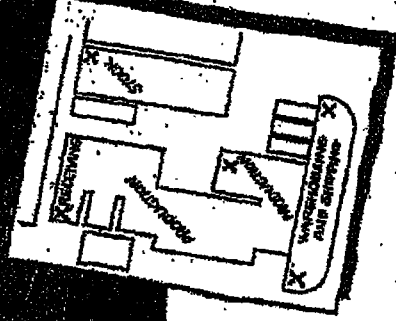
Akron, Ohio introduces a new portable fire-fighting device, the extinguisher with unique design and quiet operating features developed during the war.

Made to meet the full approval of the underwriters, the container holds four pounds of carbon dioxide and comes with a carrying handle and control button designed for fast operation. It can be easily carried in one hand, with the thumb of the carrying hand operating the push button. A burst-spring quickly raises or lowers as needed, remaining in long position when attached to the wall rack furnished with each extinguisher, together with a quick release chain.

Painted vivid orange and black for high visibility, the extinguisher may be recharged at regular retail service establishments.

Surveys have indicated that the four pound unit, while not meeting all requirements for plants, is also used in the vast majority of industrial installations.

Plan above how G-E chargers can be located to charge electric truck batteries in their working areas. This saves time, labor and battery power usually wasted in returning trucks to a central charging station.

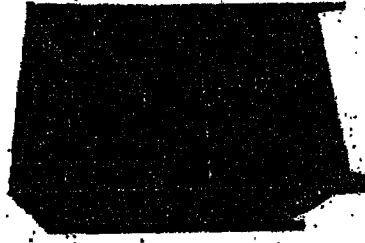


X marks the SPOT for G-E BATTERY CHARGER

Come are the days when it was necessary to ship electric trucks to a central charging station after long hauls or a hard day's work. Now you can charge batteries in truck working areas by simply "spotting" G-E Copper-nickel battery chargers at strategic locations where they are always ready to do a job. The savings in time, labor and battery power are obvious.

The charger is easy and economical to use. It's fully automatics—all a user has to do is plug in the connections, turn on the switch and the charger does everything else. It shuts off automatically on completion of the charge and a built-in control prevents batteries from discharging back through the charger after the a-c current turns off.

There are G-E Copper-nickel chargers for lead-acid batteries, nickel alkaline batteries or combination chargers to accommodate both. G-E chargers have no moving parts other than the cooling fan blance. Maintenance costs compared with other types of battery charging equipment are negligible. For full details write Section A168-23, Appliances and Merchandise Dept., General Electric Company, Bridgeport, Conn.



NEW EQUIPMENT—Continued

is properly placed in the die. High speed production is the principal feature of this tool. Connections can be made just as rapidly as the opening can slip the connector on the end of the wire and lay the assembly in the holding die. Another advantage is that a single pair of dies accommodates three conductors close. The dies now available will take Hydant connectors No. 13, 14 and 16, which means that connections may be made on wire and cable sizes from No. 22 to 30, inclusive. Thus a good range is obtained without a die change.

This new Hyproc, Catalog No. Y1000P, is a companion to the recently announced, Burdy Hytool, Catalog No. Y100R, the latter being a foot-operated mechanical device for making electrical connections. The newer tool, however, requires less operation effort since air pressure is used for the power source. Dies are interchangeable.

New Tubing Fitting to Eliminate End Preparation

GUSZEW-BACOF Manufacturing Company of Kansas City, Mo., have announced a time-saving tubing fitting which eliminates end preparation or soldering of the tubing and yet produces a stronger, leakproof and flexible joint.



The Flexigrip fitting, made in standard sizes from $\frac{1}{8}$ " to $1\frac{1}{2}$ " O. D., consists of four parts—the body, a gripping ring, synthetic rubber gasket and nut. To attach the fitting, the nut (with gasket and ring inside) is slipped over any plain-end tube cut to desired length. The tubing end is inserted into the body as far as it will go and the nut tightened. Tightening the nut compresses the ring into a tight grip and moulds the gasket around the ring for a leak-proof seal that is so flexible it will withstand unusual vibration or flexing. Flexigrip tubing fittings are available in brass, aluminum or steel.

GENERAL ELECTRIC

NEW EQUIPMENT—Continued

Pulsating Control Drive System

YARDENY ENGINEERING COMPANY, 105 Chamber Street, New York 7, N. Y., have developed a pulsating drive which provides single knob precision control of any type of reversible motor. Direction and extent of motor motion are under complete control of the single knob. The motor may be continuously rotated or moved in small increments—easily and accurately. The Yardeny Pulsating Drive works on all standard currents and frequencies. The extent of fine and coarse control provided by the unit can be made to suit every purpose in a manner that permits quick approach and precise positioning of the controlled object. The drives are suitable for inclusion in all existing controlled motor devices and offer many advantages that recommend it for new design projects.

Static Balancer

SAMUEL S. GILBERG, 34 S. Jefferson St., Chicago 6, Illinois, announces a new precision balancer having a number of distinctive and useful features that make it a useful addition to shops where rotating parts must be put in static balance. The 9" model illustrated has a finger tip span adjustment up to 9 1/4".

This is a tool of utmost simplicity, accurate to the finest degree, compact, strong and rigid. Because there are no movable parts, there is nothing to get out of order. The balancing surfaces are deep hardened and ground for accuracy. Particular attention is called to the spirit levels which always indicate the positive horizontal position of the rails.

The frames are made of cast aluminum, highly polished. Ideal for balancing motor armatures and small rotating parts. Supporting capacity of 100 lbs., and shipping weight of 2 lbs. Two larger models are available in the 24" and 36" sizes.

De-Scaling of Evaporators

TRUSTEES LABORATORIES, 281 - 283 South Third Street, Philadelphia 6, Pa., announce a highly effective new agent for loosening and dislodging scale from evaporator tubes and coils. **Test Scale-Off** is a penetrating agent, specifically designed to speed up the removal of the stubborn type of scale deposited in the evaporators of high pressure marine steam sys-



The WORK of a GIANT

• Within these walls a giant stands ready to work for you. Giving him no thought at all, you touch the control button. At your command his mighty muscles go into action and the load moves.

The operating mechanism of Shepard Niles hoists is completely enclosed, assuring permanent alignment—more durable, trouble-free, efficient service. Whatever your lifting or handling requirements may be, there's a Shepard Niles hoist for the job—more than 5,000 types and sizes.



Powerful and rugged, Shepard Niles Cranes are available in any desired capacity and span—designed to handle greatly varying loads with precision, safety and economy. Shepard Niles Cranes have the same sound, progressive features as do the Shepard Niles Hoists. A request will promptly bring illustrated literature.

Shepard Niles
CRANE & HOIST CORPORATION

The experience and facilities of Shepard Niles engineers are at your service. Plan ahead now for the right material handling equipment. Your inquiry will receive prompt attention.

455 SCHUYLER AVENUE • MONTAIGNE FALLS, N.Y.

NEW EQUIPMENT—Continued

tems, but is equally applicable to evaporators in stationary service. Scale-Off reduces the time required for scale removal because of its unique penetrating action, which insures rapid loosening of scale. Used in connection with cold-shocks to speed up cracking and dislodgement of deposits, it can bring an evaporator back to full rated capacity in a total period of treatment of 12 hours from start to finish.

Improved Protecting Thermocouple Tubes

Raynor Instruments Company, industrial instrument division of Minneapolis-Honeywell Regulator Company, Philadelphia, Pa., have developed an improved cast iron thermocouple protecting tube that is said to meet advanced requirements of the chemical, metallurgical and die casting industries.

The new tubes have a uniform wall thickness to within plus or minus one thirty-second of an inch and

have better surface finishes. They are cast with both ends open, permitting positive support for the core each end. One end is closed with a cast iron plug, welded in place with a cast iron filler rod, the opposite end being threaded for a one inch standard pipe.

Air Reducing Valve

LEON COMPANY, 185 Deland Avenue, Lyndhurst, N. J., have announced a new improved type of internal pilot operated air reducing valve, known as Class L-1A. Steady, accurate regulation and tight closing in dead-end service are provided.



New Comparator Gage Saves Time — Gives 6 Inspections in One!

Even the most inexperienced operator can obtain accurate inspection of externally threaded parts, with the Limited Comparator Gage—in many instances, increasing the rate of inspection as much as 400%. The Limited, served in hundreds of war plants, permits 6 visual checks in one quick glance: form, taper, out-of-roundness, angle, and straightness. Its use reduces inspection and production costs, cuts scrap waste while increasing speeds of operation. If a part passes the Limited, it will assemble accurately.

Graduated dials are furnished as standard equipment. These dials are graduated in increments which approximate .0005 inch when the magnification is 250 to 1, and serve as a guide in determining just how far over or under the limits the part might be.

Another "help on the job" is chewing gum. Chewing tends to make work go easier, time go faster. Good chewing gum is available, but there's still a shortage. That's why we at Wrigley wish we could make Wrigley's Spearmint now, to help increase the available supply. You may be sure we will, just as soon as sugar restrictions are lifted. Meanwhile, chew any good available brand, because it's the chewing that really does you good.

You can get complete information from N.A. Woodworth Co., Sales Division, 1300 E. Nine Mile Rd., Dearborn 20, Michigan.



Used Model used for "to process" gages



AA-51



Among the main features of this new type valve, are its stability under all flow conditions, and its responsive instant reaction to widest and most sudden variations in load. Elastic inserts in the valve seats provide positive tight shutoff and long life.

The new valve is available in sizes 1/4" through 4" inclusive, designed for initial pressure up to 400 pounds psi air pressure and reduced pressures from 5 to 300 psi.

Mobile Crane

THE HUGHES-KIRKMAN COMPANY, 648 Newman St., Mansfield, Ohio, has recently announced a powerful new Roustabout Crane, Model MC-3, which handles loads to 10 tons.

It's a mobile following boom crane, tractor mounted, that is easily driven where needed. Booms of standard

NEW EQUIPMENT—Continued

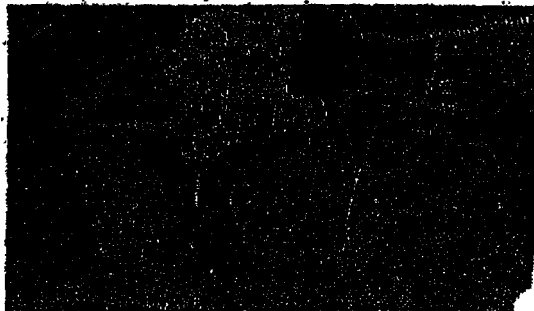
the from 15 to 30 feet are furnished; MC-8 is especially adapted to use of long booms, will handle loads of nearly 3 tons at a 30 foot radius, 1 ton at 6 feet. Ball-bearing boom, suitable and all gears and clutches run in oil, fully enclosed. Boom swing and hoist and load hoist are all independent actions, with separate controls and automatic brakes. Suggested unit, designed for easy efficient operation. Ideal for loading, unloading, moving or stacking heavy bulky objects; especially outside the range of big overhead cranes or where cranes are available.

Letting Go

METALLIZING ENGINEERING COMPANY, INC., 38-1A 84th Street, Long Island City 1, N. Y., announces the latest Type X Metallizing Gun for heavy duty continuous operation. It is designed and built specifically for mechanical spraying and continuous operation.

**To see
EXTRA VALUES
... inspect a few
"POWER PLANTS"
by PRITCHARD**

Its many outstanding features include the use of 3/16-inch wire, when combined with an steady pressure of only 15 psi more doubles any previous spraying speeds. The Miteco Type Y Gun—because it is designed with a total de-



to weight and size limitations heavy for the hand gun—is much lighter and much more rugged in construction. Gears, worms and shafts several times larger than

Pritchard

ENGINEERS • CONSTRUCTORS • MANUFACTURERS

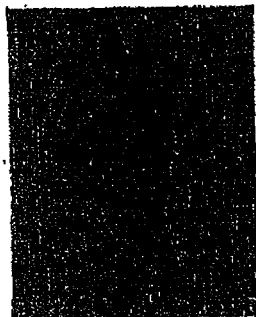
able or, semi-permanent ventilation or any handling of air, gases or light solids.

NEW EQUIPMENT—Continued:

any used previously, virtually eliminates wear and replacement. Further details are given in Bulletin 492.

Flexible J tubing

TEN WATSON BROTHERS COMPANY, Bridgeport, Conn., have developed a new type of flexible tubing, non-collapsible under loads or minus pressures and retractable to about one-eighth its extended length, for port-



A feature of the Synambe construction is the method of spiral-stitching the spring core within the fabric. The inside surface is free of whip ridges, providing far less resistance to air-flow and no obstruction to the passage of solids. Sharp bends can be made with only slight reduction of air flow and without the use of elbows or special fittings. The tubing is considerably lighter than metal duct or moulded tubing, and takes up less space when retracted. The standard Synambe is made of long-fibre duck having a bursting strength of 170psi; this fabric is processed fire-resistant and covered with tough, durable thermoplastic. It is furnished in standard diameters from 3 inches to 16 inches, and in lengths of 10, 15 and 25 feet.

Electronic Air Filter

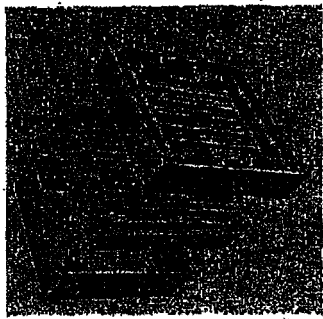
ARMSTRONG AIR FILTER COMPANY, 126 Central Ave., Louisville 4, Kentucky, announce the latest addition to their lines of electronic air filters, the Electro-Airmat in which the collector element is electrostatically charged Airmat paper. Introducing an entirely new principle in Elec-

Continuous Duty HORIZONTAL PUMPS

Precision-built by Peerless

trous air intrusion, the atmosphere rating of the Electro-Alkmat is 80% or better with atmospheric dust or smoke.

The filter weighs 40% less than Electronic Filters having metal plate collectors and requires 30% less floor area.



Alkmat is American Air Filter's trade name for a cellulose product composed of a number of piles of porous, tissue-like sheets formed of short cellulose fibers. It is unlike any other filtering media. When an electrostatic charge is applied to Alkmat, the piles tend to separate and each individual fiber becomes a collecting electrode which attracts and holds the dust and smoke particles.



Feasibly
Dayton-Dowd

HORIZONTAL PUMPS FOR:

Water Towers

Boilers

Fan Protection

Boiler Feed

Condensate

Exhaust

Chemicals

VERTICAL PUMP TYPES:

Deep Well Turbine

Hi-Lift (Moyno Type)

Centrifugal

Sewage

Jet

Shallow Well

Hydro-Pneum. (Gas-Puller)

Feedless (Formerly Dayton-Dowd) Horizontal Centrifugal pumps are found wherever reliability, dependability and economical operation are desired. Engineered and manufactured with a view to long life, Feedless Pumps are available for all classes of pumping requirements.

The right pump for the right job. All capacities and specifications furnished by trained engineers.



VERTICAL &
HORIZONTAL

NEW EQUIPMENT—Continued

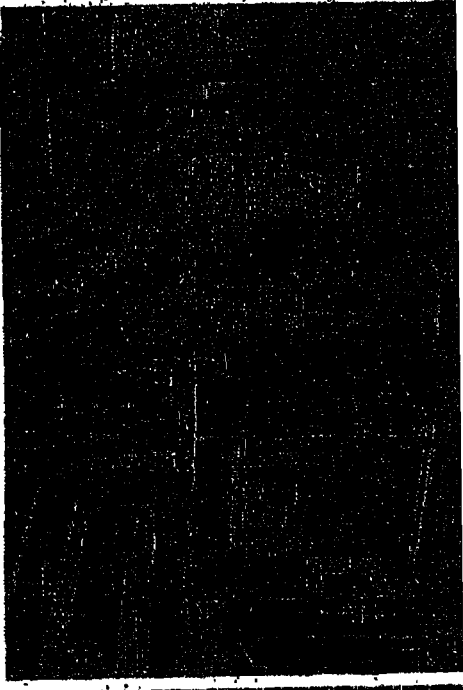
not is also a highly efficient mechanical filtering media, thus, when the power is off for any reason it affords ample protection against the infiltration of dust due to "stack effects" in air conditioning systems.

Rubber Insulated Trolley System

BEACON MANUFACTURING COMPANY, Hobart Building, San Francisco 4, California, have developed a new fully rubber insulated Trolley suitable for virtually every type of electrically operated mobile equipment, such as cranes, monorails, portable tools, etc.



DETECT AND ELIMINATE FUEL LOSSES



with the aid of RICHARDSON COAL SCALES

Where does inefficiency occur when boilers deliver less than maximum evaporation?

There are many sources of lost efficiency, but knowing how much coal is burned will help you to detect and eliminate them.

A Richardson Coal Weighing and Feeding System points out inefficient boilers. It helps get every B.t.u. and kw-hr. that boilers can produce—by providing complete, continuous, comparative records of coal consumed per boiler, per hour, per shift, per week, month or year. With their accurate, automatic easily-read counters, Richardson Scales register indisputable data . . . inside, edge which has reduced coal consumption and increased boiler efficiency in hundreds of power plants of every size.

The Richardson System includes: gate and spouts from bunker; inlet chutes to scales; the recording scale itself and Monorate Non-Segregating Distributor to stoker, or downspout to pulverizer. In stoker installations, the Monorate Spreader assures maximum combustion efficiency by distributing coal evenly across the stoker hopper without segregation of coarses and fines.

For full details of this thoroughly proved Richardson System of "coal-control economy," write for Bulletin No. 1143.

RICHARDSON SCALE CO.

CLIFTON, N. J.

Agents: Boston • Chicago • Omaha • Montreal • New York • Philadelphia
Minneapolis • Detroit • San Francisco • Tampa • Wichita • Pittsburgh

This system meets safety code requirements which prohibit unguarded conductors. The Traff-Tray system consists of a copper conductor in standard 10 foot lengths encased in a slotted rubber track supported by a rigid backing, and individual traveling collectors which employ an endless chain, like a tractor tread, to provide positive six tooth multiple contact at all times. Arcing and pitting, as well as fire and explosion hazards are thereby eliminated.

New Arc-Welding Aid

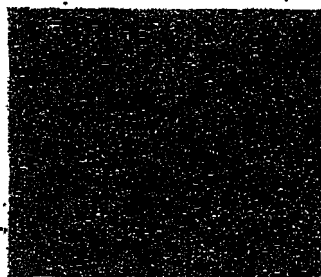
General Electric Company, Electric Welding Division, Schenectady, N. Y., has developed a new arc-welding compound designed to aid in instantaneous creeling and maintaining a molten welding arc where low currents and small-diameter electrodes are employed.

Known as Stick-easy, this new compound is easily applied and can be used on any kind of metal, with any type of electrode. The compound, which is in paste form, is available from distributors in one-pound glass jars, completely ready for use. No mixing or other preparation is required.

NEW EQUIPMENT—Continued

Lift Truck

THE YALE AND TOWNE MANUFACTURING COMPANY, 4539 Tacony Street, Philadelphia 24, Pa., have recently added to their line of materials handling machinery the Workaver Electric Truck. The truck has power for lifting and power for travel which relieves its operator of all physical strain. Compact and easily controlled, it can be maneuvered in congested areas, along narrow passages, and



around sharp corners without waste of time or effort.

The elevating unit on the truck consists of a high-torque electric motor which operates a high-pressure hydraulic gear pump, which, in turn, activates a ram. Lifting and lowering is controlled by a convenient switch placed on the front of the battery compartment.

Power for both the elevating and drive motors is obtained from a lead or alkaline battery in a compartment which is an integral part of the truck chassis.

The Workaver is available in two types: the platform or pallet type of truck.

Standard Horizontal Milling Machine

THE VAN NORMAN COMPANY, Springfield, Massachusetts, announces a new No. 3 Horizontal Milling Machine especially designed for a wide range of general purpose and production milling. A large heavy duty miller, it has a 64 inch by 14 inch table permitting the user to handle heavy work. This machine is usually compact, with exceptional rigidity and dependability assuring smooth operation on the heaviest cuts. It combines rugged strength with utmost accuracy and extreme sensitivity of operation and control.

An important feature of the new transmission includes a heavy, large

diameter fly-wheel mounted on the spindle inside of the column assuring smooth, uniform application of power to the cutter.

Among the new engineering and design features incorporated in the new miller are—a new column and base, which is bradder and heavier with generous internal ribbing to assure rigid support for the heavy duty spindle transmission as well as the generously proportioned knee.

The rigid ram-type overarm has dove-tail ways bearing on the column. Improved cam-type gibbing solidly locks ram to column front and rear. An overarm pilot wheel provides exceptional ease for positioning the overarm. Sturdy floor supports, for B style arbors, are clamped to the underside of the overarm by cam-type locks. These supports are equipped with oil reservoirs which simplify arbor lubrication.

The new heavy duty cutter spindle and transmission incorporates wide face hardened alloy steel gears mounted on multi-splined shafts rotating on taper roller bearings.

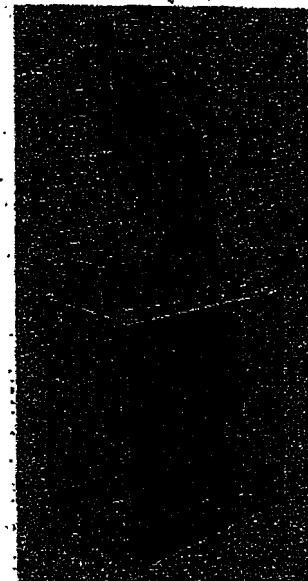
Exceptional ease of control is obtained by the front and rear directional control of all power feeds. Actuated in the direction of desired movement, they provide maximum operator safety. In addition, hand feeds are provided in both front and rear of the miller enabling the operator to line up the work from either position.



A few operating specifications of the No. 3 standard milling machine are table 64" x 14", drive motor 7½ hp, table travel longitudinal 36", saddle cross feed 12", knee vertical feed 17", 18 speeds are available from 25 to 1250 rpm, 18 feeds from ⅜" to .02". The miller is available with plain or universal saddle. The universal saddle permits the table to be swiveled 45° to the right and 45° to the left.

Hydraulic Press

MURPHY MANUFACTURING COMPANY, Export, Pa., have added an interesting and versatile line of positive self-contained hydraulic presses adaptable to all sizes and types of shops.



They are available in capacities of ¼, 1, 10, 15, 20 and 25 tons, with means to limit pressures as low as desired. Pressure gauges help determine pressures being applied, such as in laboratories, testing, etc. A holding valve may be ordered as an extra, enabling press to be used for certain molding or glue weld operation which causes ram to be held under pressure until lever is tripped.

Liquid Filter

DOWDING CORPORATION, Rochester 3, N. Y., announce that their Staynew Model LFS Filter features an entirely new and superior design of filter insert.

The new type insert, known as the Slip-On, permits the use of practically any type of filtering medium obtainable in sheet form and can be changed. It also permits quick change or replacement of filtering medium in the field. Spare insert outer forms are relatively inexpensive and may be stocked in a variety of media ready for instant change or replacement.

NEWS

(Continued from page 112)

...Thompson, who served the company before the war as sales engineer in the Pittsburgh office. Mr. Thompson was in the Navy on active duty since August, 1942, and held the rank of Lt. Commander. He was discharged October 15. In his new position he will work with Robins Conveyors agents in all southern states east of the Mississippi river.

President Thomas Robins, Jr., announced that C. R. Davis, 1000 S. 43 Street, the company's Birmingham agent since 1916, has retired from business and is moving to Florida. Mr. Robins said the rapid industrial growth in the South is creating a greater demand for conveyors and other materials handling machinery of the type this company builds. He said the New Birmingham branch will aid in distribution of this equipment.

Wilson Returns to Continental Gin Staff

The Continental Gin Co. announces the return to their Atlanta office of R. Bates Wilson after nearly four years service in the Navy. Wilson returns as District Rep. in the Industrial Division covering North Carolina, South Carolina, Georgia and Florida. He will handle power transmission, materials handling and special job work consisting of castings, machine shop and light fabrication.

Mr. Wilson is a mechanical engineering graduate of the University of North Carolina and had, prior to his induction into the armed forces, seven years service with Continental as an Engineer in the Memphis and Atlanta districts. While in the Navy, he was assigned to general ship repair work and saw service in the Pacific and Philippines.

CURTISS-WRIGHT CORPORATION

AMERICAN DESIGN-BUFFALO PLANTS
BUFFALO, N.Y.

September 12, 1945

Buell Engineering Co., Inc.
70 Pine Street
New York 5, New York

Gentlemen:

It is a pleasure to answer the recent inquiry from your Engineering Department checking upon the mechanical operation of the Buell Dust Recovery Systems installed in our three plants.

Buell Fly Ash Collectors have been in service on twelve (12) boilers since 1941, operating continuously.

Since the time of their installation, they have cost us nothing for maintenance or repair. Their collection efficiency has fully met our requirements, and they have accomplished in a highly satisfactory manner the job for which they were installed.

Yours very truly

Ray Mahan
Ray Mahan, Plant Engineer
CURTISS-WRIGHT CORPORATION
Plant #2

* BUELL DUST RECOVERY SYSTEMS are used throughout industry in the collection or reclamation of many kinds of dust, in numerous production and process operations. Hundreds of satisfied industrial users will attest to Buell's—"High Efficiency, Low Maintenance, Long Life."

Write for Buell's new, revised book "The Buell (von Tongeren) System of Industrial Dust Recovery" now in its fourth printing.

BUELL ENGINEERING COMPANY, INC.
4 Cedar Street, New York 5, N. Y.
Sales Representatives in Principal Cities

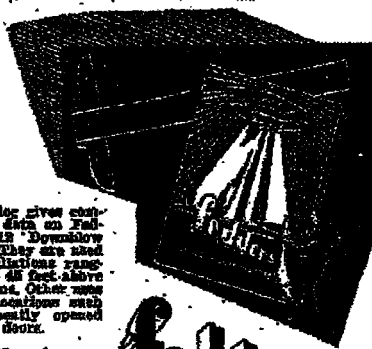


DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

Every heating man

SHOULD HAVE THIS

NEW CATALOG



This new catalog gives complete working data on Fedders Series 15 Downflow Unit Heaters. They are used for high installations ranging from 15 to 48 feet above the working level. Other units include spot heaters with as many as five independently opened shipping room doors.

Look for Fedders in your classified telephone directory or write the factory for catalog 18-C-1.

fedders

Downflow **UNIT HEATERS**

FEDDERS MFG. CO. INC., BUFFALO 7, N. Y.

For Any Fluid - Any Apparatus

ALLPAX

THE PACKING THAT "PACKS ALL"

you don't have to remove old packing to repack with ALLPAX—square cross section makes ALLPAX easy-filling in any stuffing box. Try it once and you, too, will be enthusiastic over its easy application. Right efficiency and long wear. Write us for full details.

Distributors Everywhere

THE ALLPAX CO., INC., MAMARONECK, N. Y.

**A World Standard
for Efficiency**

Write Today for Information

VULCAN

SOOT BLOWERS

VULCAN SOOT BLOWER CORP., DUBOIS, PA.

Southern Representatives:
John A. Dodd Co., Atlanta, Ga.
Bushman & Potter, Birmingham, Ala.
Power Equipment Co., Jacksonville, Fla.

NEWS—Continued

Mobile Marine Engineering Research Project

WATERMAN STRAMBERT CORPORATION, Mobile, Alabama, has announced the establishment of a research project in the Engineering Research Division, Southern Research Institute. The program will include all phases of design and improvements of marine equipment and will be under the direction of E. N. KEMMER, Head of the Division, and G. B. CLARK of the Waterman Research Laboratory.

Pittsburgh Equitable Meter Co. Now Rockwell Manufacturing Co.

THE PITTSBURGH EQUITABLE METER CO. has been established as the ROCKWELL MANUFACTURING CO., 400 N. Lexington Ave., Pittsburgh, Pa. The company manufactures motors, regulators and instruments for the measurement of liquids and gases, lubricated valve plugs, cast and forged steel valves for high pressure and high temperatures, and wood and metal working machine tools for homecraft and industry.



COL. WILLIAM F. ROCKWELL, founder of the original company, is Chairman of the board and president of the Rockwell Manufacturing Co. and nine subsidiaries.

MR. WILLIAM F. CRAWFORD, a director of the company, is president of the Edward Valve and Mfg. Co., Inc., of East Chicago, Ind. He joined the Edward organization in 1931, was elected secretary in 1933 and vice-president in 1941.

MR. A. J. KERR has been elected vice president in charge of sales. Associated with the Pittsburgh Equitable Meter Company since 1925, he has been in sales engineering and

SWS—Continued

...les management work with the company throughout that period, first as district manager in Tulsa, Okla., and later as general sales manager in Pittsburgh.

A. M. Byers Establishes Atlanta Office

Increased industrial activities in southern states has prompted the A. M. Byers Company, Pittsburgh wrought iron manufacturers, to establish a divisional office at Atlanta, Ga., to serve a five-state area.

The firm announced that JAMES A. Cain, of Atlanta, formerly assistant manager of Byers' Pittsburgh Division, has been appointed manager of the new division. His headquarters will be at 817 William Oliver Building, Atlanta.

Mr. Cain has been associated with the Byers organization since 1942. He started as a field service engineer, and since May 1, 1944, has been assistant division manager of the Pittsburgh Division, in which capacity he was responsible for the southern territory that is now included in the new Atlanta Division.

In announcing the establishment of the Atlanta division, R. H. Gardner, general sales manager of the Byers Company, stated that the excellent postwar industrial prospects in the southern states are expected to create a heavy demand for Byers wrought iron products and that it is necessary to have a divisional office there to handle these demands.

The Atlanta Division will include Georgia, North and South Carolina, Florida, Alabama and parts of Tennessee.

Institute of Textile Technology Staff Appointment

The Institute of Textile Technology has appointed Dr. Byer P. Johnson to its research staff as head of the biology division.

Born in Fort Wayne, Indiana, Dr. Johnson attended Park College, Parkville, Missouri, where he received his B. A. degree in 1923, and the University of Wisconsin where the Ph. D. in plant physiology was conferred in 1931. Following completion of his

LOOK NO. 1

THE MONARCH SUPPORTING BRIDGE

Note how this Monarch construction prevents the fibre bar from coming in direct contact with the screw connecting renewal link to knife blade. This minimizes the charring of the fibre bar and positively prevents excessive overheating of knife blades. Note also large metal parts which dissipate heat. Result: Dependable protection.

"Look No. 1" illustrates this construction in a lighter-duty Monarch knife-blade fuse and "Look No. 2" shows adaptation of this principle in a heavy-duty model.

LOOK NO. 2

Specify Monarch Fuses for improved



MONARCH FUSE CO., LTD.

715 E. FIRST ST., JAMESTOWN, N. Y.

Economize WITH POWERS TEMPERATURE REGULATORS

EASY TO READ
DIAL THERMOMETER
AUTOMATIC
TEMPERATURE
CONTROL

USE POWERS No. 11 Temperature Indicating Regulator when you want the advantages of an easy-to-read dial thermometer combined with a dependable self-operating regulator. The dial thermometer gives a visual check on the performance of the regulator and makes it easy to adjust for the required operating temperature. Various dials and ranges are available.

is easy to install—because both the thermometer and the regulator operate from the same thermal system—only one tapped opening is required.

Write for Circular 2511
THE POWERS REGULATOR CO.
2715 Broadway Avenue, Chicago 16, Illinois
231 E. 48th St., New York 17, N.Y.—Office
in 41 cities...see your phone directory

OVER 50 YEARS
OF AUTOMATIC TEMPERATURE AND HUMIDITY CONTROL

NEWS—Continued

graduate work, Dr. Johnson worked for a year at the Citrus Experiment Station in California as a National Research Fellow in the Biological Sciences. He continued his research and teaching at Wisconsin, the University of Montana and the University of Arkansas. At the last institution Dr. Johnson was assistant professor of agronomy from 1935 to 1939. In 1939 he accepted a position with the Goodyear Tire and Rubber Company, from which company he comes to this office.

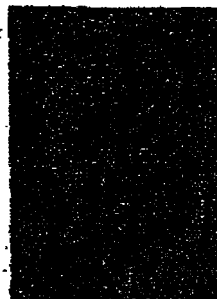
One of Dr. Johnson's most recent research interests has been in following all of the biological factors in the growth of the cotton plant to the final processing of the cotton fiber to this cord.

Hoge Elected President of Jones Foundry and Machine Co.

Mr. F. H. Hoge, Executive Vice President, was elected president to succeed Mr. William Coleman who recently resigned as president of W. A. Jones Foundry and Machine Company, 4401 Roosevelt Road, Chicago 24, Illinois.

Marsh Wins Nichols Award

The Percy Nicholls Award for 1945 has been given to THOMAS A. MARSH, National Industrial Engineer, from



THOMAS A. MARSH

FREEMAN Mfg. Co., Cleveland. It was announced by Mr. William G. Christy, Smoke Abatement Engineer, Hudson County, New Jersey, Chairman of the Committee. The Award was made to Mr. Marsh by Mr. Christy, on November 27th, at the Annual Luncheon meeting of the Fuels Division, American Society of Mechanical Engineers, held in connection with the Annual Meeting of the Society. In acceptance of the Award, Mr.

Marsh told briefly some of his experiences in the fuel burning field, also, his acquaintance with, and admiration for the late Percy Nicholls for whom the award was named.

Goodyear Expands Chemical Products Division

Expansion of the Chemical Products division of The Goodyear Tire & Rubber Company to handle demands in the postwar period was announced recently.

C. P. Jostyn, division manager, in making the announcement, predicted a gigantic civilian demand for plastics and coatings, builders' supplies and flooring, Aircram and Filofilm, the latter in packaging and wearing apparel.

Assistants to Mr. Jostyn are E. K. Elles, a mechanical engineer with a wealth of experience in development work and Herman R. Theis, former assistant director of Goodyear research. Mr. Theis also serves as manager of the important Plastics and Coatings department.

Other department managers are Howard D. Herbert, Aircram Sales; Otto C. Fahlke, Builders' Supply and Flooring; and A. F. Landefeld, Filofilm Sales.

659,000
Now in Service



FLOATS

Established in 1894, Hercules Float Works now has 650,000 units in operation in the industry and ships of the world. Not one of these floats has been returned during the one-year guarantee period, except by reason of faulty or non-understandable specifications.

Hercules Float Works are the originators of Seamless Copper Floats.

"Quality First" is the Hercules motto. It pays to specify HERCULES Floats.

HERCULES FLOAT WORKS
200 Franklin St. Springfield, Mass.

NEWS—Continued

In the Film Sales department, B. Chman is in charge of the direct packaging organization. Reporting to Mr. Chman will be W. J. O'Keefe, New York; J. B. Post, Chicago; E. D. Headle, Los Angeles; and R. J. Buskirk, Atlanta, all in charge of district sales offices.

In the Builders' Supply and Flooring department A. W. Bigger serves as assistant manager.

Wesco Names Bozeman Southeast District Stores Manager

Appointment of ROBERT A. BOZEMAN as district stores manager of Westinghouse Electric Supply Company's Southeast District has been announced by W. A. Emerson, district manager. Mr. Bozeman will make his headquarters in Atlanta, Georgia.

Mr. Bozeman, who succeeds R. C. Lutzell, resigned, has seen 20 years of service with Westinghouse during which time he has been employed as sales clerk, assistant purchasing agent and office manager. He is a native Kemisaw, Ga.

The Westinghouse Electric Supply Company is the national wholesale marketing outlet for the Westinghouse Electric Corporation and many other suppliers of apparatus, home appliances and supplies.

Myers Appointed by Eschenman & Potter

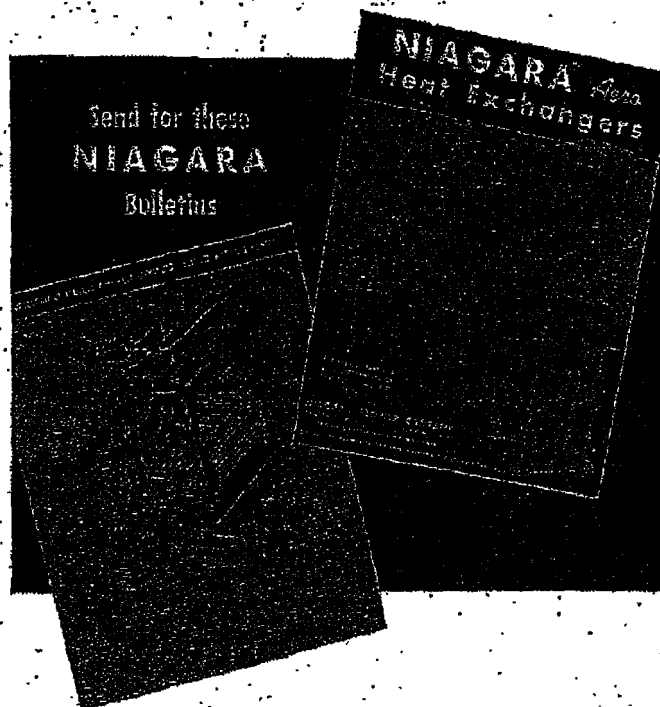
G. S. Myers has been appointed a member of the chemical engineering staff of ESCHENMAN & POTTER, combustion and chemical engineers, at BIRMINGHAM AND CHARLOTTE, N. C., it has just been announced.

Mr. Myers is a graduate of Georgia Institute of Technology. He formerly was with the power department at TVA, and prior to that with the Commonwealth & Southern Power Company and the Tennessee Electric Power Company.

New Orleans Chemical Consultant

Charles S. Williamson, Jr., head of the School of Chemical Engineering at Tulane University of Louisiana, after the past twenty-eight years, announces the opening of offices at 1739 Poydras Street, New Orleans 15, La., to continue chemical and chemical engineering consultation.

LIQUID OR GAS TEMPERATURE CONTROL PROBLEM?



These publications describe the NIAGARA AERO HEAT EXCHANGER and some of its applications. It accurately regulates the temperature of gases and liquids. Industrial plants using chemical and heat-treating processes have gained extra benefits from using this equipment wherever cooling water is used or any fluid is cooled to exact temperatures.

Some of the applications are: controlling temperature of liquid chemicals and intermediates in process; controlling jacket water temperature in power and process equipment; regulating the temperature of controlled atmosphere; controlling liquid bath temperatures.

As a cooler, the NIAGARA AERO HEAT EXCHANGER saves the cost of 95% of the water circulated.

Niagara Bulletin 90, 94 and 96 give detailed information.

Write for them today.

NIAGARA BLOWER COMPANY

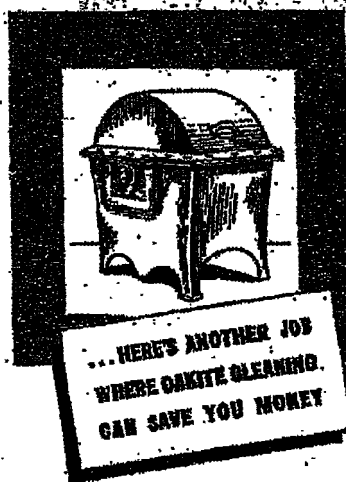
Over 30 Years of Service in Industrial Air Engineering

DEPT. SP-16, 6 E. 45th St.

NEW YORK 17, N. Y.

Atlanta Office: Crowley-Gockardt Co., 118 W. Peachtree Pl. N. W.

INDUSTRIAL COOLING HEATING & DRYING
NIAGARA
HUMIDIFYING & AIR ENGINEERING EQUIPMENT



Simplify Steam Condensate Meter Maintenance

To maintain normal volumetric capacity of your steam condensate meter units, periodic overhaul and re-standardization are necessary.

You can speed up and simplify conditioning of your units for accurate recording of steam flow by adopting this performance-proved Oakite maintenance cleaning method.

Immerse meter drums in solution of Oakite Composition No. 24 or other recommended Oakite material. Then rinse. If lime-scale and rust are present, immerse units in solution of Oakite Compound No. 22. Rinse and neutralize. You will find that this low-cost method saves time; does a thorough job; restores full recording efficiency.

Send for FREE Digest Now!

Send today for FREE 26-page Digest describing successfully used Oakite materials and techniques that will help you expedite this and 70 similar maintenance jobs!



OAKITE PRODUCTS, INC.
234 Thimmes Street, New York 6, N. Y.

Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE *Specialist*
CLEANING
MATERIALS • METHODS • SERVICE

Hygiene

(Continued from page 90)

- (3) See that the men and machines are properly equipped and ready to start on the job.
- (4) Check the number of men to do the job.

During the Day

- (1) Check against lost motion or lost time due to workmen waiting on material.
- (2) Check at intervals, workmen to see that orders and instructions are thoroughly understood and being carried out properly.
- (3) Check for the proper use, distribution and temporary storage of material on the job.
- (4) See that tools and equipment are returned to their proper places when not in use.
- (5) See if there are too many or too few men on the job.
- (6) Be always ready to listen to comment or suggestions offered by workmen.
- (7) Any orders given on the job should be double checked to see that they are clearly understood.
- (8) Check the handling of materials and tools by the workmen on the job to see that work handling is done in accordance with standard practices and in clean, safe, convenient and easily.
- (9) As the workmen finish their own work as they finish it and you yourself check the jobs as they are done, check materials being wasted or thrown away which can be salvaged.
- (10) See that all working surfaces and guards are placed.
- (11) See that all necessary protective devices such as goggles and safety belts are worn.

At the End of the Day

- (1) See that all materials, tools, and equipment are stored away for the night.
- (2) See that all salvaged or returned materials and junk are properly accounted for and prepared for disposal.
- (3) Check all necessary items to be included in the reports.
- (4) Make all necessary daily reports, not allowing them to accumulate.
- (5) Record all data necessary for weekly, monthly, and end of the job reports. Do not trust your memory.

End of the Job

- (1) Check to all equipment and tools, making condition as well as type and number.
- (2) Make all necessary arrangements for the next job to be done, checking to see how it fits the job just finished.
- (3) Check all returned material, salvages, and junk for proper disposal.
- (4) See that all necessary reports have been made and forwarded.

(5) See that all engineering, mechanical, and other data have been entered and posted in order that engineering and accounting records may be complete.

Some Things to Check at Various Times

- (1) Check the progress of men under your supervision to see if they are advancing in the craft art and in the general understanding of the work they are supposed to do.
- (2) Maintain cooperative relationship with other foremen and other department.
- (3) Maintain proper human relationship with the men under your supervision.
- (4) Watch the job continually to see if any suggestions made are passed on in proper consideration.
- (5) Watch your labor force-over:
- (a) Try to appreciate cost of labor.
- (b) Maintain the proper type of clothing.
- (c) Watch the progress of men in regard to wages and promotion.
- (d) Keep the men on the job that is clean and safe.
- (e) Be fair and impartial in your treatment of the men.
- (f) Be fair and square in your own ideas and inspection.
- (g) Study and analyze the company policies, especially those in regard to wages and working conditions in order that you might interpret them properly to the men.
- (h) See if you are getting the most production possible from the workmen.
- (i) Check yourself as to your instruction and direction.
- (j) Check your attitude as to cost, waste and suggestions.
- (k) Check yourself in the way you are related to the men.
- (l) Be sure that you rate your men on a fair and impartial basis.
- (m) Check your men continually for physical and mental ability.
- (n) Be on the alert for human problems.
- (o) Take advantage of every opportunity to improve yourself.
- (p) Accept foreman's suggestions.
- (q) Study everything that you can of your hands on that will help you in your job.
- (r) Consult with other supervisors other departments in order to know about their jobs and thus improve your own methods.
- (s) Take advantage of every opportunity to learn more about the prevention of accidents.
- (t) Keep informed of all the latest methods and ways of doing the various jobs which come under your supervision.
- (u) Watch for changes in materials, tools, and equipment.
- (v) Keep yourself informed not only of the things pertaining to your job but also those things which will make you well-rounded, well-informed man as well as a foreman.

TEMPLETON RETURN STEAM TRAPS

for Pumping, Boiler Feeding, Drainage, Heating and Vacuum Lines

Pumps Water at any temperature or pressure.

Open float cannot burst or waterlog. Valves and Seat Bronze or Stainless Steel.

Sizes 1 in. to 4 in. inlet and outlet.

Capacity 2500 lbs. to 60,000 lbs. water discharge per hr.

Ask for catalogue and prices

TEMPLETON BROS., INC.

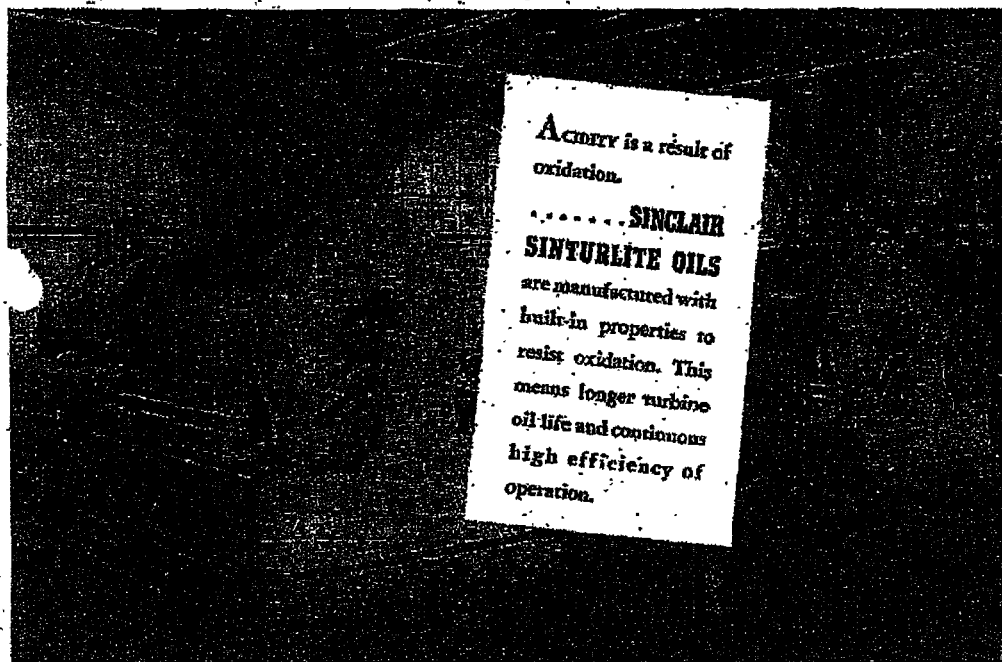
699 Main St. Walpole, Mass.



TO COMBAT ACIDITY



SINTURLITE OILS FOR STEAM TURBINES



Acidity is a result of
oxidation.

..... **SINCLAIR**
SINTURLITE OILS
are manufactured with
built-in properties to
resist oxidation. This
means longer turbine
oil life and continuous
high efficiency of
operation.

IN EXTENSIVE service performance **SINCLAIR SINTURLITE OILS** have proved their stability and resistance to formation of deposits. They fully meet requirements of steam turbine manufacturers. **SINTURLITEs** have added serviceability as excellent oils for hydraulic and other enclosed circulating systems. Five viscosity ranges are provided to suit individual installations. Information on application of **SINTURLITE OILS** to your lubrication problems will be promptly furnished.

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION ON LUBRICATION CONSULT WRITE SINCLAIR ENGINE COMPANY, 434 FIFTH AVENUE, NEW YORK 20, N. Y.

GREATER EMPLOYEE COMFORT MEANS MORE PRODUCTION



The SIGN of the GREATEST
COOLING for the LEAST
EXPENDITURE of
MONEY,

MATERIALS,
MAINTENANCE.

COOLING FLAT TOP BUILDINGS
COOLING ALL TYPES OF BUILDINGS

IS ACCOMPLISHED
MOST ECONOMICALLY
WITH

APRIL SHOWERS

APRIL SHOWERS systems are installed by your local plumber, air conditioning engineer, under HOME OFFICE supervision at ALL TIMES.

APRIL SHOWERS systems perform AUTOMATICALLY and maintain even low roof temperatures throughout the summer months.

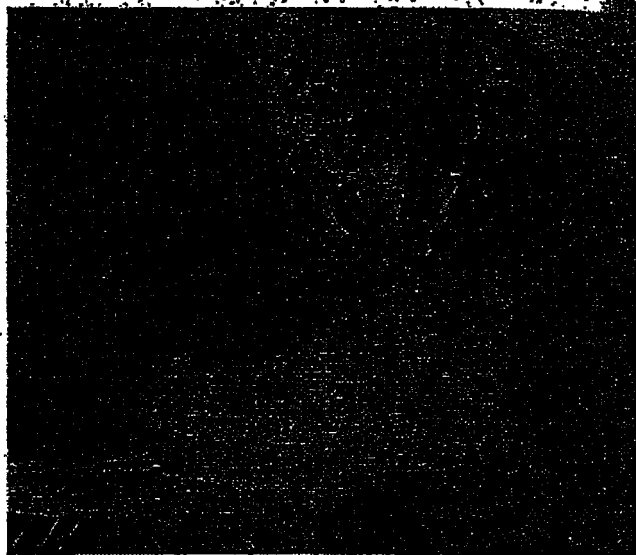
The CANOPY OF SPRAY over your factory roof creates more cooling effect for the least cost than other means. Thousands of cubic feet of fresh cooled air flow over and bathe the entire building. Space temperatures within the factory or shop are reduced 10 to 15 degrees and NO ONE has to operate the cooling system.

APRIL SHOWERS systems are made of brass, copper and bronzes and will perform for years without repairs.

Have your plumber or contractor write for Dealer Book. Hundreds of installations from Boston to Los Angeles are made every year. Estimate for system sent upon receipt of room dimensions or roof plan.

APRIL SHOWERS CO.

WASHINGTON 11, D. C.



Under Water Welding Photographed for First Time

THE practicability of welding and cutting under water has been proven successful by a number of recent applications, such as salvage work on damaged war vessels. However, such work has literally been "done in the dark" as no one except the diver or a companion has been able to see the actual operation of the arc welding process. Now, for the first time, so far as known, underwater welding has been successfully pictured.

Shown in the above view, Mr. R. L. E. Cook, Welding Engineer

for Armes International Corporation and representing The Lincoln Electric Company, Cleveland, Oh is clearly seen are welding under 15 feet of water. The welding being done with a mild steel electrode having a special coating it is impervious to water.

The photo was taken through porthole in the specially design tank used for training welders underwater welding and cutting operations in the Mechanical Division of The Panama Canal Zone.

Courtesy The Lincoln Electric Company, Cleveland, Ohio.



BOILERS "SNAP OUT OF IT!" MARION SOOT BLOWERS

modernize boilers right now! They do this work

- Increase boiler capacity • Do the job mechanically and quickly
- Save 5 to 10 percent on fuel • Blow out soot deposit without injury to boiler

MARION SOOT BLOWERS eliminate stubborn soot with minimum waste of steam. Type "F" for water tube boiler blow in any length of arc from 15 to 45 degrees. "Range or Rollin" to right or left as desired. Provision with chilled and water and power plant sources. MARION SOOT BLOWERS are made for all sizes and types of boilers. Parts are interchangeable. Continuous service with low replacement and repair costs.

Type "F" for water tube boiler

Write for Specifications and Prices
Save Cost, Time, and Worry



MARION MACHINE, FOUNDRY AND SUPPLY CO. • MARION, INDIANA, U. S. A.

New Sugar Process

TOW far an extra ten to twelve pounds of sugar per ton will read over millions of sugar-short American tables is problematical, but a refining process which results in giving just that much extra sugar has been developed at Louisiana State University's Audubon Sugar Refinery.

Chemical ion exchange (refining by electrical impulse) is the secret behind the process. It is claimed that ionization will not only give the extra ten pounds of sugar, but will make palatable syrup from formerly nearly wasted blackstrap molasses.

This process is the most radical change in sugar making in 100 years. Formerly raw cane juice was treated with lime, heated, settled, decanted, evaporated, crystallized and centrifuged. The LSU process centrifuges the juice to remove "big" impurities, then filters it electrically. The twin filter beds consist of synthetic resins, one of which has a positive and the other negative charge. This charge is used by an "atomic force" occurring when one resin atom loses a few of its electrons.

The electrically-charged resin beds act as magnets in attracting cane juice impurities, and account for virtually all foreign matter.

Ionization is not a completely new process in sugar refining; LSU scientists say that it has been tried before but was too expensive due to the fact that electrical filtering was used in conjunction with the old methods. This time it has worked independently.

The process is the cooperative baby of the LSU refinery, the US Department of Agriculture, American Cyanamid and Chemical Corp., and the Louisiana State University engineering college.

1945 INDEX

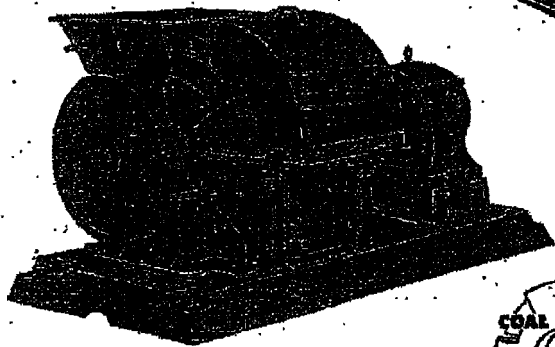
Available to Subscribers

If you keep your back issues—write the editors for a free copy of this Index.



**AMERICAN SHREDDER RINGS
SPLIT-INSTEAD OF CRUSHING
-COAL TO UNIFORM SIZES
for stoker firing and pulverizer feeding**

NO OVERSIZE AND COMPLETE
CONTROL OF FINES TO
MINIMUM OR MAXIMUM



ROM or lump is rapidly reduced to stoker size or commercial screenings uniformly—for efficient stoking and for a uniform fire bed which quickly responds to sudden steam demands.

The American Type "S" is custom-built in 9 different sizes—in capacities from 25 to 800 TPH. Its sturdy construction and fine operating features assure long life and minimum maintenance under hard continuous usage.

The total operating cost of American Crushers is unusually low—less than 1¢ per ton.

Power demands for Americans are minimized through their dynamically balanced rotors and through their double use of centrifugal force.

Americans are built by makers of crushers exclusively. Ask any of the many who operate American—all over the world!



The manganese shredder rings, employed exclusively by Americans, each have 20 cutting edges which split coal by terrific centrifugal force. This is the American feature that provides a uniform crushed product.

The shredder rings revolve freely on their own shafts and when contacting tramp metal, they deflect undamaged. No shear pins or conventional safety devices to bother with.

Send for informational literature and specifications

American PULVERIZER COMPANY
Originators and Manufacturers of
Ring Crushers and Pulverizers
1245 WACKEND AVE.
ST. LOUIS 10, MO.

New Sugar Process

TOW far an extra ten to twelve pounds of sugar per ton will spread over millions of sugar-short American tables is problematical, but a refining process which results in giving just that much extra sugar has been developed at Louisiana State University's Audubon Sugar Refinery.

Chemical ion exchange (refining by electrical impulses) is the secret behind the process. It is claimed that ionization will not only give the extra ten pounds of sugar, but will make palatable syrup from formerly nearly wasted blackstrap molasses.

This process is the most radical change in sugar making in 100 years. Formerly raw cane juice was treated with lime, heated, settled, decanted, evaporated, crystallized and centrifuged. The LSU process centrifuges the juice to remove "big" impurities, then filters it electrically. The twin filter beds consist of synthetic resins, one of which has a positive and the other negative charge. This charge is used by an "atomic force" occurring when one resin atom loses a few of its electrons.

The electrically-charged resin beds act as magnets in attracting cane juice impurities, and account for virtually all foreign matter.

Ionization is not a completely new process in sugar refining; LSU scientists say that it has been tried before but was too expensive due to the fact that electrical filtering was used in conjunction with the old methods. This time it has worked independently.

The process is the cooperative baby of the LSU refinery, the US Department of Agriculture, American Cyanamid and Chemical Corp., and the Louisiana State University engineering college.

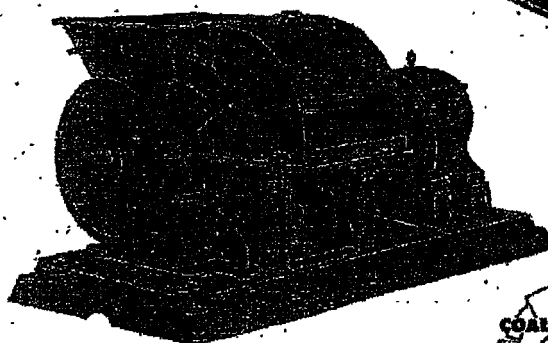
1945 INDEX

Available to Subscribers

If you keep your back issues—write the editors for a free copy of this Index.

**AMERICAN SHREDDER RINGS
SPLIT INSTEAD OF CRUSHING
—COAL TO UNIFORM SIZES
for stoker firing and pulverizer feeding**

NO OVERSIZE AND COMPLETE
CONTROL OF FINES TO
MINIMUM OR MAXIMUM



ROM or lump is rapidly reduced to stoker size or commercial screenings uniformly—for efficient stoking and for a uniform fire bed which quickly responds to sudden steam demands.

The American Type "S" is custom-built to fit different sizes—in capacities from 2½ to 500 TPH. Its sturdy construction and fine operating features assure long life and minimum maintenance under hard continuous usage.

The total operating cost of American Crushers is unusually low—less than 1¢ per ton.

Power demands for Americans are minimized through their dynamically balanced rotors and through their double use of centrifugal force.

Americans are built by makers of crushers exclusively. Ask any of the many who operate Americans—all over the world!

The manganese shredder rings, employed exclusively by Americans, each have 20 cutting edges which split coal by terrific centrifugal force. This is the American feature that provides a uniform crushed product.

The shredder rings revolve freely on their own shafts and when contacting tramp metal, they deflect undamaged. No shear pins or conventional safety devices to bother with.

Send for informational literature and specifications

AMERICAN PULVERIZER COMPANY
Originators and Manufacturers of
Ring Crushers and Pulverizers
1243 WACKLAND AVE.
ST. LOUIS 10, MO.

GREATER EMPLOYEE COMFORT MEANS MORE PRODUCTION



The SIGN of the GREATEST
COOLING for the LEAST
EXPENDITURE of
MONEY,

MATERIALS,
MAINTENANCE.

COOLING FLAT TOP BUILDINGS
COOLING ALL TYPES OF BUILDINGS

IS ACCOMPLISHED
MOST ECONOMICALLY
WITH

APRIL SHOWERS

APRIL SHOWERS systems are
installed by your local plumber,
air conditioning engineer,
under HOME OFFICE super-
vision at ALL TIMES.

APRIL SHOWERS systems
perform AUTOMATICALLY
and maintain even low roof
temperatures throughout the
summer months.

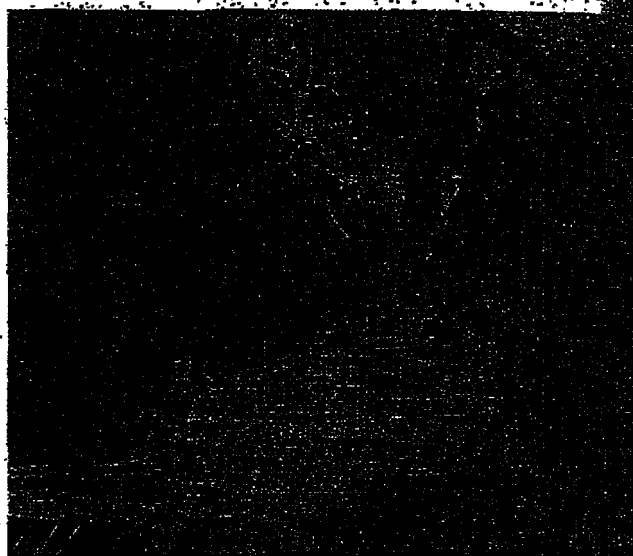
The CANOPY OF SPRAY
over your factory roof creates
more cooling effect for the
least cost than other means.
Thousands of cubic feet of
fresh cooled air flow over and
bathe the entire building.
Space temperatures within the
factory or shop are reduced 10
to 15 degrees and NO ONE has
to operate the cooling system.

APRIL SHOWERS systems are
made of brass, copper and
bronze and will perform for
years without repairs.

Have your plumber or con-
tractor write for Dealer Book.
Hundreds of installations from
Boston to Los Angeles are
made every year. Estimate for
system sent upon receipt of
room dimensions or roof plan.

APRIL SHOWERS CO.

WASHINGTON 11, D. C.



Under Water Welding Photographed for First Time

THE practicability of welding
and cutting under water has
been proven successful by a num-
ber of recent applications, such as
salvage work on damaged war ves-
sels. However, such work has lit-
erally been "done in the dark" as
no one except the diver or a com-
panion has been able to see the
actual operation of this modern
technical development of the arc
welding process. Now, for the
first time, so far as known, under-
water welding has been success-
fully pictured.

Shown in the above view, Mr.
R. L. E. Cook, Welding Engineer

for Arneo International Corpo-
ration and representing The Linco
Electric Company, Cleveland, Oh
is clearly seen are welding und-
er 15 feet of water. The welding
being done with a mild steel el-
trode having a special coating it
is impervious to water.

The photo was taken through
porthole in the specially design
tank used for training welders
underwater welding and cutti-
ng operations in the Mechanical Di-
vision of The Panama Canal Zon-

Courtesy The Lincoln Elect-
ric Company, Cleveland, Ohio.



BOILERS- "SNAP OUT OF IT!" MARION SOOT BLOWERS

modernize boilers right now! They do this work

- Increase boiler capacity
- Do the job mechanically and quickly
- Save 5 to 10 percent on fuel
- Blow out soot, deposit, scale without injury to boiler

MARION SOOT BLOWERS eliminate stubborn soot with minimum waste of steam. Type "F" for water tube boiler blows in any length of row from 15 to 125 degrees. "Keeps on Rolling" to right or left as desired. Features with skilled tool work and power plant service. MARION SOOT BLOWERS are made for all sizes and types of boilers. Parts are interchangeable. Continuous service with few replacement and repair costs.

Write for Specifications and Prices
Save Cost, Time, and Worry

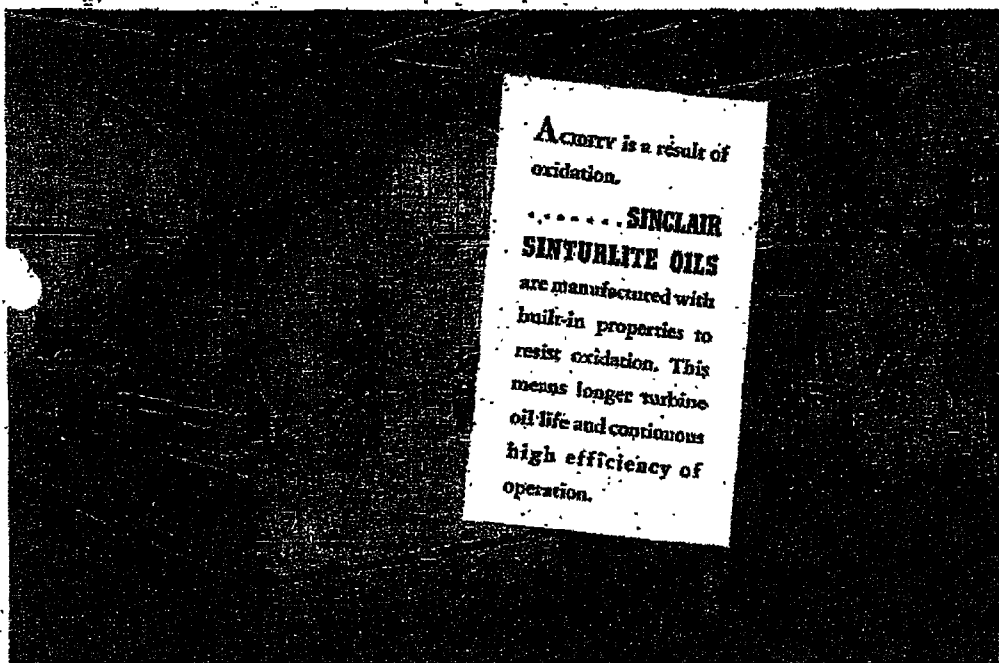


MARION MACHINE, FOUNDRY AND SUPPLY CO. • MARION, INDIANA, U.S.A.

TO COMBAT ACIDITY



SINTURLITE OILS FOR STEAM TURBINES



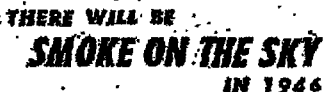
Acidity is a result of
oxidation.

..... SINCLAIR
SINTURLITE OILS
are manufactured with
built-in properties to
resist oxidation. This
means longer turbine
oil life and continuous
high efficiency of
operation.

IN EXTENSIVE service performance SINCLAIR SINTURLITE OILS have proved their stability and resistance to formation of deposits. They fully meet requirements of steam turbine manufacturers. SINTURLITEs have added serviceability as excellent oils for hydraulic and other enclosed circulating systems. Five viscosity ranges are provided to suit individual installations. Information on application of SINTURLITE OILS to your lubrication problems will be promptly furnished.

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION ON LUBRICATION CONSULT WHITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.



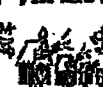
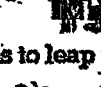
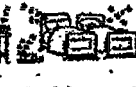
WELL WATER SYSTEMS VERTICAL TURBINE PUMPS

AIRLESS BLAST CLEANING—Catalog No. 514 gives complete information on the use of the Airless Blasting System for efficient abrasive blasting used to clean a wide range of intricate or irregular shapes formerly cleaned in air blast rooms in jobbing operations and other metal working plants. Gives detailed information on four types of blasting construction fixtures, overall dimensions, drawings and specifications. **WILLIAM W. UNDERHILL COMPANY, CO.** P.O. Box 265 South Byron Street, Milwaukee 1, Wis. A-77

FLIBRICO JOINTLESS FIREBRICK CO
1378 Wabash Street, Chicago, Illinois

Only VOSS VALVES Can Do That!

VOSS VALVE NEWS

• When in a long course of years  exasperatingly balky compressor valves have worn you down , by busting in the bulk , in the slim  or in the slimmer  weight — when for the umpteenth time you have  jumped out of bed, hurdled porch  rails, snow banks and ash cans to leap to the saddle  of your trusted T bone careening through sleet and  ice and storm over hill and  dale — when for the umpteenth time you reach the Ice Cap  Plant down by the river to find that an ever so tiny part in the circulating valve center of that big burley brute of a compressor  has busted again — when you see that tiny piece  and wonder why the deuce you gamble  with that kind of thingamajigs — — and when in exasperation as also for egotistical humane reasons of personal  well-being and also for reasonably amiable family and public relations you have finally included, as tail-end of your nightly prayers  the enjoiner: "and please don't let the compressor valves bust" — — and when at last you have convinced the boss  that a radical change must be made and when finally you have thrown out your worries together with the pestiferous old valves, and when you then have enjoyed "peace of mind"  with regular good-night's uninterrupted sleep  and have lived life to the full for 5, 6 or more years and feel again like rock and rye  and let the world go bye, well

Then that's

VOSS VALVES



Write for Circulars and References Explaining all about **VOSS VALVES**

J. H. H. VOSS CO.

785 East 144th Street
NEW YORK 54, N. Y.

The TERRY

USES A SOLID STEEL ROTOR

The rotor of the Terry Whirl Turbine is made from a single forging of special competition steel. The vanes, buckets or pockets are milled from the solid metal. The steps in the machining of a wheel are shown below. There are no parts to become loose or work out.

The power-producing action of the steam in the whirl bucket takes place entirely on the curved surface of the back of the bucket and therefore close blade clearance is not necessary.

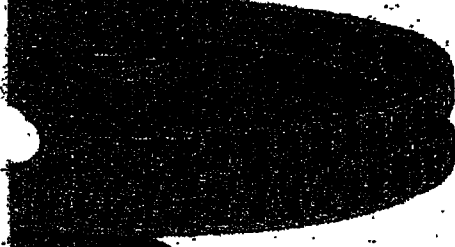
As the only function of these blades is to form a series of pockets, wear of the blades is of little consequence and does not materially affect the turbine's efficiency. The important part of the bucket is the back or bottom, which is a solid casting.

Action of steam in Terry Solid Wheel Turbine. The steam issues from an expanding nozzle at high velocity and enters the side of the wheel bucket, in which its direction is reversed 180°. The steam is caught in a stationary power chamber and released to the wheel. This process is repeated several times.

POWERING — ROTARY TURBINE

THE TERRY STEAM TURBINE CO.

Wheel Turbine



FURNISHED
WHEEL

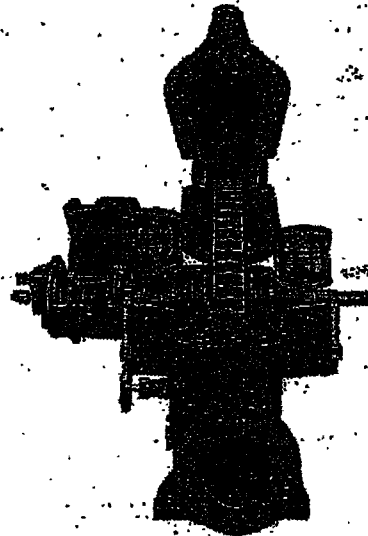
STEPS IN THE MACHINING OF A TERRY TURBINE WHEEL

SECOND
MILLING CUT

FIRST
MILLING CUT

SMOOTH
TURNED

Typical Terry Solid Wheel Turbine with cover and bearing caps raised. Note the ruggedness and the accessibility of all parts. Units of this type are used to drive boiler feed pumps, generators, and all types of power plant equipment. Built in sizes from 5 H.P. to 2000 H.P.



FOR FULL DETAILS ASK
FOR BULLETIN E-116

T-1135

TERRY SQUARE - HARTFORD, CONN.

PRODUCTION for PEACE

A year of remarkable history has just passed, in which the normal routine way of living for most every individual in many countries of the world, was disturbed. Citizens everywhere were devoting their energies to war—to destroy, instead of to build.



INDUSTRIAL Rubber Products that Quaker is making **NOW** for civilian use

Transmission Belting
Agricultural Belting
Conveyor Belting
Elevator Belting
Air Drill Hose
Chemical Hose
Creamery Hose
Fire Hose
Fuel Oil Hose
Garden Hose
Gasoline Hose
Tank Car and Truck
Truck Hose
Sand Blast Hose
Spray Hose
Steam Hose
Suction Hose
Oil Suction and Discharge Hose
Water Hose
Road Contractors' Hose
Welding Hose
Tubing
Rod Packings
Sheet Packings
Gaskets
Washers
Pump Valves
Moulded Articles

and NOW it is 1946

1946 starts out with a fresh inspiration to guide us in peacetime endeavors. Quaker had no reconversion problem. The products of Industrial Rubber Goods which we manufacture are very similar, whether used for war industries or for peacetime industries. The paper work on cancellations of Government orders is just about completed. Full scale production on civilian orders started August 17th and has been going on steadily ever since.

Naturally we are making headway on our backlog of orders. It still will be several months before critical raw materials will be available in quantities wanted. But we are making better deliveries on many items, especially on Fire Hose, Mill Hose and in Wrapped Construction Hose in sizes 3" and larger.

Our suggestion to the keen buyers, with an eye on the future, is to place their orders well in advance of requirements. This will insure getting your merchandise when desired.

Anticipate your needs on Industrial Rubber Products and send your orders to Quaker NOW.

If there is a way to get it done
QUAKER will do it

QUAKER RUBBER CORPORATION

Min. Industrial Rubber Products

PHILADELPHIA 24, PENNSYLVANIA
NEW YORK • CLEVELAND • CHICAGO • HOUSTON

Western Territory

Quaker Pacific Rubber Company
San Francisco Los Angeles

TAPERED LEGS

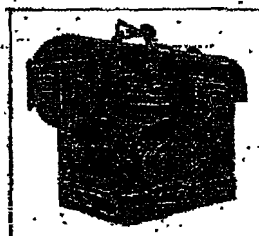
There's a big improvement in the action of boilers equipped with tapered water legs developed by Brownell many years ago. These legs are used in Brownell Archer boilers—single, double, and triple pass.

The taper in the water legs gives room for the volume increase of water as it expands and rises. This provides much faster circulation and facilitates heat transfer; also prevents fluctuating water line by eliminating the surging which would otherwise be caused by locked-up vapor in the legs.

In Brownell boilers you get the benefit of Brownell's 68 years of boiler-making experience and engineering. Ask for literature and name of nearest agent.

THE BROWNELL COMPANY

304 N. FUNDLAY ST.
DAYTON 1, OHIO



Sectional View of Brownell Standard Boiler Showing Tapered Water Legs



BOLTS, SCREWS, RIVETS
Tightened to STAY



With Smooth-On No. 1 Iron Repair Cement, you can not only stop leaks and seal cracks, but you also find it the most effective tightener of loose parts and fixtures. Bolts, screws and rivets set in Smooth-On stay put, because Smooth-On expands as it hardens, insuring tightness.

Always keep a can of Smooth-On No. 1 on hand for those little repairs that often save a lot of trouble and expense. Easy to use as putty. Buy it in 7-oz., 1-, 5-, 25- or 100-lb. size at your supply house, or direct from us, if necessary.

Famous Repair Handbook FREE

Over 1,000,000 already put to work. 66 pages, 175 illustrations. Tells, step by step, how to make repairs on everything from a car to a house. A book every mechanic, engineer and homeowner wants. Write for your copy NOW.

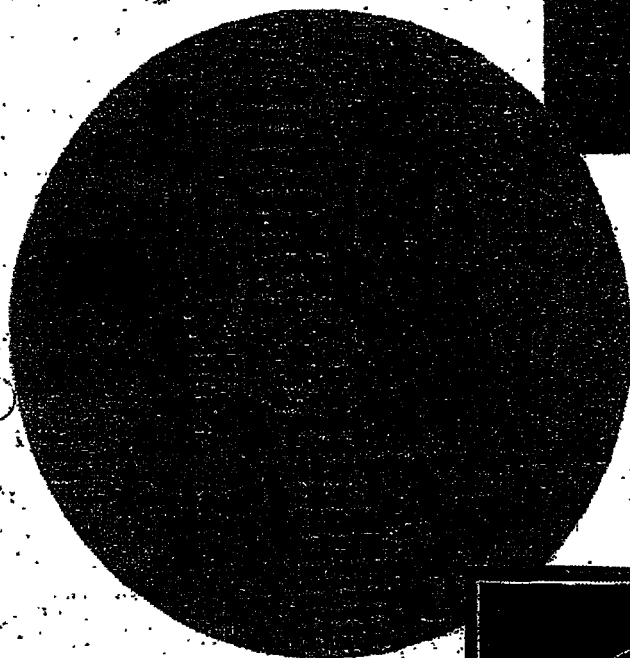
SMOOTH-ON MFG. CO.
Dept. 25
575 Commonwealth Ave.
Jersey City 4, N. J.



Do it with **SMOOTH-ON**

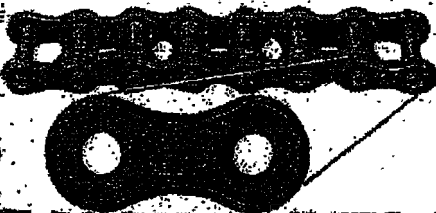
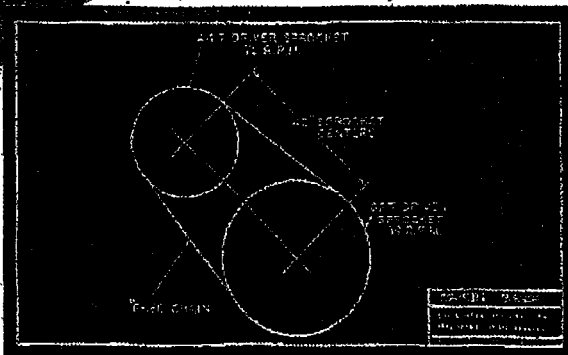
"We put a Stop to Power Pauses"

① **TROUBLED WITH A PLANT DRIVE** that slips or jerks? That slipping drive causes interruption in the flow of power to equipment . . . "power pauses" that mount up to a considerable loss at the end of the day. You can stop the power pauses with pushy Baldwin-Rex Roller chain belts.



② **THIS PLANT** doesn't worry about power pauses. The sturdy triple-strand Baldwin-Rex Roller chain belt transmits all the power. There's no slippage to waste power and step up costs. They're strong, too. They don't take time out for frequent repairs and adjustments. Once installed, they stay on the job . . . operating quietly and efficiently.

③ **AS THIS DIAGRAM** of the drive indicates, Baldwin-Rex Roller chain belts are not dependent on set distances between centers for effective operation . . . they run slack and do not depend on tension for proper operation. They are easy to install and, as they are not installed under tension, there is no pre-load to shorten bearing life. Baldwin-Rex chains are not affected by dust and grease and are highly shock absorbent.

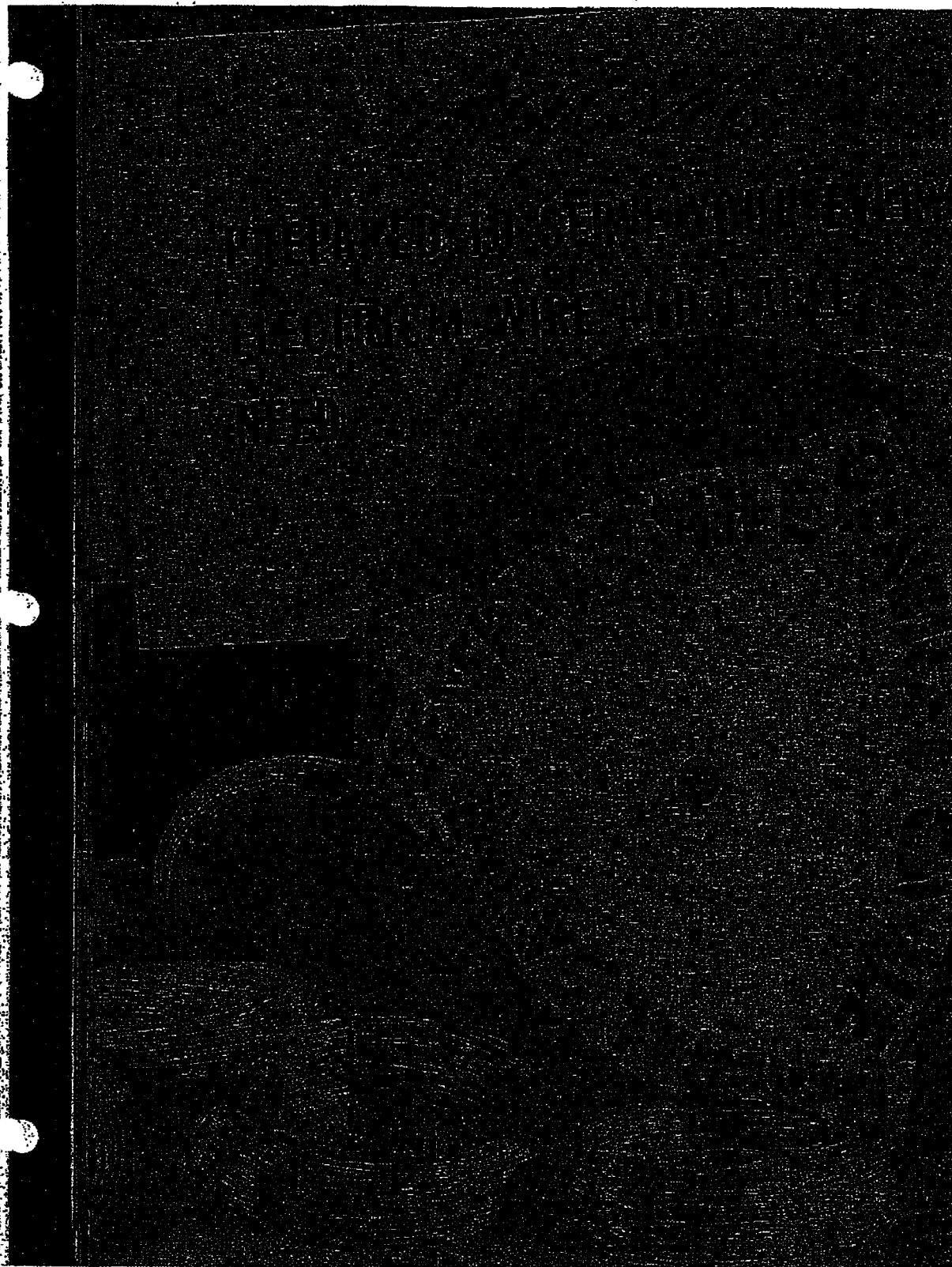


For catalogs on Baldwin-Rex Roller chain belts or competent information on your specific drive problems, write **BALDWIN-DUCKWORTH Division of CHAIN BELT COMPANY**, 369 Plainfield Street, Springfield 2, Mass., or call your local Baldwin-Rex representative.

BALDWIN-REX ROLLER CHAIN BELTS

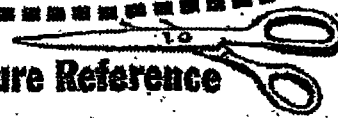
Baldwin-Duckworth Division, Springfield 2, Massachusetts

For Chain Belt and Transmission Division, Rex Conveyor and Process Equipment Division, Allentown 4, Vt.



WHICH OF THESE PRODUCTS DO YOU USE?

Cut Out and File for Future Reference



ASBESTOS WIRES AND CABLES

BARE AND TINNED COPPER WIRE

Solid and Stranded, Copper Covered Steel Wire, Trolley Wires, Segments and shapes.

BUILDING WIRES

Rubber, Braid and Lead, and Synthetics, all types.

CONTROL CABLES

Rubber, Braid, Lead, Steel, Armored and Non-metallic Railway Signal Cable, Fire Alarm Cable, Switchboard Cable.

CORB SETS

FIXTURE WIRE

FLEXIBLE CORDS

All Types.

HEAVY DUTY PORTABLE POWER &

CONTROL CABLES

Welding Cables, Mining Machine Cables, Dredge Cable.

MAGNET WIRE

Round, Square and Rectangular, Enameled, Paper, Cotton, Silk, Glass, Asbestos Covered, and Combinations.

NON-METALLIC SHEATHED (ROMEX)

PAPER POWER CABLES

Belted or Shielded, Gas Filled Cables, Oil Filled Cables.

RADIO WIRES AND MICROPHONE &

HIGH FREQUENCY CABLES

RUBBER POWER CABLES

Braid, Lead, Steel Armored, and Non-metallic.

SERVICE ENTRANCE, SERVICE DROP CABLE

TELEPHONE WIRES AND CABLES

Rubber Insulated, Paper Insulated.

VARNISHED CAMBRIC WIRES AND CABLES

WEATHERPROOF WIRE

Slow Burning.

X-RAY CABLE

and . . . Electrical Wires & Cables to your specifications

See your phone book for complete address of our sales office in the cities listed below.

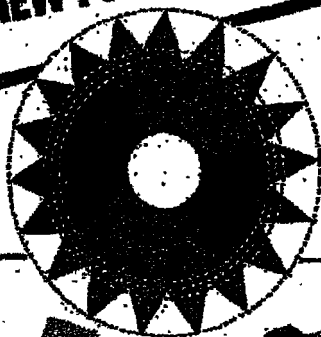
GENERAL CABLE

C O R P O R A T I O N



Headquarters at 450 Lexington Ave., New York 17, N. Y. General Cable Corporation Sales Offices are located in: Albany, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Kansas City, Los Angeles, New York, Philadelphia, Pittsburgh, Rome, N. Y., St. Louis, San Francisco, Seattle, Washington, D. C.

AIRETOOL'S NEW FORM CUTTERS



PREVENTS TUBE CLEANER TRACKING STOPS TUBE DAMAGE

The operator of Airetool Tube Cleaners need have no fear of cleaner damaging tubes. That is because the new form cutters, used in Airetool Tube Cleaners, eliminate the tendency of the cutter to track. The periphery of the cutter is milled to divide sections of the circumference in teeth of various pitch, which prevents the cutters finding same spot in a tube wall during each revolution—an exclusive Airetool development.

Other Airetool Tube Cleaner features are: A 28% more powerful motor made possible by the Airetool Balanced Rotor and Power Seal, precision construction of finest alloy steels, ease of operation. Made for tubes 1/2" to 24" I.D.; straight or curved.

AIRETOOL TUBE EXPANDERS

Airetool Tube Expanders are precision tools, made to efficiently and thoroughly perform any tube rolling operation. They are precision built of heat treated alloy steel, with a maximum amount of torsional strength provided in the mandrel to resist the extreme twisting action and another special alloy steel in the roll to resist compression during the rolling operation. Made for tubes 1/4" to 12" I.D.; straight or curved.

Airetool offers a complete line of equipment for tube maintenance including tube flgs, gauges and calipers.

WRITE DEPT. SP FOR COMPLETE INFORMATION
AND HELPFUL BULLETINS.

Airetool & Yost-Superior Factory Bldgs.
SPRINGFIELD, OHIO

AIRETOOL MANUFACTURING
COMPANY

Watthour Meters- Panel Meters- Test Equipment- Laboratory Equipment, Etc.

For Sale Through R.F.C.
Released Materials Program

All Makes—Good Condition
Guaranteed

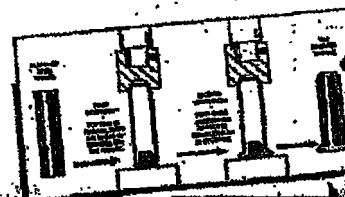
COLE-

COLE INSTRUMENT CO.

1320 So. Grand Ave., Los Angeles 15, Calif.

AGENTS FOR R. F. C.

KRW HYDRAULIC PRESSES SPEED-UP MANUFACTURING OPERATIONS



HANDLE GRIPS
FORMED IN
10 SECONDS

STEEL TRUSSES
COLD FORMED
WITH SIMPLE DIES

Many bending, straightening, flattening, offsetting, shearing and other operations can be performed on KRW Standard and Special Presses by using simple, inexpensive dies. The examples given here are for the manufacturing of products in our own plant. Press frames will cold bend from a bar of SAE 1045 steel, 1" x 3/4", with a heat treatment.

KRW Hydraulic Airer Presses provide the slitting in speed and incorporate exclusive features which adapt them to manufacturing operations. Standard Presses are made in 25, 50, 60 and 75-ton capacities. Special Presses, designed to order. Contact factory. Write for our Press Bulletin.

K. R. WILSON

OFFICE: 200 HUNTER STREET, NEW YORK, N. Y.

Whether you need **THIS**
—or **THIS**



**You can get what you want in
the complete range of Jones Herringbone Speed Reducers**

YOU will find this 128-page catalog of Jones Herringbone Speed Reducers helpful in the selection of reducers in accordance with A.G.M.A. recommended practice for all conditions of service. Jones Herringbone Speed Reducers are built in single, double and triple reduction types and in every standard ratio

in ratings ranging from 125 H.P. to 440 H.P.

All these reducers have heat treated gears, ground shafts and are mounted with anti-friction bearings throughout. Liberal stocks are carried to facilitate shipments.

Catalog No. 70 will save you time and effort in laying out drives that call for Herringbone gears.

WRITE FOR YOUR FREE COPY

W. A. JONES FOUNDRY & MACHINE CO., 4119 Roosevelt Rd., Chicago, Ill.

Jones

HERRINGBONE—WORM—SPUR—GEAR SPEED REDUCERS • PULLEYS
CUT AND MOLDED TOOTH GEARS • V-BELT SHEAVES • ANTI-FRICTION
BELOW BLOCKS • FRICTION CLUTCHES • TRANSMISSION APPLIANCES

LET'S LOOK AT THE RECORD!..

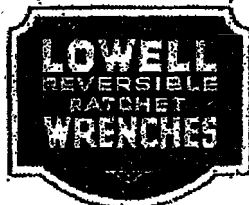
**BACKED BY 76 YEARS
OF SERVICE**

We are merely reasserting what hundreds of users know when we say that Lowell Wrenches are unequalled for quality and service.

We stand on that record today.

Send for Catalog No. 40

LOWELL WRENCH CO., WORCESTER, E. MASS.



THE OLD RELIABLE



C. H. WHEELER OF PHILADELPHIA

Steam Condensers

Steam Ejector Type Vacuum Pumps

Mechanical Draft Water Cooling Towers

C. H. WHEELER MFG. CO.

19th Street and Lehigh Avenue
Philadelphia 32, Pa.

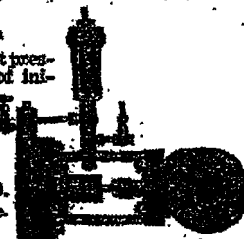
Squires

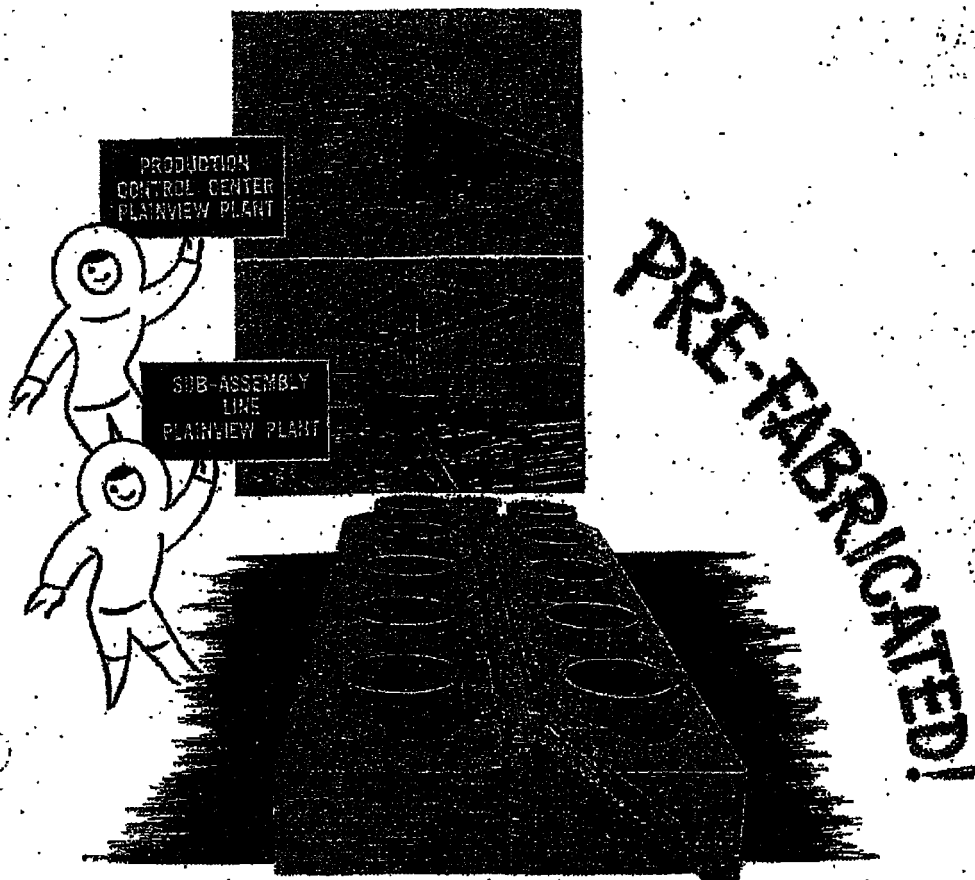
**Reducing
Valve**

Will maintain the constant pressure desired regardless of initial pressure. It is a dead end valve.

May we send catalog C-107

The C. B. SQUIRES CO.
R. 48th St. & Kelley Ave.
CLEVELAND, OHIO





Cuts Cooling Tower Erection Time 50%

Faster time from your O. K. to tower operation on site. Materials plant stocked. Production control center expedites work in well-staffed, modern mill and woodworking plant. Crane operated production line assembles units for quick shipment.

L-H pre-fabrication cuts time on any type tower: Spray, Atmospheric Deck, Forced, or Induced Draft.

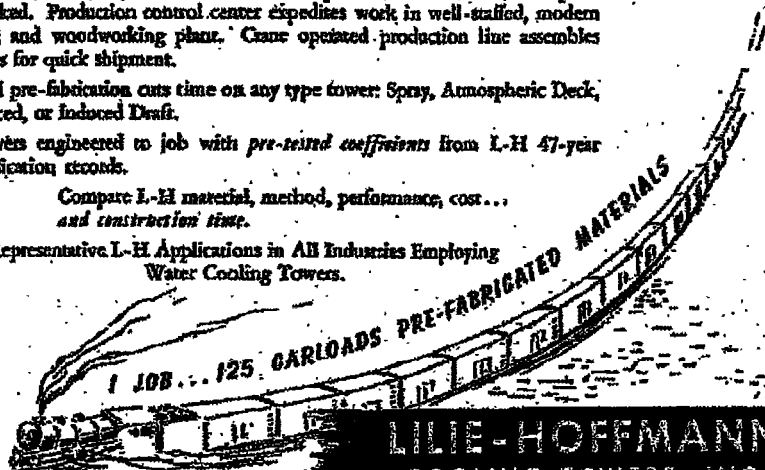
Towers engineered to job with *pre-tested coefficients* from L-H 47-year application records.

Compare L-H material, method, performance, cost... and construction time.

Representative L-H Applications in All Industries Employing Water Cooling Towers.



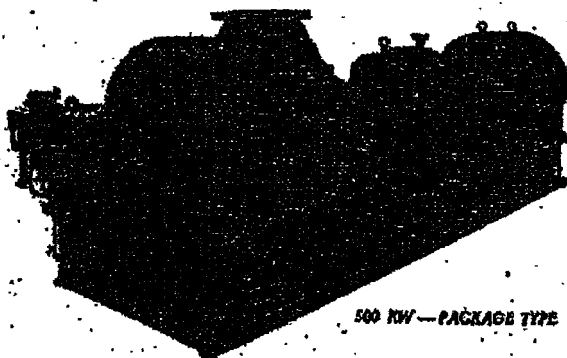
Write for CATALOG 440-A



LIE-HOFFMANN
COOLING TOWERS, INC.

Manufacturers of All Types of Water Cooling Towers
GENERAL OFFICE: 4224 DUNN AVE. - ST. LOUIS, MO.
PLANT: 11 ST. LOUIS, MO. - ONE PLAINVIEW, TEXAS

MURRAY STEAM TURBINE GENERATING UNITS



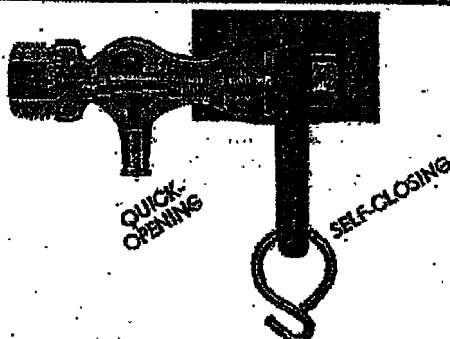
500 KW — PACKAGE TYPE

MURRAY also produces
Mechanical Drive Turbines—Horizontal and Vertical
Reduction Gears
Steam Boilers

The unit shown was one of thirty designed to deliver 500 KW alternating current on steam at 285 lb. Gauge initial pressure, 700 degrees F. total temperature and 27 inches vacuum. Provided with a rigid structural steel baseplate, and with all service connections except generator leads above the floor line, the machine can be handled as a unit and installed with a minimum of preparation.

While "Package Type" units were furnished for export for installation in remote areas not previously supplied with power, the design can be utilized for small industrial plants for main or standby power supply.

MURRAY IRON WORKS COMPANY
BURLINGTON, IOWA
BUILDERS OF STEAM POWER EQUIPMENT FOR THREE-QUARTERS OF A CENTURY



"PBH" GAUGE COCK

A gentle pull opens this sturdy, long-wearing gauge cock and an adjustable weight automatically closes it when you let go. Removable monel metal seat and copper valve pencil insures leak-tight service.

Write today for catalogue and prices.

The PAUL B. HUYETTE CO., Inc.
Est. 1896
401 N. BROAD ST. PHILADELPHIA 8, PA.

WATER GAUGES—Vertical and Inclined
GAUGE-GLASS PROTECTORS • AIRTITE
BOILER WALL COATING • WATER COLUMNS •
BOILER ALARMS, INSTRUMENTS & CONTROLS

FYR-FEEDER STOKERS

MULTIPLE
SPREADER

BURN COAL LIKE OIL!

Burn with Fyr-Feeder—Burn less coal—Cheaper coal—Local fuels—Streamline—Coal yard savings, wet or dry—Wet coal is no handicap.

FYR-FEEDER

exclusively employs

air JET coal PROPULSION

Flies into suspension, larger pieces are spread evenly over grate.

Fyr-Feeder increases boiler capacity—responds instantly to sudden load variations—requires no special skill or experience to operate—this fuel bed eliminates clinkers—makes burner's work much easier—no backing losses.

CHANGE OVER TO FYR-FEEDER NOW!

Easily installed in minimum time.

Fyr-Feeder is built in sizes to burn from 200 to 25,000 lbs. of coal per hour. If you are or expect to be in the market for automatic coal burning equipment.

Wire or Write

FYR-FEEDER Stoker Division

AMERICAN COAL BURNER COMPANY

Engineers

37-18 E. 8th St.

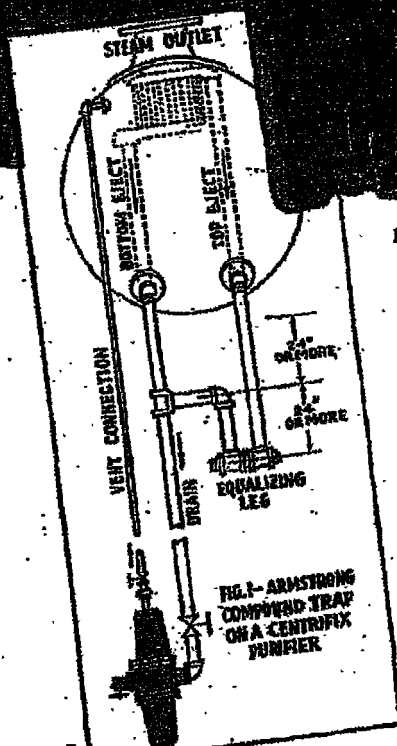
Chicago 11, Ill.

One of a series of 10
 illustrations, each dis-
 cussing trapping prac-
 tice on a different
 kind of equipment.

HOW TO TRAP

STEAM PURIFIERS AND SEPARATORS

to eliminate dangerous slugs of
 water by quick, complete drainage



Where load and water conditions cause foaming and priming at the boiler, Armstrong traps are a logical choice for draining the necessary purifiers and separators. Here's why: They prevent slugs of water from passing beyond the purifier and damaging expensive steam-using units.

They quickly drain purifiers and separators which have small water-storage capacities.

Armstrong trapping of purifiers and separators outdates old-fashioned gravity drainage. Depending on capacities required, Armstrong offers either standard traps or piston-operated compound traps with semi-steel or forged steel bodies for this service.

Send for a copy of Catalog H for valuable information on separator and purifier drainage, with charts, data and tips on trapping problems encountered by engineers everywhere.

When Trapping Purifiers or Separators,

remember to:

- Install trap below purifier.
- Keep drain line to trap free from bends.
- Use a vent line as shown for quick opening.

Armstrong Machine Works, 888 Maple St., Three Rivers, Mich.

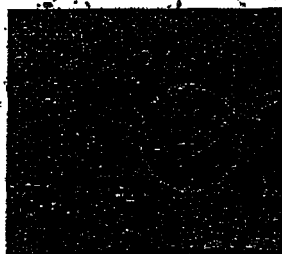


ARMSTRONG

STEAM TRAPS

Over a Million in Use... For Power... Process... Heating

Banishes Fire-cracking & Leaking The NATIONAL Boiler Girth Seam PROTECTOR



No more costly repair bills for your boiler seams, after you attach this simple, yet effective protector! Easily installed in an hour's time by any handy man.

NATIONAL BOILER PROTECTOR CO.
DAYTON, OHIO [Write for Bulletin S-A]

Detroit Stokers

- ✱ FOR LOWER STEAM COSTS
- ✱ FOR ALL OPERATING CONDITIONS
- ✱ FOR ALL BOILERS
- ✱ FOR ALL BITUMINOUS COALS

MANZEL CHEMICAL FEEDERS

offer
DEPENDABLE WATER
TREATMENT
at LOW COST



Manzel Chemical Feeders are simple, dependable metering pumps. They inject boiler compound in accurately measured amounts with clock-like precision.

Every gallon of feed-water gets the same amount of chemical with a Manzel Feeder. The Feeder is installed directly on the feed-water pump and starts and stops with it.

Feed on Manzel Chemical Feeders is easily adjusted and very accurate. Once feed is set, Manzel Feeders require no attention except to maintain chemical supply in reservoir.

Write for Bulletin.

MANZEL BROTHERS COMPANY
318 Babcock Street, Buffalo 10, N. Y.

NICHOLSON

TRAPS YOU CAN TRUST

FOR **Tough Tasks**



Heavy-duty units, for every power and process purpose and a wide range of pressure applications.

Send for Trap Catalog 444

W. H. NICHOLSON & CO.
15 West 21, New York 11

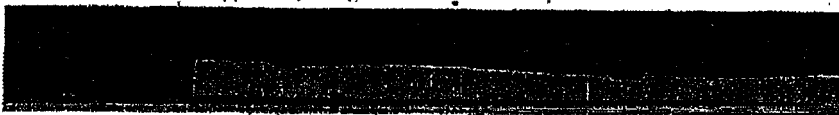
Specify PEABODY BURNERS To Be Sure

Oil — Gas — Pulverized Coal —
Burned singly or in Any Combination
Natural or Forced Draft

A Type and Size for Every Service
ask for Data

PEABODY ENGINEERING CORPORATION
580 Fifth Ave. New York 29, N. Y.

Atlanta: Gieseler & Co., Bank Office Building
Houston: The Tennant Co., Ninth Republic Bldg.
New Orleans: Allan J. Morris Co., Bank Building



Research Gives
Fairbanks Horse Scales
Enduring Accuracy

Fairbanks-Morse Scales have earned their world-wide reputation for enduring accuracy through constant research to improve even the most minute parts—through research in the selection of the most enduring materials—through research in design to perfect each part. This has been the Fairbanks-Morse policy for over a hundred years, and it continues

to be the Fairbanks-Morse policy today.

Skilled craftsmen produce these parts with the aid of modern machines. Trained assemblers put them together. A weighing machine so constructed performs accurately day after day, year after year.

Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

Fairbanks-Morse



A name worth remembering

Diesel Locomotives • Diesel Engines
Scales • Motors • Pumps • Constructors
Winches • Sickers • Railroad Motor
Cars and Standpipes • Farm Equipment

SOUTHERN POWER & INDUSTRY for JANUARY, 1946

You can:

Reduce Heating in Panels and Switches

Keep circuits operating -
Prevent costly shutdowns
by installing FUSETRONS



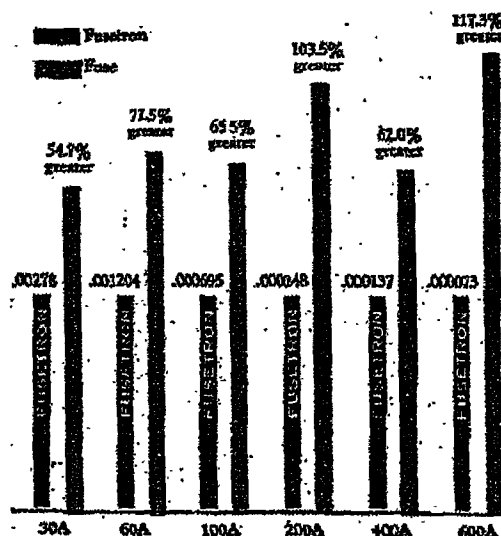
Fuses, like all other protective devices, operate from heat created by the current flowing through them. Thus they produce some heat even in normal operation.

This heat must be dissipated from switches and panels through the air, through metal parts and through the wires connected to such enclosures.

Sometimes the heat is not dissipated fast enough—so it piles up in switches or panels.

This piled up heat over-heats fuses and reduces their carrying capacity. Then fuses often blow even though not loaded to their rated capacity.

LOOK AT THE RESISTANCE OF FUSETRONS COMPARED TO THE LOWEST RESISTANCE FUSE



Resistance shown at full load in ohms. Chart shows 250 volt sizes. 600 volt sizes show similar results.

To solve the heating problem by putting in larger metal parts or wires to conduct heat away faster is always costly. A more logical answer is to cut down heat at its source by using Fusetrons—they produce less heat because they have less electrical resistance than ordinary fuses.

Cooler Operation of Switches and Panels Reduces Needless Blowing of Fuses

Install Fusetrons in your switches and panels and they will operate much cooler than with fuses because the heat produced by the flow of current is proportional to resistance and Fusetrons have very much less resistance than ordinary fuses.

This cooler operation means the elimination of needless blows and useless shutdowns that are the result of heating in fuses.

Cooler operation also adds to the life of panels and switches.

Here's PROOF Fusetrons Reduce Heating

Says an executive of a large Detroit Company. (Name on request.) "One-time fuses formerly used in a lighting circuit feeder panel got so hot that every fuse burned itself up and had to be replaced every month. Our Chief Electrician changed the fuses to Fusetrons of the same size. After three months, only one circuit had opened and the panel was very much cooler than it had been with one-time fuses. Subsequently we changed all our fuses to Fusetrons."

BUSS

CONTINUED POWER & ELECTRICITY • JANUARY 1964

Fuse-trons do everything fuses do. They open on harmful overloads and on short-circuits stop the flow of current by and safety, all of which is confirmed by the Underwriters' Laboratories label...and in addition you can

Get many kinds of protection, heretofore not available — by installing FUSETRONS throughout the entire electrical system

★ Entirely wipe out needless blows caused by motor starting currents or other harmless overloads.

Fuse-trons have tremendous time-lag. They hold 300% load more than 10 seconds whereas most sizes of ordinary fuses blow in less than one second. They won't open on starting currents or harmless overloads (heavy overloads for a short time or light overloads for a longer time). Fuse-trons won't shut down a circuit needlessly. They open only when something goes wrong.

★ Give Thermal Protection to Fuses and Switches

The thermal cutoff in the Fuse-tron will open when its temperature reaches 280° F. Thus if poor contact heat develops from any cause the Fuse-tron cuts off the current before damaging temperatures can be reached.

Ordinary fuses can't so protect because the temperature of the hot spot reaches 700° F. before it will melt out.

With Fuse-trons you are warned that a minor maintenance job is needed instead of having panel or switch damaged or destroyed by poor contact.

★ Prevent Needless Blows caused by Heating in Fuses and Switches

(See Opposite Page).

★ Permit use of larger motor or adding more motors on circuit WITHOUT installing larger switch or panel

The operating load on Fuse-trons can be close to their ampere rating because Fuse-trons hold starting currents. But ordinary fuses must be installed oversize because they lack sufficient time-lag to hold starting currents.

By replacing ordinary fuses with Fuse-trons, you can load panels or switches near their capacity. A larger motor or additional motors can be installed without the trouble or expense of changing the panel or switch.

★ On new installations, PROPER size switches and panels can be used instead of OVERSIZE

With ordinary fuses, switches and panels must be oversize because fuses larger than the operating load must be used to hold starting currents.

But Fuse-trons hold starting currents, therefore, PROPER size switches and panels to fit the load can be installed, saving money and space.

★ Protect motors against burnout

On normal installations, Fuse-trons used in a size near ampere rating of motor will protect it against burnout from lack of oil, worn bearings, tight belt or anything that causes a dangerous electrical overload — yet their tremendous time-lag keeps them from blowing on motor-starting current.

★ Give DOUBLE burnout protection to large motors.

Larger motors already equipped with overload protection sometimes burn out due to thermals or relays failing to operate. Replace fuses used for short-circuit protection with Fuse-trons of size near motor rating and they will protect motor against burnout from any electrical overload, entirely independent of other overload device.

★ Provide simplest way to stop burnouts from single phasing

When single phasing occurs, increased current flowing through remaining phase will open Fuse-tron (if size used is near the rating of the motor) and shut down motor. Never before has such dependable single phasing protection been available.

★ Make burnout protection of SMALL motors simple and inexpensive

Small motors have generally been operated without burnout protection because the cost of protecting them has been too great compared to cost of replacing motor. Now for the little cost of installing a Fuse-tron of proper size, any motor can be given safe, dependable burnout protection.

★ Protect Coils, Transformers and Solenoids against burnout

Install a proper size Fuse-tron. It won't open on harmless overloads of inrush current, but it will open on a dangerous overload open for any reason. It will cut off the current to prevent a burnout.

WHAT IS THE FUSETRON?



The Fuse-tron is a DIAL element device — A Fuse in which is added a Thermal Element.

The result is a fuse with tremendous time-lag and much less electrical resistance.

Fuse-trons have the same degree of Underwriters' Laboratories approval for both non-maintaining and circuit protection as the most expensive device made.

Fit standard fuse blocks

Fuse-trons are made to meet dimensions as underwriter fuses and fit all standard fuse holders.

They are obtainable in all sizes from 1/10 to 600 amperes — in both 250 and 500 volt types.

Also obtainable in plug type and Temperature-limiting type (available for 100 volt circuits).

Their Cost is Surprisingly Low

ACT ON THE FACTS; Even one needless shut-down or one lost motor or one destroyed panel may cost you more than replacing every fuse with a Fuse-tron. Don't risk such losses, change over the whole plant to Fuse-trons at once.

FUSETRONS

GET THE FACTS — CHECK THE COST

BRIDGMAN MFG. Co., Underwriters, Jefferson, St. Louis 7, Mo. (Division McGraw-Hill Co.)
Please send me complete facts about BRIDGMAN Fuse-trons.

Name _____
Title _____
Company _____
Address _____
City _____ State _____ Zip _____

This COMMUNITY REFRIGERATION CENTER Serves Over 15,000 Customers



5,000 Refrigerated Food Lockers



10,000 Pkts. in Storage



43,000 Cu. Ft. Freezer Storage



14-Ton Ice-Making System



Processing & Quick Freezing Foods



Air-Conditioned Sales Room



Restaurant Service

Pat Denham's model plant covers an entire block at Oklahoma City, Okla., and provides a total of ten distinct services to the public.

It has the world's largest refrigerated food locker system; it safekeeps 10,000 furs under cold temperatures; it operates a big general freezer storage.

The plant makes 14 tons of crystal-clear ice daily; chills, ages, and processes all kinds of foods; does quick-freezing in two cold-air-blast freezers. It sells quantities of frozen foods; runs a good sized restaurant; has a popular gas station; and includes a big laundry.

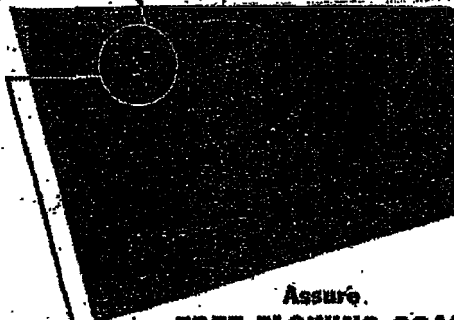
All the cooling loads are carried by Frick refrigerating, ice-making, and air conditioning equipment.

Our Bulletin 126 tells how any town or city can profit from a similar COMMUNITY REFRIGERATION CENTER. Get your copy now; see what modern cooling and freezing facilities are doing for other places.

Frick Compressor, 1 of 8, with Engine

DEPENDABLE REFRIGERATION SINCE 1892
Frick Co.
WAYNESBORO, PENNA. U.S.A.

SYNTRON *"Pulsating Motion"* ELECTRIC VIBRATORS



Assure
FREE FLOWING COAL
Bins, Hoppers and Chutes



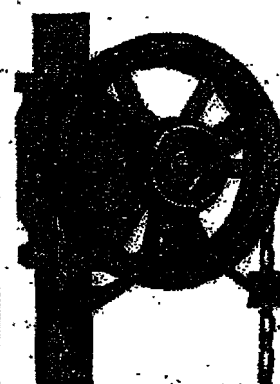
3600 powerful "Electronic-Controlled" vibrations per minute, break down arching and plugging—without damage to prime equipment.

Eliminate pounding and slogging.

Write for illustrated folder

SYNTRON CO., 118 Lexington, Homer City, Pa.

Makes "Inaccessible" Valves ACCESSIBLE!



Babbitt Sprocket Rims can be quickly and inexpensively installed on any make or size of valve to give instant, handy control of out-of-reach valves.

No more ladder climbing—fewer accidents—less time lost! . . . Babbitt Rims will save you time, steam and man-power. Write today for complete information.

Jenkins Brothers of Atlanta have a complete Stock for Your Convenience

Babbitt
Adjustable
SPROCKET RIM
with Chain Guide

BABBITT STEAM SPECIALTY CO.
New Bedford, Mass., U. S. A.

③ INCREASES PRODUCTION

These advantages as well as many others are the result of the scientific approach to your dust control problems by Liberty Engineers.

Requirements of the individual plant are first thoroughly analyzed. After the study has been made a complete dust control system is designed and installed to meet these particular plant requirements.

For many years it has been our privilege to design and install dust control systems that operate efficiently and dependably. The first hand knowledge thus gained in studying the needs of a large and varied line of industries is embodied in the planning and designing

of every dust control system we build today. Why experiment. Have a Liberty Dust Control System designed for your specific needs. Keep the air in your plant beautifully clear. Safeguard workers' health. Increase production by reducing absenteeism thereby reducing operating costs.

Your plans may call for reworking your present system or for expansion to meet past or future production. If so, there is a Liberty Engineer ready to give you the unbiased opinion of what type of dust control system will give the most satisfactory results. For further information, write to the

LIBERTY ENGINEERING & MFG. CO.

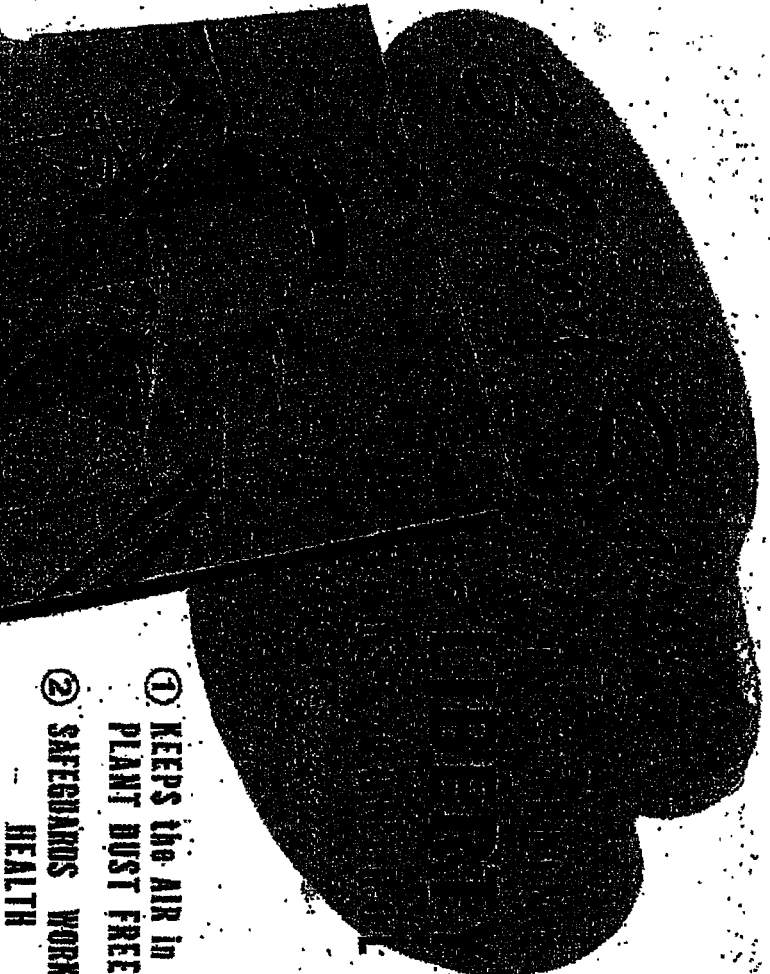
INCORPORATED

1434 SO. 15TH ST.

LIBERTY DIVISION OF THE KIMBLE & BILM MFG. CO.

LOUISVILLE 1, KY.

SOUTHERN POWER & INDUSTRIES for JANUARY 1946



① KEEPS the AIR in your
PLANT DUST FREE

② SAFEGUARDS WORKERS'

HEALTH

Write for Bulletin ID-205.

50-#

CONTINENTAL GIN COMPANY

RICHMOND, VA. 23101



At the time of the study, the following information was available:

DALLAS

HEADLINE



A black and white photograph of a book titled "POWER PLANT ENGINEERS GUIDE" by "THE POWER ENGINEERS". The book is shown at an angle, highlighting its spine and front cover. The title is printed in large, bold, sans-serif capital letters on the front cover. The author's name is printed in smaller capital letters below the title. The book appears to be a technical manual or reference guide.

JUST PUBLISHED—For all Engineers, Electricians, Water Treat-
ers, Oilers, Operators, Repair
Men and Applicants for En-
gineers License Examinations.
A Complete Steam Engineers' Library in One Book:
1800 PAGES—48 CHARTS
1700 ILLUSTRATIONS FULL INDEX

IN MANY FORMS FEATURING:
Basic principles of Steam Engi-
neering, including Boiler Con-
struction, Operation and Repair.
Gives practical information on
Boiler Calculations, Iron, Lead

gas, water heaters, exchangers, pumps, injectors, traps, draughts, oil burners, stokers, condensers, towers, evaporators, steam and hot water heating, and hot water heating & tubing. Contains complete details of Steam Engines and Turbines. Includes Valve Setting, Air Compressors, Engine Operation, Lubrication.

4 **WILKINSON'S** oil burners, stokers, condensers, heaters, cooling towers, evaporators, steam and hot water heating, hot mixing & tubing. Contains complete catalog of all types of Steam Engines and Turbines. Illustrations. Valves, Pumps, Compressors, Air Compressors. **COMPLETE** Hoists, Cranes, Locomotives, Engines, Pumps, Compressors.

FIX 30¢. Get this information for yourself—
ONLY 10¢. ASK TO SEE IT—Mail coupon today!

ANDER, Publishers 429 W. 32d St., New York 10, N.Y.
Mail **ANDER'S Power, Heat, Engines, Hoists** (Price 30¢) or 7 mail **coupons** (10¢). I will send you one free and one month's trial 5¢ in paid. Otherwise, I will return 5¢.

Name _____
Address _____
Occupation _____
Employed by _____



Boiler furnaces lined with CAREGO last two to four times longer than those lined with fire brick. Write for quotations.

CAROLINA REFRACTORIES COMPANY
HARTFORD, C. T.

and Guards
for Boilers
Tanks, etc.
all Pressure

State's young people

ROUTED TO ALLIED AIRCRAFT COMMAND.
 [REDACTED]
 [REDACTED]
 FOUND -- Chief & Airline
 FLAT -- Plain Type "A"; Radio
 Type, 1947
 ALSO MICA SHIELDS -- All Sizes

supplied in all sizes

ALL INFORMATION FROM JACK, SAVED:

WATER COLUMN & G

Ernst WATER COLUMN & GAGE CO.

Livingston, N. J. Livingston 6-1480

**1,000,000 lb.
CARBON BLACK BIN**

**ESSENTIAL EQUIPMENT
for an
IMPORTANT
INDUSTRY**

CARBON black is one of the important ingredients used in the production of synthetic rubber products. It has the peculiar characteristic of adding toughness and durability to rubber and is extremely important in the production of tires as well as other rubber goods.

Carbon black is a fine powdery material and requires specially-designed equipment for efficient and economical handling. Large cone-bottom steel bins like the one shown above are used by manufacturers of this product. The carbon black is withdrawn through the cone-

bottom by gravity and loaded for bulk shipment. The bin shown holds 1,000,000 lbs. It was designed, fabricated and erected by us for a producer of carbon black in Texas.

Carbon black bins are only one of many kinds of steel tanks that are being designed and fabricated in our plants for chemical and process industries. Other equipment which we build includes: refinery towers or pressure vessels, elevated water storage tanks and a wide variety of steel plate work. We invite you to write our nearest office for quotations when you need equipment of this sort.

CHICAGO BRIDGE & IRON COMPANY

Atlanta, Ga. 2100 Hunter Bldg.
Birmingham, Ala. 1800 N. Fifth St.
Chicago, Ill. McCormick Bldg.
Cleveland, Ohio 2222 Century Bldg.
Cincinnati, Ohio 1000 Bank Bldg.
Tulsa, Okla. 1000 Bank Bldg.

Plant at BIRMINGHAM, CHICAGO,



Los Angeles, Cal. Wm. Fox Bldg.
New York, N. Y. 100 Broadway Bldg.
Philadelphia, Pa. 1700 Walnut Bldg.
Washington, D. C. 703 Atlantic Bldg.
Houston, Tex. 5000 Clinton Drive
Hawaii Office Room 402

and GREENVILLE, PENNSYLVANIA

Blazing THE ... DESIGN FOR 1000°F.

TEMPERATURE CONTROL ...

Final steam temperature control with an all-convection type superheater invariably requires a compromise between two limiting conditions.

FIRST—when furnace exit temperatures to the superheater are high enough to obtain the desired control range, slagging of the boiler and superheater surfaces may result.

SECOND—when gas temperatures to the superheater are low enough to prevent slagging, the desired control range cannot be met.

The necessity for compromise can be eliminated by using a combination radiant and convection type superheater. Slagging in the boiler and superheater can be eliminated and a high final steam temperature maintained over a wide load range.



FOSTER

ENGINEERING TRAIL

FINAL STEAM TEMPERATURE

FIRST . . .

The first high pressure public utility steam generating unit designed for 1000°F. final steam temperature will go into service during 1946 at the Atlantic City, N. J. station of the Atlantic City Electric Company. Capacity is 310,000 lb. steam per hour at a pressure of 1550 psi. This marks another milestone in design progress for high-pressure, high-temperature steam generating units.

PROBLEM . . .

The engineering problem here was to design a superheater which could deliver steam at 1000°F. final temperature over a wide load range, and in addition, satisfy the second condition of slag-free operation.

SATISFYING BOTH CONDITIONS . . .

The Foster Wheeler combination radiant and convection type superheater satisfies both requirements. Offsetting characteristics of the two superheater types balance to yield an almost constant final steam temperature over a wide load range. As the load increases the steam temperature from the radiant section decreases, while temperature from the convection section increases. Condenser type control provides what regulation is necessary to maintain a steady 1000° over the load range of 130,000 lb. to 310,000 lb. steam per hour.

The second condition—freedom from slugging—is the result of combining radiant and convection heat-absorbing surfaces, permitting the specified temperature of 1000° to be obtained, while furnace exit temperatures to the convection superheater are kept below the slugging point.

FOSTER WHEELER CORPORATION
165 Broadway • New York 6, N.Y.

WHEELER



CLASSIFIED ADS

BUSINESS—EMPLOYMENT—EQUIPMENT—PROFESSIONAL CARDS—OPPORTUNITIES

RATES DISPLAYED

"For Sale," Agents Wanted, and all other advertisements under head face type or otherwise displayed, \$5.00 per column inch per insertion.

Special for larger spaces furnished on application.

WITHOUT DISPLAY

"Position Wanted" advertisements, 5 cents per word per insertion. Minimum charge \$1.00. Payable in advance. (When replies are to be received in our care allow eight words for the box address.)

FOR SALE

Approximately twenty used Model H 250-pound-per-hour capacity Fairbanks Morse stokers. These stokers have been used around two years and are offered subject to prior sale at approximately one-third their original cost. If interested write or wire Tennessee Eastman Corporation, Kingsport, Tennessee.

INDUCED DRAFT FAN

NEW, never been used, American Blower Service, No. 7 Induced Draft Fan. Capacity 90,000 CFM. @ 2 1/2" S.P. 575 R.P.M., Water Cooled Bearings, 20 hp motor, automatic starter V-belt drive, pulleys, no belts. \$750.00 F.O.B. Houston, Texas. MECHANICAL EQUIPMENT CO., HOUSTON, TEXAS.

James D. Shearhouse, Engineer
104 Whitehead Bldg., Atlanta 2, Georgia
Tel.—MA 1286

Structural Steel, Mechanical and Industrial Engineering, Designing, Estimating and Detailing. Inquiries Solicited.

POSITION WANTED

Available near Houston. Over 20 years experience: applications, pipe and structural steel, mechanical, electrical, and civil. Good health, good references, and 24 hrs. married. No salary considered. Reply Box 100, P.O. SOUTHERN POWER & INDUSTRY, Grant Building, Atlanta 2, Ga.

FOR SALE

One used Cooper-Bessmer EN-3 Diesel engine with 100 kw, 220-440 volt AC generator, direct connected, good rebuilt condition.

One Cooper-Bessmer EN-4 Diesel engine, V-belt driven, 110 hp, 65 kw Diesel generating set, good condition.

Calmes Engineering Company
705 Saroyne Street,
New Orleans, Louisiana

FOR SALE

1—5 phase, 60 cycles, Type T20, 60 KVA, 2000 volt, 247 KVA Alternator
Current Generator
1—Type 20 Belt Drive 5 KW, 125 volt, 40 amp, 1150 RPM Direct Current
Generator set above. Rheostats for both
machines.
1—200 gallon per minute at 150 ft head
Dyson-Dowd, direct connected, Diesel
Engine Pump. This pump is direct
connected to a 6-5 15-HP 220-440,
4 phase, 1750 RPM motor.
1—6-5 15 HP 220-440 volt, 4 phase,
type 220 1125 RPM motor.
Above equipment will be shipped F.O.B.
Atlanta, Ga. For information on the above,
write, wire or phone S. H. Gutter, Sup't.
Right & Water Dept., City of Atlanta, Georgia.

Your Advertisement On This Page . . .

HAVE you some equipment, new or second hand, which you wish to dispose of? Do you desire a good man to fill a vacancy in your plant? Do you desire a position? Do you desire your business or professional card placed before the power, industrial and refrigeration fields?

Why not try an advertisement on this page of **SOUTHERN POWER & INDUSTRY** with its 15,000 copies per month? **SOUTHERN POWER & INDUSTRY** reaches the active executives and managers, superintendents, heads of departments and engineers,—the men directly in charge of plant process, the men who buy or dictate the buying of machinery, equipment and supplies.

Advertising on this page produces results at small cost. Note the rates above and tell us what you wish to advertise.

SOUTHERN POWER & INDUSTRY

GRANT BUILDING

ATLANTA, GEORGIA

Leut!



LEAKPROOF

AIR GUNS



THE "A" operates for accurate and reliable air flow on hose.

A slight flex of the hose operates the patented half-angled valve, discharging a puff of full blast of air.

- Streamlined to save
- Friction-free control
- No lever-to button
- No effort—no fatigue
- Perfectly balanced
- Saves air, power, time, money
- Speeds production
- Quick cleanup
- Study discharge connection
- No repair or replacement costs

In plant after plant, a few TRICO AIR GUNS purchased for trial always resulted in repeat orders. Look around your plant—you will find many uses on your air and water lines—places.

THE "A" for accurate and reliable air flow on hose.

TRY TRICO AIR GUNS TODAY!

Write for Bulletin No. 49

TRICO GUNS, INC., 1000 W. 10th St., WICHITA, KANSAS

A VALVE THAT WILL INTEREST EVERY POWER ENGINEER



THE DAVIS

No. 268

HIGH PRESSURE RELIEF VALVE

for:

- Turbine relief on bleeder system.
- Protection of any boiler room or process equipment by relief to atmosphere.
- Relief of high pressure lines to low pressure lines at predetermined pressure.
- Plants carrying multiple boiler pressures to protect lower pressure systems.

The Davis No. 268 High Pressure Relief Valve, an exclusive Davis design offers numerous features or advantages:

1. Multiple springs—less spring replacement—less bulking for maximum relief—has blowdown to show.
2. Requires appreciably less head room because of compact design, with springs loaded at side.
3. Coarse adjusting screw provides quick, easy change of pressure setting.
4. Can be supplied with test lever.
5. Available with hold open device.
6. Available in cast-steel or steel with bronze or stainless steel trim.
7. Size range 4" to 30".

DAVIS REGULATOR COMPANY

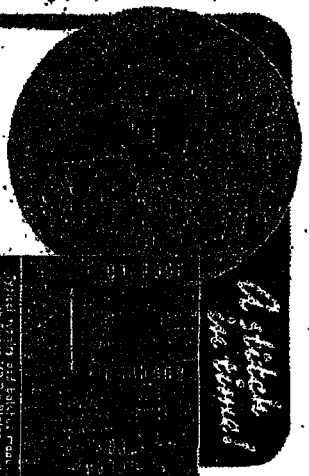
2217 N. Western Ave.

Chicago, Ill.



DAVIS
AUTOMATIC
VALVE SPECIALTIES

A little bit of time!



THERMANS of time to industrial plants, where they will save the country any money just what the time is doing. They are doing this by so-called conveyor belts with FLEXCO ED Ray rollers.

WRITE TODAY FOR FLEXCO ROLLER ROPS that show how they are to report signs, to save money and space and to put in practice by using FLEXCO ED Ray rollers. The booklet also shows how to make light belt joints in each conveyor and overhead belt with FLEXCO ED Ray Fasteners. These fasteners are made in the same. Illustrated in special analysis steel for general use and in various alloys to meet special conditions.

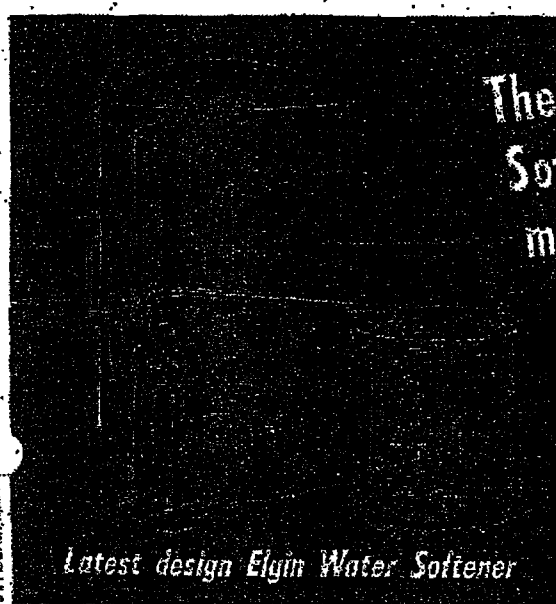
FLEXCO ROLLER ROPS CO.
4825 Lexington St., Chicago, Ill.

FLEXCO ROLLER ROPS BELT FASTENERS
Sold by FLEXCO ROLLER ROPS CO.

The Advertiser's Index is published as a convenience, and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

[illegible]

..... NOW YOU CAN HAVE
All the Soft water you want
 ... AT NO EXTRA COST!



The Elgin "Double-Check"
 Softener gives up to 44%
 more soft water, size for size

Latest design Elgin Water Softener

Too often the use of soft water begins and ends in the boiler room. But the extra amount of soft water that costs so little more in the big-output Elgin "Double-Check" Softener permits many uses of soft water that are highly profitable through saving labor costs, improving processes and reducing maintenance costs. Throughout the hot water system, zero-soft water eliminates scale and lime deposits in tanks, heaters and piping, cutting plumbing costs. In all plant cleaning operations it does a better, faster job with 1/10 saving of soap and cleaning compounds. In many plant processes Elgin zero-soft water improves the quality of finished products and where jacketed equipment is involved it increases operating efficiency and cuts maintenance cost.

Ask for this New Bulletin

... DESCRIBING THE OPERATION AND CONSTRUCTION OF THIS REVOLUTIONARY WATER SOFTENER *



AUTHORITIES agree that in far too many plants there is not enough softened water for all the uses to which it should profitably be put. In some cases this is because requirements have outgrown water softener output; in other cases the management has not put in a softener of adequate size, either because of the space required for a larger unit or because of the greater initial and operating cost of a larger softener.

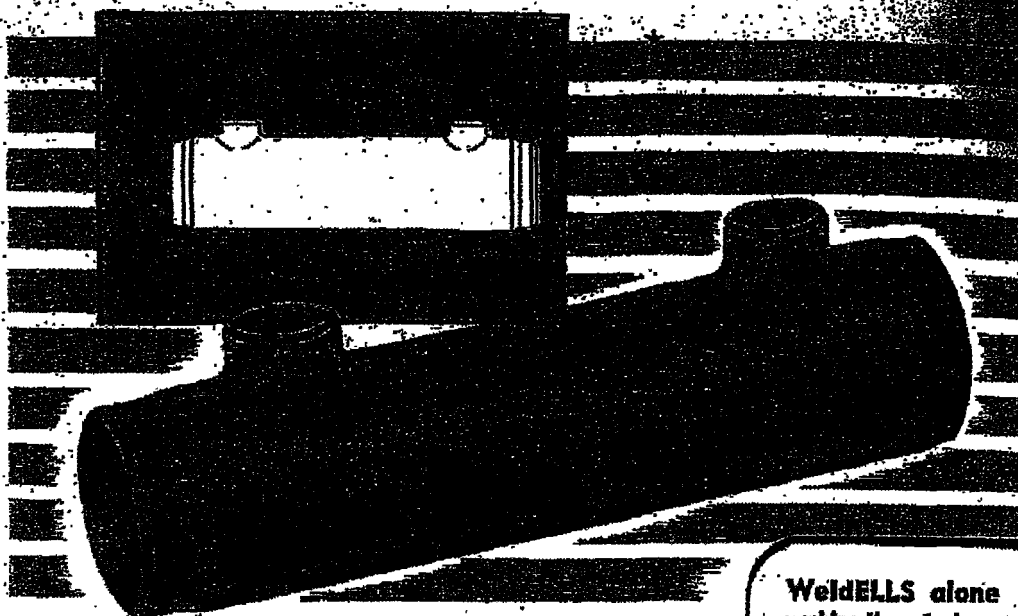
But whatever the objection it has no standing now. An Elgin "Double-Check" Softener no larger than a water softener of ordinary design will deliver up to 44% more soft water—and deliver it at far lower cost.

The reason for this higher capacity and efficiency is quite simple. The Elgin accommodates a far greater quantity of zeolite and uses it more effectively. It accommodates more zeolite because an ingenious "Double-Check" manifold system prevents the escape of zeolite and therefore permits the use of a far deeper zeolite bed. It uses the zeolite more effectively because a higher backwashing rate is made possible by preventing zeolite loss. This keeps the bed clean and active so that more "zero-soft" water is produced per pound of salt used. As is well known, a deeper zeolite bed gives far greater water softening efficiency.

* Existing softeners, regardless of make, can be modified by Elgin to incorporate the features and advantages of the Elgin "Double-Check" Softener.

ELGIN SOFTENER CORPORATION

SOFTENERS * FILTERS * WATER TREATMENT * BOILER WATER CONDITIONING



TEE FOR TWO.....

Taylor Forge arrangement—

★ Of course two tees with a nipple welded between them could be made to provide an assembly with the same dimensions as this special "tandem outlet tee." However, a rigid set of conditions demanded this seamless one-piece fitting. From there on it was the old familiar story: "This is a tough one—only for Taylor Forge."

YES, you've heard the story before: A tough one is one for Taylor Forge! It's really no wonder so many of the people who come to Taylor Forge for the unusual, and often very difficult jobs, are equally careful to see that their needs for standard welding fittings are always supplied by Taylor Forge.

They should be equally careful, because the very same factors that have built the Taylor reputation for licking the tough ones, provide many extra values that are found only in WeldELLS and other Taylor Forge fittings for pipe welding.

In the sense of knowledge and experience, WeldELLS, too, are "special." Special steps are necessary to achieve uniform strength through selective distribution of extra metal where stresses are greatest. Special truing operations give WeldELLS their remarkable dimensional accuracy. Special processes account for the tangents and many other features of WeldELLS.

In fact, you will find Taylor Forge know-how reflected in every one of the features listed opposite. Check the list and we believe you will agree that

WeldELLS alone combine these features:

- Seamless—greater strength and uniformity.
- Tangents—keep weld away from zone of highest stress—simplify fitting up.
- Precision quarter-matched ends—simplify layout and help insure accuracy.
- 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—ensures full strength and long life.
- Machine tool beveled ends—provides true working surface and accurate bend and lead.
- The most complete line of Welding Fittings and Forged Steel Flanges in the World—insures complete service and undivided responsibility.

WeldELLS have everything

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

Jenkins PRACTICAL PIPING LAYOUTS

How to plan FUEL OIL STORAGE CONNECTIONS WITH HEATING COIL

One of a series of basic Piping Layouts illustrating the proven 3-point formula for trouble-free, time-defying hookups—

1. Place valves correctly in the line.
2. Use the right type valve for the service.
3. Choose Jenkins Valves for lifetime economy.

Code	Quantity	Smoking Valves	Service
A	4	Fig. 920 Borehole-Borewell Borewell Seal Valve Globe	Oil Lines
B	4	Fig. 920 Borehole-Borewell Borewell Seal Valve Globe	Steam Lines
C	4	Fig. 920 C.B.A.V. Borewell Globe	Steam Lines
D	4	Fig. 718 Borewell Spring Check	Steam Lines

HEATED TANKS must be provided for the storage of industrial heating oil in most plants using this fuel for boiler furnaces generating heat or power, or for processing furnaces. TO ASSURE UNINTERRUPTED SERVICE when cleaning, or in event of a breakdown of one of the systems, a duplicate installation of tanks is shown in this layout. Since circulation must be provided to keep the oil fluid, a return line as well as a suction line from the tanks is shown. A valve is provided to control the amount of oil from the return line that recirculates directly to the suction line. Connections are provided

for both high and low section. High section guards against difficulties from sediment, while the low section is necessary when the fuel oil supply is extremely low. MANY TYPES AND PRESSURE RANGES of Jenkins Valves other than those shown can be used for this type of layout, according to the factors involved. Consultation with accredited piping engineers and contractors is recommended when making these suggestions to your own requirements, or when planning any major piping installation. COPIES OF LAYOUT NO. 4, with additional information

be sent on request. "Piping Layouts" are available. Just fill out and mail the coupon from our office. To save time, fill out the coupon to get the information you need. Jenkins Valves are available in all sizes and pressure ranges. Write to Jenkins Valve Company, 1000 N. 1st St., St. Paul, Minn. 55101.



JENKINS VALVES

For every industrial, engineering, plant service... in Denver, Colorado. Corporation, Building, Denver, Colorado.

AFFIDAVIT OF DOCUMENT AUTHENTICATION

STATE OF TEXAS

COUNTY OF DALLAS

BEFORE ME, the undersigned authority, on this day personally appeared Devett D. Bickston, who, being by me duly sworn, deposed as follows:

My name is Devett D. Bickston. I am over the age of 18 and of sound mind, capable of making this affidavit. All the statements contained herein are true and correct, and are based on my personal knowledge.

I am a professional librarian, information researcher, and director of an information center at Southern Methodist University. Today, I received photocopies of the entire January 1946 issue of a trade journal entitled - Southern Power & Industry. I have compared these copies with the actual issue which we hold in our collections. I find the photocopies to be a complete and exact photocopy of all 162 pages in that issue.

The SMU Science/Engineering Library owns the magazine title and issue shown above, and it is kept in our storage shelving in the basement. The purpose of this affidavit is to verify that the pages attached are a true copy of the original, physical issue of this journal.

It was during the regular course of business that on Friday, September 2, 2005, that I compared the pages attached to the original issue, and I delivered this information to a representative of Waters and Krauss LLP, a member of our information services program.

Devett D. Bickston
Affiant

SWORN TO AND SUBSCRIBED before me on the 2nd day of

September, 2005.

Melinda Argenti
Notary Public

