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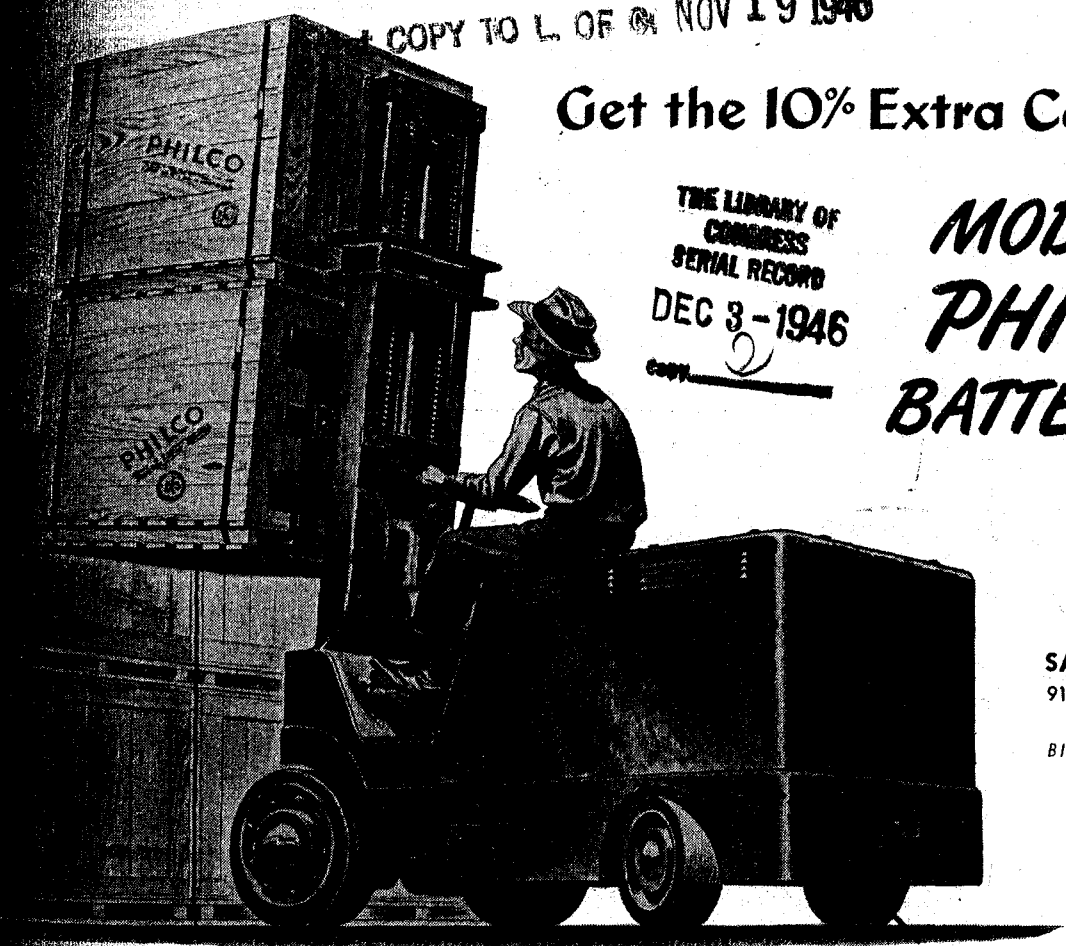
OUTHERN POWER AND INDUSTRY



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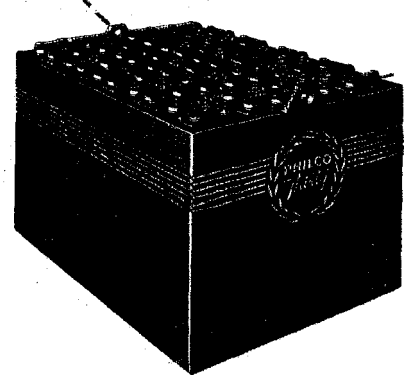

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GRANT BUILDING
ATLANTA, GEORGIA

SOUTHERN POWER AND INDUSTRY

CONTENTS

Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

November 1, 1946

POWER EQUIPMENT INNOVATIONS of the past several months will be featured at the 17th National Power Show to be held the first week of December in New York. A model of a gas turbine designed for power generation in the utility field will be displayed along with new combustion equipment, apparatus for pulverizing coal, small Diesel-electric units designed for portable use, "emergency" 50 to 500 hp self-contained boilers, and burners capable of firing coal, oil, and gas selectively or in combination. Machine tools, materials handling equipment, and power plant protective equipment will also be featured.

ALUMINUM ALLOY BEARINGS are now being developed for improved score, fatigue, and corrosion resistance in heavy load applications. Numerous reported service tests of solid aluminum alloy and steel-backed aluminum bearings indicate improved performance. Self-lubricating powdered aluminum alloy bearings are still in the formulative stage.

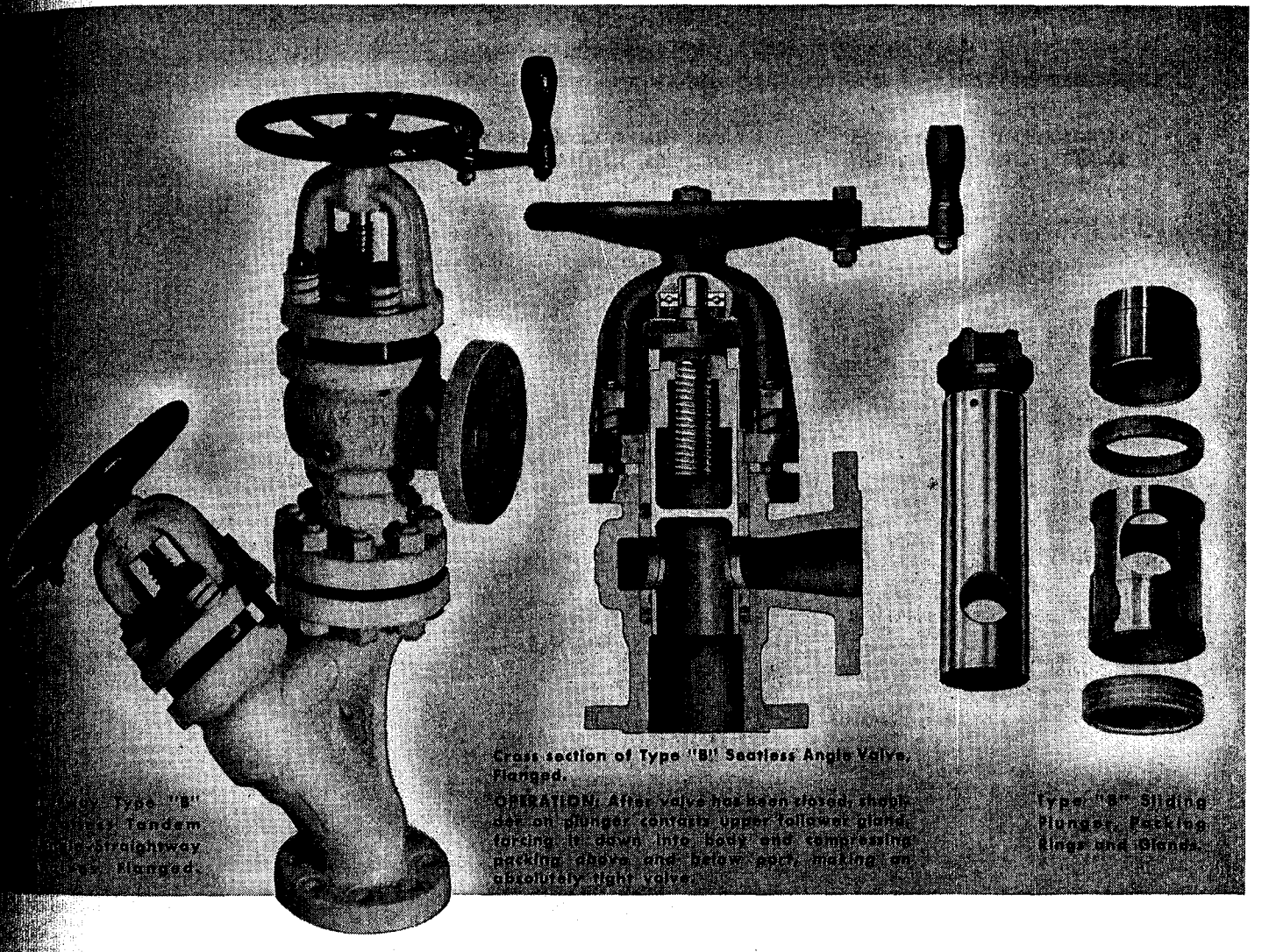
METHODS TRENDS – transparent plastic machine bearing models, fed with pigment colored oil, afford visual study of lubrication effectiveness . . . protective chemical packing compound applied with spray gun has tensile strength of 2,000 psi and elongation of 200 per cent and is stable from minus 40 F to plus 180 F.

OVER 1700 INDUSTRIAL – VOCATIONAL FILMS, available to industry on rental, purchase, or free loan basis, are listed in "The Index of Training Films" distributed by the Eastman Kodak Co., Rochester 4, N. Y. This classified industrial inventory of available training materials covers diversified fields in the Ceramic and Glass Industries; Chemical Industry; Electronics including Generators & Motors, Electrical Measurement, Motor Maintenance & Repair, Radio & Communication; Engineering; Diesel, Internal Combustion & Steam Engines; Foundry and Forging Practice; Hydraulics; Machine Shop Practice; and in the Plastics, Refrigeration, and Wood Working Industries.

REPRODUCTION OF WORKING DRAWINGS on metals, plastics, hard rubber, and other non-porous materials can be economically accomplished by the use of a new spray gun applied, light-sensitive, quick-drying, primer and coating. The process, carried out in ordinary room lighting conditions, consists of clear lacquer priming, coating, exposure to bright light of sensitized metal in contact with the drawing and washing with a 2 per cent solution of ammonia and warm water. Complex layouts can be produced in quantity and finished layouts withstand bending, shearing, and punching without loosening. It is applicable in the making of photo templates, wiring diagrams, instrument panels, dials, and for general decoration of metal, wood, and plastic surfaces.

NO SEAT!

TO SCORE...WEAR...CLOG...LEAK



Cross section of Type "B" Seatless Angle Valve, Flanged.

"OPERATION: After valve has been closed, shank dog on plunger contacts upper follower gland, forcing it down into body and compressing packing above and below seat, making an absolutely tight valve.

Type "S" Sliding Flanges, Packing Rings and Glands.

Yarway Seatless Blow-Off Valves have become standard in more than 12,000 boiler plants because they eliminate a common source of trouble and expense with conventional type blow-off valve operation.

Yarways have no seat to score, wear, clog and leak!

This famous seatless design, first introduced by Yarway more than 35 years ago, has been constantly improved and adapted to meet modern service requirements. Mechanical and metallurgical research in Yarway's own unique Steam Laboratory anticipates changing conditions . . . assures the finest in blow-off valves for today's boiler plants.

There is a Yarway Blow-Off Valve for every pressure. For complete details of valves for pressures up to 400 psi., send for Bulletin B-424; for higher pressures ask for Bulletin B-432.

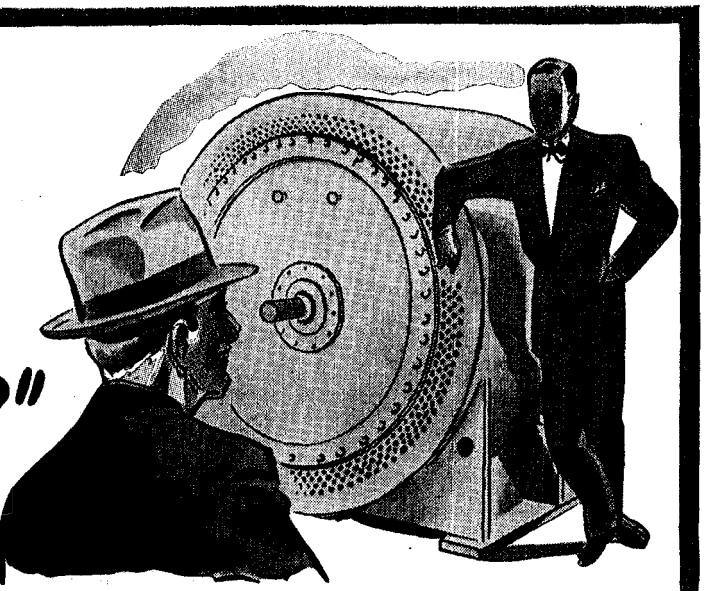
YARNALL-WARING COMPANY

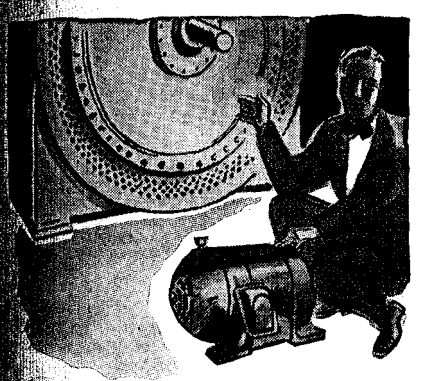
Home Office: 116 Mermaid Ave., Phila. 18, Pa.

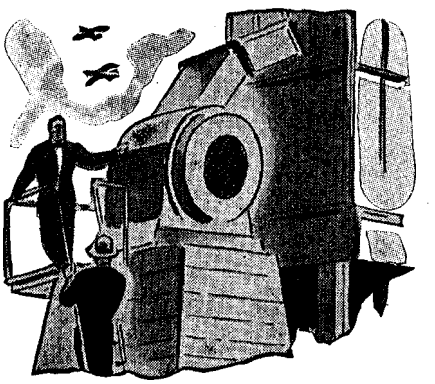
Southern Representative: ROGER A. MARTIN, Bona Allen Building, Atlanta 3, Ga.

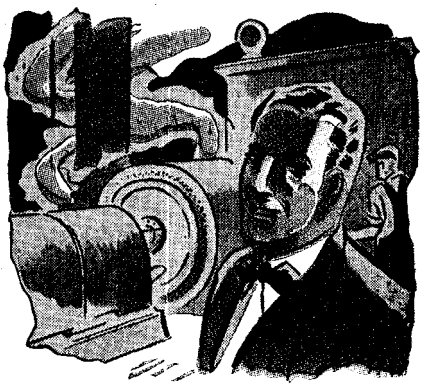
YARWAY BLOW-OFF VALVES

"Did You Say, Up to 2000 hp ...Weatherproof?"





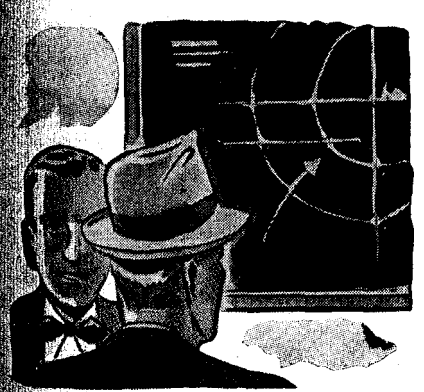




Right. In Allis-Chalmers' modern motor line we're now prepared to offer you a *complete range* of outdoor weatherproof, totally-enclosed motors all the way from small, standard ratings to sizes of 2,000 hp or larger."

"Why, That Means Then," our customer exclaimed, "in larger ratings they fill the need of power plant engineers who want to install equipment like draft fans *outside,* and thus keep down structure costs per kw capacity." Right again —and they fit into *other* industries too!

Chemical, for instance. Here cast iron motors have generally been preferred ... because they stand up better under acid and alkali conditions. But now these *new* motors, with *new* design improvements, promise to provide several important operating advantages ...

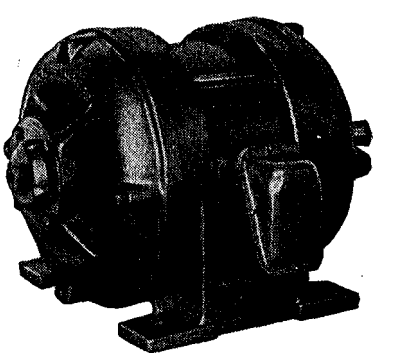


We've Re-designed the heat-transfer system to *improve ventilation.* We've *reduced maintenance* by making air passages not only more accessible, but practically *self*-cleaning as well. And we've *eliminated* liquid and dirt-trapping pockets. In the smaller ratings we of course offer our standard design.

Looking for a Good Motor?

SPECIFY "Allis-Chalmers"! For whether your job calls for a large motor like that above, or a small standard machine, you can be sure of getting two things when you specify "Allis-Chalmers:" 1) Exactly the right type and size motor; 2) consistent with the finest quality workmanship of which we are capable.

For the full story of liberal Allis-Chalmers motor construction, call our nearby dealer or sales office. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2117



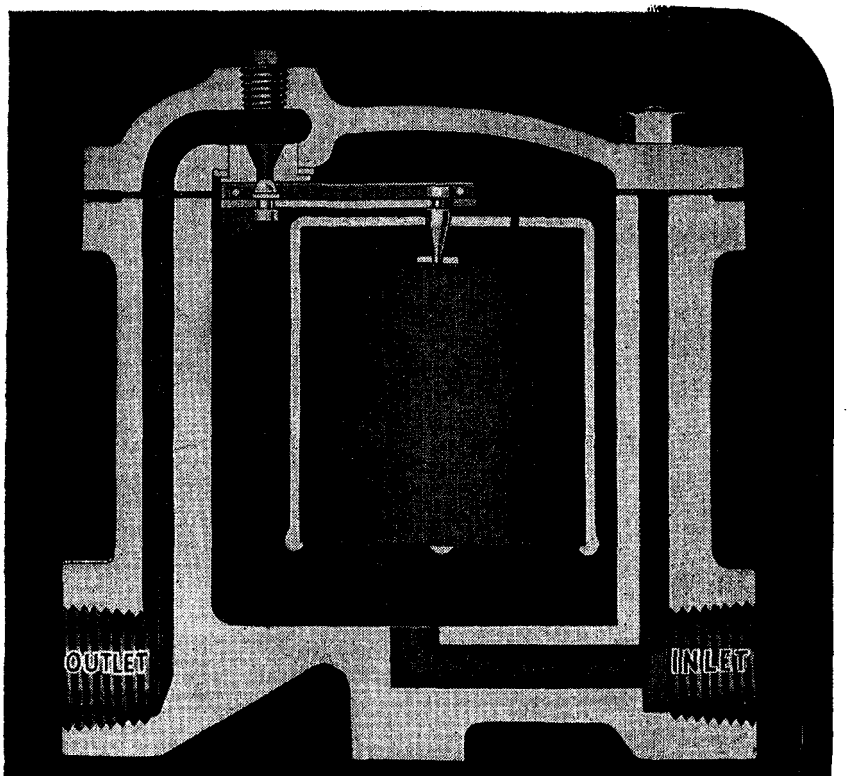
ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

LONGER LIFE . . .

Wherever steam, air or gas are used, Clark Fluid Controls not only give your equipment longer life, but they increase efficiency and decrease fuel costs.

38 YEARS of building better products have built a steadily rising acceptance for fluid controls made and backed by Clark.



The popular CLARK SERIES 70—small inverted bucket type steam trap with Clark Patented Bucket Venting Device and other exclusive Clark features, suitable for general drainage. Available in 3 sizes: ½", ¾" and 1". For pressures up to 200 P.S.I. and temperatures up to 400°F. Write for free catalog of complete specifications and applications for the wide line of Clark Fluid Controls.

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FLUID CONTROLS

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STEAM AND FLUID TRAPS
VACUUM AND LIFTING TRAPS
STRAINERS
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PRESSURE REGULATORS
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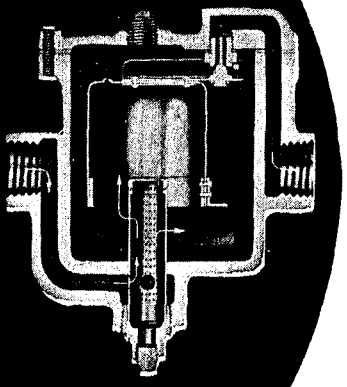
GOOD STEAM TRAPS SAVE MONEY



No one will quarrel with that! Plant operators know that air and condensation must be removed from steam coils and lines rapidly and completely, if the steam is to do its work efficiently.

A good steam trap will do this, day after day, for years, and with a minimum of maintenance or interruption.

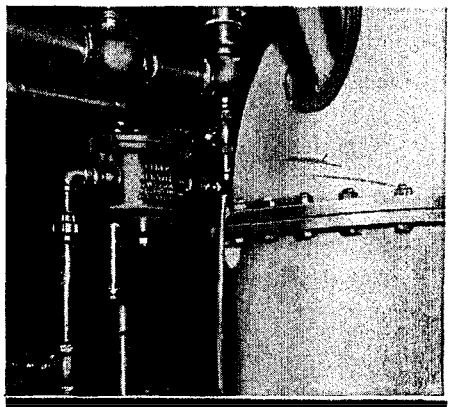
The Sarco Inverted Bucket Trap illustrated is such a good steam trap, as testified by hundreds of users who employ them throughout their plants.

The advanced design includes straight-through conections for easy installation; a strainer built into every trap; stainless steel mechanism attached to the trap cover for easy inspection and cleaning.

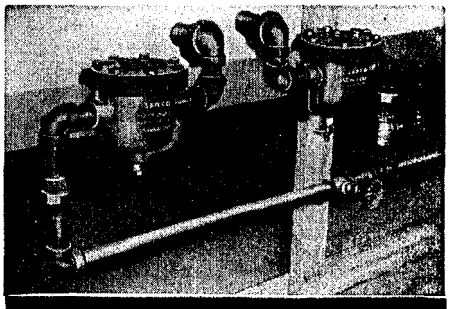
Standard types, ½" to 2" up to 250 lbs.; forged steel types to 900 lbs. pressure. Ask for Catalog No. 350.

438

FOOD DRYING



LINE DRIPPING



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now better than ever

In 1935 the C-E Raymond Bowl Mill came into the steam-power field with design and operating advantages that revolutionized previous concepts of coal pulverization. It had a wide capacity range. It handled wet coal with great facility. It was rugged, accessible and easily maintained. The mill ran quietly and power consumption was low. In consequence, the Bowl Mill won immediate and widespread acceptance among plant engineers — more than a million lb pr hr of grinding capacity was ordered within five years.

Today, the Bowl Mill with all of its initial advantages, offers several new improvements, among which the following are of major importance:

❶ Flat-Bottom Bowl — increases the response of the mill to load changes by eliminating any inactive area where coal can remain in the mill; also avoids any tendency of heavy, abrasive material such as pyrites, to accumulate in the bottom of the bowl.

❷ The Whizzer Wheel — a new exhauster wheel design which greatly increases the life of exhauster blades. A shrouded wheel carries heavily constructed "whizzer" blades which bypass a portion of the air-coal mixture directly to the exhauster outlet. In service this has doubled the life of exhauster blades — in some cases more than doubled it.

❸ New, Wear-Resisting Materials — are now being used for exhauster liners and deflectors, resulting in greatly increased life of these parts.

❹ Center Feed — where conditions permit, larger Bowl Mills can now be arranged for center feed which assures a freer flow of coal to the mill and serves to equalize wear on grinding parts.

Thus 1946 finds the C-E Raymond Bowl Mill, after more than 10 years at the top of its field, still adding refinements in design and materials that make it better than ever before.

40% of all Bowl Mills purchased to date are *Repeat* orders

C-E

A-977

n ENGINEERING

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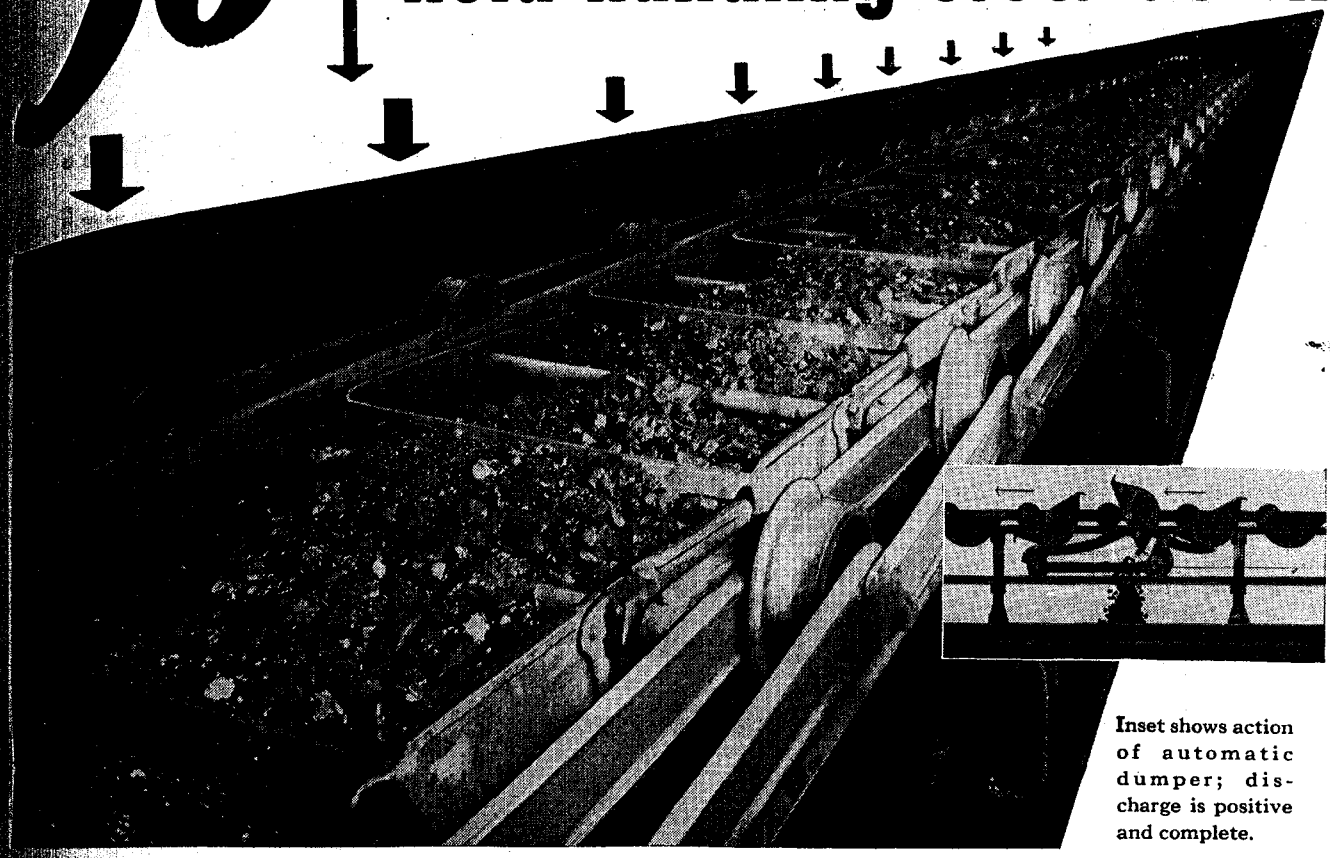
IR HEATERS

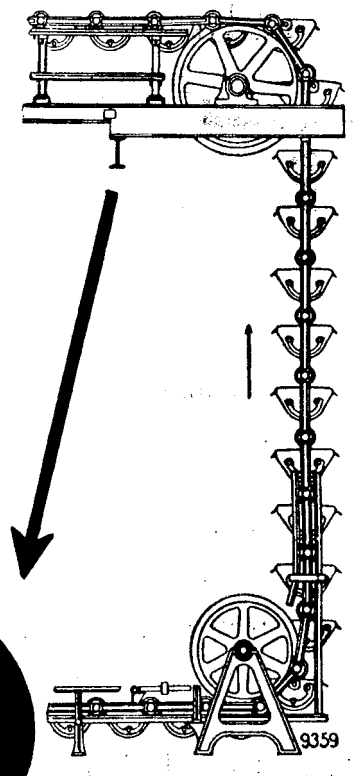
50 miles of PECK CARRIER hold handling costs down



Inset shows action of automatic dumper; discharge is positive and complete.

● In its field, the Peck overlapping, pivoted-bucket carrier offers the lowest cost and most dependable type of conveying . . . proved by more than fifty miles of installations handling coal, ashes and other materials. Many Peck carrier units have been in continuous use twenty years and longer, attesting to the dependability, long life and economy of this equipment.

Since the buckets at all times maintain their carrying position by gravity, a single carrier can transport coal or ashes horizontally, vertically and again horizontally, or on any desired path. The material is *carried* in buckets, supported by rollers of large diameter in connection with two strands of specially constructed rolling chain; therefore friction and power requirements are reduced to a minimum. The material can be discharged at a number of points, merely by pre-setting the dumper which is used for engaging the cams on both sides of buckets. Each bucket rights itself to normal carrying position, and the dumping will continue automatically until moved to a new location. Can be used in cramped space. Standardization of individual units and assemblies assures interchangeability and makes possible combinations practically limitless. For details write for Book No. 1720.



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Atlanta Plant, 1116 Murphy Ave., S.W.; Dallas 1 Plant, 500 Latimer St.; New Orleans 13, Baltimore 1, Houston 2, Washington 5, D. C.

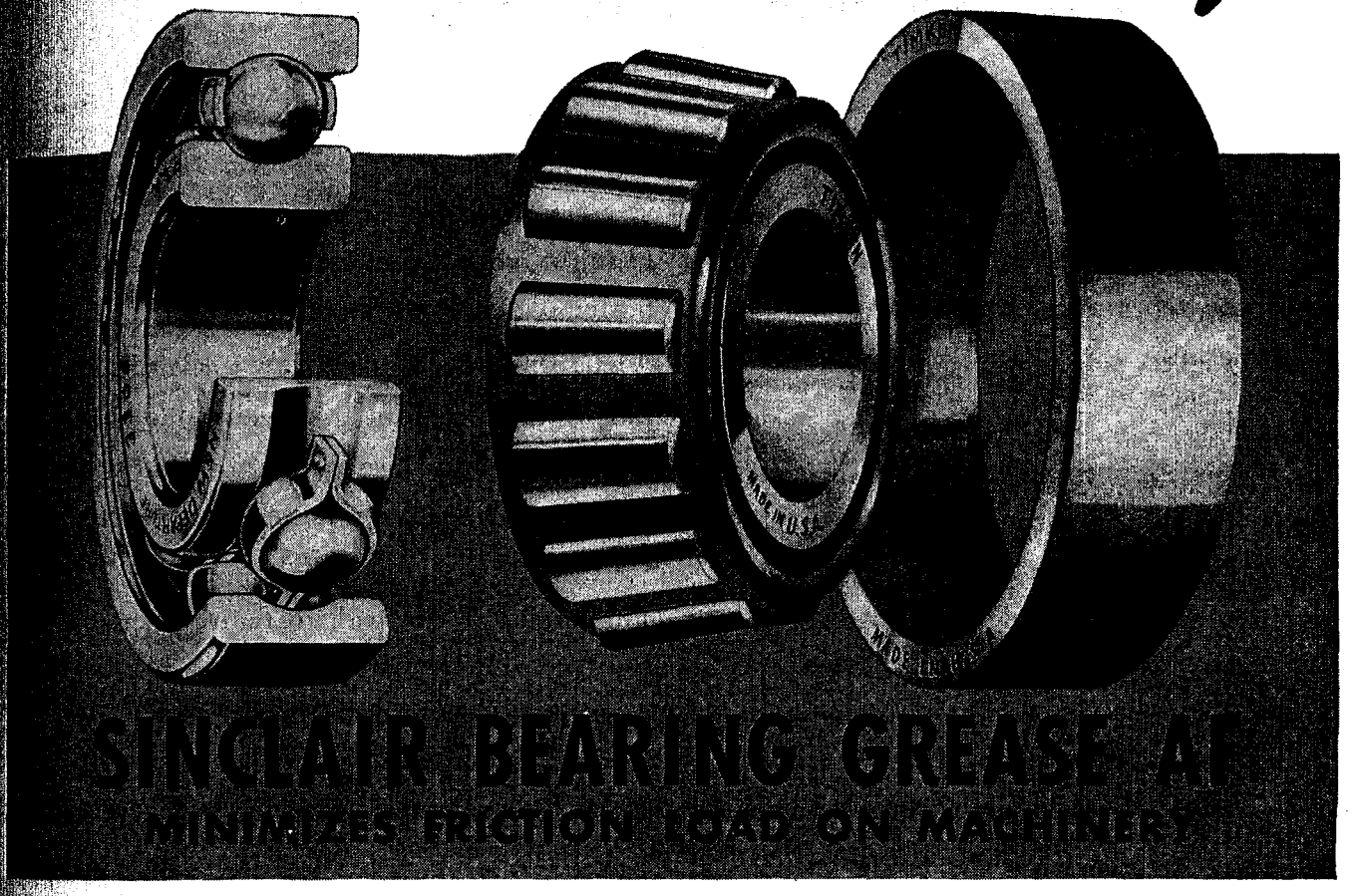
10,262A

LINK-BELT

THE SYMBOL OF QUALITY — LINK-BELT COMPANY

COAL AND ASHES HANDLING EQUIPMENT

Anti-Friction Greases FOR Anti-Friction Bearings



Anti-friction bearings not only act to minimize friction load on machinery; they serve long periods without lubrication and maintenance attention . . . *if the correct lubricant is used.*

For maximum serviceability of bearing and lubricant, special anti-friction bearing greases are required. Such a grease must be smooth...must keep a film of lubricant on balls or rollers and races... must not bleed or separate...must not thin out nor thicken in use.

Highly developed manufacturing techniques and high quality oils of correct body are used in making Sinclair BEARING GREASE AF. All ingredients are carefully selected and controlled to produce a lubricant of long endurance and stability through extended periods of continuous operation. Ask our engineers for specific advice.

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

Here's what Hall Clients get:

1. Thorough study of all factors concerning water involved in producing steam.
Boiler temperatures, pressures and ratings, boiler design, and other factors must be taken into consideration—not merely the constituents of the feed water.

2. Procedure for the proper treatment of boiler water.
A definite program of treatment to maintain the required chemical equilibria, plus instruction for frequency of blowdown and other matters related to proper functioning of the boiler.

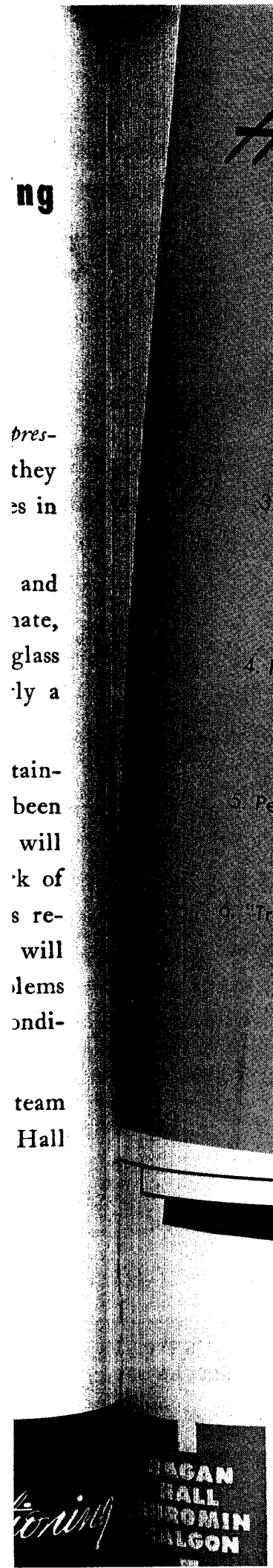
3. Instruction of designated employees in making of essential control tests.
When proper conditions have been established, they must be maintained, in spite of variations in feed water and changes in operating conditions. Any boiler operator can, after instruction, follow the simple test routine developed by Hall chemists.

4. Periodic check up by Hall service engineers.
Experience in hundreds of plants is brought to your plant by these men, and often enables them to detect conditions that might otherwise be overlooked.

5. Periodic checking of samples by Hall Laboratories.
This is your assurance that testing at the plant is being carried out according to instructions.

6. "Trouble shooting" as problems arise.
If trouble does occur, Hall engineers are prepared to trace it to its source, and give all possible help in correcting it.

PLUS the assurance that you not only have the most effective system of boiler water conditioning yet devised, but also that new developments in this field will be available to you as soon as their value has been established under actual operating conditions.



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...stations and industrial power plants of to-morrow, Crane has a lot to offer. Now, ...re planning to rebuild or expand, count ...complete Crane line to help speed and sim-...e step of piping procedures—from design ...on to maintenance.

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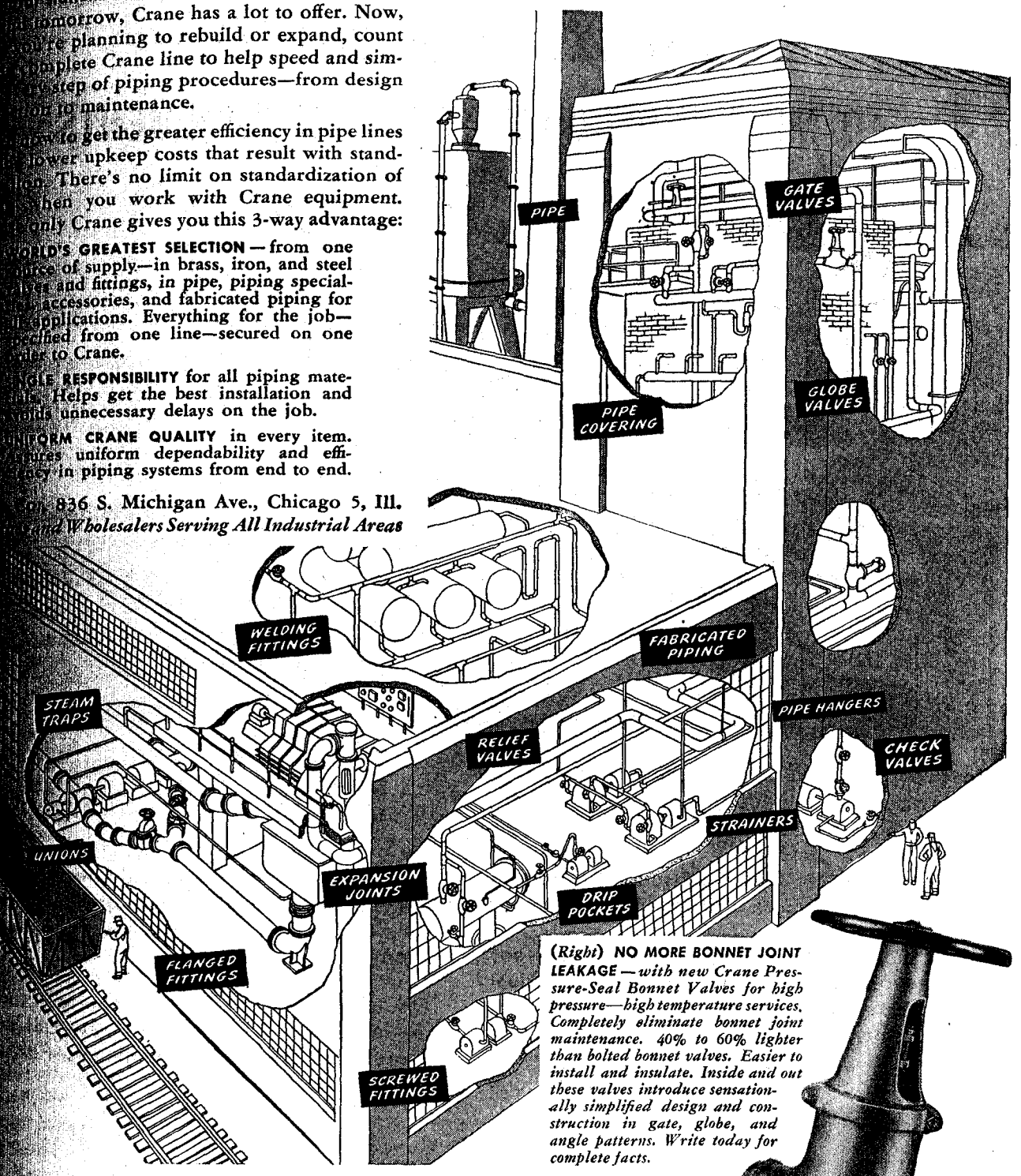

(*Right*) **NO MORE BONNET JOINT LEAKAGE** — *with new Crane Pressure-Seal Bonnet Valves for high pressure—high temperature services. Completely eliminate bonnet joint maintenance. 40% to 60% lighter than bolted bonnet valves. Easier to install and insulate. Inside and out these valves introduce sensationally simplified design and construction in gate, globe, and angle patterns. Write today for complete facts.*

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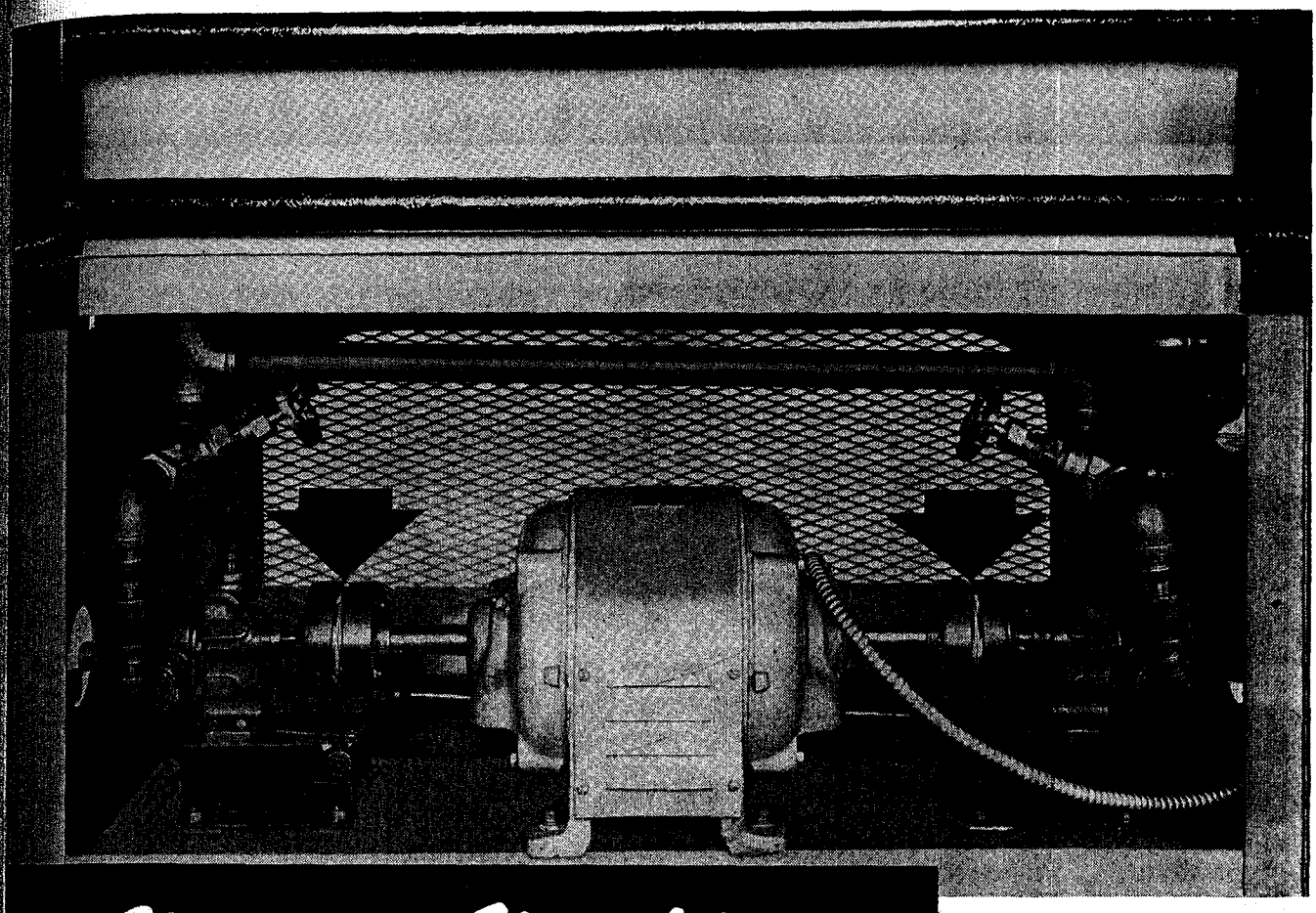
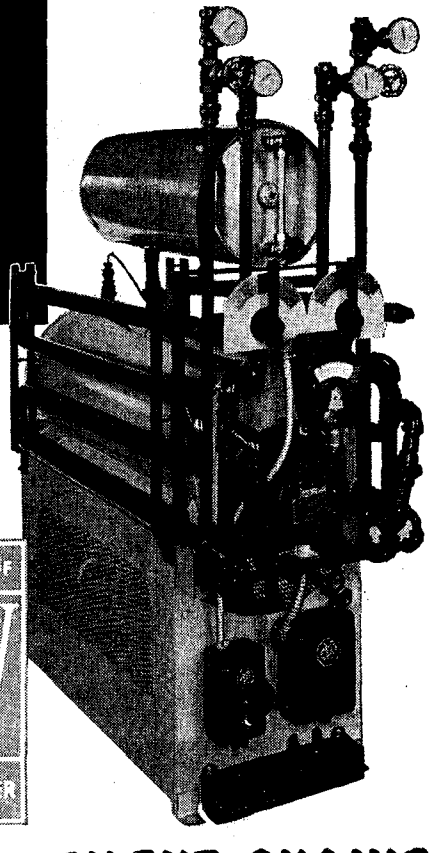
FOR EVERY PIPING SYSTEM



Modern Machines Deserve MORFLEX Couplings



John Royle & Sons, manufacturers of extrusion equipment, use Morflex couplings in the power drives of their temperature control units, which handle extruding temperatures of 90° to 500°.

Morflex couplings require no lubrication, are unaffected by gas, oil, dirt or weather. The exclusive Morse-designed Neoprene biscuit cushions shock, isolates vibration and uneven impulses, *prolonging machinery life.* MORSE CHAIN COMPANY—Ithaca, N.Y.—Detroit 8, Mich.

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MORSE ROLLER and SILENT CHAINS and COUPLINGS

THE HIGH PRESSURE PACKING WITH THE LOW MAINTENANCE COST

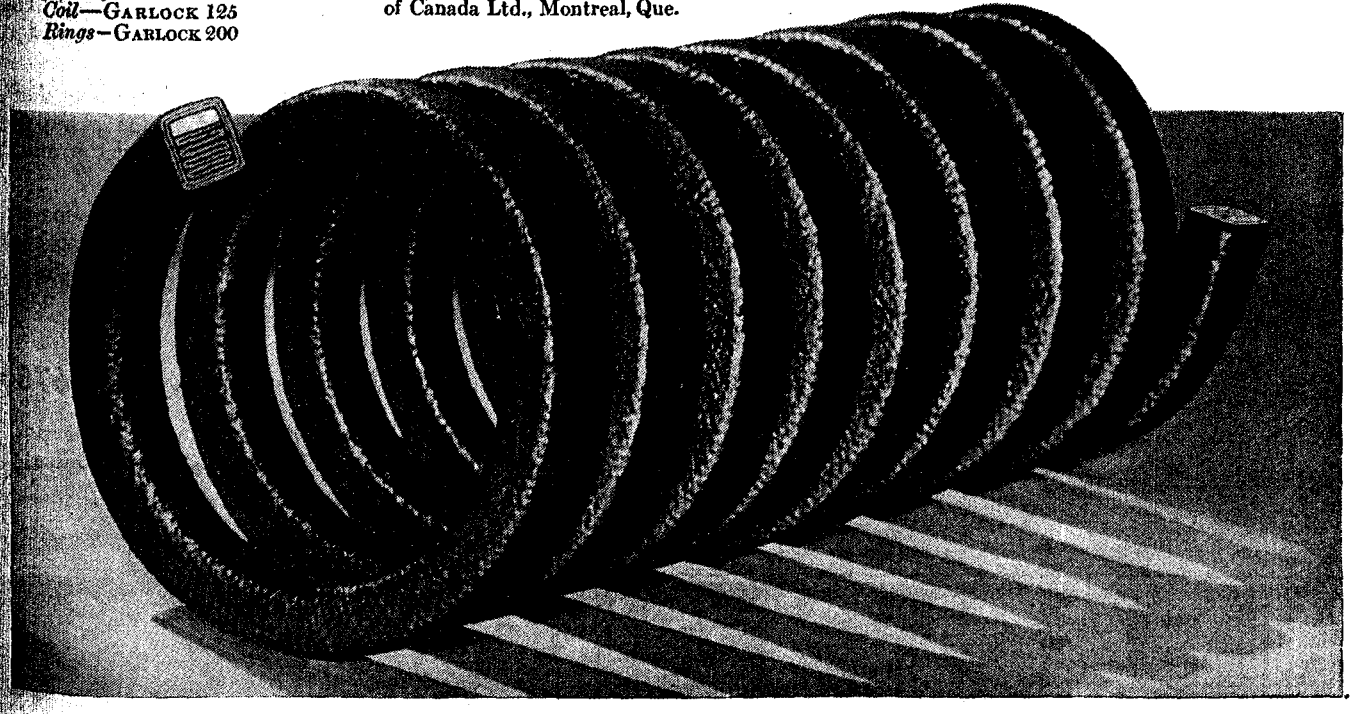
GARLOCK 150

Low in maintenance cost because it gives such *long, dependable* service. Costly shutdowns for frequent repacking are avoided. Man hours and machine hours are saved. Use GARLOCK 150 on piston rods of engines, pumps, compressors, etc., against steam pressures up to 300 lbs.

The Garlock Packing Company, Palmyra, New York

In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

GARLOCK 150 *Spiral packing, illustrated. Coil*—GARLOCK 125 *Rings*—GARLOCK 200



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Yes, such savings are possible. An A.T.C. Specialist will show you the record—give you proof that Automatic Fork Trucks bring business real profits . . . the dollar profits that 55% material handling savings represent.

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ELECTRIC TRUCKS
Lighten LIFE'S LOADS

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Please mail me, without cost or obligation, complete facts about AUTOMATIC FORK TRUCKS.
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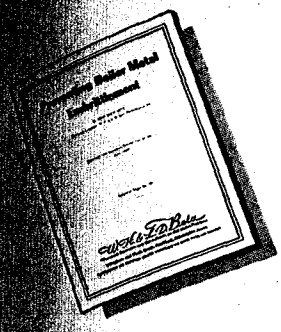
BETZ *Boiler Water Conditioning*

IS A CONTINUOUS SERVICE



Efficient operation of any steam plant calls for properly controlled combustion, well-maintained auxiliaries and low maintenance. High on the list of important factors that affect efficiency is a complete—and *continuous*—program of boiler water conditioning. Such a service is provided by W. H. & L. D. Betz.

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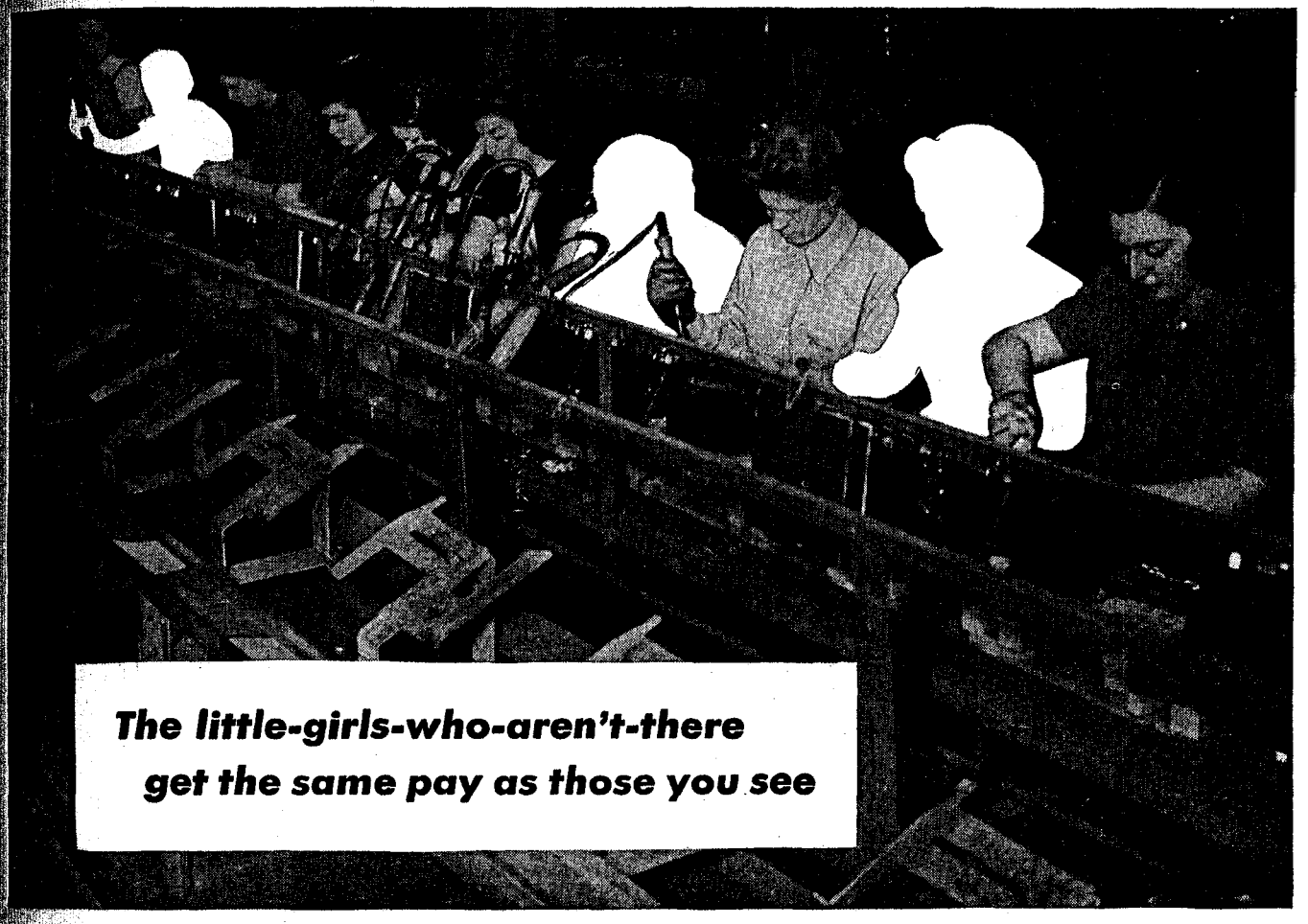

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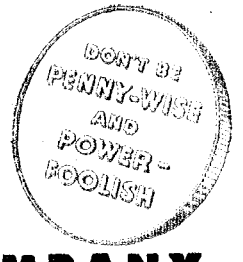

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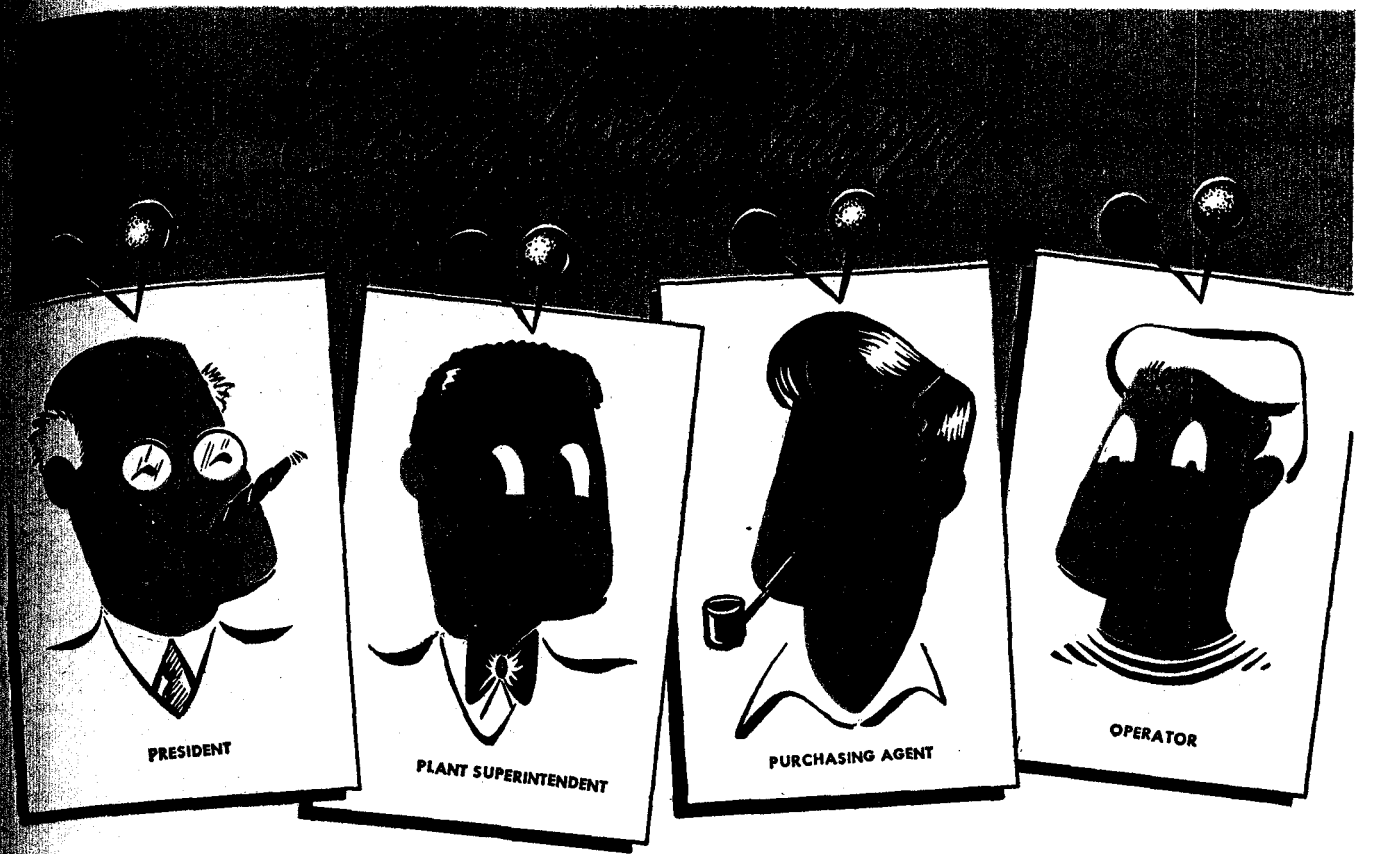

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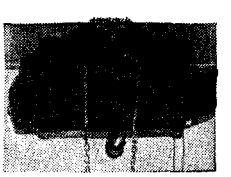

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Timely Comments

Inflation Avoidable

THE obvious defense against inflation is increased production. And to get production workers must go to work; being on the payroll is not sufficient. Some will say that materials constitute the limiting factor, but in a land of ample resources, availability of materials depends on the combined efforts of labor and management—no work, no materials. For example, fabricators can't work because there is no steel. But there could be steel if miners were mining, if scrap yards were providing scrap, if smelters were smelting, if rollers were rolling. Finding the cause and effecting a cure is a job for unions and management. They are not solely interested in their own plants. They are dependent on other workers, other management.

Goods a-plenty will hold prices in line, but even assuming the nation is ready to go to work, we will not get goods a-plenty in a day. There will be an appreciable interim period. And during that period prices will rise, and there is no way to completely prohibit the rise. Complete and perfect price controls on both labor and commodities would theoretically prevent it. But who believes we could inaugurate and enforce complete and perfect controls? Feeble efforts, anything short of perfect, would only result in defeating the goal of quickly attaining goods a-plenty production.

During the interim period we must depend largely on forbearance. Manufacturers must resist the temptation to raise prices and labor must resist temptation to make unreasonable demands.

The tools for controlling inflation are in the hands of the people, not government. And, as usual, the basic desires of management and labor are the same, but cooperative effort toward gaining these desires is lacking.

Army Scientists

BOTH the Army and the Navy have been criticized by thoughtful scientists for a tendency to underestimate the revolutionary aspect of new weapons, including the atomic bomb. Many high officers in the Army have been heard to say that even in the next war it will be the infantry that really does the fighting and the winning. An even greater number of admirals have promised that the Navy will need only a few changes in design to withstand atomic weapons and that the fleet, in future wars, will be as valuable as ever.

The Army and the Navy are not alone in this "thinking in the past." Many of the people generally do not seem to realize that, at most, a few thousand, well-guided, atomic rockets could reduce any industrial nation to a state where further effective resistance would be impossible.

However, this truth seems to be gradually dawning on the Army, at least. General Eisenhower has announced a new policy for War Department research and development. It is designed to apply the nation's civilian scientific resources to the solution of military problems.

At the moment, General Aurand, who is head of this division of the War Department, is bringing into this division, on an annual rotation basis, a group of top-flight engineers and scientists recruited from the laboratories of our educational institutions, foundations, and industries. They will assist him in the same manner as military personnel assigned to the division.

This "drafting" of scientists and engineers is much more sensible, so far as security of the nation is concerned, than the drafting of eighteen-year-olds for general inductee training. We do, of course, need a sizable army for occupation and policing in Europe and Asia, but it is the application of scientific developments rather than the infantry that will win the next war, if there must be one. Wise diplomacy and world federation could eliminate the necessity of using either scientists or youth for military purposes, but it seems that, so far, nations, if not the people in them, demand home rule.

Fewer State Barriers

LOUISIANA, whose legislature has recently passed a number of laws to encourage the establishment of industry within the state, has made permanent the liberalized war-time maximum weight for motor freight vehicles. Before the war, heavy motor freight vehicles were forced to stop at almost very state line for weighing and inspection to see that their weight was not greater than allowed by state laws. To speed highway motor freight, maximum weights were liberalized for the duration. In making permanent these liberalized war-time maximum weights for motor freight vehicles, Louisiana has taken a big step toward breaking down state barriers and expanding the open-door policy of reciprocity.

Tennessee, Virginia, and North Carolina, among others, have improved their size and weight limits within recent months. The way to build business is to help, not hinder, motor carriers. More states could adopt the same attitude with profit to themselves.

Industry Speaks

Paul G. Hoffman

President, Studebaker Corporation,

Speaking before the Fall Meeting of A.S.M.E. in Boston, where he received the Gantt Memorial Medal for "distinguished achievement in industrial management as a service to the community," said in part:

"IT IS relatively simple to provide jobs for all if the citizens of a state are willing to give up their freedoms, and if they are willing to make job security the one objective of their existence."

Mr. Hoffman then described the worker's goal, in addition to job security, as being five fold, including:

1. Employment of his own choosing, that is well-paid, productive, worthwhile and satisfying.

2. Opportunity to grow and develop materially, intellectually, socially and spiritually.

3. Political freedom, the opportunity for self-government through chosen representatives, and the attendant individual liberties of person and of property, freedom of speech, freedom of press, freedom of worship and freedom of peaceful assembly.

4. Opportunity to live in a progressive economy that affords an abundance of things for the worker's material welfare, and under a government that promotes these goals for all the people and their children.

5. Opportunity to live in a world of peace — at home and abroad.

"All these objectives can be attained simultaneously and continuously only by maintaining our American system of capitalism. Under that system, and that system alone, is it possible to carry on the economic activities of a nation without infringing upon the liberties of the people or their rights to representative government.

"The best proof of this statement is attested by the economic and political progress made by the United States since its founding. Not only have our free citizens produced more goods and services per capita and distributed more material benefits to more people than have other men under any other system in any period of history, but in addition, an environment has prevailed that has brought about the fullest flowering of political and individual freedom so far known to mankind.

"The one best way to insure the maintenance of our capitalistic system is to adopt measures that will bring about an even better functioning of the system in the future than has prevailed heretofore. If we take full advantage of the potentialities of our capitalistic system, and if we remain at peace, the real income of most of our people can be doubled within the next 25 years and we also can realize largely the age-old dream of abolishing poverty.

"But before we can discuss intelligently measures for improving the functioning of our economy we had best try to find out what makes it tick, what its strength is, and its weakness. The great strength of our system lies in its dynamic quality and its major weakness is its tendency toward instability. On the basis of this analysis our course of action is indicated clearly. We should try to find measures which will enhance its dynamism and moderate its tendency toward immoderate fluctuations.

"Perhaps mine is the voice of an optimist, but I believe that if we do these things, we shall see during the next 25 years an unparalleled progress toward achieving conditions in this land of ours which will mean not only equality of opportunity for all, but also certainty of opportunity for every man, woman and child to grow and develop materially, intellectually and spiritually. Therein will lie the strength, the power and the grandeur of the America of tomorrow."

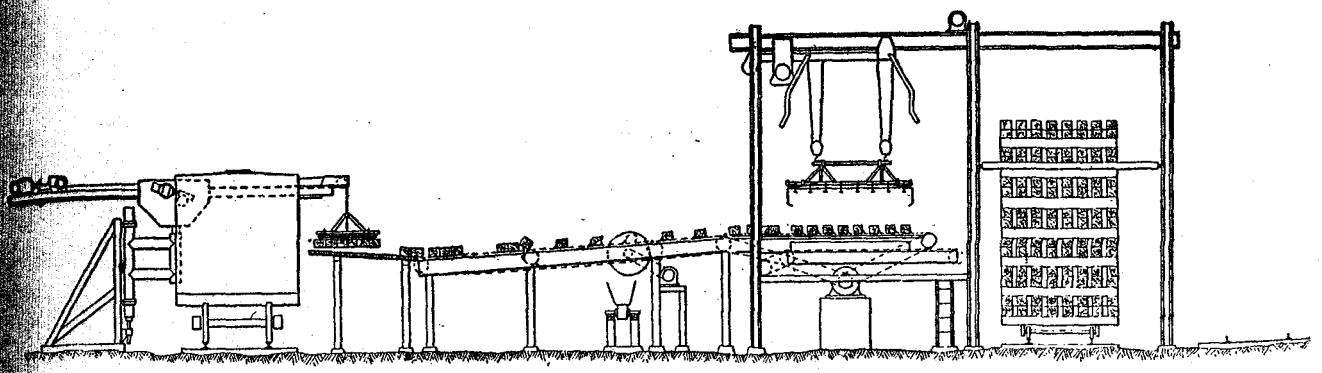


FIG. 1. DIAGRAM OF THE BOX CAR UNLOADER AND TIE STACKING EQUIPMENT.

air circulation between individual ties and layers.

4. A grapple designed to pick up the complete layer along with the stringer tie.

5. A straddle type truck of proper size and capacity to remove such a completed rick from the tram car and deposit it in proper position on the tie seasoning yard.

CAR UNLOADER

The car unloading device, while primarily designed for the removal of cross ties from box cars, might readily be adapted to the handling of other heavy objects. It is mounted on a three-legged frame, securely bolted to a concrete foundation. The boom, which can be extended into either end of the car, is pivotally mounted on this frame. In actual operation, the box car is placed with the car door centered opposite the unloader. After the boom is swung into the car door, anchor chains are fastened to hold the unloader firmly in the desired position.

An electric motor mounted on the side of the machine supplies power for moving the boom horizontally back and forward. Power for raising and lowering the load is provided by a motor and cable drum mounted on the back end of the boom.

A grapple designed to pick up five or six ties is attached to the end of the lift cable. The boom is projected into the car, turning either right or left as desired, and the grapple lowered on a "lift" of ties. As the grapple is raised, the hooks are freed by hand so they can drop into place and engage the ends of the ties. When the ties are raised clear, the boom is racked back toward the machine base. Then, as a workman guides one end of the ties out the far door of the car, the boom is racked forward. When the ties are outside the car, they are revolved through 90 degrees and lowered to a chain conveyor. As the ties come to rest on the conveyor, the grapple automatically releases the ties. The boom is then racked back into the car and the operation is repeated.

After the first forty or fifty ties are removed, work proceeds at the rate of five or six ties per minute. The time required to change over to another car varies from seven to ten minutes.

CHAIN CONVEYOR

As the ties move along the chain conveyor, they are engaged by guides that arrange the ties in position to be cut to the desired length. The cutting is controlled by a cam arrangement so integrated with lugs on the chain that the ties are moved past the saw one at a time, about 30" apart.

Just beyond the saw a space of seven or eight feet is provided where "anti-checking" irons may be applied. The application of these "anti-checking" irons at a central point makes possible the use of air hammers, whereas, when the job is done on the seasoning yard, only manual labor can be used.

SPACING TABLE

Arranging the ties so that proper air circulation will be obtained

SPECIAL HANDLING EQUIPMENT

1. **A machine to remove cross ties from cars, and place them on a conveyor immediately adjacent to the car.**
2. **A chain conveyor along which the ties move as they are cut to length. Space has also been provided to mechanically apply "anti-checking" irons.**
3. **A spacing table where the ties are assembled in layers, each properly spaced on stringer ties to provide air circulation between individual ties and layers.**
4. **A grapple designed to pick up the complete layer along with the stringer tie.**
5. **A straddle type truck of proper size and capacity to remove such a completed rick from the tram car and deposit it in proper position on the tie seasoning yard.**

EDITORS NOTE:

The principal features involved in the handling process here described were developed by the author and his associates in cooperation with materials handling equipment manufacturers, and are covered by patents.

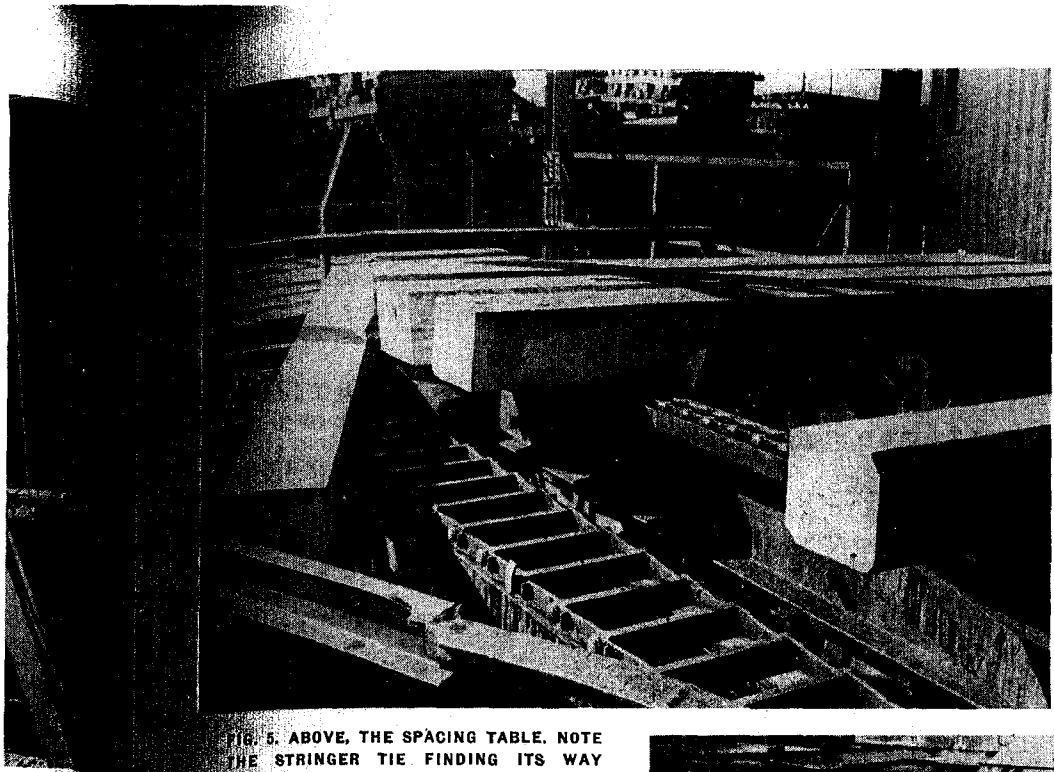


FIG. 5. ABOVE, THE SPACING TABLE. NOTE THE STRINGER TIE FINDING ITS WAY ALONG THE GUIDE BEING PROPELLED BY THE CHAIN SHOWN IN THE FOREGROUND. THREE TIES HAVE BEEN ASSEMBLED ON THE SPACING TABLE WITH THE SPACER IN POSITION TO RECEIVE THE FOURTH TIE.

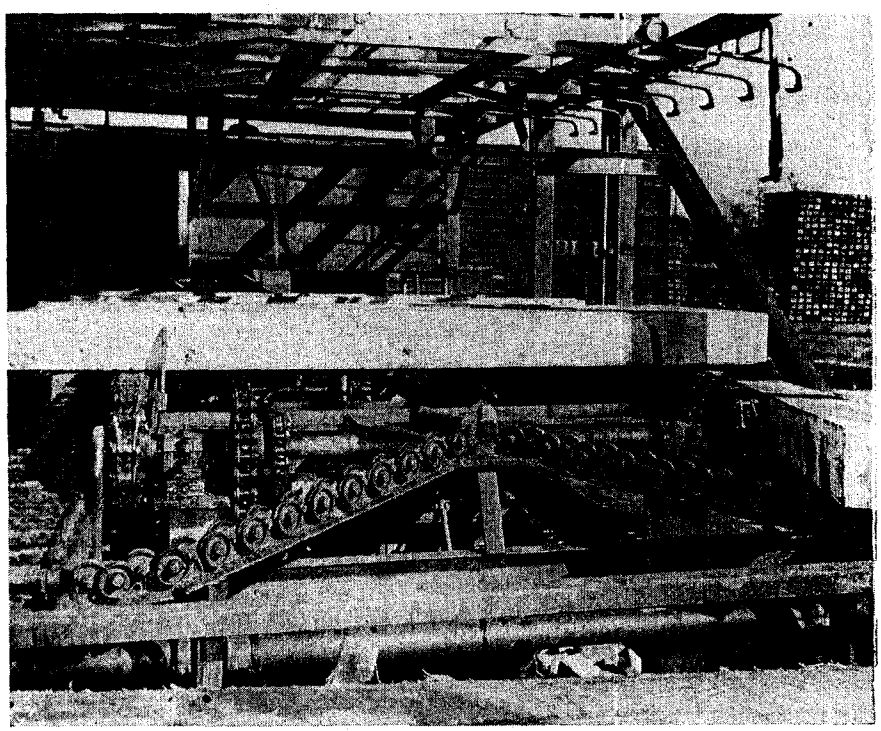


FIG. 6. RIGHT, THE SPACING TABLE WITH PARTICULAR EMPHASIS ON SOME OF THE MECHANISM FOR PLACING STRINGER TIES. THE STRINGER TIE ON THE EXTREME RIGHT IS BEING PULLED SLOWLY INTO POSITION UNDER THE LAYER OF TIES. AS ONE END OF THIS STRINGER TIE DESCENDS THE GRAVITY ROLLERS SHOWN IN THE FOREGROUND, A CHAIN ENGAGES AND CONVEYS THE STRINGER TIE. THIS CHAIN IS SIMILAR TO THE ONE SHOWN AT THE EXTREME LEFT. THE GRAPPLE SHOWN ABOVE IS READY TO DESCEND UPON THE ASSEMBLY OF TIES AS SOON AS IT IS COMPLETE.

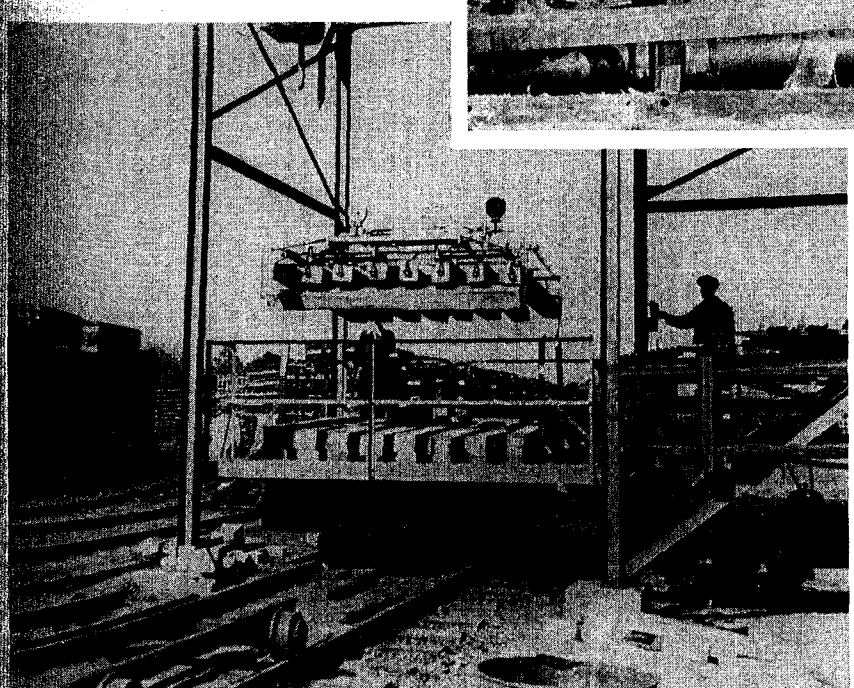


FIG. 7. LEFT, A VIEW OF AN ASSEMBLY OF TIES READY TO BE DEPOSITED ON A RICK. AT THE LOWER LEFT IS AN EMPTY TRAM CAR.

will be placed in the same seasoning stack.

When a suitable number of loaded trams have been assembled, they are moved to the seasoning yard by a small gasoline locomotive in trains of from 4 to 12 ricks of 127 ties each.

CARRIER TRUCK

When the tram train arrives at the proper point in the drying yard, it is then necessary to remove the ricks from the trams and deposit them in rows perpendicular to the track. A straddle type carrier truck is utilized at this time.

The carrier truck has a clearance 9′ wide and about 15′ high. When a rick of ties has been placed on the railroad track opposite the point where it is to be placed for seasoning, the carrier truck (moving perpendicular to the track) mounts the railroad track astride the load, picks up the rick of ties high enough to clear the tram car, and then backs off the railroad track and proceeds to the desired point where the ties are deposited on creosoted stacking

Cost Data

Operation	Green ties, cars to storage	Dry ties, storage to A&B Mach.
Tie carrier piece rates	3.8c	3.0c
New method	23 ties per man hr. = 3.0c	78 ties per man hr. = 1.0c

ing the period this test was made, and it was necessary to lay treads on the ground to support the carrier truck. The time consumed for this work is included in the truck operating time.

There are many items entering into the total cost of handling cross ties. The equipment discussed entirely replaces manual carrying of ties. A comparison of costs, reduced to its simplest form, is tabulated herewith.

The cost of gasoline, oil, and electricity is almost negligible, amounting to approximately five cents per tie on each green and dry tie handled. It is too early to predict maintenance charges, but indications are that they will be small. These charges, along with interest and reserves for depreciation should approximate five cents per tie on 500,000 green and dry ties handled per year.

There are a number of intangible but nevertheless real advantages in operation under the new system. It has been found that inclement weather causes practically no interruption of daily operation whereas this factor caused considerable lost time when the work was done by tie carriers.

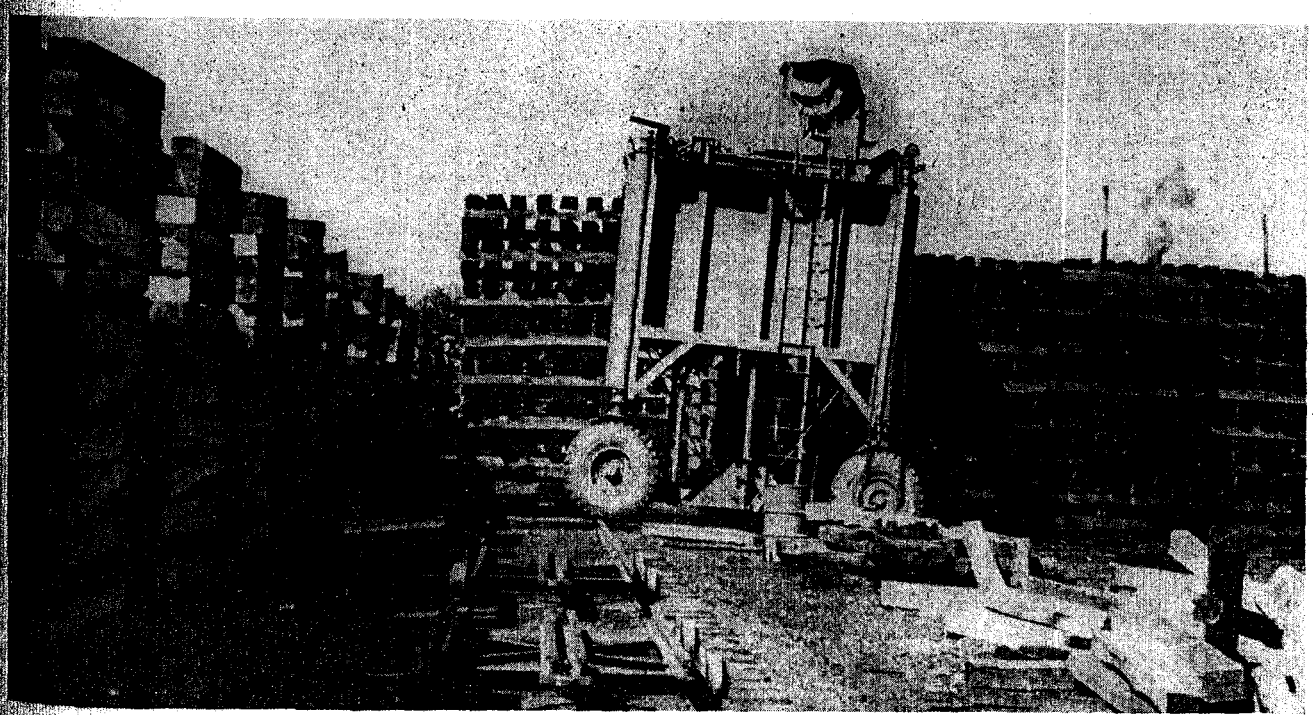
It is too early to predict what might be expected in the way of accidents. It is significant, however, that during the first eight months' operation, when the men had to familiarize themselves with the equipment, only two loss-of-time accidents occurred, neither serious. We have no records to compare with this, but believe the record, using machines, will be fully as good as with manual labor. Furthermore, a number of tie handlers developed bad sacroilliacs, injured shoulders, and other ailments due to the very heavy work previously involved.

Since it is now practicable to carry ties much greater distances from the railroad track than with the old method, it follows that tie yards can now be laid out with fewer tracks. In our case, we have already removed one track, making room for storage of an additional 40,000 cross ties.

The important thing, however, is that the job of carrying cross-ties is so laborious that workers are almost unobtainable, and that this job is now being done by the use of mechanical equipment in such a way that ordinary workmen can be quickly trained to do an acceptable job.

It should be understood that this materials handling equipment, capable of handling such heavy loads of cross-ties and bringing about the sizeable saving shown, was developed through the co-operative efforts of the company's management, engineering staff, labor, and materials handling equipment manufacturers. Everyone interested in these problems added something to the solution. A number of ideas coming directly from the yard laborers are included in the design of various pieces of equipment.

FIG. 10. THE ROSS CARRIER DESCENDS FROM THE RAILROAD TRACK AFTER PLACING A RICK OF DRY TIES (127) ON A RAILROAD TRANSFER CAR. NOTE THE MIRROR THAT IS FASTENED TO THE TOP OF THE CAR TO ASSIST THE OPERATOR.



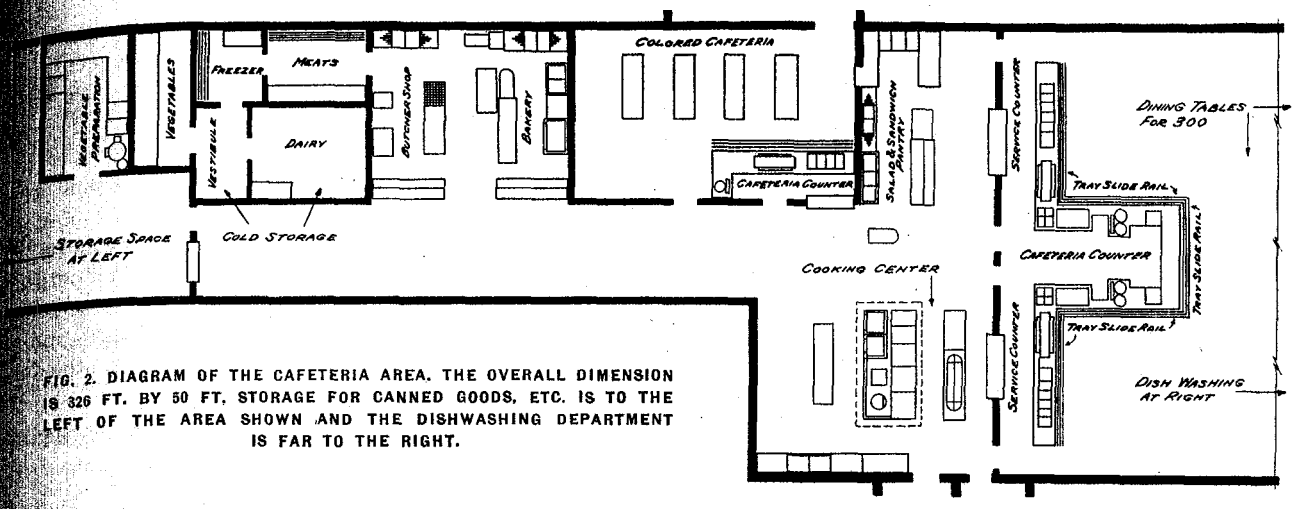


FIG. 2. DIAGRAM OF THE CAFETERIA AREA. THE OVERALL DIMENSION IS 326 FT. BY 50 FT. STORAGE FOR CANNED GOODS, ETC. IS TO THE LEFT OF THE AREA SHOWN AND THE DISHWASHING DEPARTMENT IS FAR TO THE RIGHT.

mphasis placed on such programs, ar agencies gave high priorities for materials needed for these improvements even during the most urgent stages of our conflict. The Pepperell Cafeteria, presently to be described, was allocated the needed materials right when the war demands were greatest.

New Cafeteria

To best meet plant needs, a cafeteria has to be located at a central, convenient point in the mill so that employees can reach it quickly and have ample time for a leisurely lunch without overstaying the allotted time. Pepperell's ample new cafeteria located on the third floor of the new dye house was opened to employees on March 4, 1946, and has been serving something like 1800 hot meals a day ever since.

There is no more eating in the work areas or "getting someone to watch the machine while you grab a bite". Machinery is shut down by groups on prearranged schedule so that each employee's lunch period is free of plant duties. Thus the thirty-minute lunch period is one of relaxation and rest. That arrangement, alone, eliminates considerable indigestion.

The plant operates on normal eight-hour work shifts, and the machine shut-downs are so scheduled that the cafeteria's comfortable seating capacity of 300 people is never exceeded. For example, 900 employees of the day shift eat between 10:30 A.M. and 12:30 P.M., but they do not all shut their machine down at the same time. About 100 employees leave their work places each ten minutes—so that in about two hours 900 people have been fed (each having thirty minutes) without exceeding the 300 limit which is set by seating capacity.

The three serving periods are: 10:30 A.M. to 12:30 P.M., 5:00 P.M. to 7:00 P.M., and 2:00 A.M. to 3:00 A.M.; but the kitchen operates continuously. That arrangement obviates necessity for storing cooked food, thereby giving each customer a freshly cooked meal. In fact, most of the foods are cooked in relatively small batches as required, and all foods, including breads and pastries, are prepared in the kitchen—ice cream being the only exception.

Equipment

As will be seen from the accompanying plan, the space allocated to the cafeteria as a whole is liberal. In fact, the storage, preparation, cooking, and service space looks all out of proportion to the eating room, but when consideration is given to the ten-minute scheduling previously mentioned, the reason for this becomes clear.

Even the most remote corners of storage spaces show evidence of careful design and construction, with especial emphasis on sanitation and minimum maintenance. Walls are of ceramic tile — red wainscot and cream above. Floors in the kitchen are ceramic tile and in the dining room asphalt tile is used. Stainless steel is used extensively — sinks, serving counters, work tables, etc.

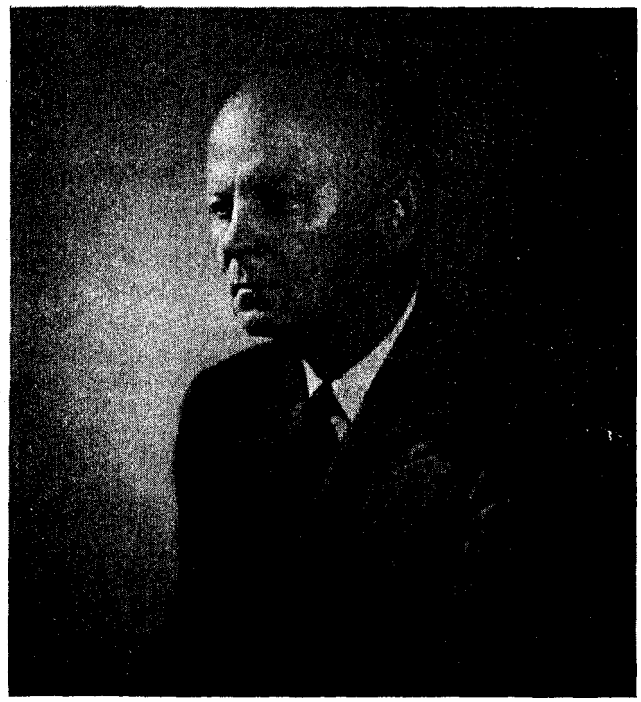
Results

Do the employees like it? Well, they eat there, and the expressions on their faces indicate enjoyment. Some of the girls complain of difficulty with figure control, but

FIG. 3. A GENERAL VIEW OF THE MAIN COOKING CENTER.

Profits in Plant Layout —

An article in eight sections complete in this issue, discussing every phase of wise plant layout.



(c) Bachrach

By Gregory M. Dexter
Consulting Industrial Engineer
on
Business Management Problems

Section I

Consider The Product

NUMEROUS important factors in plant layout are often overlooked. An executive will argue that a study of plant layout is not worth while, that his plant handles such varied work that no one best layout is possible, or that no change is economically possible. A summary of important factors involved, however, should show that there are few plants where a careful study of layout will not pay big profits.

Production vs. Sales

Approximate curves of production and monthly sales by units of products made for a typical year should be compared. Ascertain the normal working day and week. Approximate estimates of storage space required for raw material, purchased parts, and completed equipment or material can be made from the curves. Possible storage of finished products near sales centers as a means of smoothing production, reducing factory storage, and improving service to customers should not be overlooked. Uniform production is an important way of reducing cost of labor and equipment. It permits good labor relations.

Provision for increased production in five or ten years, for new products, new buildings, and new machinery should be made. Exact decisions are not possible on these points but qualitative analysis of them will usually give valuable guidance.

Design of Product

Eliminate poor selling items as every unnecessary product complicates the plant layout. Redesign all products for as much standardization as possible using standard bolts, screws, chemicals, and other components that may be bought more cheaply from large manufacturers. Redesign for increased sales appeal through better packaging. Use welded shapes instead of castings or use plastic parts instead of metal, with an eye to lower costs through such changes. Change processing methods to obtain better quality, particularly if obtainable at little or no increase in cost. The best plant layout is not

should not be overlooked. Provision for them is sometimes possible with little increase in capital cost of new buildings. Records of the local building department or of neighboring plants are often helpful in the design of building or machinery foundations.

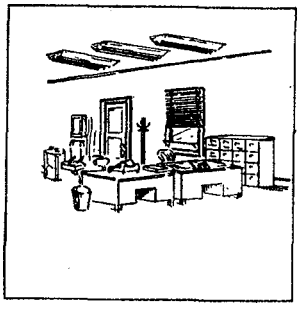
Necessary clearances and height of platforms and canopies for railroad service can be obtained from the local railroad. Tank-car or boat shipments of various liquids or gases such as ammonia, sulfur dioxide, gasoline, fuel oil, caustic soda, molasses, and similar products involve varying requirements as to storage, piping, earth dikes, and similar safety measures that are readily determined from manufacturers of such commodities, public carriers, and insurance companies.

High chimneys and elevated tanks involve codes for the safety of airplanes. Safety measures inside and outside a plant are covered by requirements of insurance companies and are included in various pamphlets of the National Safety Council, Inc.

Adherence to these codes are the secret of low insurance rates by the Factory Mutuals or by the Factory Insurance Association of the stock fire-insurance companies, and for workmen's compensation.

Section III

Office and Employee Facilities



A STATEMENT of the number of employees required in the general offices and their desired location will determine whether a separate office building is needed. Overhead costs are frequently reduced and a smoother-running organization obtained if the general offices and the plant are located near each other. When the two are separated by miles, the paper work necessary is increased. Make a flow-line chart for the general offices and for the central mail room, as described later for the plant.

Visitors to the plant are usually most interested in contact with the sales, engineering, purchasing, and manufacturing departments. Their location on the ground floor of the plant or office building is therefore an advantage. The sequence is logical as orders coming into the plant usually do so from sales to engineering, where they are broken into material to be purchased from outsiders and material to be produced by the manufacturing department. Financial or accounting and general executive departments can be well placed on a floor above. The space required in the offices will vary from 50 to 100 sq ft or more per person, depending on extent of executive staff and company policies in allotment of working space. Provision should be made for the additional space that may be needed from any increased governmental control.

The traffic department for incoming and outgoing shipments is advantageously made a part of the purchasing department. The latter should have room for a sample cabinet and catalog file.

The library should be adjacent to the engineering department.

Manufacturing Dept.

The manufacturing department should have space for a laboratory, visiting inspectors, night watchmen and guards, janitors' closets, production control, costs, men's smoking room, women's rest room, and a meeting room for foremen. Ample wall space in production control for large charts is desirable.

Rest Rooms

A rest room for women should have couches, easy chairs, high foot-rests that can be used as stools, metal waste-container, toilet-seat sterilizers, full-length mirror, shelves and plenty of hooks in toilets, and mirror and shelf over each wash basin. If the company has no cafeteria, a refrigerator, electric stove, and dinette in the rest room are worth while. Shower baths are appreciated, especially if work is done under hot or dirty conditions.

Reception Room

The vestibule and reception room are often supervised in small plants by the telephone operator, but this has the drawback that visitors while waiting can often pick up confidential data from the operator's conversations. A beautiful front entrance to the factory is necessary and should be made the focal point that first attracts the visitor. The atmosphere of the reception room should be in keeping with the architectural design. A lavatory and private telephone booth for visitors are desirable.

Personnel and Medical

Admission to the personnel and medical departments should be direct in order to avoid confusion with inter-office movement of company employees. The personnel department requires private interview rooms and, in large plants, a comfortable waiting room. The medical department must have facilities for physical and eye examinations as well as first aid. Its location between the personnel department and the manufacturing floor is an advantage.

Filing and Stenographic

A central filing department for the engineering and manufacturing departments in small plants is often justified. The sales and purchasing departments usually do better by controlling their own files. Similar arrangements are desirable on stenographic service. But any central file or stenographic pool should be on the same floor with the departments it serves;

for process layout is based on the grouping of like machines such as lathes, radial drills, etc., and the movement of material back and forth among the various groups. The other type, or product layout, is based on continuous movement in as direct a line as possible from the receiving to the shipping department with machines provided as needed in sequence to perform the various manufacturing steps. Sometimes a combination of the two types of flow can be used to advantage as when various parts are manufactured in different departments and then brought to a conveyor assembly line. A great variety of products will usually require the grouping of like machines.

Machine Location

Aisles should be wide enough for two trucks to pass. Widths of 6 to 14 feet are commonly used. Corners should be curved so trucks may go around them easily. Make sure that any extension of a machine such as a milling-machine table will not interfere with passage in the aisle.

Allow space for hand tools, tool boxes, and for additional equipment to meet the demand for increased production. A study of reasons for idle-time of existing equipment may give clues as to improvements needed in the new layout.

Space will be needed at each machine for four tote boxes or equivalent. One tote box will contain material being processed and another material waiting to be processed. Two more tote boxes will be needed to care for the processed material, as sometimes material is not moved as soon as it is processed. Instead of tote boxes, space might be needed for skid platforms or trucks. The use of skid platforms for the storage of heavy tools or material will eliminate handling and reduce costs.

Further Requirements

Leave space on the floor for the assembly of complicated or heavy machinery. Clearances around each machine should be large enough to permit operators to work comfortably and to handle the longest piece of material coming to them. With steel and lumber, required clearances become great and may be as much as 20 ft. in a woodworking plant. Space for machine repairs may be necessary. Bulky or heavy material may require hand-operated hoists or cranes beside various machines. Overhead travelling cranes may be needed for an entire shop. Floor space should also be set aside where material and tools for various shop orders may be assembled for issuance to operators. This space should be enclosed by wire netting so its contents cannot be used as a source of supply for jobs already in the shop.

Benches and Tables

Benches should be at right angles to a building wall with windows, preferably the north wall. Revolving tables may be used to reduce space needed for assembly operations. Such tables and all assembly tables should be designed with clear space under them so female workers will not snag their stockings. Table tops might well be fitted with fiber board or linoleum in order to avoid chilling operators' arms. Foot rests are sometimes provided. A standard height of about 37 inches should be adopted, depending on work performed.

Machine Operation

By the proper use of tote boxes, skids, conveyors, and similar helps, the picking up and putting down of articles can be avoided. Make sure that operators do not do the work of laborers.

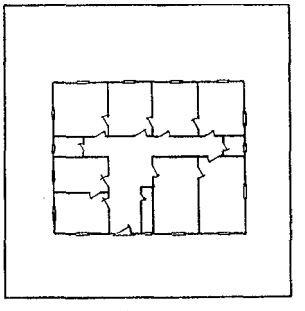
Individual motor drives for machines are usually preferable but machines with small motors may sometimes be advantageously grouped for line-shaft drive.

Consult key operators and foremen as to possible improvements in layout of machines, process charts, and flow lines. They will often have good ideas. Regrouping of machines and changes in sequence or kind of operations should in particular be discussed.

Section V

Locating Departments

TRY to put noisy departments in closed rooms and thus protect the workmen in quieter departments. Shops should be located in reasonable order in relation to each other, such as pattern shop, foundry, machine shop, and welding shop; or wet building, dryer building, pulverizer building, scale house, and warehouse for a starch plant. Pattern shop should be near pattern storage. The engineering department should be near the pattern shop and machine shop. The welding plant should be near the power plant in order to reduce length of power cables. The shop for spray painting, lacquering, or dipping should generally be



between the point of final assembly and the shipping department.

Fireproof vault for storage of duplicates of engineering drawings and of pattern records might well be placed in the engineering department.

Materials Handling

The ideal plant has its receiving department with trackage and roadway at the opposite end of the plant site from the shipping department with its trackage and roadway. Where only one track and roadway are possible, the receiving and shipping departments are side by side. Raw material stores should be near the receiving

...thout the necessity of rehandling from trucks or railroad car. A cut-off and rip saw are the minimum requirement at the lumber rack.

Waste Storage

Provision for storage of waste near shipping department where it can be moved easily by truck or railroad is desirable. Various reclaiming devices such as sieves, briquetters, and filters are available. Some inexpensive care in reclaiming waste will often increase its sales value materially. Collection of waste by conveyors or blowers instead of trucks is sometimes possible.

Tool Room

The equipment needed for a tool room will depend upon the elaborateness of the work to be done. A lathe, milling machine, and grinder are certainly the minimum requirement. A woodworking plant, for example, will need a large amount of special saw-sharpening and cutter equipment. Racks and shelving for tools, dies, and fixtures so they can be easily found, as well as drawing and filing cabinets for the storage of engineering drawings and standard instruction sheets, are obviously necessary. Here, also, doors with spring locks and counters where tools may be issued should be provided.

Maintenance Department

The equipment in the maintenance department should include a lathe; milling machine; pipe-threading machine; cut-off saw; shear; some wood-working tools such as a variety saw, planer, and lathe; spray-painting equipment; ladders; and benches. The exact set-up again will depend on the size of plant and extent of maintenance work contemplated. Several trucks and storage space for them should be provided. Each truck should be completely equipped with the hand tools needed by one trade such as millwright, pipe fitter, and electrician. There is no economy in mechanics chasing back and forth for tools and material needed for a repair job.

The oil truck with tanks to service various machine tools and operating equipment should be stationed here.

Roadways and Parking

The separation of incoming from outgoing traffic on roadways is desirable. Provide the roadways with easy curves and ample width for passing. It should be easy for trucks to back up to loading and unloading platforms. An enclosed shed over such platforms will reduce labor costs in inclement weather. Where trucks have to unload heavy material at a machine shop or foundry, an air lock with two sets of doors will protect workmen in the shops in cold weather.

Parking lots should be well drained and not too big. The driveways in them should be hard surfaced and wide. All parking spaces should be well gravelled and clearly marked. Several parking lots are often desirable in order to reduce the distance employees have to walk between factory and automobile in bad weather. An underground or overhead passage at railroad trackage between parking lots and factory is desirable as a safety measure. Sheds are sometimes provided for the cars of executives but may cause some ill feeling among subordinates.

Garage space for company trucks and automobiles with repair shop and gasoline pumps should be located between or near the shipping and receiving departments.

Entrance to the roadways and parking lots should be past a watchman's booth. Do not forget to heat the booth with electricity or steam. Time clocks are sometimes located there advantageously. A telephone connection from the booth to the central switchboard and, in large plants, a direct connection to the office of the captain of the guards are desirable.

Armed guards and wire fences were necessary during the war but are repugnant to most Americans; insist on results by vigilance of guards coupled with courtesy in order that fences and side arms may be dispensed with. An emergency-alarm connection to police headquarters is to be preferred to the atmosphere of a prison.

Comfort and Beauty

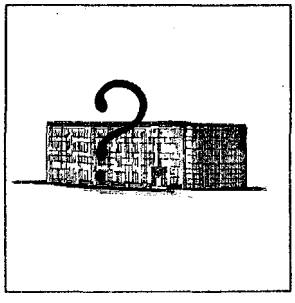
Platforms with covering sheds and windbreaks are desirable where employees have to wait for buses or trolleys. They should be well lighted at night. Covered walks between buildings where traffic is heavy are worth while.

Landscaping necessary to make the factory appear attractive should not be overlooked. It is astonishing what beautiful results can be obtained for a small expenditure by a competent landscape architect. Beauty at a factory has a definitely favorable effect on employees' morale.

Section VII

Other Layout Problems

A PLANT need not be ugly. Lines can be put into the brick or concrete at little or no expense that will carry the eye with them to create an impression of beauty and style. The location of sash



and doors can be such as to add to the impression. Build the plant around the desired layout only after thorough study of it has been completed. Never try to put equipment into a plant the size of

still commands low insurance rates.

Success in getting low costs in manufacturing depends on the same question that scientists use in research, namely "Why?" It should be asked concerning every operation, movement, delay, storage, grouping of machines, lack of machines, type of machine, and other steps involved in the manufacture of each product. The question typifies the inquiring mind.

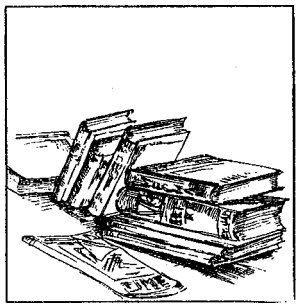
An engineer, however, should not be content with his ability in asking that question. He should learn from machinery salesmen and technical articles what other manufacturers are doing. His presence in the library for hours should be considered in his favor. He will soon learn that there is an astonishing amount of data available to the seeker that will help greatly in the formulation of a program for the rehabilitation or layout of a plant.

Recommendations

A comparison of the summaries for various layouts as to distances travelled, time and labor required, volume of building space, cost of buildings and equipment, extent of backtracking, and number of times flow lines cross will help to determine the best layout. Even then it will be necessary to know whether the necessary expenditure must be paid for from earnings in six months or other periods ranging up to five years. It is generally desirable to keep plant investment low. Some decisions can be made only on the basis of what is good policy in relations with labor. Even the question of return on investment must be viewed with caution. A company sometimes has to pay for improvements out of obsolescent reserves without regard to return on investment if competitors are getting lower costs with more modern equipment. A newcomer in an industry has the advantage frequently of purchasing new and more efficient equipment at little or no more cost, even less cost, than equipment generally in use by established manufacturers. It is the newcomer's methods that have to be watched closely by the established manufacturer.

Section VIII

Research Library



ANY executive or engineer who is to engage in the laying out of a plant will find his work easier by familiarity with the books listed below. Many excellent books are available but those listed will give material help on the problems involved. The methods outlined in them are the guides to big profits in plant layout.

Ramsey, G. R. and Sleeper, H. R. *Architectural Graphic Standards.* New York, N. Y: John Wiley & Sons, Inc., 1941.
Dimension sheets on details such as radiators, telephone booths, windows, railroad clearances, stair proportions, driveways, kitchen equipment, toilets, shower baths, and requirements for sports such as tennis courts, bowling alleys, and similar facilities.

Seelye, Elwyn E. *Data Book for Civil Engineers.* New York, N. Y: John Wiley & Sons, Inc., 1945. Vol. 1, Design.
Dimension sheets on foundations, floors, roads, coal trestles, drainage, water-treatment plants, and similar subjects.

Strock, Clifford, and Hotchkiss, C.H.B. *Air Conditioning Engineers' Atlas.* New York, N. Y: The Industrial Press, 1939.
Extensive climatic data for about 100 cities and maps covering the country.

Muther, Richard. *Production Line Technique.* New York, N. Y: McGraw-Hill Book Co., Inc., 1944.
Concise, popular presentation of industrial methods, including plant layout, conveyors, assembly, and similar problems.

Wiren, Alexis R. and Heyel, Carl. *Practical Management Research.* New York, N. Y: McGraw-Hill Book Co., Inc., 1945.
The approach needed by the executive who would lay out a new plant or rehabilitate an old plant.

Knoeppel, E. E. and Seybold, Edgar R. *Managing for Profit.* New York, N. Y: McGraw-Hill Book Co., Inc., 1937.
Simple methods for determining sales to justify a new plant, reductions in cost to earn a specified profit, and similar financial engineering problems.

Cuno, Charles W. "Economic Factors in Chemical Plant Location", *Chemical Engineers' Handbook,* edited by John H. Perry. New York, N. Y: McGraw-Hill Book Co., Inc., 1941.
Methods outlined are applicable to any kind of plant.

Hudson, Wilbur R. *Conveyors and Related Equipment.* New York, N. Y: John Wiley & Sons, Inc., 1944.
Concise discussion of material handling methods with engineering data. No data on lift trucks and similar equipment.

Stocker, Harry E. *Materials Handling.* New York, N. Y: Prentice-Hall, Inc., 1943.
Data on lift trucks, pallets, and similar equipment. Discussion on warehouse design.

Barnes, Ralph M. *Motion and Time Study.* New York, N. Y: John Wiley & Sons, Inc., 1937.
Numerous suggestions on ways of obtaining motion economy.

Barnes, Ralph M. *Work Methods Manual.* New York, N. Y: John Wiley & Sons, Inc., 1944.
Summarizes preparation of process charts, flow diagrams, man and machine charts, and similar data needed for a plant layout.

Vilbrandt, Frank C. *Chemical Engineering Plant Design.* New York, N. Y: McGraw-Hill Book Co., Inc., 1942.
Chapters on plant location to supplement Cuno, above, and on flow diagrams for the chemical plant.

Alford, L. P. and Bangs, John R. *Production Handbook.* New York, N. Y: The Ronald Press Co., 1944.
The reference manual before consulting more specialized books and articles.

minimum interference with production when raw materials are again unlimited.

The modernization program includes complete factory renovation, production line revision, installation of air conditioning, increased mechanization, and construction of a quality control laboratory. Completion of the program will result in better working conditions, greater production capacity, and more uniform products of better quality.

Air Conditioning

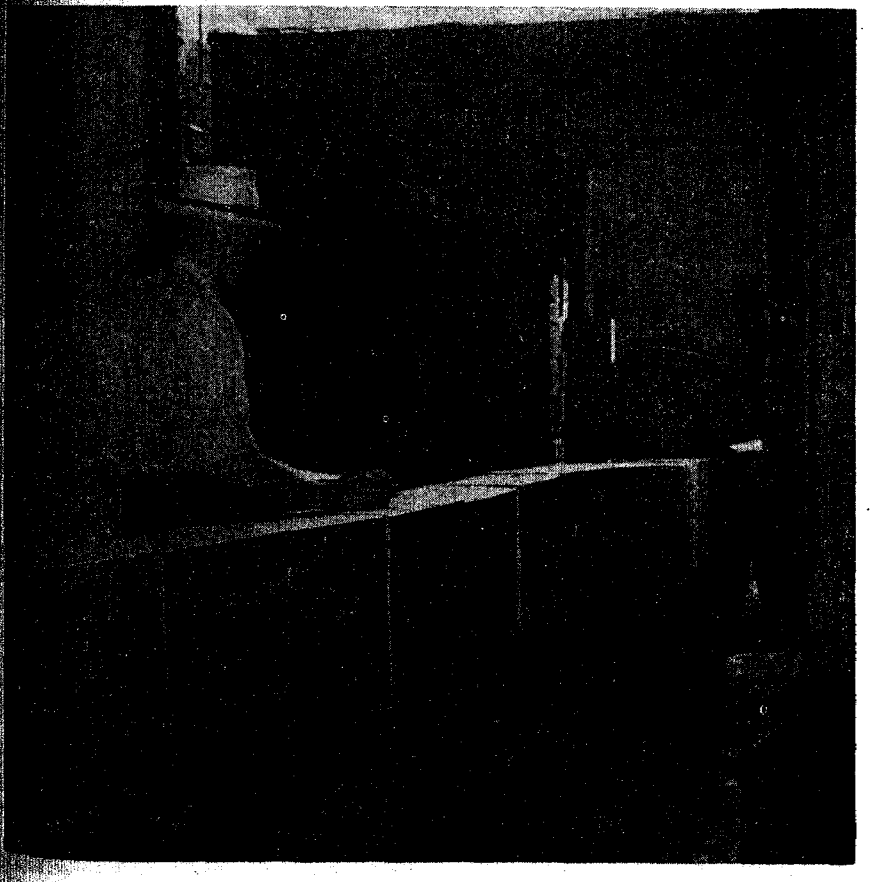
Refrigeration of certain rooms has always been necessary for the performance of some operations in the manufacture of candy. Application of chocolate coatings would otherwise be impossible at summer temperatures in the South. However, control of both temperature and humidity (air conditioning) is a relatively recent innovation in candy factories in this region.

The Brock Company has just completed the installation of equipment for the air conditioning of its offices and rooms used for cooling, storage, wrapping, packing, and shipping its candy products. Already evident are its beneficial effects on personnel, product handling, and machine efficiency.

BOXES OF CANDY ARE PASSED THROUGH X-RAY UNIT FOR FINAL INSPECTION.

New application of air conditioning and X-ray inspection assure quality of product and ease of handling.

FINAL PRODUCT IS TRANSFERRED DIRECTLY FROM AIR CONDITIONED SHIPPING ROOM TO REFRIGERATED BOX CARS.



The effects on the well being and efficiency of the personnel are remarkable. Previously, fatigue was so great during the hot summer weather that by the end of the day the workers were nearing physical exhaustion. Since the installation of the air conditioning system, the employees show very little fatigue and are nearly as fresh at the end of the day as in the morning. Working efficiency is greatly increased, and the morale of the workers vastly improved.

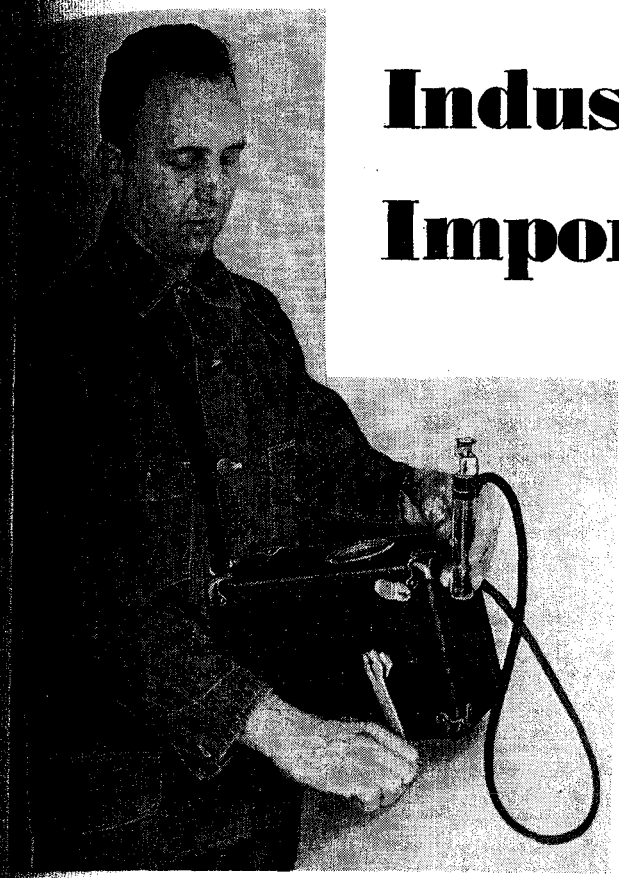
Equally important are the effects of air conditioning upon product quality and ease of handling. Until its installation, hard candies, gum drops, and other items of this nature were subject to "sweating" on hot, humid summer days. They could not be handled at all until a cooler, drier day allowed them to dry out. Since the introduction of air conditioning in

Industrial Hygiene Importance of Dust

By N. V. Hendricks

Chief Engineer Industrial Hygiene Service, Georgia Department of Public Health

Nearly all types of modern industry are concerned with dust and its control.



Courtesy M. S. A. Co.

FIG. 1. THE MIDGET IMPINGER USED FOR COLLECTING ATMOSPHERIC DUST SAMPLES.

THE annual cost to industry from uncontrolled dust amounts to a staggering figure. In many cases the problem of dust is dismissed by management as only a nuisance. In other plants, the recovery of certain dusts is economically sound, especially where the particulate matter may contain precious metals or may carry valuable processing stock. Aside from any nuisance or economic loss resulting from the escape of dust there are certain dust exposures which may result in acute health hazards. This is especially true of dusts containing a high percentage of free silica, asbestos, and other toxic materials. Where health considerations are involved in such exposures, legal aspects present themselves. In most states where occupational diseases are compensable, specific coverage is given to those disabilities resulting from the inhalation of silica dust.

Definitions

Many times true dusts are confused with fumes, smokes, mists, and fogs. In order to differentiate between the origin of these materials, a definition of them is in order.

DUSTS are formed by the reduction of earthy materials and are usually produced by such operations as crushing, grinding, buffing, etc. The particle size of dusts may vary considerably, ranging from sub-microscopic to visible.

FUMES are formed by condensation and sublimation. Chemically, they are metallic and are usually the oxides of such metals as zinc, and lead. The particle size is usually below one micron.

Smoke comes from the burning of organic material and its particle size is usually less than one-half micron.

Mists and **Fogs** result from the condensation of water vapor on suitable nuclei, and the particle size will vary with given conditions.

General Properties

As a substance is reduced in particle size, there are certain general properties of the material which are changed. On breaking up a solid into finely divided particles, the surface area is greatly enlarged and therefore the space occupied is greatly increased. As an example, a piece of quartz one centimeter on each side when crushed to where the particles of one micron in size will present a system containing 10^{12} number of particles. The total surface area will be 6 square meters. If these dust particles are dispersed onto the atmosphere in such manner that the concentration will be 100 million particles per cubic foot, the space occupied by this dispersed system will be 10 thousand cubic feet.

The chemical activity of a solid is considerably increased by a reduction in particle size. Thus the rate of oxidation is increased as is evidenced by occasional disastrous dust explosions. The phenomena of adsorption becomes more important as gases are more easily adsorbed on the surface of the smaller particle.

From the standpoint of health hazards resulting from dust exposures, the physiological properties of dust vary somewhat with the particle size. It is an accepted fact that with exposures to silica dust, the smaller the particle size, the greater the hazard.

Physiological Response

Drinker has summarized the reactions resulting from the inhala-

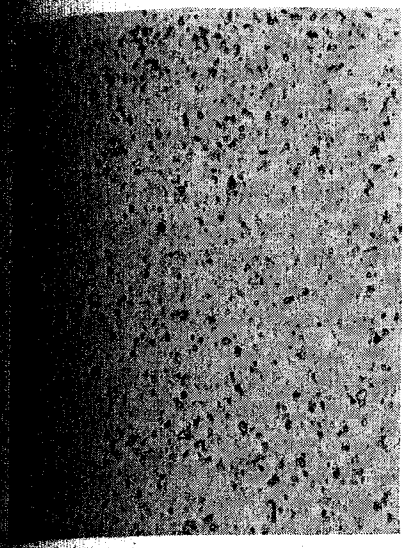


FIG. 3. GEORGIA KAOLIN DUST MAGNIFICATION 130X.

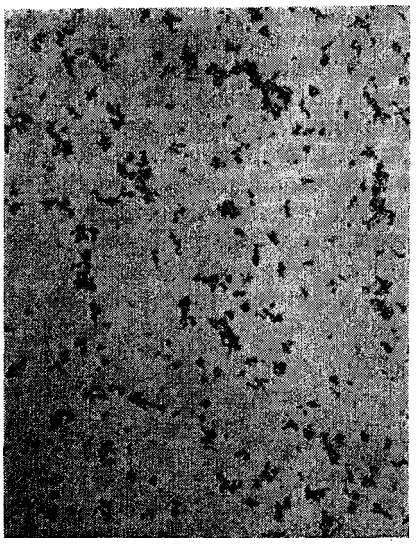


FIG. 4. QUARTZ DUST ($Si\ O_2$) MAGNIFICATION 130X.

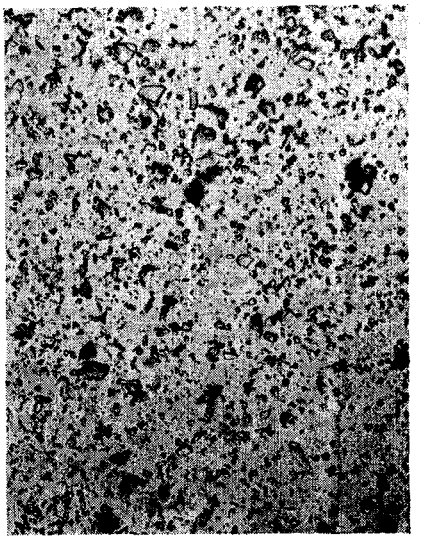


FIG. 5. CALCIUM CARBONATE DUST MAGNIFICATION 130X.

this metal. However, it appears that exposure to the dust of iron does not produce pathology unless such exposure is accompanied by the pressure of free silica.

The mining of coal results in exposure to coal dust which contains a high percentage of carbon. Detailed studies of exposure to coal dust have been made by the U. S. Public Health Service and other agencies. It has been found that, in general, coal dust is retained in the lungs only when such dust contains a high percentage of free silica. Although coal dust may be deposited in the lungs of exposed individuals, the condition resulting is usually not considered disabling unless silica is present.

Silicates make up an important class of industrial materials and are used principally in the production of ceramics and similar materials. Talc, kaolin, mica, clays, etc., are chemically silicates and their widespread industrial application results in a great number of employees being exposed to this type dust. With the exception of asbestos, which is a silicate, this general class of materials does not appear to produce a disabling condition, except in isolated cases, when taken into the body by inhalation.

Asbestos is the only silicate known at the present time which produces a lung pathology comparable with that resulting from exposure to silica dust.

Of all the dust found in industry, probably the most important is free silica or silicon dioxide. It occurs in the form of quartz, flint, sandstone, and chert; and is associated with many other minerals and ores. The disabling condition resulting from the inhalation of free silica is known as silicosis and has long been a problem with industries such as stone cutting, granite, foundry, abrasive, and the like, where silica is used in processing. There are relatively few industrial operations which might result in direct exposure to pure silica dust. The importance of silica lies in its association with other materials. As an example, in foundry operations the dust generally will contain clay and materials of a nonsilicious character, so that the actual percentage of free silica may be relatively low. This is also true in exposures to coal, iron oxide, and the mining of ores. When hard rock or silica is present, these dusts become important mainly due to the presence of silica rather than to the inherent properties of the parent material.

Factors Influencing Hazards

In evaluating the exposure to a dust there are several factors which should be taken into consideration. The duration of exposure is important, as it will indicate in a general way the total amount of dust which might be expected to have entered the body. Obviously other factors enter into such an evaluation of total dustiness, and these will be discussed later. History of past exposure is important. This is particularly true where an individual is exposed to silica dust. This point is of extreme importance to industry due to the fact that a worker may have contracted silicosis under a previous employment. Where such a condition exists, the desirability of preemployment examination is obvious.

The concentration of dust breathed is important as this, within certain limits, will determine the possibility of development of dust diseases. Considerable research and practical observations have been made in the field of dust exposures to correlate clinical findings with atmospheric concentrations. For free silica, asbestos, and some of the other materials, fairly definite standards have been established. The nature of dust is important primarily from the standpoint of free silica content. This is particularly true of mixed dusts which constitute the majority of industrial exposures. The volume of air breathed enters into the picture as it directly influences the amount of dust which will be taken into the body. The rate of respiration or amount of air breathed in general will be determined by the physical effort required on the particular job. Where heavy work is being done, naturally an individual will require more ventilation than where less physical effort is involved.

Dust Measurements

In addition to the factors influencing dust hazards, it is necessary to make direct dust measurements in order to obtain a true evaluation of any dust exposure. Such measurements are made by the actual collection of dust samples, the counting of the dust particles, and by the identification of the materials making up the dis-

Centrifugal Boiler Feed Pump Installation, Operation and Maintenance

By Igor J. Karassik

Applications Engineer
Worthington Pump & Machinery Corporation

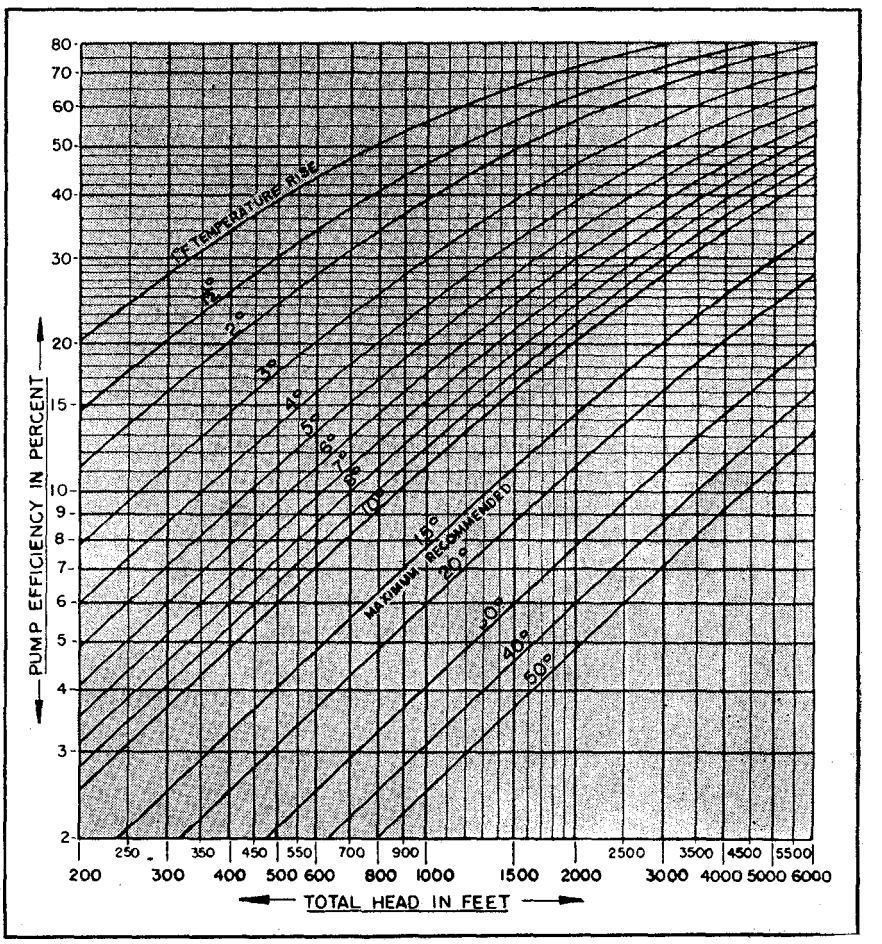


FIG. 1. CHART FOR DETERMINING TEMPERATURE RISE IN A CENTRIFUGAL PUMP, KNOWING TOTAL HEAD AND EFFICIENCY.

IT can no longer be said that the problems arising from the operation of centrifugal boiler feed pumps at reduced capacities have received insufficient attention in the technical and professional literature. Contrasted to the situation a short ten years ago, when neither quantitative nor even qualitative information was available to the steam power plant operator, formulas, charts, and entire treatises have been devoted, within the last decade, to the subject matter of protection against overheating of boiler feed pumps.

The first phase of the educational program on this subject concerned itself with introducing factual information to the designer of new steam power plants to insure the inclusion of suitable protective measures. This program is now ready to enter a secondary phase —that of disseminating the information even farther, partly through repetitive tactics, partly through devoting more attention to older plants operating at lower pressures.

TEMPERATURE RISE

In a centrifugal boiler feed pump, the difference between the brake horsepower consumed and the water horsepower developed represents the power losses within the pump itself, all this power loss being transformed into heat. For practical reasons it is accurate enough to assume that all this heat is transferred to the feedwater passing through the pump. The actual amount of temperature rise in degrees F at any given operating condition can, therefore, be easily determined from the following formula:

$$dT = \frac{(BHP - WHP)\ 2545}{W}$$

Where dT is the temperature rise, BHP is brake horsepower, WHP is water horsepower, and W is the pump capacity in pounds per hour. This formula may also be expressed as:

$$dT = \frac{H}{778}\left(\frac{1}{e} - 1\right)$$

H being the total head in feet and e being the efficiency. This latter form is more readily used in connection with the conventional pump performance curve. The chart reproduced as Fig. 1 offers a graphical representation of this

capacity of the boiler feed is solely governed by the water regulator which is controlled by the main turbine load and the resulting rise or fall of the drum level, some specific means must be applied to maintain predetermined minimum flow through the boiler feed pump regardless of turbine load.

This is achieved by installing a by-pass in the discharge line from the boiler feed pump. This by-pass is located on the pump side of the discharge gate valve and check valve and leads to some region of lower pressure in the boiler feed cycle. The capacity of the by-pass is such that should the demand at the boiler fall to zero, or should one of the valves become closed while the pump is running at full speed, the flow through the pump will not fall below the predetermined permissible minimum. The operation of the by-pass is then regulated by means of either a manually or automatically controlled valve.

MINIMUM CAPACITY

Inasmuch as the temperature rise within a boiler feed pump varies with capacity, it is obvious that the minimum permissible capacity will eventually depend on the maximum permissible temperature rise. The factors which determine this are quite numerous and include such variables as the available and required net positive suction heads and the operating temperature. This precludes the possibility of establishing a rigid rule, for these factors themselves will vary with each installation. It is necessary to consider each factor individually, determine the maximum temperature rise dictated by this factor, and finally select the lowest of these separate maximums as the maximum permissible temperature rise for the installation in question.

Fortunately, it is never necessary to establish the value of the minimum permissible capacity very accurately. The difference in power consumption is negligible even if this capacity were to be established more or less empirically and on the safe side. On the basis of past experience, it can be said that where the maximum temperature rise is held to 15F, no danger of overheating the pump or of flashing in the first stage impeller exists. It is recommended that the temperature rise be held to this maximum, unless some special reason exists in an exceptional installation to warrant a greater or a lower maximum permissible rise.

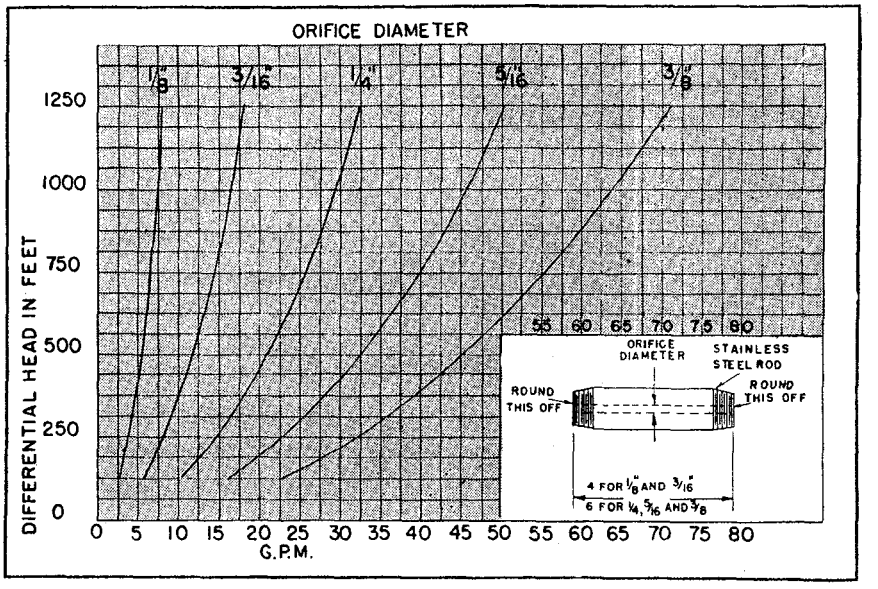


FIG. 4. PERFORMANCE CHART FOR SINGLE BY-PASS ORIFICE.

Fig. 1 can be used to determine the minimum capacity, as the pump total head curve is fairly flat near the shut-off conditions. The intersection of the head curve at low flow and the curve corresponding to 15F rise will yield the pump efficiency at minimum recommended capacity. A glance at the pump performance curve

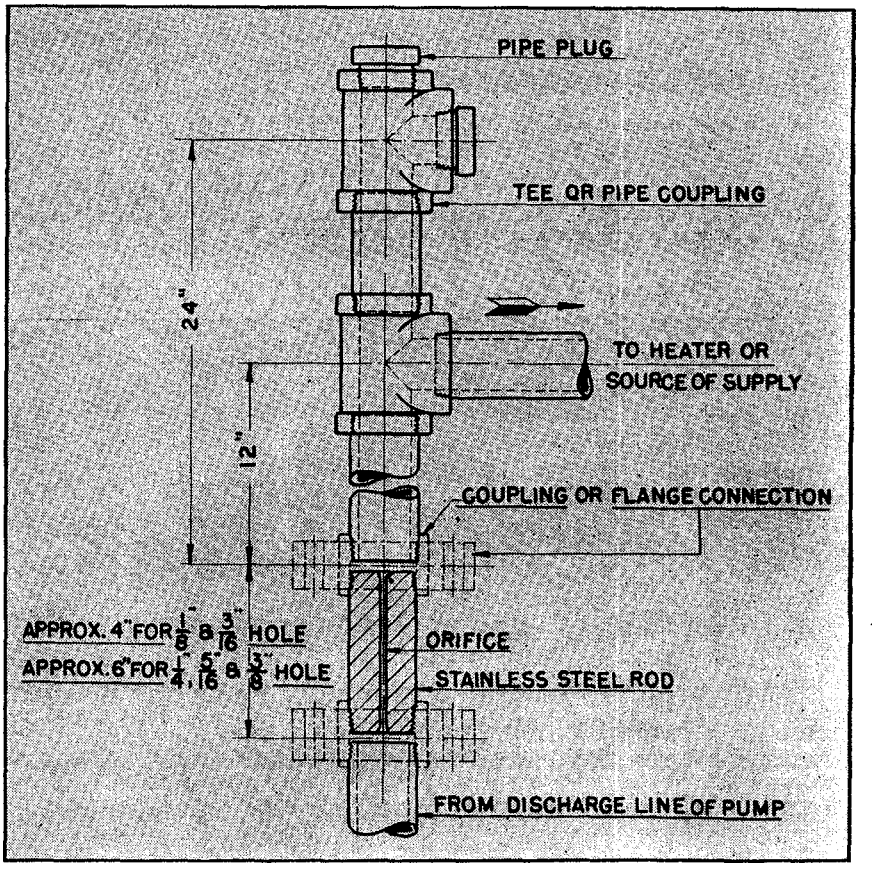
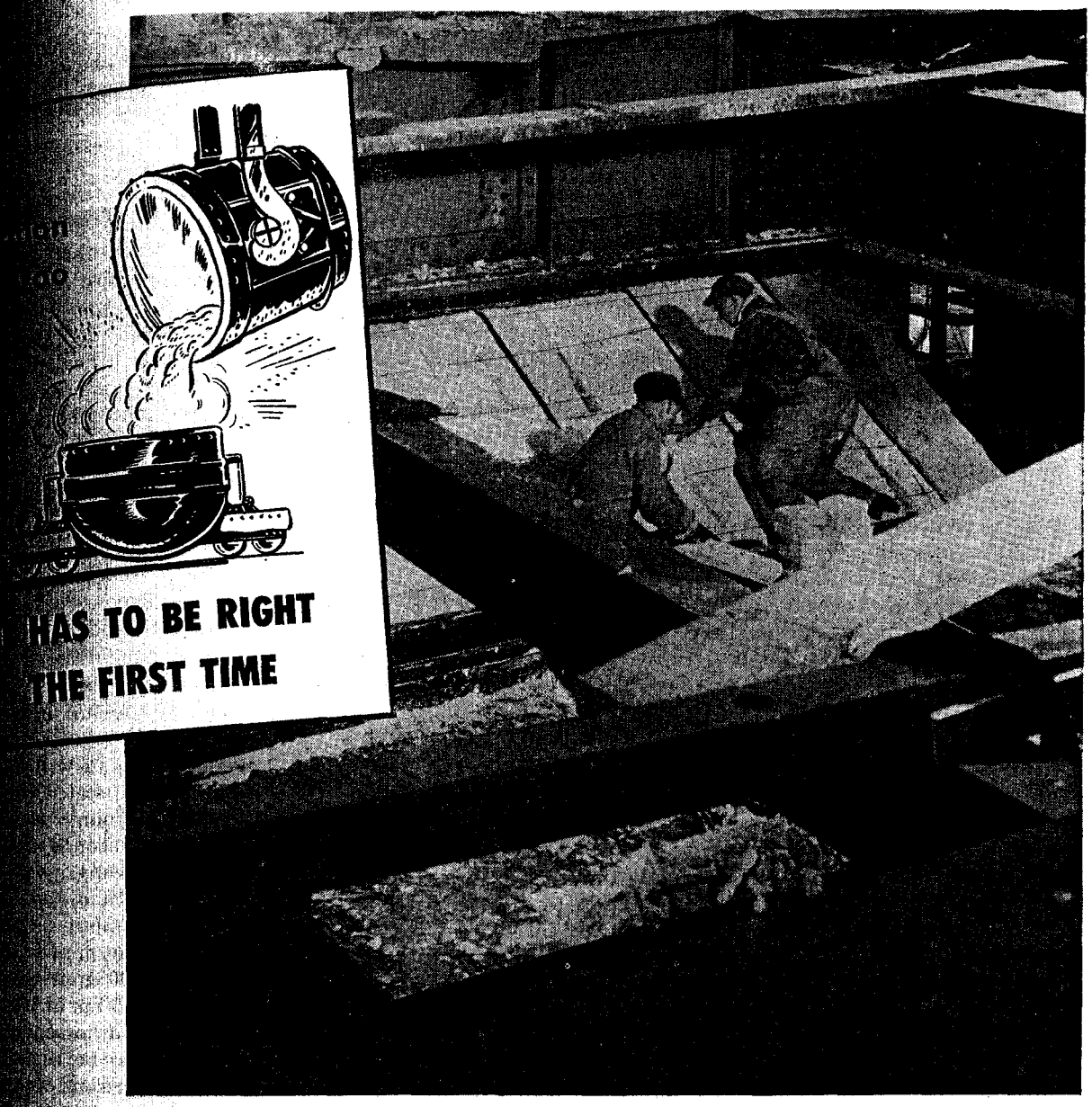


FIG. 5. DETAILS OF RECOMMENDED PRACTICE FOR INSTALLATION OF ORIFICE IN BY-PASS LINE.



hat's why industry relies on J-M Insulations applied by J-M Applicators!

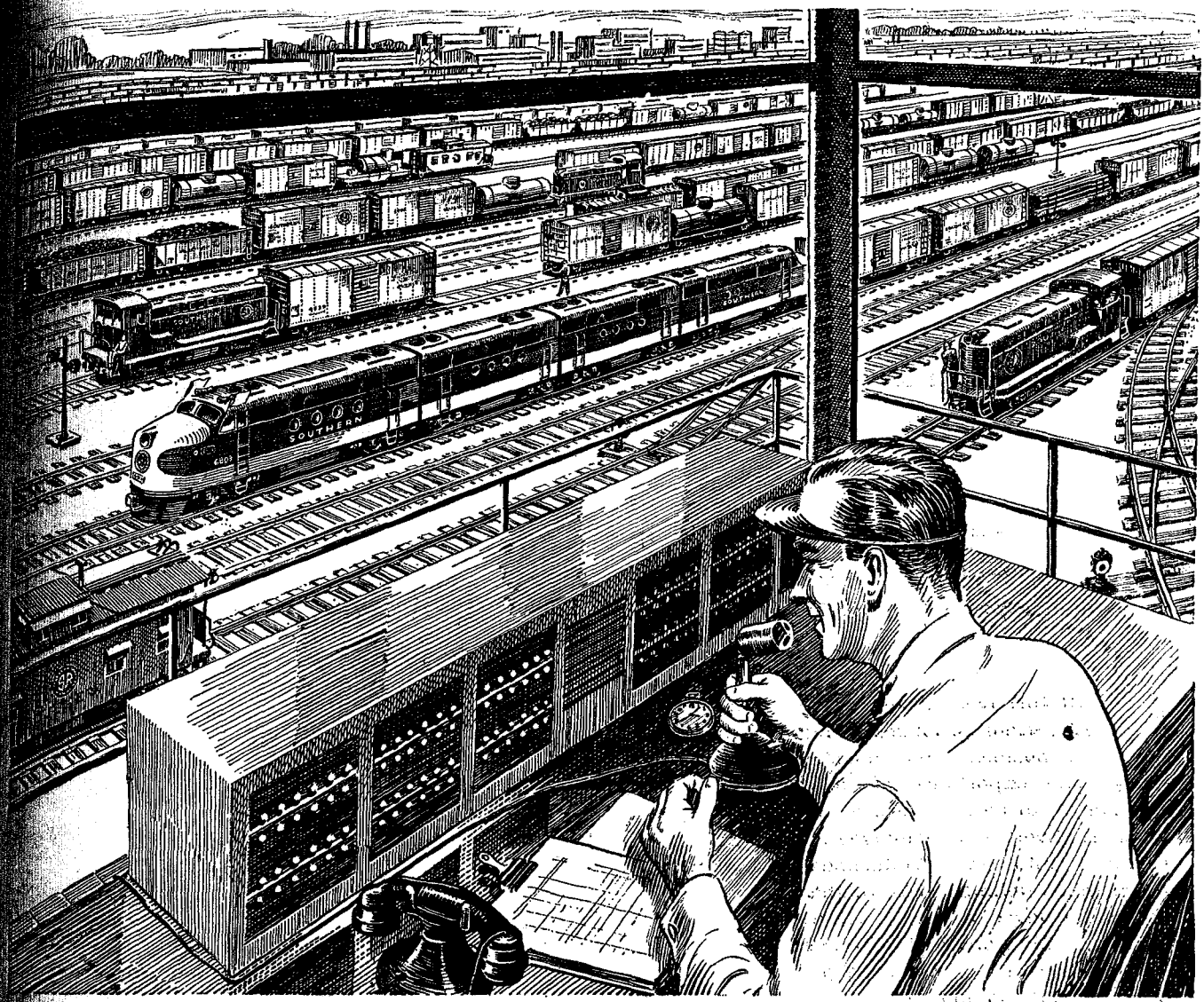
od insulation alone is no guarantee of top avings. To cut down heat waste and to on cutting it down through years of ce, insulation must be *properly applied.* t's where Johns-Manville can help you. Insulation Engineers, and the facilities he J-M Insulation Research Laboratory, vailable to help you with specific prob- no matter how simple or complex. The Industrial insulation line offers a care- ngineered material for every service . . . for every temperature from 400° F below zero to 2800° F above.

And you have positive assurance of proper application because J-M Insulation Applicators know exactly which material is right for each service . . . know how to apply it for greatest economies at installation and throughout years of service.

For details, write your nearest J-M Insulation Applicator, or Johns-Manville, Box 290, New York 16, New York.

JOHNS-MANVILLE JM PRODUCTS

NS-MANVILLE *First in* INSULATIONS



Man with a 32-track mind

He's moved upstairs . . . this Southern Railway yardmaster!

Yesterday he ran his legs off in all kinds of weather trying to be all over his yard at once. Today he sits in a glass-enclosed, air-conditioned tower sixty feet above the ground... acres of tracks spread out before him.

Through the magic of electronics he gives orders and instructions to switching crews and others throughout the yard . . . and the men can report back to him over this two-way communicating system...thus speeding the "making up" into trains of as many as 5,000 freight cars a day.

Progress? You bet!

Always on the alert for new methods . . . never taking anything for granted . . . we're doing our best to provide the kind of mass transportation service that is so vital to the continued growth and prosperity of the South.

Whether it's pioneering with the first Diesel freight locomotive or building a tower for the "man with a 32-track mind," the Southern Railway is . . . and will continue to be . . . a railway that is always looking for, and finding, better ways to "Serve the South."

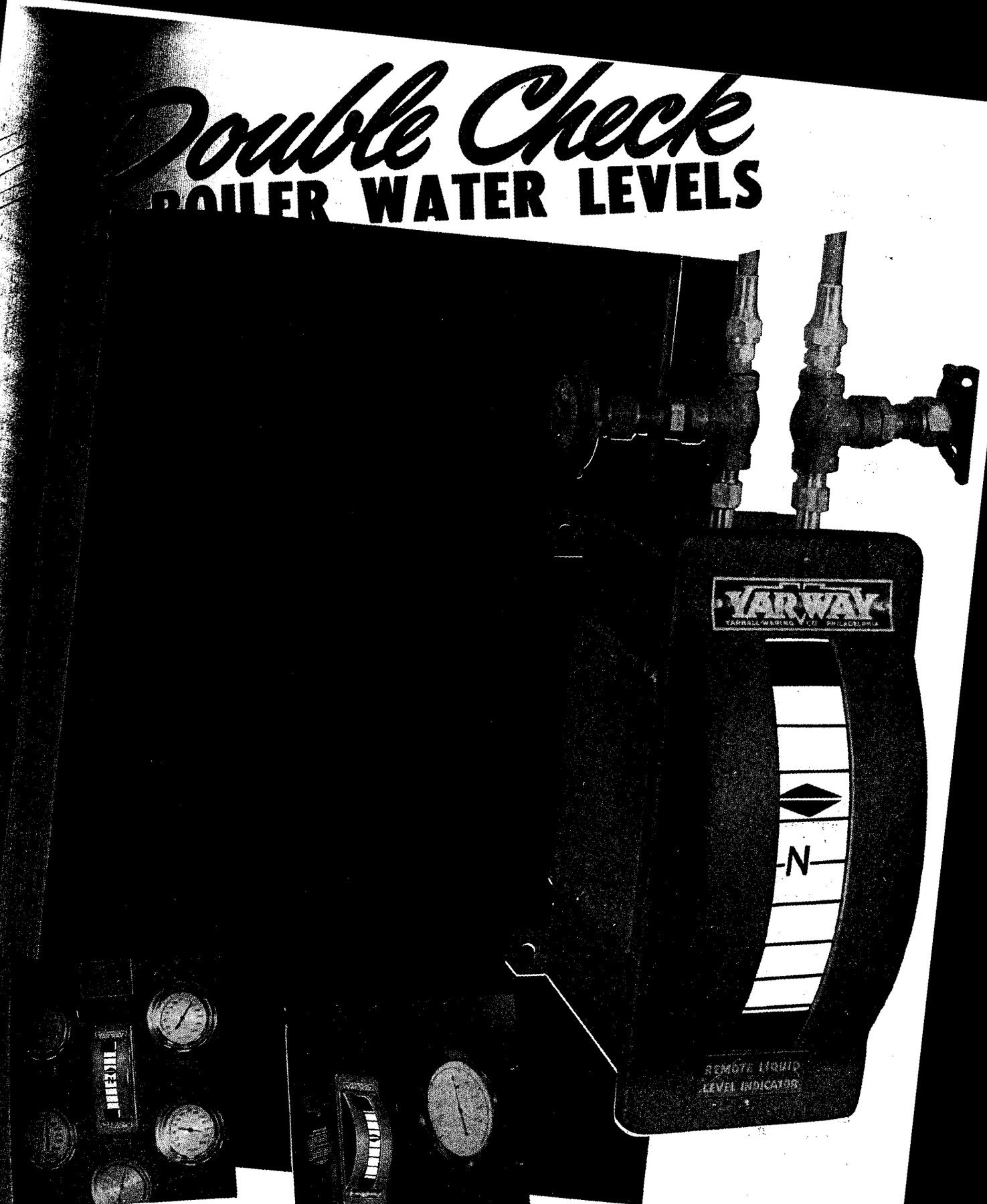
Ernest E. Norris

President

SOUTHERN RAILWAY SYSTEM

THE SOUTHERN SR SERVES THE SOUTH

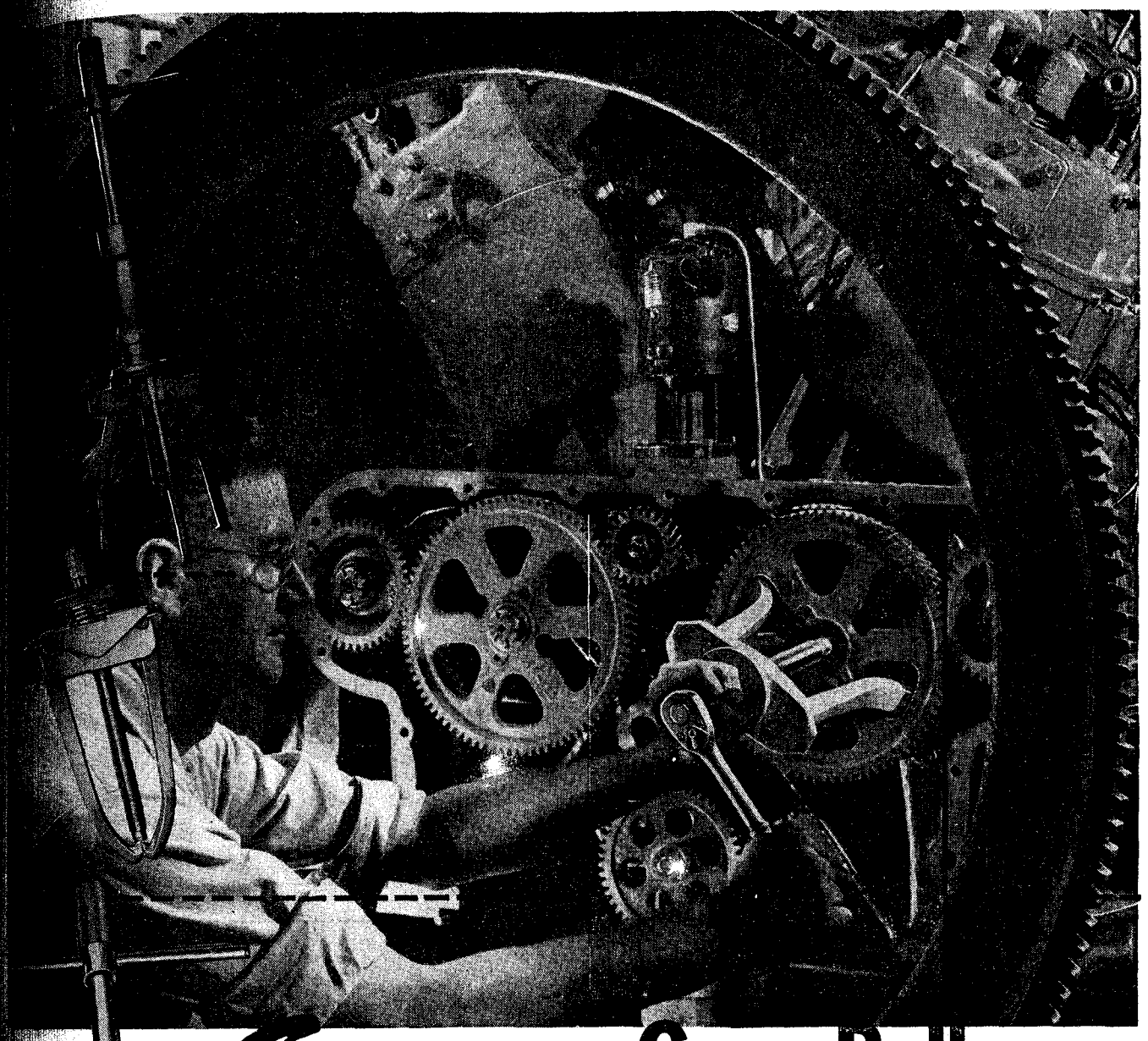
Double Check
BOILER WATER LEVELS



Typical instrument panel mounting of Yarway Indicator in rubber manufacturing plant.

One of two Yarway Indicators mounted on end of instrument panel in boiler room of Western utility.

YARWAY REMOTE LIQUID LEVEL INDICATOR



Snap-on Gear Pullers

give you safe, uniform power over entire range

On the testing floor . . . in maintenance operations . . . wherever there is a need for gear pullers, Snap-ons are favored by men who know good tools. There are four definite reasons for this popularity: (1) Snap-ons have more "locking power" for added safety. (2) They give you a "tip-less" pull that prevents binding. (3) You enjoy smooth uniform power for easy pulling over the entire range. (4) Snap-on pullers are available in a wide range of types and sizes.

You'll like the comfortable, well-balanced feel of Snap-on pullers. They have the ruggedness and stamina that makes easy jobs out of the tough ones.

Ask the Snap-on man who calls at your plant for full details on Snap-on gear pullers or write for catalog of 3,000 Snap-on tools for industrial production and maintenance.

SNAP-ON TOOLS CORPORATION
8056-K 28th AVENUE KENOSHA, WISCONSIN

A FOSTER WHEELER FIRST

EXPANDED TUBE CONDENSERS *for purest feed water*

Expanded tube condenser design, introduced 20 years ago by Foster Wheeler and considered a highlight of condenser development, is used by modern condenser manufacturers. The design completely eliminates leakage of circulating water into the condensate.

Condensate contamination became a major problem with the advent of higher pressure and temperature steam generators. Slight impurity of feed water, unnoticed for years in plants operating at 300 or 400 psi, quickly forms heavy scale at higher pressures and temperatures. Modern steam generators need almost chemically pure feed water — purer than drinking water.

Foster Wheeler anticipated this problem by designing the first expanded tube condenser for stationary power plants.

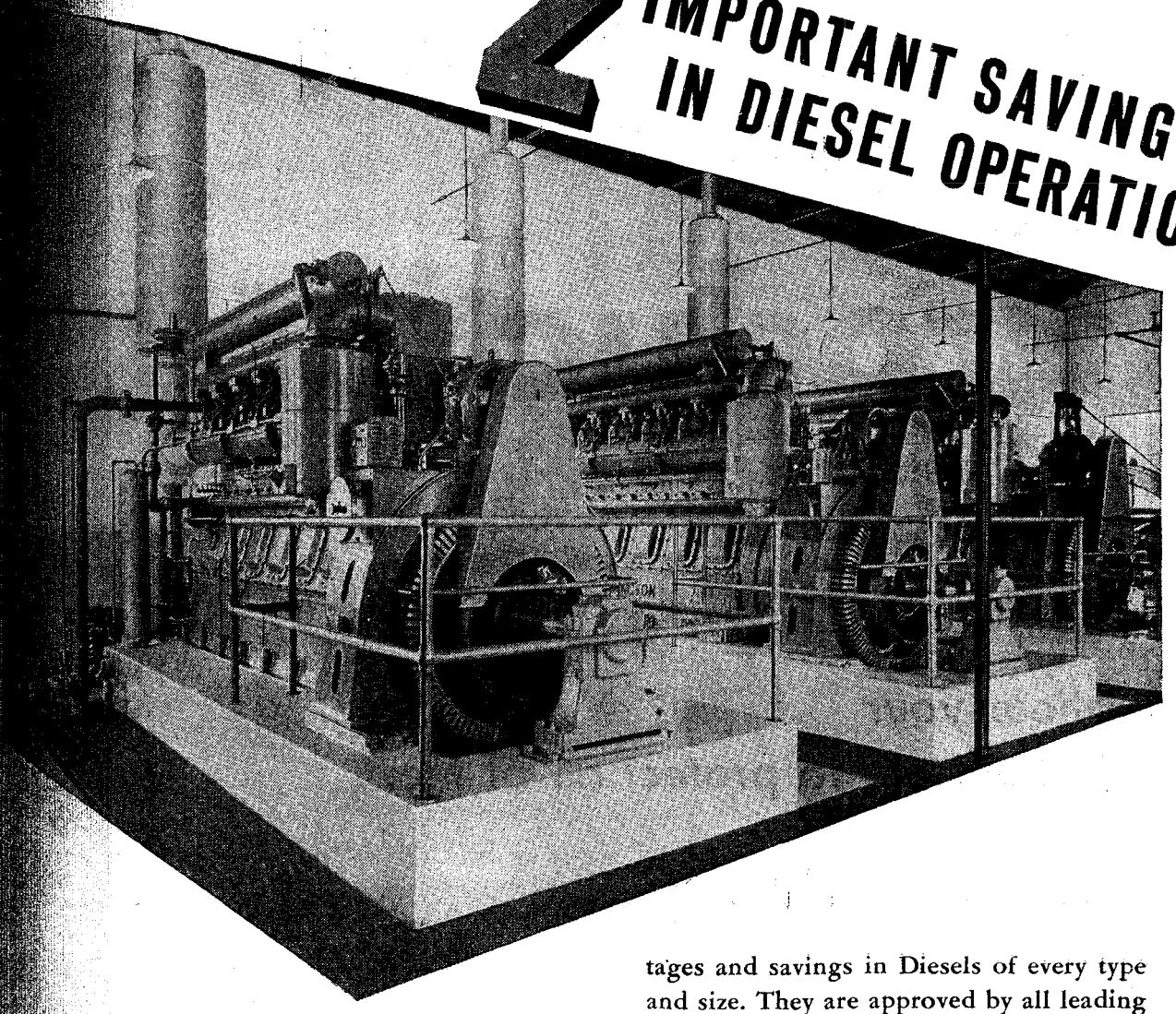
The condensers illustrated, first practical application of this design, were built in 1925 by Foster Wheeler for the Trinidad, Texas, station of the Texas Power & Light Company. Test data proved that expanded tube condensers provide feed water purer than all previous types.

Foster Wheeler offers industry practical engineering ability and experience plus foresight necessary for progress.

Foster Wheeler Corporation • 165 Broadway, N.Y.6, N.Y.

FOSTER WHEELER

MAKE 2 IMPORTANT SAVINGS IN DIESEL OPERATION



FOR low operating cost, lubricate your Diesels with *Texaco Ursa Oils.* You'll *save on fuel, save on maintenance.*

Texaco Ursa Oils stand up in the severest service . . . keep engines clean . . . assure longer life for bearings, liners, rings and pistons. *Ursa Oils* promote maximum engine efficiency . . . dependable, full-power output . . . minimum expense for fuel and maintenance.

There are *Ursa Oils* to assure these advantages and savings in Diesels of every type and size. They are approved by all leading Diesel manufacturers and used by operators the world over. In fact, because of their effectiveness—

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

For Texaco Products and Lubrication Engineering Service, call the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write The Texas Company, 135 E. 42nd St., New York 17, N.Y.

TEXACO

TEXACO Ursa Oils

FOR ALL DIESEL ENGINES

Tune In...TEXACO STAR THEATRE presents the NEW EDDIE BRACKEN SHOW every Sunday night. See newspapers for time and station.

GET SMALL MOTOR PROTECTION *Simply and Inexpensively*

Burnout of motors from lack of oil, worn bearings, tight belt, overloading—or anything that causes a dangerous excess of current through the motor—can, on normal installations, be prevented by Fusetrons.

Just install a Fusetron of motor-running protection size, anywhere in the circuit to handle only the motor current. *That's All.*

If motor is on a separate circuit, install the Fusetron in the switch or panelboard. Then the motor as well as the circuit wiring is protected.

If the motor is on a general use circuit or a circuit feeding more than one motor, protect each motor individually by installing a switch or a fuse block with the proper size Fusetron. *It Is As Simple As That.*

Protect Against Cost of Replacing a Motor—and Against Production or Operating Losses

When pumps, fans, air compressors, blowers, conveyors, mixers, stokers, oil burners, grinders—or any of the hundreds of other circuits on which small motors are used—are out of service because of a motor burnout the losses incurred generally make the cost of Fusetron protection seem mighty small.

You not only have the cost and trouble of removing and replacing the destroyed motor—but all the time the motor is down, production or operating losses pile up.

It's guarding against these double losses that makes it pay you so well, to go to the little expense and trouble necessary to install Fusetrons for the protection of all small motors used throughout your plant or building.

FUSETRONS GIVE MANY OTHER KINDS OF PROTECTION HERETOFORE NOT AVAILABLE

Fusetrons do everything fuses do, as is confirmed by the Underwriters' Laboratories' Label, and in addition . . .

★ Provide simplest way to stop burnouts from single phasing. ★ Entirely wipe out needless blows caused by motor starting currents or other harmless overloads. ★ Give thermal protection to panelboards and switches. ★ Prevent needless blows caused by heating in panels and switches. ★ Permit use of larger motor or adding more motors on circuit without installing larger switch or panel. ★ On new installations proper size switches and panels can be used instead of oversize. Protect motors against burnout. ★ Give double burnout protection to large motors.

What is the FUSETRON?

The Fusetron is a DUAL element device—a Fuse to which is added a Thermal cutout.

The result is a fuse with tremendous time-lag and much less electrical resistance.

Fusetrons have the same degree of Underwriter's Laboratory approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses, Fusetrons fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere in both 250 and 600 volt types. Also in tamper-resisting type (Fustats) for 125 volt circuits.

Their cost is surprisingly low.

Get All the Facts

Get Better Protection—Send the Coupon Now

Even one lost, hard-to-replace motor, or one needless shutdown or destroyed panel may cost you far more than replacing every fuse with a FUSETRON.

Don't risk such losses—protect your production schedules by changing over your entire electrical system to FUSETRONS.

BUSSMANN MFG. COMPANY
University at Jefferson • St. Louis 7, Mo.
(*Division McGraw Electric Co.*)

BUSSMANN MFG. CO., University at Jefferson 1146
St. Louis 7, Mo. (*Division McGraw Electric Co.*)

Please send me complete facts about BUSS Fusetrons.

Name_____

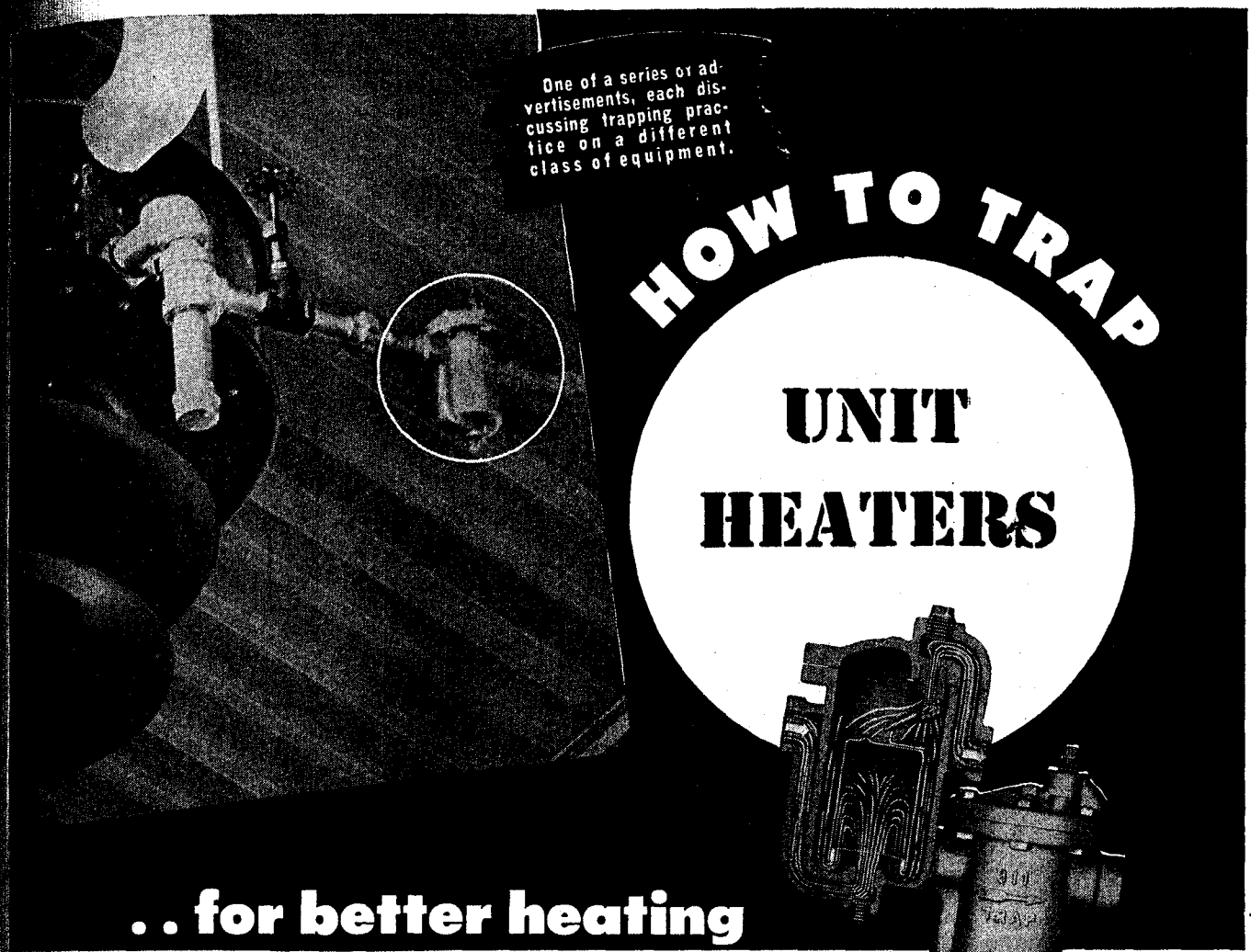
Title_____

Company_____

Address_____

City_____ State_____

Sold through Wholesalers



Advantages Offered by Armstrong Traps

Whether you use *low pressure* or *high pressure* unit heaters, application of Armstrong traps gives you these important advantages:

1. FULL HEATER CAPACITY. Heaters drained by Armstrong traps are kept dry! No waiting for condensate to cool before trap opens. No cooling leg is necessary.

2. AUTOMATIC AIR VENTING. No separate air vent is required. Both air and condensate pass out through same valve. Minimum maintenance, minimum repair cost.

3. PROTECTION AGAINST CORROSION. Prompt removal of air and condensate from heater minimizes danger of CO_2 or oxygen causing corrosion.

4. LONG VALVE LIFE. All internal mechanism is stainless steel. Valves are same quality as used for 2400 p.s.i.

For complete information on Armstrong traps for heating service, see your local Armstrong representative or write ARMSTRONG MACHINE WORKS, 806 Maple Street, Three Rivers, Michigan, U. S. A.

TRAPPING TIPS*

- Install trap below and close to unit heater.
- If trap discharges to overhead return, use a check valve.
- Use a separate trap for each unit heater.
- Use a trap Safety Factor of 3 to 1.
- If heater operates on variable pressures, order trap for highest pressure.
- Use ample size supply and drain pipe lines. Keep supply mains drained with proper traps.

★ Complete data, diagrams, tables, capacities in 36-page CATALOG H, available on request.

See our exhibit at the 17th National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York, December 2 to 7, 1946

ARMSTRONG STEAM TRAPS

Over a Million in Use...For Power...Process...Heating

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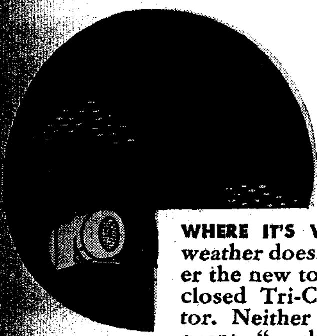
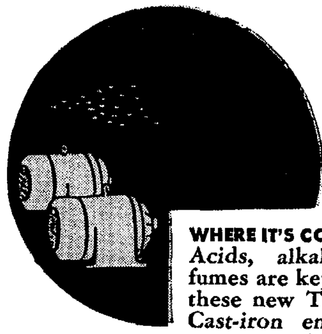
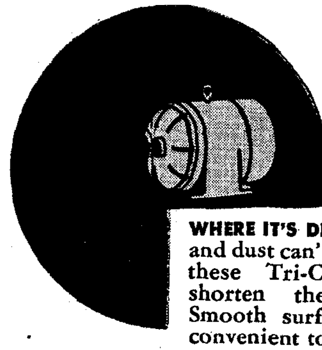
FOR TODAY'S TOUGHER JOBS, HERE'S A NEW TOUGHER MOTOR



WHERE IT'S WET Wet weather doesn't bother the new totally-enclosed Tri-Clad motor. Neither do frequent "washdowns" in food plants.

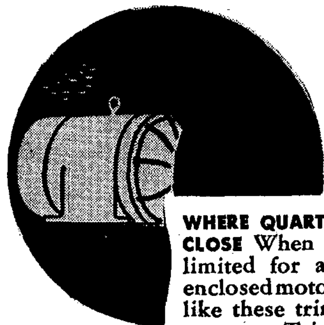


WHERE IT'S CORROSIVE Acids, alkalis, and fumes are kept out of these new Tri-Clads. Cast-iron enclosures are corrosion-resistant, extra strong.



WHERE IT'S DIRTY Dirt and dust can't get into these Tri-Clads to shorten their life. Smooth surfaces are convenient to clean.

WHERE IRON DUST FLIES Harmful iron dust and metal filings can't get past the inner wall. Bearings are protected from dust.



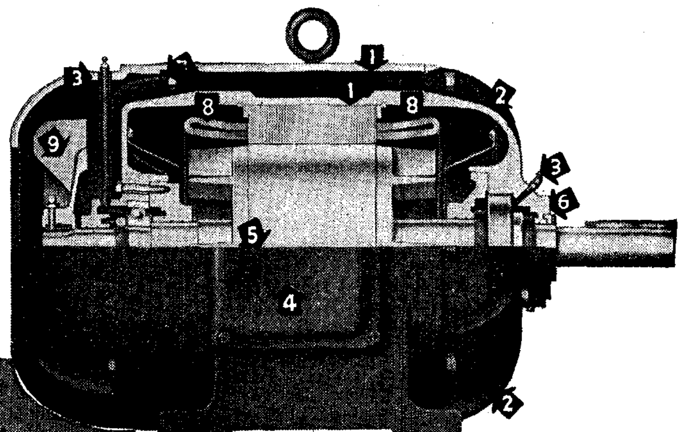
WHERE QUARTERS ARE CLOSE When space is limited for a totally enclosed motor, you'll like these trim, compact new Tri-Clads.

WHERE EXPLOSION HAZARDS EXIST The new Tri-Clad motors are available in explosion-proof constructions where needed.

THE G-E *TRI-CLAD* TOTALLY ENCLOSED MOTOR

(1 TO 1000 HP)

In 1940 you welcomed the Tri-Clad open motor with it's *extra protection features*. More Tri-Clads have since gone into service than any other integral-horsepower motor. Now G.E. is ready with a new line of tough, totally enclosed Tri-Clad motors for use in adverse atmospheres. *We believe they are industry's most dependable motors.* Their longer life and lower maintenance will make them a sound investment on almost every job. Apparatus Dept., General Electric Co., Schenectady 5, N. Y.



POINT PROTECTION

A cast-iron, double-wall frame completely encloses and protects the windings and punchings.
Corrosion-resistant cast-iron end shields are machined to provide a tight fit and protect the motor from dust, dirt and moisture. Primer and finish coat of "Glyptal"* varnish affords high resistance.
A pressure-relief greasing system, which can be packed with long-life lubricant, protects the bearings.
The cast-iron conduit box is diagonally split for easy wiring. Boxes are inherently explosion-proof on Class I ...
Nonshrinking compound around leads protects motor interiors from dust and moisture at the point where leads pass through the frame.
6. Rotating labyrinth seal further protects motor interior from damage by foreign matter.
7. Large air passages provide adequate protection from overheating. They're easy to keep clean and open, too.
8. Modern, "ageless" insulation treatment includes windings of "Formex" magnet wire.
9. The powerful external fan is removable to simplify maintenance; nonsparking type in explosion-proof motors.
10. Individual dynamic balance of rotors and external fans protects against vibration hazards, even under severe operating conditions.

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

FOR THE COMPLETE STORY

Apparatus Department, Section Q 750-278C
General Electric Company
Schenectady 5, N. Y.

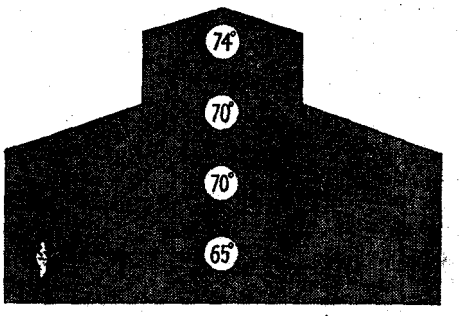
☐ Please send me GEA-4400, which describes the new Tri-Clad totally enclosed motors.
☐ Please send me GEA-4131, "Motors and Control for Hazardous Locations."

NAME ....
COMPANY ....
ADDRESS ....

GENERAL ELECTRIC

Some New Angles on INDUSTRIAL and COMMERCIAL HEATING

Angle #1 . . . working level recirculation



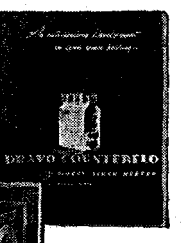
Actual tests with balloon-suspended thermometers in a building with 200,000 square feet of roof showed temperature differential between roof and working area to be only 9 degrees with Dravo Heaters. This is a big fuel-saving advantage when compared with other methods in which roof area temperatures are often 35 degrees higher than those at the working level.

The Dravo Heater offers today's highest possible efficiency for open space heating. It recirculates warm air in the working level, thus minimizing the tendency of the heated air to rise and cause excessive heat losses through the roof. Under the Dravo method warm air is discharged above the heads of the workers and cool air is taken off the floor. This provides a thermostatically controlled comfort zone in the working level with no annoyance to workers.

In addition to saving fuel through low roof heat loss, the Dravo Heater is extremely economical in these respects . . . **Sustained efficiency of 80 to 85% by constantly getting more Btus from each gallon of oil or cubic foot of gas burned. —Lower initial cost compared with indirect heating systems. —Ease of installation . . . it is necessary only to provide power line, fuel line and stack. —No stand-by heat or specialized attendant is necessary. Heater operates only when thermostat dictates your requirements.**

Dravo Heaters are available in capacities ranging from 400,000 to 2,000,000 BTUs per hour output. The money-saving angles for Industrial and Commercial Heating with DRAVO COUNTERFLO DIRECT FIRED HEATERS are more fully described in Bulletin NF 516. Write Heating Section, DRAVO CORPORATION, 300 Penn Avenue, Pittsburgh 22, Pa.

Dravo Counterflo Direct Fired Heaters are products of the Machinery Division.



DRAVO CORPORATION

PITTSBURGH · WILMINGTON · PHILADELPHIA · WASHINGTON

NEW YORK · CLEVELAND · DETROIT

ARGE DIAMETERS

FOR *EXTRA* YEARS OF MAXIMUM

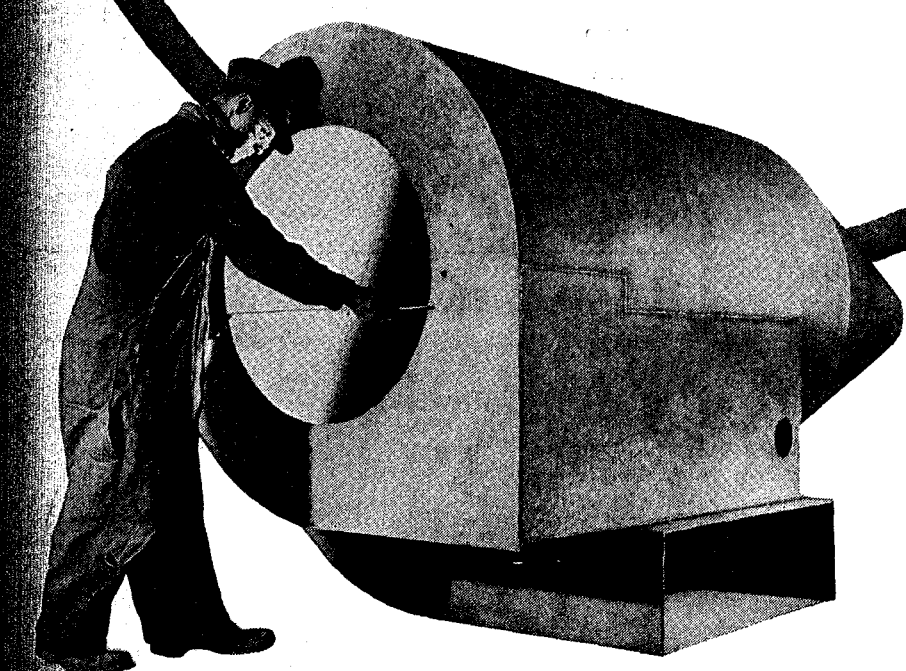
Dust recovery

Because of Buell's exclusive feature—the patented van Tongeren "shave-off"—the cyclones in Buell Dust Recovery Systems do not have to be made with small diameters in order to achieve high recovery efficiency. On the contrary, diameters of Buell cyclones can be in excess of four feet without loss in efficiency.

These large diameters make possible operation with low centrifugal force and consequent reduction in abrasive wear; and permit one-piece construction of extra-thick steel, with large duct outlets, that makes clogging virtually impossible.

All these are prime factors in the trouble-free operation, low maintenance cost, and high efficiency of custom built Buell Dust Recovery Systems—as established from actual records of installations in service for three, four, five or more years.

Buell's book—"The van Tongeren System of Industrial Dust Recovery"—illustrates and explains the patented van Tongeren principle and its many applications to industry. We will be pleased to send you a copy without charge. Write for it today.



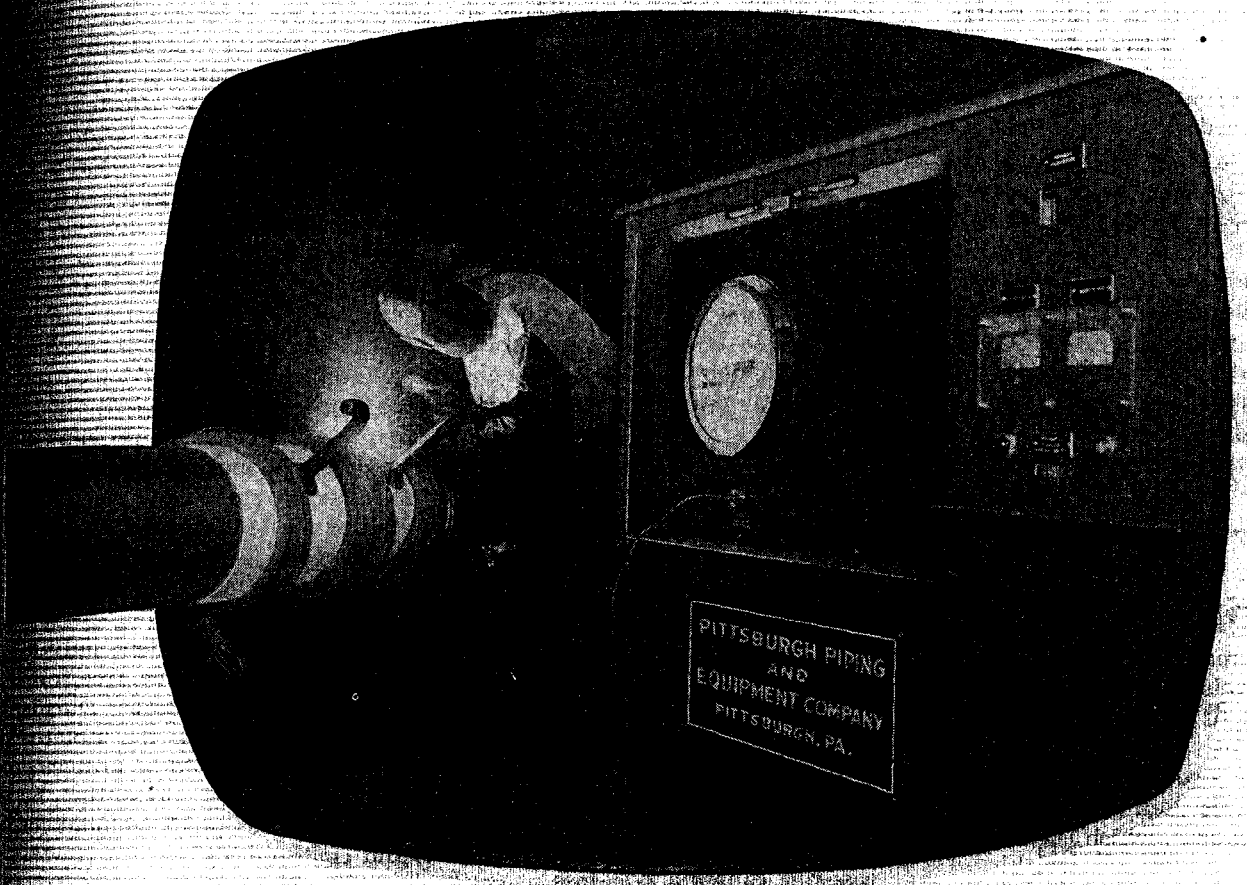
Six Exclusive Buell Features

1. THE "SHAVE-OFF"
2. ✓ LARGE DIAMETERS
3. EXTRA-STURDY NSTRUCTION
4. CORRECT HOPPER DESIGN
5. SPLIT-DUCT MANIFOLDING
6. INNER WELDS GROUND SMOOTH

UELL ENGINEERING COMPANY, INC.
4 Cedar Street, New York 5, N. Y.
Sales Representatives in Principal Cities

buell DUST RECOVERY SYSTEM

PRECISE CONTROL
OF WELDING PROCEDURES



AVAILABLE ONLY THROUGH MODERN SHOP FABRICATION

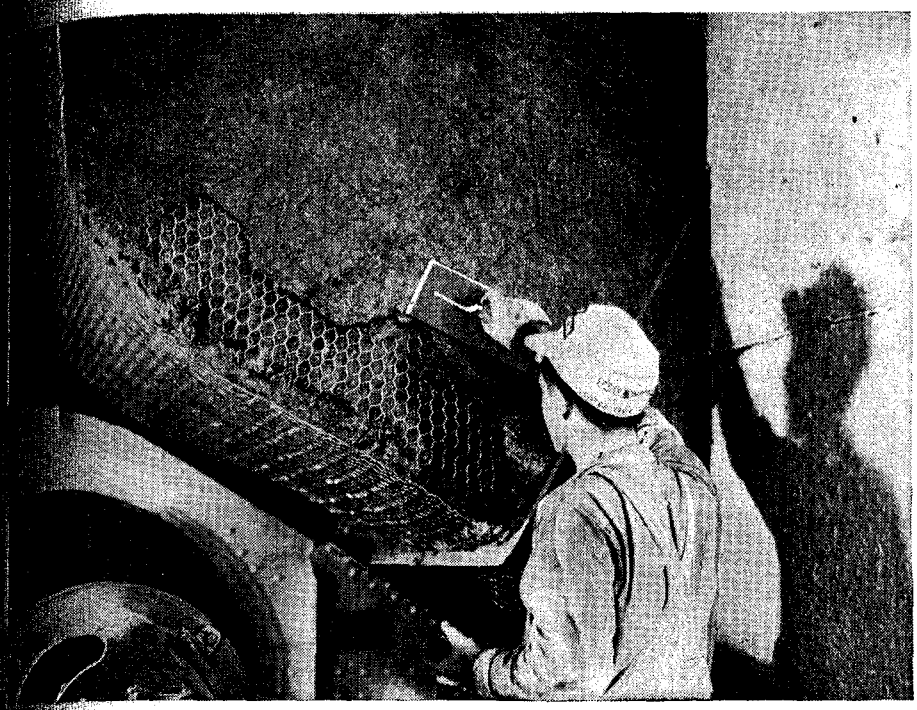
PRECISE welding control is a major reason why shop fabrication by Pittsburgh Piping and Equipment Company results in a thoroughly dependable piping installation.

The illustration shows how a welding operation on 14" high pressure, high temperature piping is performed. The area adjacent to the weld is induction preheated to a temperature of 500°F. min. This temperature is accurately maintained during the entire electric arc-welding operation by means of indicating and control instruments. When the weld is finished, stress-relieving is accomplished by similar procedure.

Better welding contributes to the safer, more satisfactory prefabricated piping installations produced by Pittsburgh Piping and Equipment Company.

Pittsburgh Piping
AND EQUIPMENT COMPANY
10 Forty-Third Street—Pittsburgh, Penna.

Woolworth Building, New York
Chamber of Commerce Bldg., Indianapolis
Book Tower, Detroit
525 Market Street, San Francisco
634 S. Gramercy Place, Los Angeles
Peoples Gas Building, Chicago
Public Square Building, Cleveland
10 High Street, Boston
Heights State Bank Bldg., Houston
Whitehead Building, Atlanta



Users applaud the high Rust-Inhibition of Eagle Super "66" Insulating Cement

...en who have used Eagle Super "66" ...sulating Cement are enthusiastic not ...ly about its great fuel-saving ability ...they applaud the way Super "66" ...ually inhibits rust on heated metal ...ipment!

This unique rust-inhibitive quality ...s been conclusively proved by labo...tory tests, and in actual use. It's an ...portant factor in prolonging the life ...boilers, ovens, tanks, towers, heat ...changers, etc.

"Springy Ball" structure gives remarkable efficiency

The tremendous insulating ...ficiency of Super "66" comes from its "Springy Ball" pellets of Eagle Mineral Wool. Each pellet is a maze of dead air cells — one of Nature's most effective barriers against passage of heat. "Springy Ball" structure is permanent — lasts as long as the insulation.

Eagle Super "66" withstands a full range of temperatures up to 1800° F. If not subjected to temperatures above 1200° F., it can be *removed, remixed* and *re-used!* An all-purpose insulation, it can be troweled with little effort on almost any size or shape surface. Wet coverage is as high as 65 sq. ft. per 100 lbs., 1 in. thick . . . and shrinkage is less than 15%.

Send for data sheets. *They contain complete technical information about Eagle Super "66". Available on request.*

Other Eagle Industrial Products include:

Eagle Insulseal. A protective coating for insulation. Trowels on — dries to a hard finish. Withstands temperatures up to 450° F.

Eagle Swetchek (black). A prepared, asphaltic base, rust-inhibitive anti-condensation compound.

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

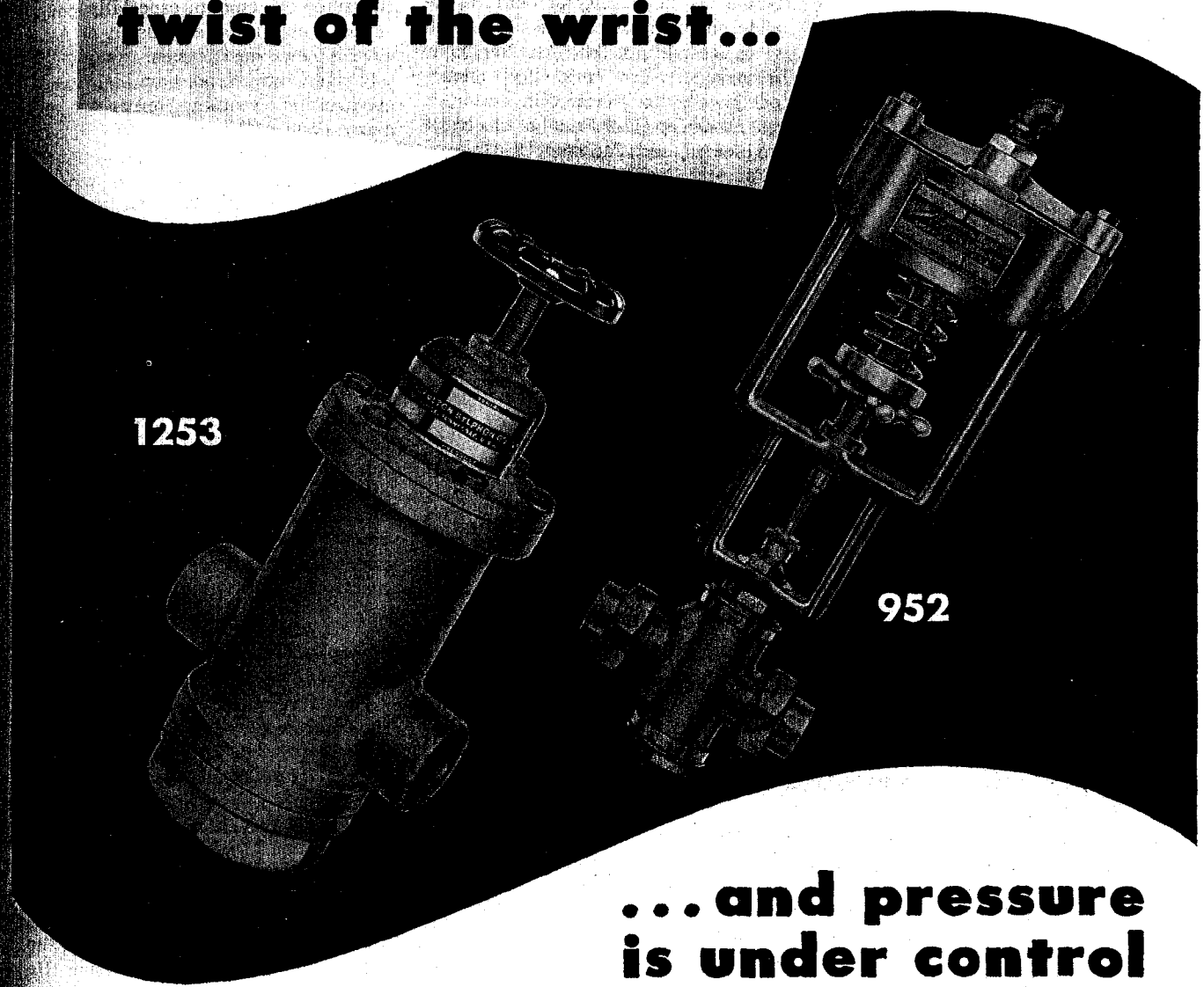
EAGLE-PICHER INSULATIONS
High and Low Temperature

EAGLE EP PICHER

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

Eagle Super "66" Insulating Cement • Eagle L-T and M-2 Felt • Eagle Supertemp Block • Eagle Blankets • Eagle Pipe Covering
Eagle Insulseal • Eagle Loose Wool • Eagle Insulstic • Eagle Swetchek

A simple twist of the wrist...



...and pressure is under control

● Here are two Fulton Sylphon regulators . . . job-proved by engineers and contractors in your industry . . . for solving pressure problems in steam, air, water or oil lines.

On the left is the No. 1253 with packless, all-metal construction. Single-seated valve for dead-end service—may be held in wide open position. Requires no "feeler" pipe. Reduced pressure ranges—20 to 100 lbs. and 30 to 150 lbs.

Shown with it is the No. 952 which is used as an automatic pressure regulator for reducing from high to low pressure—or to insure a constant delivery pressure when supply fluctuates. Equipped with direct-acting type valve (closes with rising pressure). Maximum initial pressure—150 lbs.; maximum controlled pressure—100 lbs.

Both are handwheel, spring adjusted . . . equipped with Sylphon metal bellows . . . rugged, reliable, long-lasting. Both are backed by 45 years of specialized experience. For complete information, write today for Catalog VL-100.

FS

FIRST WITH BELLOWS

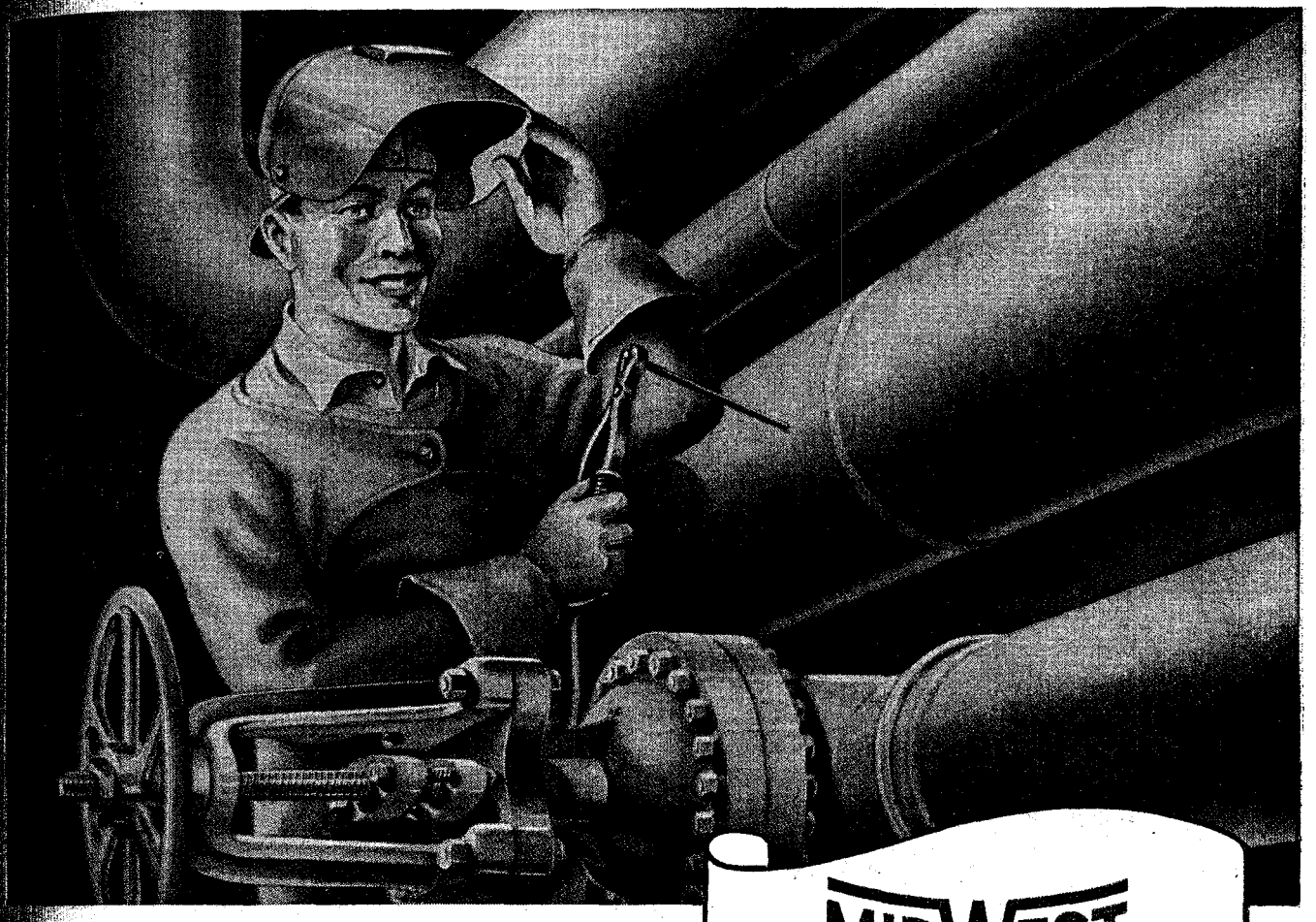
THE FULTON SYLPHON CO. KNOXVILLE 4, TENN.

FULTON SYLPHON

Temperature Controls Bellows Bellows Assemblies

Canadian Representatives, Darling Brothers, Montreal

The Man in the Field KNOWS When Pre-Fabricated Piping is Right

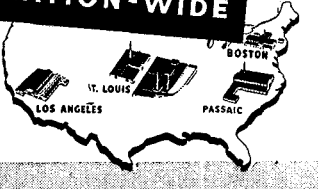


MIDWEST

CONTRACTING DEPARTMENT *Checks*

MIDWEST PIPING QUALITY

MIDWEST PIPING SERVICE IS NATION-WIDE



...men in the field who erect piping know when shop fabrication is well done . . . they know if the subassemblies fit correctly, line up easily and have all field welds or flanged joints in accessible positions. When this is the case, the erecting job is easier . . . saves both time and money.

Midwest has a Construction Department which has erected piping of all kinds for 46 years. The critical attitude of this department is the best stimulant to our four pipe-fabricating plants. The Construction Department also frequently contributes useful and practical suggestions for improving pipe fabrication.

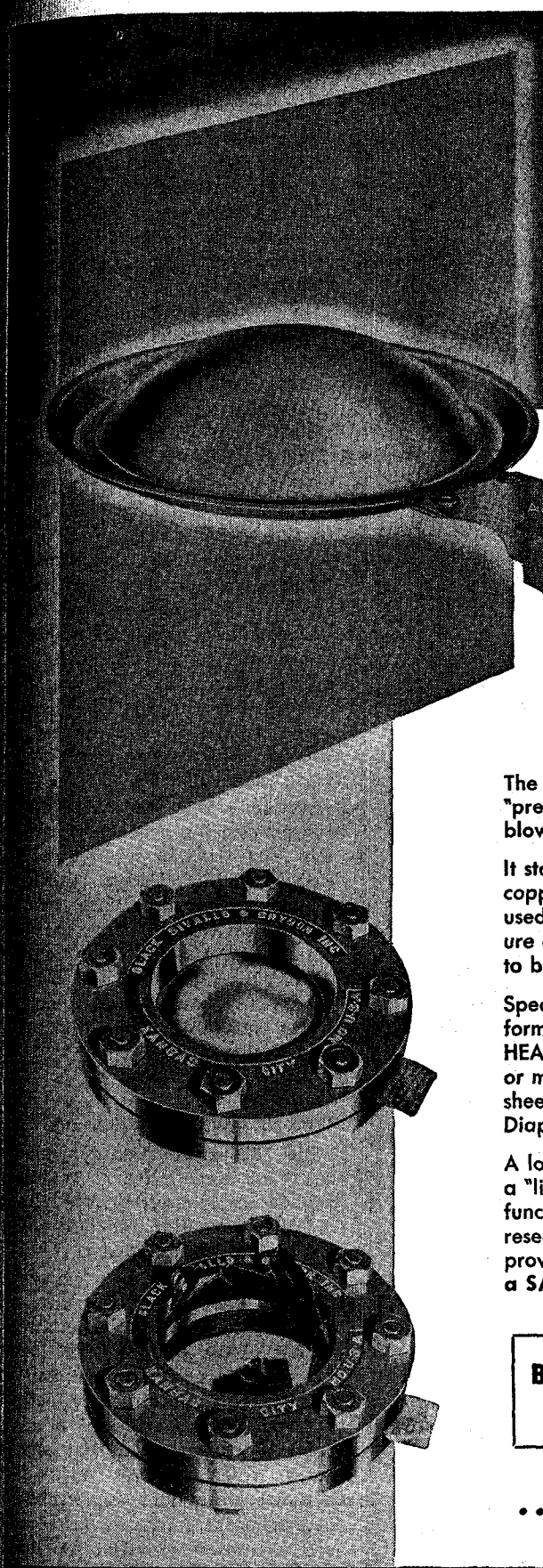
This situation has a powerful effect in keeping the whole organization alert . . . and in encouraging continuous improvement. It is one of many reasons why you get the best when you buy Midwest Pre-Fabricated Piping . . . either as materials furnished or piping completely installed.

MIDWEST PIPING & SUPPLY CO., INC.

MAIN OFFICE: 1450 SOUTH SECOND ST., ST. LOUIS 4, MO.

Plants: St. Louis, Passaic, Los Angeles and South Boston • Sales Offices: New York 7—30 Church St. • Chicago 3—645 Marquette Bldg. • Los Angeles 33—520 Anderson St. • Houston 2—229 Shell Bldg. • Tulsa 3—533 Mayo Bldg. • Atlanta 3—Red Rock Bldg. • South Boston 27—426 First St.

2266



Just a Piece of METAL

...But IT MAY *SAVE YOUR LIFE*

The rupture diaphragm of the B. S. & B. SAFETY HEAD is the "pressure fuse" which will prevent your pressure vessels from blowing up.

It starts life as a flat blank of almost any metal—Aluminum, copper, silver, stainless steel, platinum and a dozen others are used. Then it is given the spherical form which in great measure accounts for its ability to withstand fatigue in service and to burst at the right pressure in time of need.

Specimen discs are regularly burst to assure consistent performance. The specified bursting pressure of each SAFETY HEAD diaphragm is the average of bursting pressures of two or more specimen discs from an adjacent section of the same sheet of metal. The bursting pressure of the SAFETY HEAD Diaphragn is marked on a permanently attached metal tab.

A lot of care goes into turning this little piece of metal into a "life preserver" for your life and property. We believe this function deserves the full measure of our fifteen years of research and know-how—and the success of our efforts is proven by the fact that **no pressure vessel equipped with a SAFETY HEAD has ever burst from over pressure.**

BOOTH 564—NATIONAL POWER SHOW
NEW YORK CITY, DEC. 2-7

...WRITE FOR CATALOG

PRODUCTS B S & B SERVICE

BLACK, SIVALLS & BRYSON, Inc.

• **SALES OFFICES-- 24th FLOOR POWER AND LIGHT BUILDING, KANSAS CITY 6, MO.**
• **PLANT-- 7500 EAST 12th STREET, KANSAS CITY 3, MISSOURI**

Production, Prosperity and POWELL VALVES

The real wealth of a nation lies in its power to produce. And the greater the production, the greater the prosperity of its people.

Production depends on many things. Not the least of these is the efficiency of the equipment that controls the flow of the innumerable media that constitute the lifeblood of Industry.

Powell's contribution to national prosperity is a line of valves that is so complete that today there are Powell Valves adapted to *every* service in *every* branch of modern industry.

The Powell Line of Valves for Power Plants includes Bronze and Iron Valves of all required types, sizes, and designs and all types of Cast Steel Valves (including an outstanding line of Non-returns) available in pressure classes from 150 to 2500 pounds. Where quick, positive operation by remote control is desirable, electric motor operators can be furnished.

The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

Catalogs furnished on request. Kindly state whether you are chiefly interested in Bronze, Iron, or Cast Steel Valves.

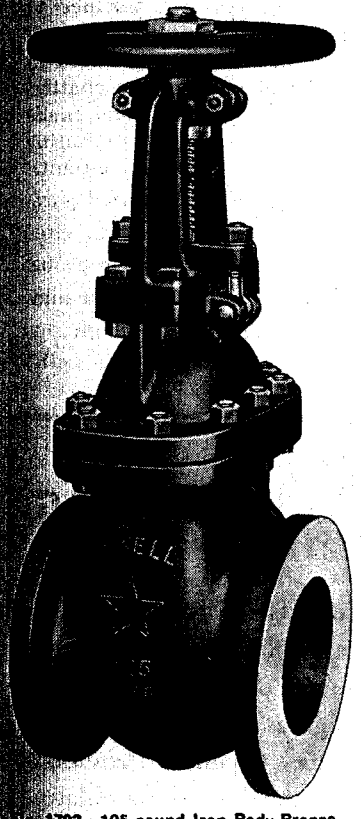


Fig. 1793—125-pound Iron Body Bronze Mounted Gate Valve for 125 pounds W. P. in sizes 2" to 30", incl. Has flanged ends, bolted flanged yoke, outside screw rising stem and taper wedge solid disc. Taper wedge double discs can be provided in sizes 2" to 12", incl. Seat rings and stem are in bronze. Disc is bronze in 3/4" and smaller size valves; bronze used in the larger sizes. Also available in All Iron.

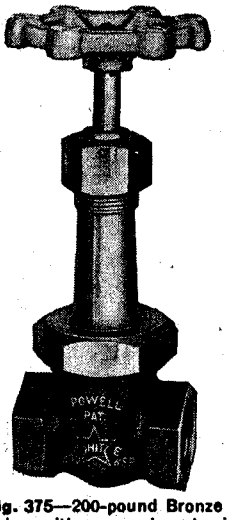


Fig. 375—200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable, wear-resisting "Powellium" nickel-bronze taper wedge solid disc in sizes 1/4" to 3/4", inclusive; taper wedge double disc in sizes 1" to 3", inclusive.

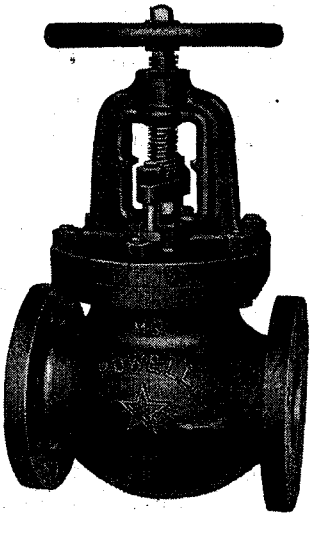


Fig. 241—125-pound Iron Body Bronze Mounted Globe Valve. Made in sizes 2" to 16", incl. Has flanged ends, outside screw rising stem, bolted flanged yoke and regrindable, renewable bronze seat and disc. Also available in All Iron.

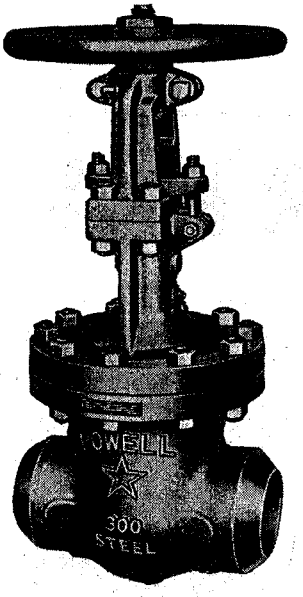


Fig. 3003 W.E.—Class 300-pound Cast Steel Gate Valve with welding ends, outside screw rising stem and bolted flanged yoke.

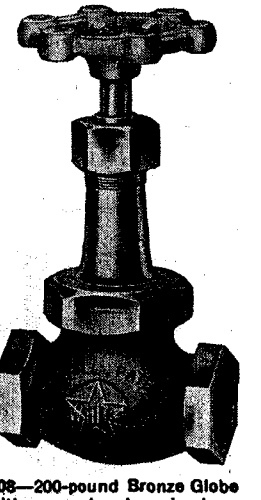


Fig. 1708—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable stainless steel seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze semi-cone plug type disc. Made in sizes 1/4" to 3", inclusive.

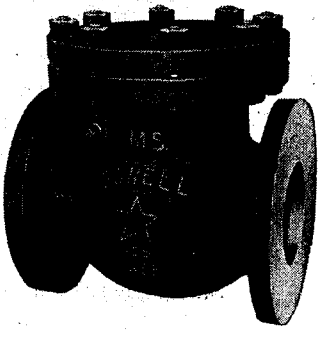


Fig. 559—125-pound Iron Body Bronze Mounted Swing Check Valve. Made in sizes 2" to 16", incl. Has flanged ends bolted flanged cap and regrindable, renewable bronze seat and disc. Disc, when wide open permits full unobstructed flow through the valve body. Also available in All Iron.

POWELL VALVES

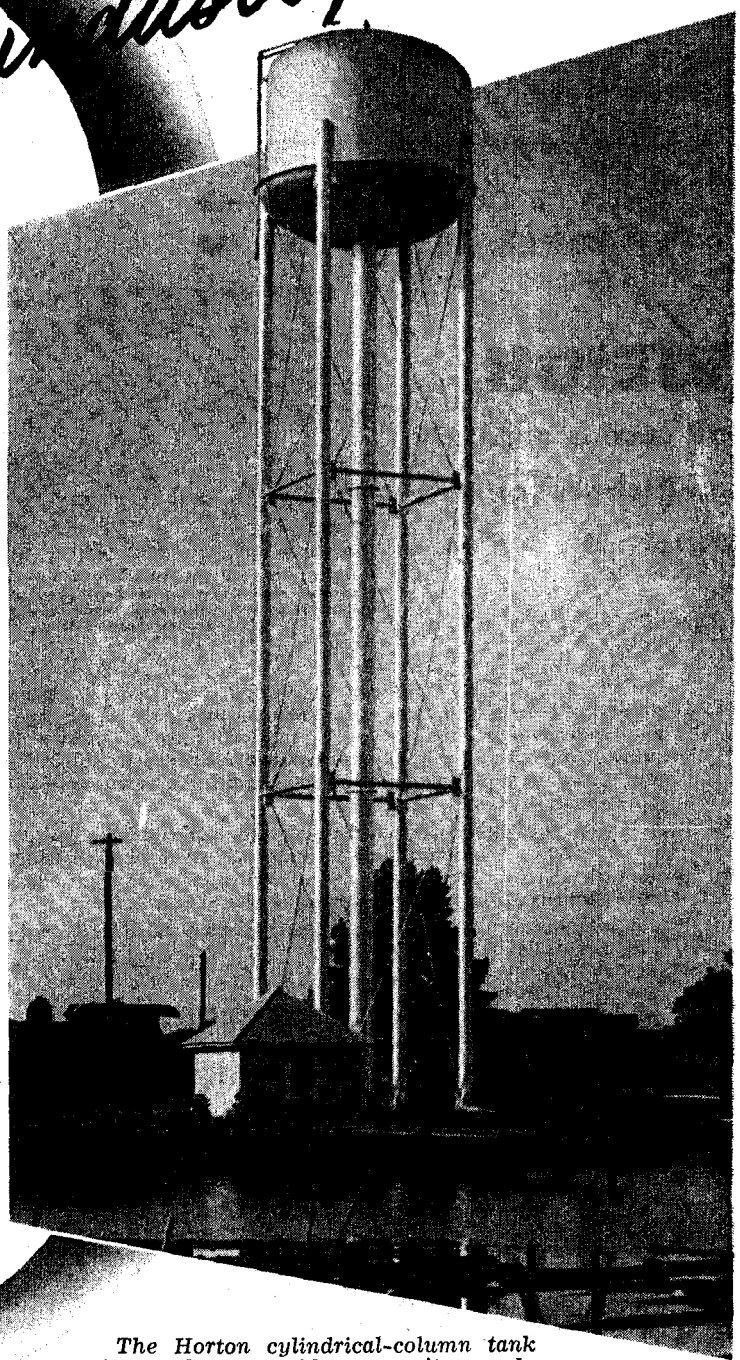
GRAVITY WATER PRESSURE

for all industry's needs!

For general water service or for fire protection, you can depend on gravity water pressure, as provided by Horton elevated storage tanks, to furnish water *at a moment's notice! Horton* all-welded elevated tanks are widely used throughout the South for this purpose.

The 75,000-gal. cylindrical-column tank at the right is a typical elevated water tank installation. It was erected at the T. R. Miller Mill Company, Inc. at Brewton, Alabama, and is used to supply water to the saw mill, planing mill, shop, veneer mill and box factory. The tank is filled twice each day, early in the morning and again in the late afternoon, with a 1,000-gal. per min. electrically-driven pump. About 150,000 gals. of water are used per day for boiler feed and other uses. According to the T. R. Miller Mill Company, the water supply from the tank is *"as near 100% perfect as we could expect."*

Investigate Horton *all-welded* elevated storage tanks when considering a gravity water supply for general service or fire protection.



The Horton cylindrical-column tank shown above provides a gravity supply of water for general service. It holds 75,000 gals. and is 100 ft. to bottom.

CHICAGO BRIDGE & IRON COMPANY

Atlanta, 3 . . . . . 2180 Healey Bldg.	Los Angeles, 14 . . . . . Wm. Fox Bldg.
Birmingham, 1 . . . . . 1500 N. Fiftieth St.	New York, 6 . . . . . 165 Broadway Bldg.
Chicago, 4 . . . . . McCormick Bldg.	Philadelphia, 3 . . . 1700 Walnut St. Bldg.
San Francisco, 11 . . 22 Battery St. Bldg.	Washington, 4 . . . . . 703 Atlantic Bldg.
Cleveland, 15 . . . . . Guildhall Bldg.	Houston, 1 . . . . . 5600 Clinton Drive
Tulsa, 3 . . . . . Hunt Bldg.	Detroit, 26 . . . . . Lafayette Bldg.

Plants at BIRMINGHAM, CHICAGO and GREENVILLE, PENNSYLVANIA

EQUIPMENT—Continued

metallic particles in suspension liquid coolants used on machine

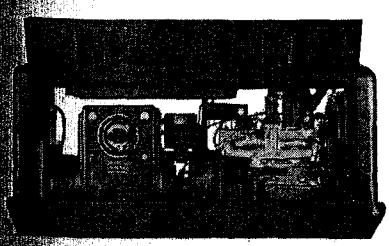
system consists of a seven gal- rectangular steel tank in which rainco strainer unit is mounted. Inject-A-Flow pump unit is nted on the lid of the tank with pump operating inside the strain- unit. The pump unit consists of a sion cast, non-corrosive, centri- pump connected to the motor ough an extended shaft. Provision made for recirculating coolant uid.

The system is equipped with a -foot, Wheelock flexible metal and a bronze flow control cock, ether with necessary wiring and tches.

◆

Electric Arc Welder

The HOBART BROTHERS COMPANY, bart Square, Troy, Ohio, announces new, combination drive Hobart ding machine which consists of standard 300 amp generator and hp induction motor mounted on eavy, solid shaft coupled to a rysler, 6-cylinder industrial en- through an over-running clutch pling. This coupling allows the oline engine to drive the welding erator. However, should the gaso- engine be stopped and the gen- tor be driven by the electric in- ction motor, the clutch will over- or free wheel. This action is en- ely automatic.



The induction motor is wound for dual 220/440 voltage. The gasoline engine is furnished with an idling device and all other features that are carried by the Standard Hobart, 300 amp gas drive.

This welder is ideal for locations where power may fail and the con- tractor or job welding shop operator with such a unit is able to take ad- vantage of the cheapest power avail- able.

...iler Feed Pumps

(Continued from page 72)

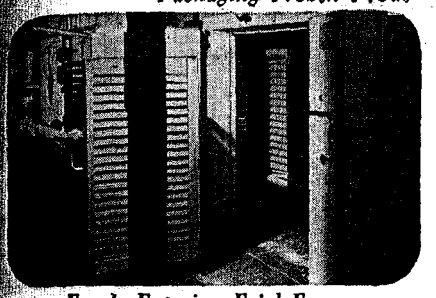
...steam plant. In addition, it is ...essary to credit the boiler feed ...p with the heat generated in ... by-pass orifice through the ...adation of pressure energy.

...in all, it can be stated that ... incidental to the operation ... boiler feed pump with by-pass ... are almost negligible and are ...urred in order to avoid possible ...age to the installed equipment ... serious interruption of the ...ice provided by the steam ...er plant. When considered in ... light, these losses become a ... reasonable premium to pay ... the assurance of continuity of ...vice of the boiler feeding equip...ent.

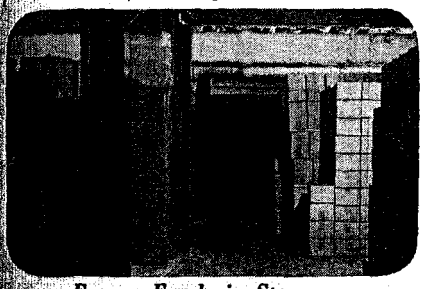
Such an evaluation of the by-... losses leads to the recom...endation that should the size of ... installation dictate against the ... of automatic by-pass controls ... by-pass should be left open at ... flows. It will become necessary ... close the by-pass valve only ...en the full load capacity of the ...d pump less the by-pass capaci... no longer suffices to fill the de...nd from the boiler. As a matter ... fact, in very small installations ...d with low pressure operating ...nditions, the by-pass require...nts are so low that they can be ...ded to the required capacity ...en establishing the design ca...ity of the feed pump, and no ...asion ever arises to close the ...-pass. For example, if the boil... feed pump is originally selected ... handle 100,000 lbs per hour of ...2F water against a net pressure ... 300 psi, the required by-pass ...pacity is approximately 5,000 lbs ... hour, and if the pump is de...ned for 105,000 lbs per hour, ... by-pass may be left open under ... conditions.

...t is readily recognized that in ...all installations, this additional ...gn capacity will add little to ... cost of he insallation, and is ... worth the investment. Larger ...mps should have automatic con...ls if possible, and, in any event, ...ould have by-passes arranged in ...ordance with the good practices ...dicated in this article.

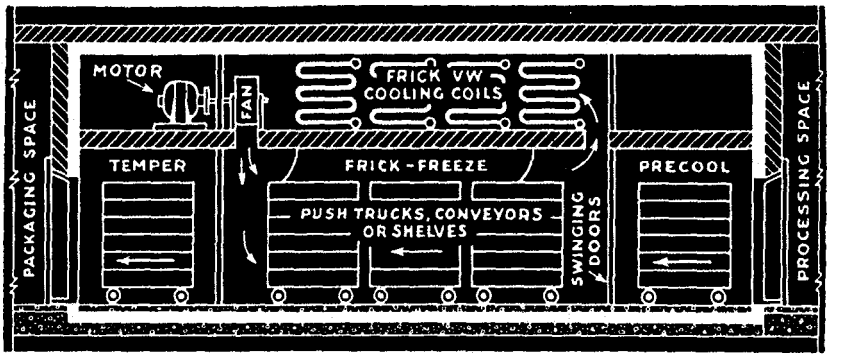
Packaging Frozen Foods



Foods Entering Frick-Freezer



Frozen Foods in Storage



There's no secret about Frick-Freezing Systems

Almost everybody is now interested in frosted foods—and in the method of freezing them. In the next few years, quick-freezing plants will be built in hundreds, if not thousands, of towns and rural districts throughout the country. This trend will affect you, and possibly your business.

If you want to be "in the know" on the latest quick-freezing methods, write for Frick Bulletins 147 and 148. They tell how to freeze either large or small quantities of foods most profitably—show how the most successful plants now do it. Write

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA. U.S.A.

TO BE SURE
Specify
PEABODY BURNERS

Oil — Gas — Pulverized Coal —
Either Singly or in Any Combination
Natural or Forced Draft

and

- Direct Fired Air Heaters
- Blast Furnace Gas Burners
- Fuel Oil Pump and Heater Sets
- Complete Combustion Systems
- Gas Scrubbers and Coolers

PEABODY ENGINEERING CORPORATION

580 Fifth Avenue — New York 19, N. Y.

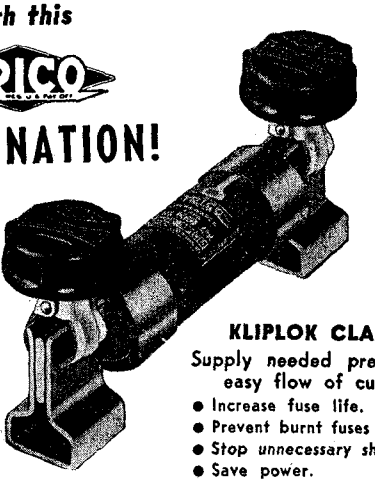
Atlanta: Rittlemeyer & Co., Bona Allen Building
Houston: The Tennant Co., Gulf Building
New Orleans: Allan J. Harris Co., Balter Building

TRIPLE FUSE SERVICE

with this

TRICO

COMBINATION!



KLIPLOK CLAMPS
Supply needed pressure for easy flow of current!
- Increase fuse life.
- Prevent burnt fuses and clips.
- Stop *unnecessary shutdowns.*
- Save power.
- Reduce fire and accident hazards.

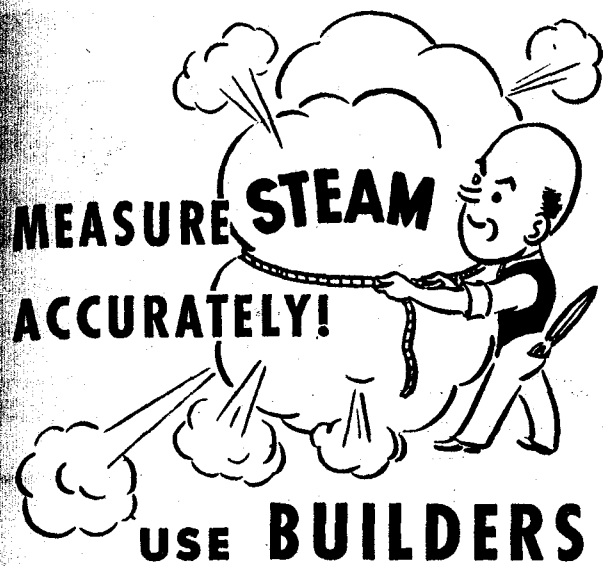
TRICO "Powder-Packed" RENEWABLE FUSE

This "different" fuse gives maximum protection and THREE TIMES the SERVICE at no added cost. Custom-built renewal element, "powder-packed" feature, and rugged construction make possible the following advantages . . .

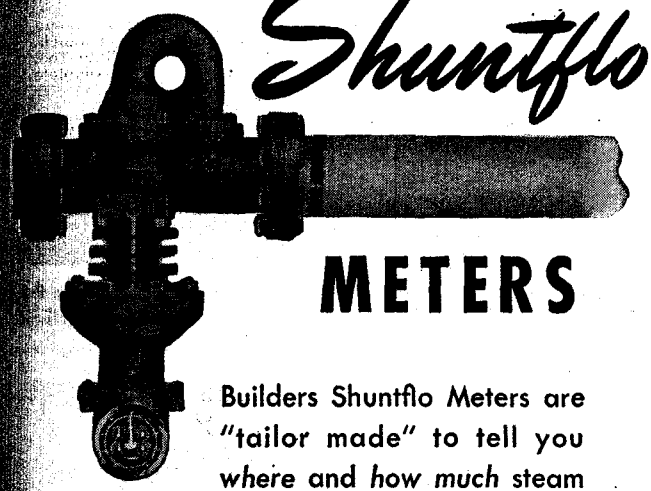
- Tamper proof protection.
- Non-interchangeable link.
- Safe time-lag.
- Link support.
- Life-time outer parts.
- Guaranteed results.

WRITE for Catalog!

TRICO FUSE MFG. CO.
MILWAUKEE WISCONSIN



USE BUILDERS *Shuntflo* METERS

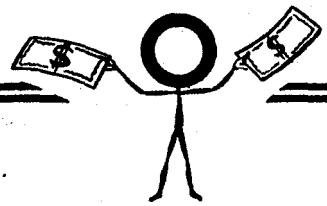


Builders Shuntflo Meters are "tailor made" to tell you *where* and *how much* steam is being used. This meter gives an accurate total of steam consumed by individual departments, tenants and processes. It measures *all* steam flow . . . provides a precise check and an accurate total of main line flow — eliminates waste and trims steam costs. The Shuntflo is self-contained — requires no electricity, mercury or clocks. It reads directly in pounds, cubic feet or other units, and gives years of trouble-free service. Readily installed in any line from 2" to 12".

For Bulletin 349, address Builders-Providence, Inc., (Division of Builders Iron Foundry), 53 Codding Street, Providence 1, R. I.

BUILDERS PROVIDENCE *Instruments*

MOCCASIN BUSHINGS PAY THEIR WAY



MOCCASIN Bushings require but 2 to 4 oilings a year, at a cost of about 75c. Compare this to $5.20—the approximate oil cost for lubricating ordinary bearings—and you'll see why Moccasin Bushings easily pay their way!

And there are many other advantages: Moccasin Bushings are long-wearing—actual experience shows them good for 20 years plus! They prevent grit or abrasive substances from reaching the bearing surface . . . eliminate improper and insufficient lubrication, the cause of 75% of all bushing failures.

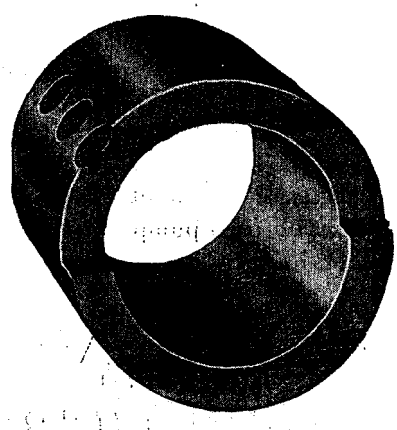
Moccasin Bushings are used by hundreds of leading manufacturers. Try one on your most troublesome bearing. Write today!

★ Moccasin Bushings lubricate from a leak-proof oil reservoir.

★ Place a continuous, unbroken film of oil on bearing surface.

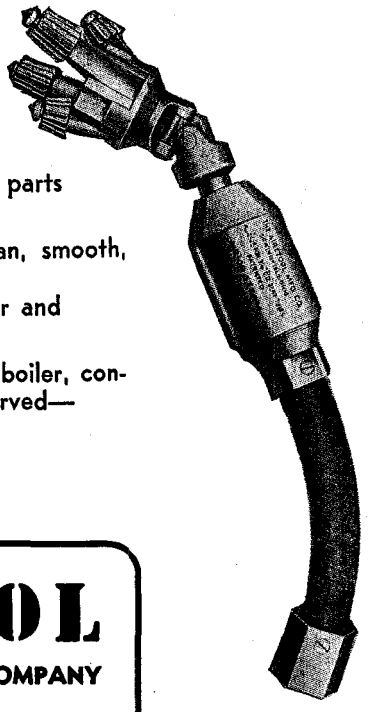
★ No oil drippage or flying grease to damage floors, belts, materials.

★ Satisfactory performance absolutely guaranteed.



Moccasin
BUSHING COMPANY
CHATTANOOGA, TENNESSEE

cut maintenance costs with AIRETOOL tube cleaners



The simplicity of construction in all Airetool Tube Cleaners assures lower maintenance costs . . . and cleaner tubes in power plants. All vital wearing parts in Airetool Cleaners are easily replaceable on the job.

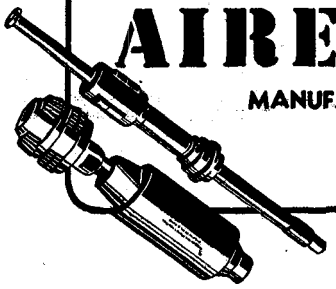
Airetool's New Form cutters eliminate tracking and give tubes a clean, smooth, undamaged surface. Airetool's motors, with Balanced Rotor and Power Seal, deliver more power—they make hard jobs easy. The motors are air and steam or water driven.

There's an Airetool Cleaner for every type of water tube and fire tube boiler, condenser, heat exchanger, and all other tubular construction—straight or curved—in sizes from 1/4" to 24" I.D.

Illustrated is the forwardly swing arm head with universal joint mounted on a "4000" series motor, air or steam driven. It is designed for bent tubes of 1 3/4" to 12" I. D.

AIRETOOL EXPANDERS

Airetool manufactures a complete line of tube expanders — meeting every requirement of the modern power plant. Special heat-treated alloy steels assure a uniform grain and hardness.



AIRETOOL
MANUFACTURING COMPANY
SPRINGFIELD, OHIO

Write Dept. SP for bulletins on tube cleaners and tube expanders especially designed for use in power plants.

SMOKE METER

For the Determination of Smoke Density in Stack Gas

The principle of this instrument is a photo-electric soot density comparator designed for oil-fired appliances.

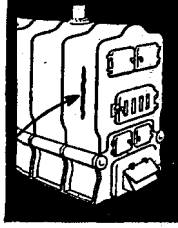
The unit is completely contained in a small metal case.

Write for Bulletin

THE REFINERY SUPPLY CO.

621 East 4th St., TULSA 3, OKLA.

HOW TO REPAIR LEAKS AND CRACKS PROMPTLY, EFFECTIVELY



When boilers, radiators, tanks, piping fixtures develop leaks, cracks or loosened parts, get Smooth-On No. 1 Iron Repair Cement. For more than fifty years the repair man's standby.

To apply, you simply mix Smooth-On with water. No heat required. It hardens like metal and stays tight.

Maintenance men and mechanics everywhere keep Smooth-On handy for both emergency and routine repairs. You can buy it in economical 7-oz., 1-, 5-, 25-lb. sizes at your supply house. If they haven't Smooth-On, contact us direct.

FREE REPAIR HANDBOOK

Clear instructions for practical, tested, short-cut repairs on equipment of countless kinds. Shows how to save time and money. 40 pages. 170 diagrams. Pocket size—should be in YOUR pocket.

SMOOTH-ON MFG. CO., Dept. 35
570 Communipaw Ave., Jersey City 4, N. J.

Do it with **SMOOTH-ON**

7 reasons....

WHY LEADERS IN EVERY FIELD CHOOSE THE ELGIN WATER SOFTENER

1 DELIVERS 44% MORE SOFT WATER
In comparison with other zeolite water softeners the Elgin delivers as much as 44% more soft water.

2 LOWER INVESTMENT
Based on cost per thousand gallons of soft water delivered, the Elgin Water Softener is far lower in price.

3 LOWER OPERATING COST
By virtue of an improved distributing and collecting system, less regenerating salt and wash water are required.

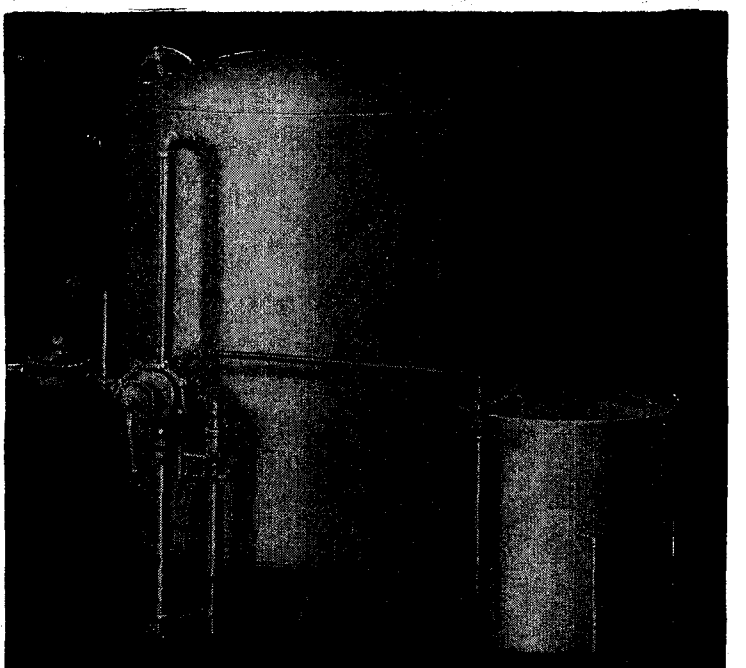
4 HIGHER EFFICIENCY
The water softening zeolite in the Elgin is kept clean and active so that equipment operates more efficiently without attention—and more "zero-soft" water is delivered per pound of salt used.

5 LESS MAINTENANCE
Unbiased surveys prove that with ELGIN quality construction throughout, fewer replacements are required. Loss of zeolite is prevented, thus eliminating costly additions.

6 LONGER LIFE
Efficient distribution, collection and regulation of water and brine add years to the life of Elgin Water Softeners.

7 LESS SPACE REQUIRED
To give the same capacity as an Elgin, other water softeners must be as much as 50% larger in size.

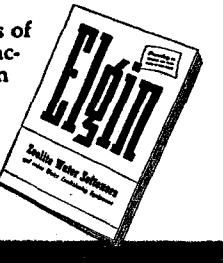
Existing water softeners of any make can be modernized by Elgin to provide the above features.



Latest design Elgin Water Softener

THE ELGIN WATER SOFTENER gives greater capacity and higher efficiency because it accommodates a far greater quantity of water softening zeolite—and uses it more effectively by virtue of an ingenious manifold system and backwash regulator. Naturally, a greater volume of soft water is delivered because it's the zeolite that softens water—and more zeolite used with greater effectiveness means more softened water.

A NEW BULLETIN . . .
So important are these features to the users of soft water that we have prepared a new factual bulletin describing the construction and operation of the postwar Elgin Water Softener and explaining the benefits and economies of softened water. Ask for Bulletin 607. For hospitals it's Bulletin 608. For laundries it's Bulletin 609.



ELGIN SOFTENER CORPORATION

SOFTENERS ★ FILTERS ★ WATER TREATMENT ★ BOILER WATER CONDITIONING

Jenkins PRACTICAL PIPING LAYOUTS 16

How to plan a DIESEL ENGINE COOLING WATER CIRCUIT WITH WASTE HEAT RECOVERY

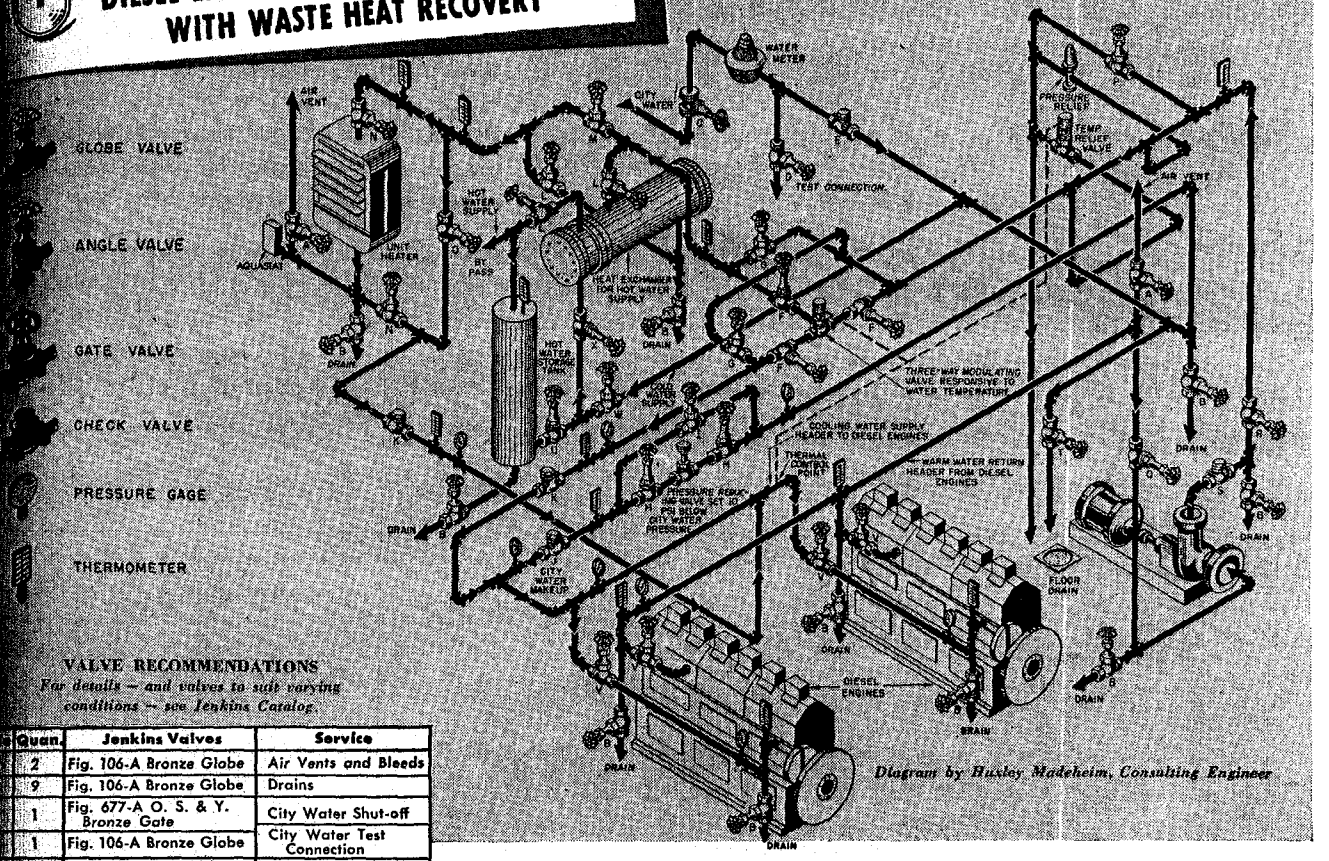


Diagram by Huxley Madeheim, Consulting Engineer

VALVE RECOMMENDATIONS

For details — and valves to suit varying conditions — see Jenkins Catalog.

Quan.	Jenkins Valves	Service
2	Fig. 106-A Bronze Globe	Air Vents and Bleeds
9	Fig. 106-A Bronze Globe	Drains
1	Fig. 677-A O. S. & Y. Bronze Gate	City Water Shut-off
1	Fig. 106-A Bronze Globe	City Water Test Connection
1	Fig. 92 Bronze Swing Check	City Water Backflow Prevention
3	Fig. 47 Bronze Gate	3-way Mod. Valves Shut-off
2	Fig. 106-A Bronze Globe	3-way Mod. Valves By-pass
2	Fig. 47 Bronze Gate	P.R.V. Shut-off
1	Fig. 106-A Bronze Globe	P.R.V. By-pass
1	Fig. 92 Br. Swing Check	Prevention of back-flow into City Water
2	Fig. 92 Br. Swing Check	City Water Check-off
2	Fig. 106-A Bronze Globe	Heat Exchanger Shut-off Control
1	Fig. 106-A Bronze Globe	Heat Exchanger By-pass
2	Fig. 106-A Bronze Globe	Unit Air Shut-off and Control
1	Fig. 106-A Bronze Globe	Unit Air By-pass
1	Fig. 106-A Bronze Globe	System Manual Bleed
1	Fig. 47 Bronze Gate	Pump Suction Shut-off
1	Fig. 106-A Bronze Globe	Pump Discharge Shut-off
1	Fig. 92 Br. Swing Check	Pump Discharge Check
1	Fig. 106-A Bronze Globe	Floor Drain Trap Fill
1	Fig. 47 Bronze Gate	Hot Water Tank Shut-off
4	Fig. 106-A Bronze Globe	Engine Cooling Water Control
1	Fig. 106-A Bronze Globe	Cold Water Supply
1	Fig. 47 Bronze Gate	Cold Water to Heat Exchanger

A typical circuit is shown for recovering waste heat in small plants, garages, laundries, etc., where a Diesel Engine is used to generate electricity. Heat in the cooling water is dissipated through unit heater, and also through an exchanger for domestic hot water supply. Heat dissipation can be balanced between the two units by means of globe valves. An aquastat shut-off is provided for unit heater fan.

Overheating *is* prevented by a temperature and pressure relief valve. Overcooling is prevented by a three-way modulating valve which by-passes a portion of cooling water back to circulating pump should the demand from heat exchanger and unit heater be too great.

Suitable protection is provided against low city water pressures and provision is made for shutdowns and freeing air from system.

Copies of Layout No. 16, enlarged, with additional information will be sent on request . . . also future Piping Layouts. Just Mail coupon.

Other types and pressure ranges of Jenkins Valves can be used for this layout, according to factors involved. Consultation with accredited piping engineers and contractors is recommended on major installations.

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