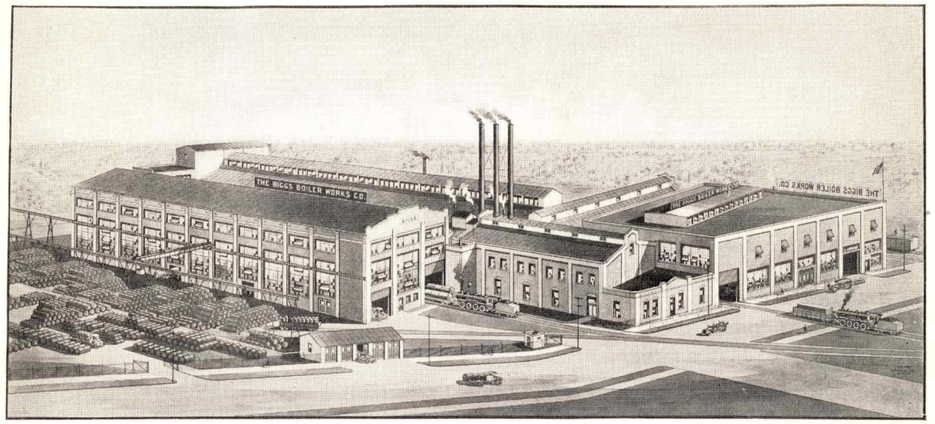
BIGGS
GLOBE *and* CYLINDER ROTARY BLEACHING BOILERS FOR GENERAL PAPER MILL SERVICE

The
BIGGS BOILER WORKS COMPANY
AKRON OHIO U.S.A.
Established 1887



A *Really* Unusual Plant

UNUSUAL—because it was built literally from the ground up for the particular job of producing high quality vessels of riveted steel; and unusual for the exceptional way in which it meets the demands that such production puts upon it.

The Biggs plant is located in the heart of the East Akron industrial district. The larger and more important units are new, of brick and steel fire-proof construction; and all machinery has been installed with the idea of making it one of the best-equipped plants for heavy steel plate construction in existence—nothing has been overlooked. The plant is provided throughout with automatic sprinklers and particular attention has been given to natural lighting and ventilation.

Ample railroad facilities are of great assistance. The plant is served by three private sidings, and the storage yard is equipped with a traveling crane to facilitate handling the finished product.

The entire power plant equipment, including steam boilers, motor generator sets, hydraulic pumps, accumulators, air compressors, etc., are installed in duplicate series to assure continuous operation in case of the most serious breakdown. The various machines, with the exception of the hydraulic equipment, are electrically driven. There has also been installed a transformer set to permit the use of city power when necessary.

This careful provision against all emergencies is added assurance of continuous production and protection to Biggs customers against delays in filling their orders. The elimination of fire hazard, through the installation of an adequate sprinkler system, is another big factor toward the same end.

The plant layout embraces Receiving Floor; Shipping Floor; Machine Shops; Welding Department, both electric and acetylene; Fabricating Plant; Flanging and Dishing Department (where all size heads, regardless of thickness or diameter, are flanged and dished under sectional and four-column heavy-duty hydraulic machines); Blacksmith and Forging Department; Riveting Tower with six hydraulic riveters, 150 tons capacity; Caulking Department; Test Block; Tool Room; Stock Rooms and Warehouses.

It is well to have an ideal and high standard, but without modern and up-to-date equipment, high ideals are difficult to attain.

With our plant and equipment, we have been able to make a definite, tangible reality out of our ideals; and to hold continually the loyalty and confidence of our customers.

Since 1887—Biggs Leadership

THROUGHOUT the years that represent the greatest growth of the paper industry, Biggs Rotary Bleaching Boilers have become known in every part of the world as standard paper-plant equipment.

The greatest test of such leadership is continued popularity and use; and the fact that now, after 36 years, more Biggs Boilers are being sold than ever, is, we believe, the best possible evidence from the customer's side that Biggs equipment represents the greatest amount of rotary boiler value that they can buy. As you well realize, very few orders are placed nowadays except on the basis of maximum return for the money.

Through constant research and study by our own Engineers, and often by the greatly-appreciated suggestions and co-operation of valued customers, Biggs equipment has been steadily developed and improved: always up-to-date, always in the lead. We propose to keep it there.

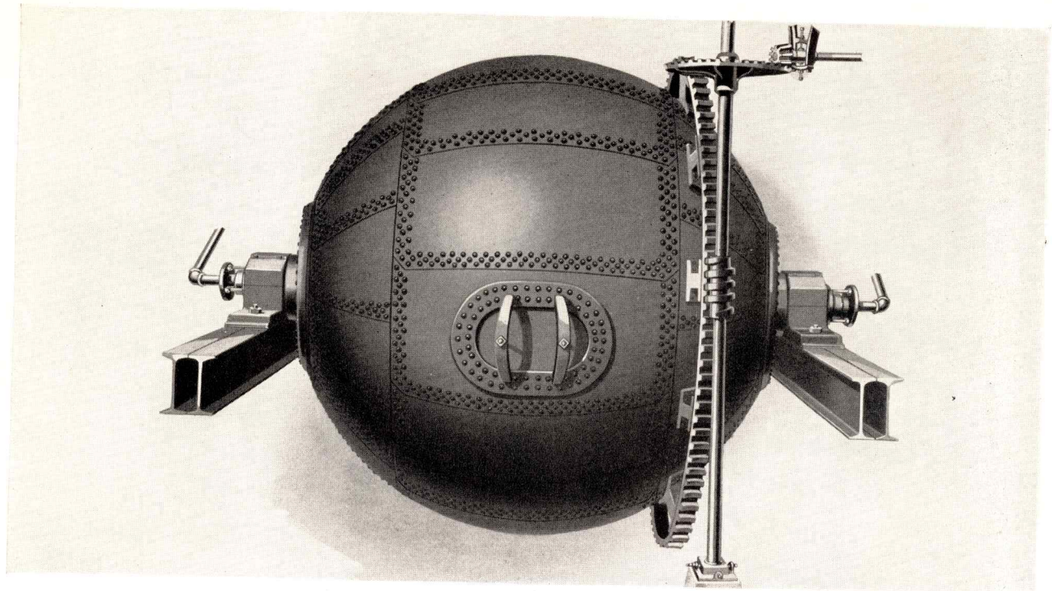
Biggs Rotary Boilers in both Globe and Cylinder types are used universally for bleaching the various stocks used in the manufacture of fine printing and writing papers, etc., also straw, bagasse, wood fibre, cotton linters and other materials used to make boxboard, strawboard, pasteboard containers, and other special products.

As will be seen from following pages, we build both types in a variety of diameters and lengths, fitting them to the requirements of all kinds of plants, producing all grades of stocks, and working under as many different conditions as one could imagine.

Biggs Rotary Bleaching Boilers are built for various working pressures, having a factor of safety of at least 5. They are designed to resist successfully the corrosion of such elements as lime, bleaching chemicals, etc.

The Biggs plant is a fitting home for the worthy lines it produces. The entire layout is practically new, and is provided with special hydraulic equipment and heavy-duty machines, such as are absolutely necessary in the manufacture of a very large product where uniformity and exactness are also essential.

A little further along in the book, we shall take you on a "visit" down through the works, giving those of you who cannot easily come to Akron, a connected story of the way a Biggs Rotary Bleaching Boiler is built, starting with the steel plate, just as it comes from the mill.



Biggs Standard Globe Rotary Bleaching Boiler

THE illustration shown above is of a standard 14-foot diameter Globe Rotary Bleaching Boiler with worm drive.

This particular size and design has been adopted by the paper industry as standard and is the size, therefore, most commonly installed throughout the entire world for cooking and bleaching straw, grass, bagasse, wood fibre, cotton linters, sulphite pulp and similar material used in making boxboard, strawboard, pasteboard containers, etc.

General Specifications

The Standard Biggs 14-foot Globe is made throughout of the best soft, open hearth flange steel obtainable, the specifications for the steel meeting the requirements of the A. S. M. E. Code and the Hartford Steam Boiler Inspection & Insurance Company.

The shell plates are 9/16-inch thick; heads are 11/16-inch thick; the seams are all lap joint, triple staggered riveted.

Two manholes are provided, size 24-inch x 42-inch. The manholes are heavily reinforced and are provided with flange steel covers made of the same material as the shell of the boiler except heavier and reinforced, making a manhole plate that, while comparatively light and easy to handle, is as strong as any other portion of the boiler.

Journals. Our 14-foot Rotaries are equipped with 14-inch diameter journals, which are triple riveted to the heads, the journals being provided with stuffing-boxes and supported with our special design ball and socket, pillow block type of support. We provide blow-off valves, rag pins and hinged strainers over blow-off and journal openings.

The worm shaft is provided with a chilled point operating in a brass step bearing.

Sizes. We are prepared to furnish Globe Rotary Bleaching Boilers in all

sizes that may be required in the paper industry, building the machines for all pressures and equipping them with special baffles, strainers and agitators and with various types of drives, including combination worm and spur gear drives, worm reductions running in oil baths, etc.

Smallest and Largest. On pages 10 and 11, we illustrate the smaller size Globes with worm wheel and spur gear drive and on page 16 we show an 18-foot diameter Globe, this being the largest Globe that has ever been built.

This particular machine was equipped with inside perforated baffle-plates and provided with a special type of steam joint or steam chest to which were connected a series of perforated pipes fastened to the shell so that the steam would always enter the mass at the bottom of the boiler, thereby preventing the possibility of charring or burning the stock at any point. This special cooking device can likewise be installed on the 14-foot Globes—the same being more fully illustrated and described on page 12.

Durability. It is not uncommon to have a set of standard worm gears on Biggs Globe Rotary Bleaching Boilers run for twenty years without a single replacement.

We recommend on all occasions that the foundation supporting the worm shaft be entirely separate from the foundation supporting the main journal bearings.

The Biggs shops are equipped with both oxyacetylene and electric welding plants; we are thus prepared to electrically weld all seams and rivet-heads on the inside of our Rotaries. On jobs where it is necessary to line the Rotaries with either lead, vitreous tile or brick for handling the more destructive bleaching chemicals, this construction is usually necessary.

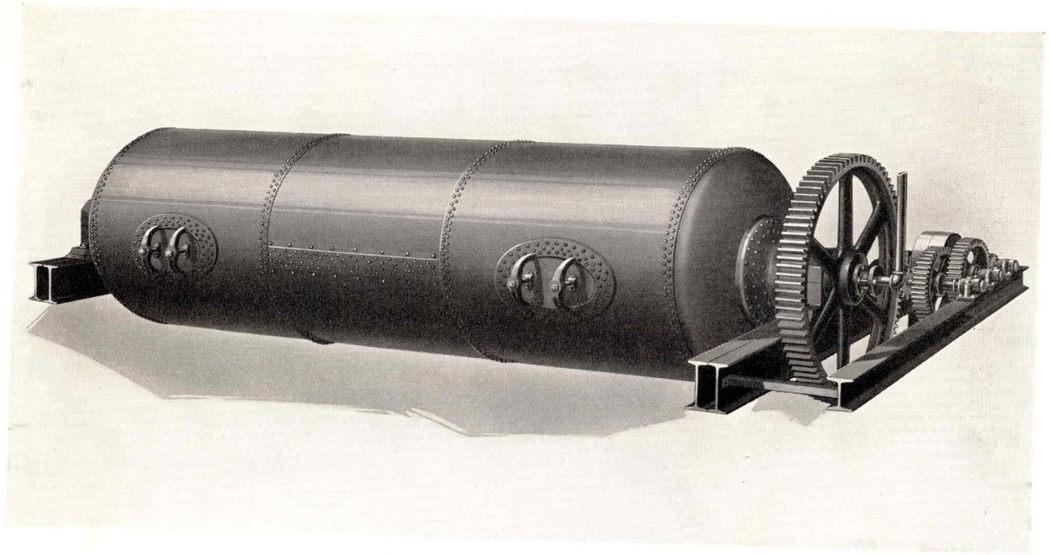
Biggs Globe Rotary Bleaching Boilers regardless of size, are designed and constructed to give the best possible service. On the following pages you will find some of the more important operations specifically described and illustrated.

Biggs Standard Globe Rotary Bleaching Boilers are built for various working pressures, using a factor of safety of at least 5, and are designed to withstand the corrosive action of chemicals.

Table of Capacities and Weights, Standard Sizes

Diameter	Thickness of Material		Capacity in Cubic Feet	Approximate Shipping Weight, Pounds
	Shell	Heads		
3′-0″	3/8″	3/8″	14	2200
6′-0″	3/8″	3/8″	110	5000
8′-0″	3/8″	3/8″	265	9600
9′-0″	7/16″	1/2″	380	12600
10′-0″	1/2″	9/16″	520	15400
11′-0″	9/16″	11/16″	700	24500
12′-0″	9/16″	11/16″	900	29000
14′-0″	9/16″	11/16″	1435	36000
18′-0″	3/4″	7/8″	3055	60000

We build any size or type Rotary Bleaching Boiler that you may require



Biggs Standard Cylinder Rotary Bleaching Boiler

THE illustration shows a Biggs Standard 8-foot x 24-foot Cylinder Rotary Bleaching Boiler with 14-inch diameter journals and standard spur gear drive consisting of 105 tooth gear and 13 tooth driving-pinion; this type of drive being most commonly used.

We are prepared, however, to furnish various types of drive for our Cylinder Rotary Bleaching Boilers, consisting of combination worm and spur gear drive, worm reduction gears running in oil baths, etc. The illustration on page 19 shows a combination worm and spur gear drive quite often used.

On our extremely large Cylinder Rotary Bleaching Boilers made of extra heavy material to withstand high steam pressures, we quite often use 18-inch or 20-inch diameter journals and have built special apparatus similar in construction with shell plates—$1\frac{1}{4}$ inches thick, and 20-inch *cast steel* journals.

General Specifications

Materials. The various thicknesses of material specified in the Table of Capacities represent our interpretation of the proper specifications for various sizes.

True, the conditions under which this type of Boiler operates do not necessitate material of the strength and type of rivet joint construction that we have employed as standard *if* we are dealing only with the actual steam operating pressure.

But the *general* conditions of operation which include a certain amount of deterioration on account of bleaching chemicals, make it necessary, we feel, to design Biggs Cylinder Rotary Bleaching Boilers with an ample margin of safety so that they may withstand such service. In addition, this construction

will stand entire pressure carried on the steam generating boilers in the event of failure of relief-valves or pressure-regulators, as often happens.

Shell Plates and Heads. The material used in the Shell Plates and Heads of Biggs Cylinder Rotary Bleaching Boilers is the best soft open hearth flange steel obtainable, the specifications for the steel meeting the requirements of the A. S. M. E. Code and The Hartford Steam Boiler Inspection & Insurance Company.

Rivets. Our standard design for rivet joint construction is the double butt, triple or quadruple staggered riveted longitudinal joint. The circumferential seams are lap joint, double staggered riveted. All rivets are driven under 150 tons hydraulic pressure.

We particularly invite your attention to pages 22 and 23, showing Cylinder Rotary Bleaching Boilers in the process of riveting and an exact reproduction of a cross-section after having been riveted by the Biggs method.

Manholes. Two or more manholes are provided, standard size 23 x 34 inches. The manholes are heavily reinforced, so as to replace all material removed by the opening, and are provided with tight-fitting steel covers.

Counter-Weights. There is also provided a counter-weight of correct capacity directly opposite each manhole so as to perfectly balance the Rotary, thereby assuring a uniform speed at all points of the revolution.

Feature Details. The Cylinders are provided with rag pins, drain valves, pressure relief valves and strainers over the blow-off and journal openings. The journals are extra heavy in design and construction, being triple riveted to the dished heads of the boiler and have a factor of safety approximately 20 to 1. The journals are provided with steam joints and supported by our special ball and socket, pillow type of journal bearing. See illustrations on page 13.

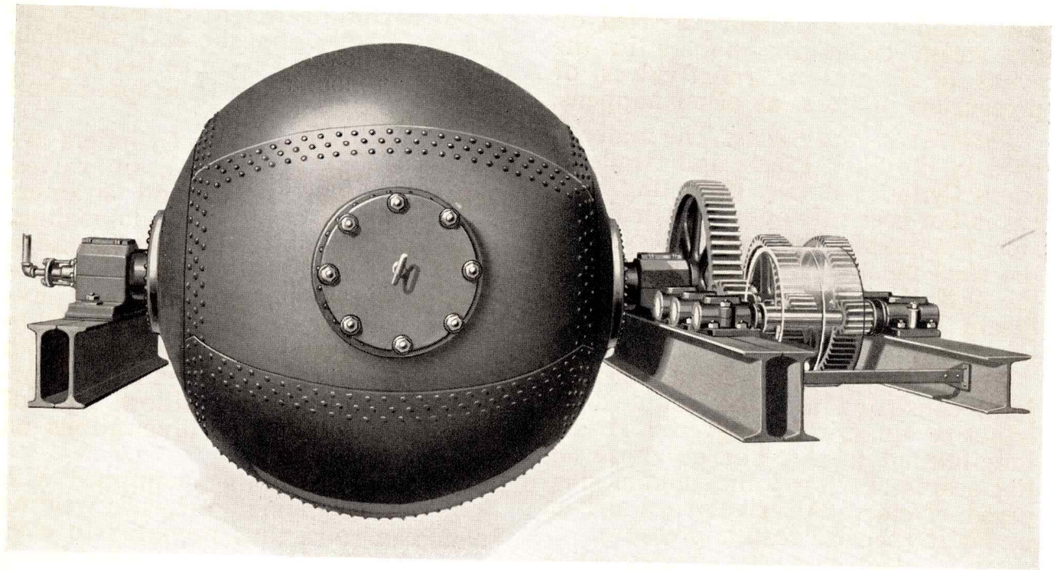
The Biggs shops are equipped with both oxyacetylene and electric welding plants; we are thus prepared to electrically weld all seams and rivet-heads on the inside of our Cylinders. On jobs where it is necessary to line the Cylinders with their lead, vitreous tile or brick for handling the more destructive bleaching chemicals, this construction is usually necessary.

Biggs Standard Cylinder Rotary Bleaching Boilers are built for various working pressures, using a factor of safety of at least 5, and are designed to withstand the corrosive action of chemicals.

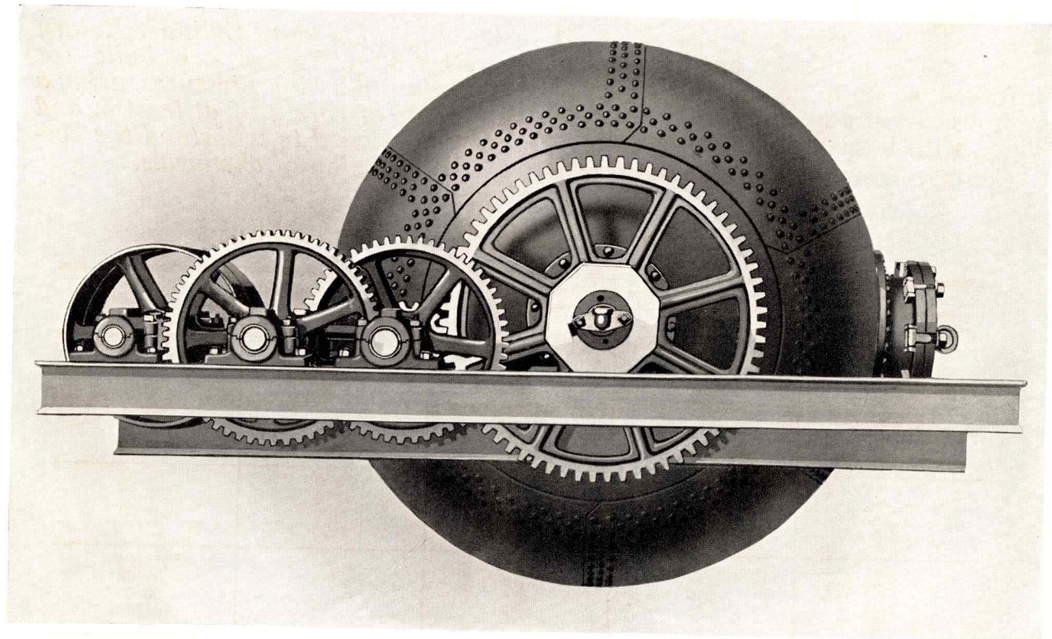
Table of Capacities and Weights, Standard Sizes

Dimensions		Thickness of Material		Capacity in Cubic Feet	Approximate Shipping Weight, Pounds
Diameter	Length	Shell	Heads		
6′-0″	16′-0″	$\frac{7}{16}$″	$\frac{1}{2}$″	470	21100
6′-0″	18′-0″	$\frac{7}{16}$″	$\frac{1}{2}$″	525	21900
6′-0″	20′-0″	$\frac{7}{16}$″	$\frac{1}{2}$″	580	22700
7′-0″	18′-0″	$\frac{1}{2}$″	$\frac{5}{8}$″	730	25800
7′-0″	20′-0″	$\frac{1}{2}$″	$\frac{5}{8}$″	805	26800
7′-0″	22′-0″	$\frac{1}{2}$″	$\frac{5}{8}$″	880	27800
8′-0″	18′-0″	$\frac{9}{16}$″	$\frac{11}{16}$″	950	29800
8′-0″	20′-0″	$\frac{9}{16}$″	$\frac{11}{16}$″	1050	31100
8′-0″	22′-0″	$\frac{9}{16}$″	$\frac{11}{16}$″	1150	32500
8′-0″	24′-0″	$\frac{9}{16}$″	$\frac{11}{16}$″	1250	33800
9′-0″	20′-0″	$\frac{5}{8}$″	$\frac{3}{4}$″	1340	36400
9′-0″	22′-0″	$\frac{5}{8}$″	$\frac{3}{4}$″	1465	38100
9′-0″	24′-0″	$\frac{5}{8}$″	$\frac{3}{4}$″	1590	39700
9′-0″	26′-0″	$\frac{5}{8}$″	$\frac{3}{4}$″	1710	41300

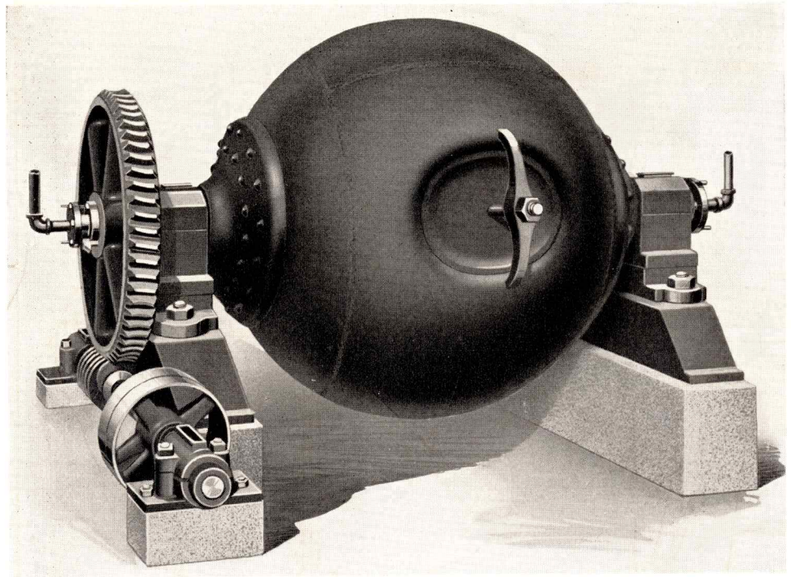
We build any size Rotary Bleaching Boiler that you may require



Biggs Globe Rotary Bleaching Boiler—9-foot diameter—front view with 8-inch cast steel journals, spur gear drive, 18-inch diameter manholes. We also use this type of drive and the same general construction on Biggs Globes—6-, 8-, and 10-foot diameters.



End View of Biggs Rotary Bleaching Boiler shown above. For domestic shipments, Globes of this size are usually riveted up complete and tested before leaving our plant.

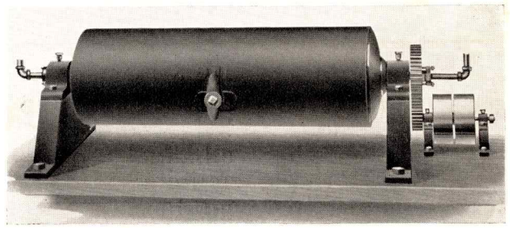


"Experimental" or "laboratory" type of Biggs Globe Rotary Boilers. Ideal for experimental-laboratory purposes, and used for working out special problems. It has worm gear drive; worm attached to the journal. Furnished in 3-, 4-, and 5-foot diameters.

Taking the "Guess" out of Experiments

Some little glimpse of the range of sizes in which Biggs Rotary Bleaching Boilers are built is given in the pictures on this page and the opposite one—or rather *would* be given, if those on this page were shown small enough to properly correspond with their larger "Biggs" brothers. The two illustrated on this page are our experimental or laboratory types, used by many paper companies for testing purposes in connection with new formulae and processes.

We build the Experimental Globe types in 3, 4 and 5 foot diameters; Cylinders in various practical diameters and lengths, to meet the special requirements of the work in hand.



"Experimental" or "laboratory" type of Biggs Cylinder Rotary Boiler; has the same applications as small Globe, shown above. This Cylinder is 8 inches in diameter and 18 inches long; we build them in various other sizes and designs, depending upon the nature of the work to be performed.

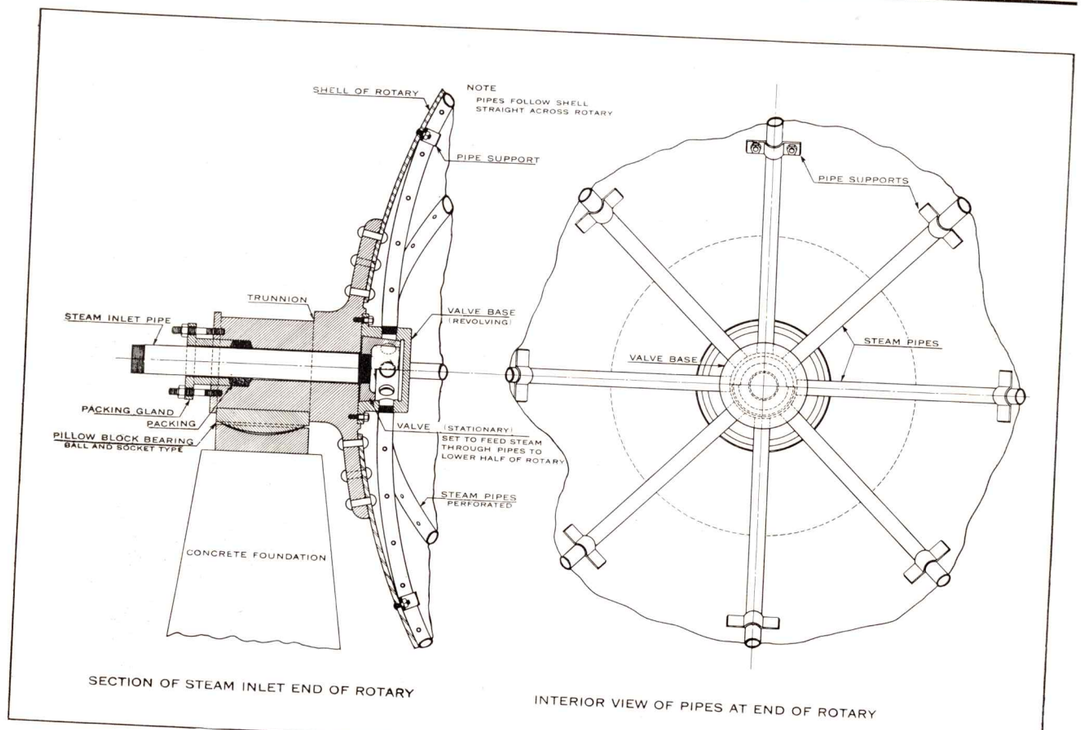
The Small Details are Worth Watching!

If there is one thing above another on which the Biggs organization prides itself, it is in the care we have trained all our people to take in the small details of Rotary Bleaching Boiler construction.

When set up and ready to operate, a full-sized Globe reaches away up into the air, while a Cylinder displays impressive length; but after all, even so large a machine is only an assembly of small parts, and it is upon the successful operation of these parts that the value of the investment must depend.

This careful, thorough-going way of doing things has been a principle with Biggs from the start; we sincerely believe it has had more to do with putting Biggs Rotary Bleaching Boilers in their place of leadership, and with *keeping* them there, than anything else could.

And so, if we seem to emphasize the care and accuracy with which we do our work, rather frequently as we tell you in the following pages how Biggs Rotaries are produced, just remember that we do so because we feel that the confidence of nearly every manufacturer in the whole paper industry is too big and important to take chances on!



SECTION OF STEAM INLET END OF ROTARY

INTERIOR VIEW OF PIPES AT END OF ROTARY

Valve Box or Steam Chest for Globe Rotary Boilers

An Exclusive Biggs Feature

THE above plan drawing shows the cross-sectional view of a special patented valve box or steam chest installed in one of our Globe Rotary Bleaching Boilers. By this arrangement, the steam enters the mass of stock along the bottom of the Rotary, coming in contact with the stock through the liquor. A great many mill superintendents prefer this arrangement, claiming that it does entirely away with the possibility of burning or charring the stock.

On the standard type of stuffing-box illustrated in the sectional view on the next page, the steam, of course, comes in through the center of the journal and if by any chance the stock should not be entirely surrounded by the bleaching liquor at that point, there is a possibility of its charring.

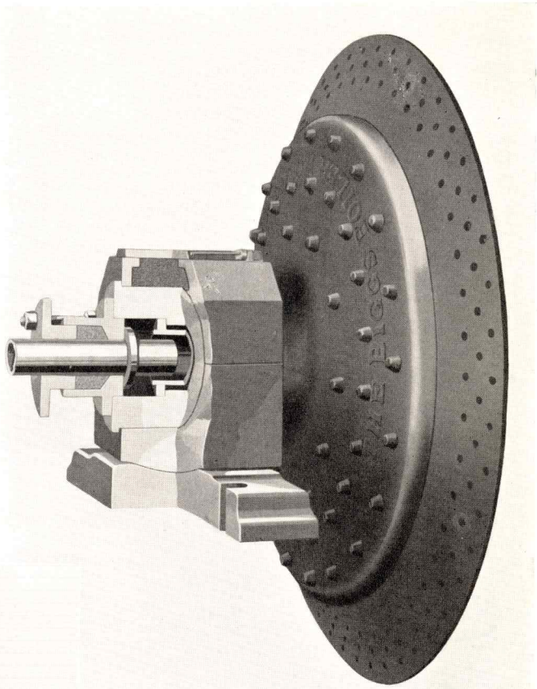
Another advantage in using this attachment is that the steam is distributed over a larger area and the valve box is so arranged if desired, that steam is admitted to the Rotary only when the distributing-pipe is at the extreme bottom, or top, or both. Quite often the Rotaries are cooked for a few hours in a stationary position.

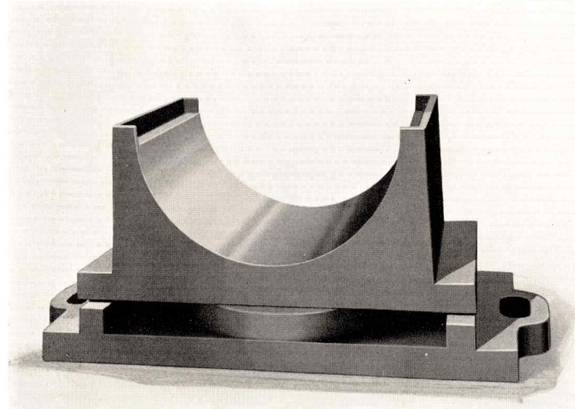
By using one journal as a water-supply, the contents of the boiler can be washed or sprayed while filling or before dumping, the perforated overhead pipes acting as sprayers.

Standard Bearing for 14-Inch Journals

The detail view at the right shows a cross-section of our regular stuffing-box and standard bearing for 14-inch diameter journals, with ball-and-socket type of journal box and sole plate.

The flange on the journal itself extends slightly beyond the face of the box, which, together with the ball-and-socket type of journal box, provides ample allowance for end expansion. For special stuffing box, see detail drawing on opposite page. The journals on Biggs Rotaries are designed with a factor of safety of approximately 20 to 1.





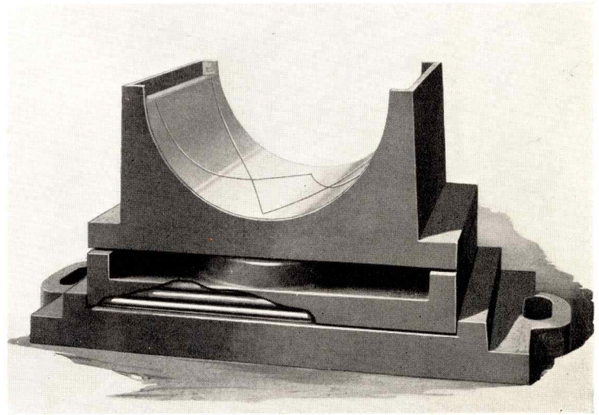
Ball-and-Socket Bearing, 14-Inch Journals

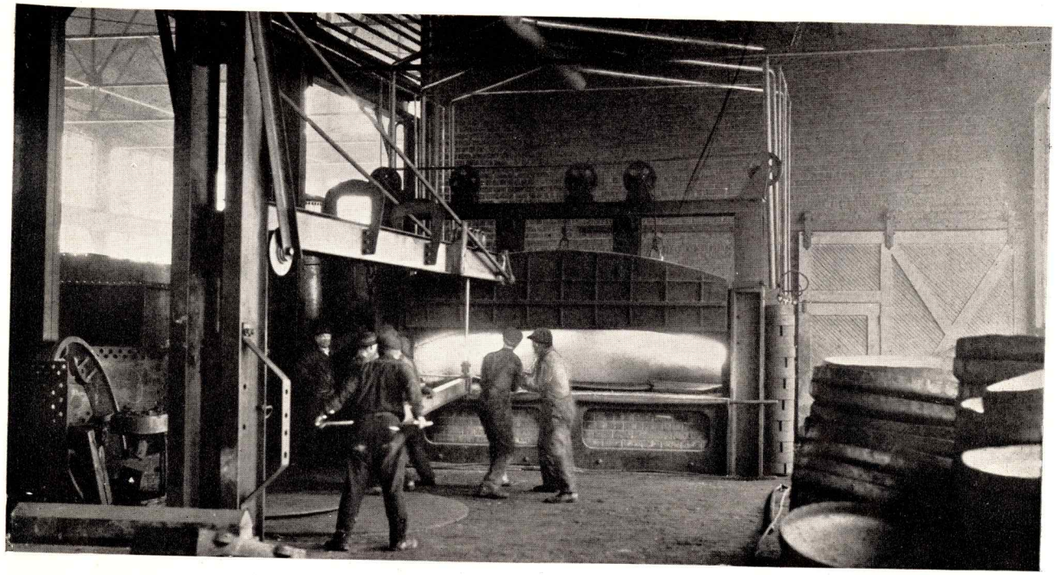
The action of the ball-and-socket bearing mentioned above is further illustrated in this view, which shows the standard type of bearing used for 14-inch diameter journal. It prevents any sudden and severe shock from being transmitted directly to the journals.

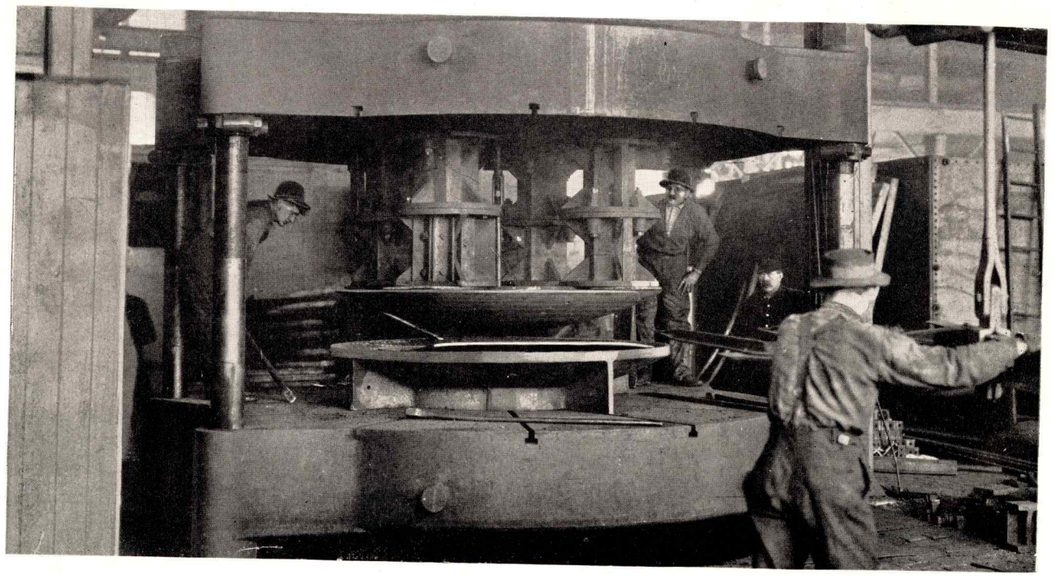
Babbitted Journal Box With Expansion Roller Bearing

(AT RIGHT)

Biggs 18-inch and 20-inch diameter journals, beside possessing the ball-and-socket type of pillow-block construction, are usually heavily babbitted. In addition, the journal opposite the gear end can be furnished with a special outboard bearing provided with rollers, to take care of end expansion. The cut-away portion of the illustration shows the hardened rollers in place.







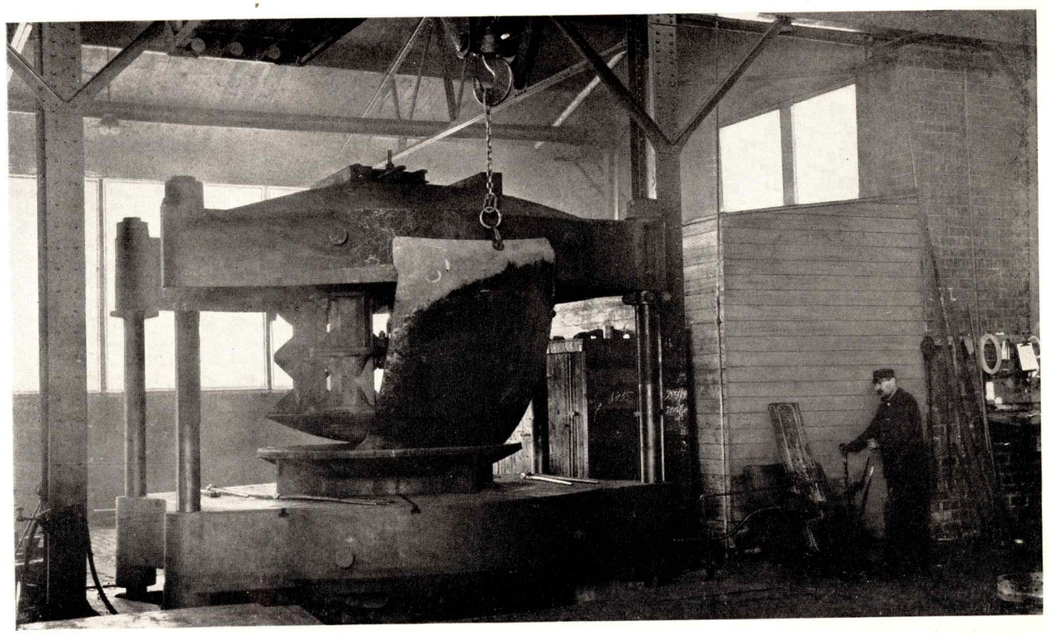
Biggs Globes Start in a Glare of Heat

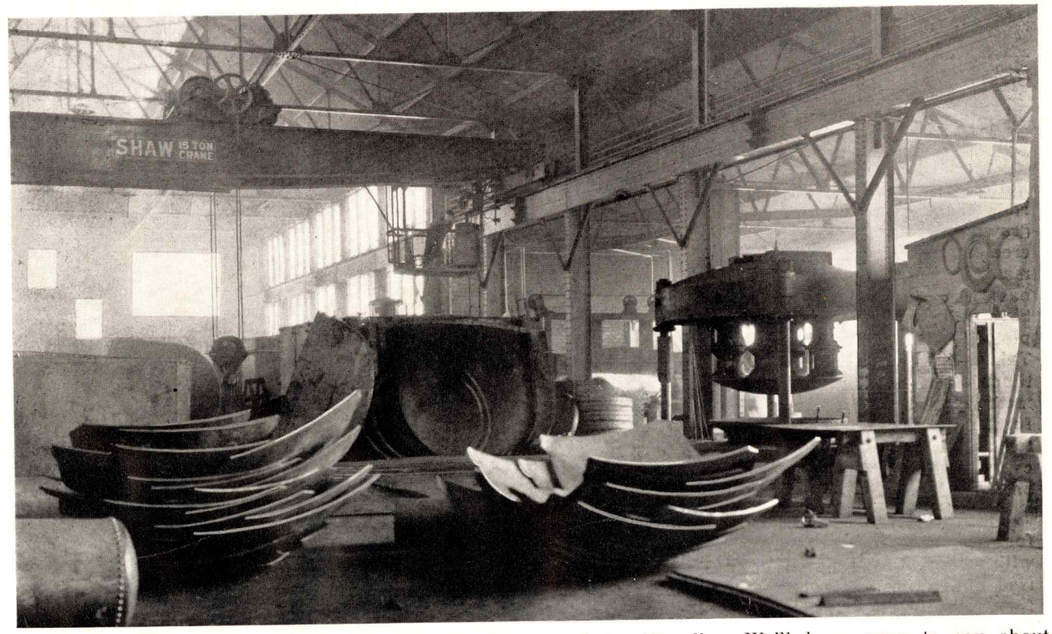
Following the process of making a Globe Rotary Bleaching Boiler in the Biggs plant, you would first be interested in a glare of dazzling light as the door of a huge oil-heated furnace was lifted and a red-hot plate of steel was brought out in the grip of a hydraulic jib crane.

You cannot see this hot plate in the upper picture, but it's right there!

The next step is the forming of the plate or section in a 300-ton hydraulic press. The lower picture gives an idea of the way this massive press works. Three hundred tons is quite a lot: equal, for instance, to the combined weight of nearly five hundred standard rolls of newsprint paper.

In this mammoth press, the red-hot plate of steel is "dished" or formed into exact shape by heavy cast steel dies, accurately machined. The tremendous pressure under which they are shaped insures the uniformity of each piece, and is responsible for the accurate spherical effect found in Biggs Globe Rotary Bleaching Boilers.



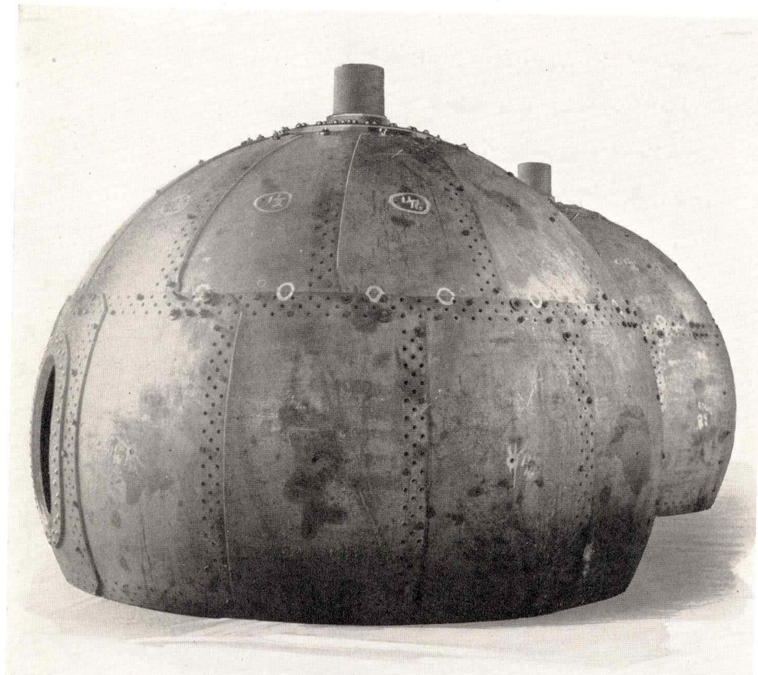


Above: the plate is still sizzling, though not red-hot any longer. This particular piece is the center sheet of one of our standard 14-foot Globes, leaving the press.

The next thing is to get the various plates marked up for punching—a job that calls for the greatest possible precision, because when the sheets are assembled for riveting, the rivet-holes must match to a hair—*literally*. We'll have more to say about riveting, later on.

It is the very extreme accuracy with which the sheets are formed, or "dished," that makes possible the perfect matching of these rivet holes.

After the plates are punched or drilled, they are beveled for caulking edge; then they are inspected and assembled, as illustrated on following pages.



Globes Assembled for Inspection and Marking

When filling export orders, we take every care to simplify the erection of the Boilers upon arrival at destination. The picture shows two of an order for eight standard Biggs Globe Rotaries, 14 feet diameter, assembled for marking on our erecting floor. We then prepare a complete drawing to simplify the customer's work in setting up. Note how perfectly the sections join up in this picture, though held together by only a few bolts.

Aside from the universal success that our Rotaries have enjoyed in foreign countries, we feel that this service alone has been responsible for the making and keeping of many of our best foreign customers.

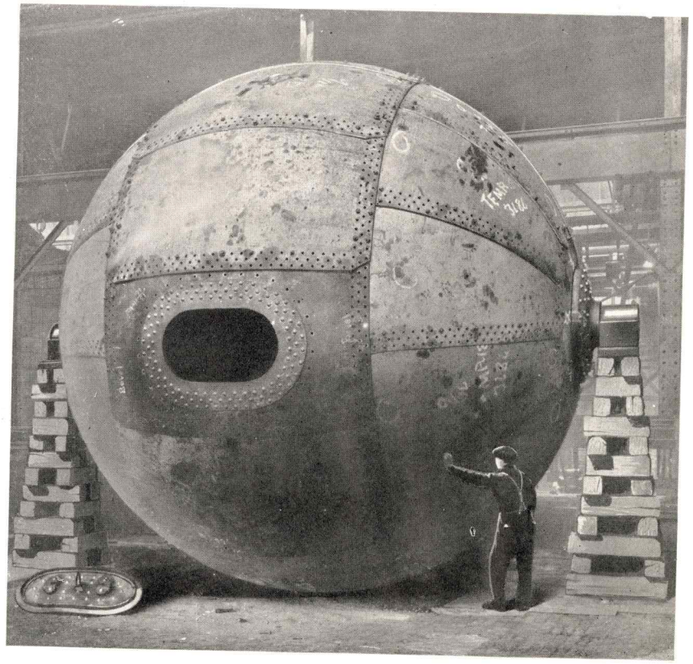
Each part is set up, checked up and carefully inspected.

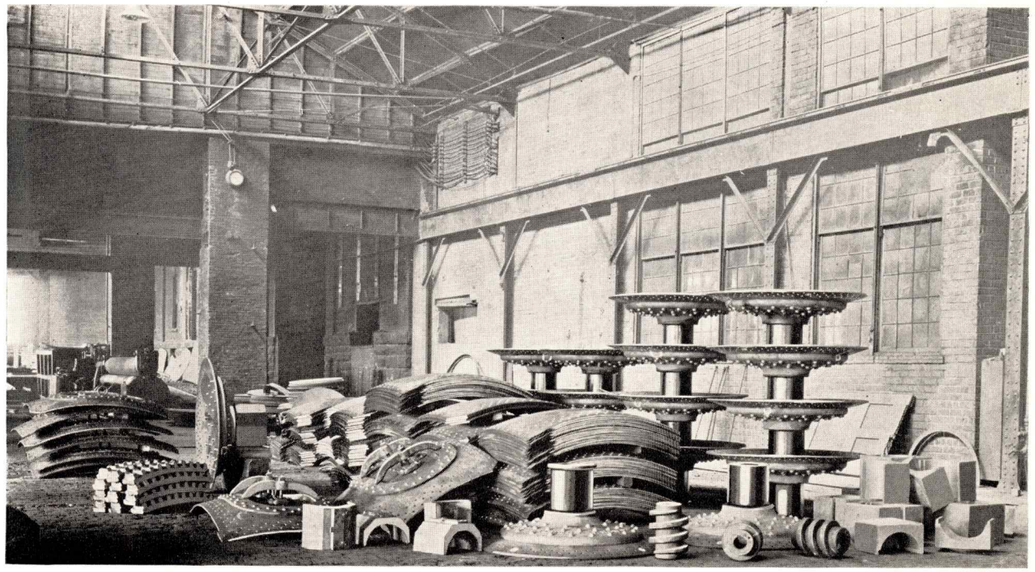
Eighteen-foot Globe

This is the largest Globe Rotary Boiler ever built—18 feet diameter. Note the relative size of a fully-grown man standing beside it. We erected it complete before shipment, to permit checking the various rivet joints—but we need not have done so, because the completed machine checked perfectly. This we consider a remarkable testimonial to the accuracy of Biggs methods, because a complete set of formers, patterns and designs had to be made especially for this job—everything new, none having ever been used on previous work.

This performance speaks volumes for the accuracy and precision with which all small details are carried out. There is nothing taken for granted in "Biggs" Rotary Bleaching Boilers.

"Biggs" Jumbo Rotaries—14 feet diameter by 20 feet long—are another example of the ability of our Engineers to do unusual things *successfully.*





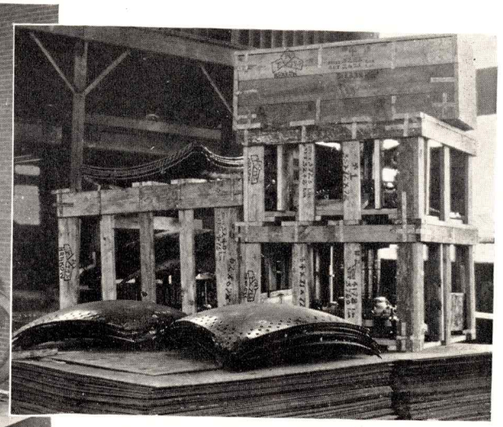
Just Another Word About Biggs Precision!

THE formed sheets, castings and parts that you see here belong to a shipment of twelve Biggs Globe Rotaries, each 14 feet diameter, that we made a while ago for The Hinde & Dauch Paper Co., Ft. Madison, Iowa. You will find views of the completed installation on page 28. These various orderly piles of parts point a fact that has a mighty lot of importance to all who buy Rotary Bleaching Boilers.

Look at the various stacks of "dished" plates in the center and at the left. See how perfectly they nest each into the one above it. That isn't any accident; it's the regular Biggs way of building Rotary Boilers. And see how uniformly machined the journals are, at the right; you wouldn't have to set your calipers but once, to measure the whole lot!

Of course, all this exactness has been made possible, not only because we had the ideals and insisted on living up to them, but because we built and equipped a plant to permit carrying them out. Every department is provided with heavy-duty traveling cranes, both hydraulic and electric. We have some remarkable special machines, too; some of them designed and built for our particular use.

For instance, the riveting tower shown in the picture at the top of page 22 has several powerful hydraulic cranes, plenty strong enough to handle readily the largest piece of work coming up to be riveted; yet so delicate that *it can take a load weighing 15 to 25 tons and move it one thirty-second of an inch with absolute certainty.*

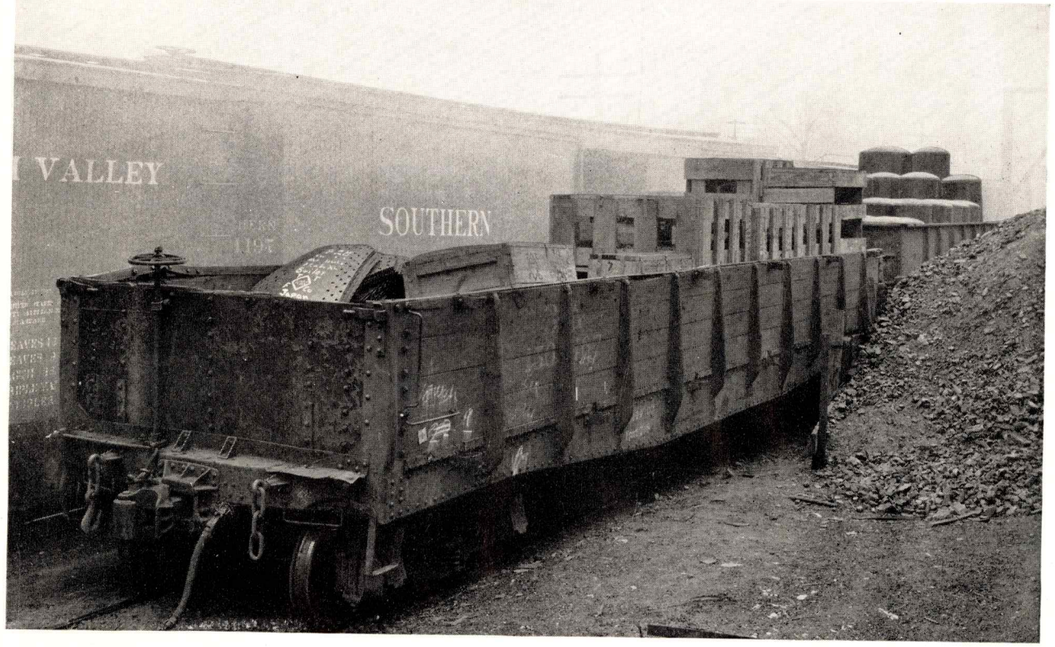


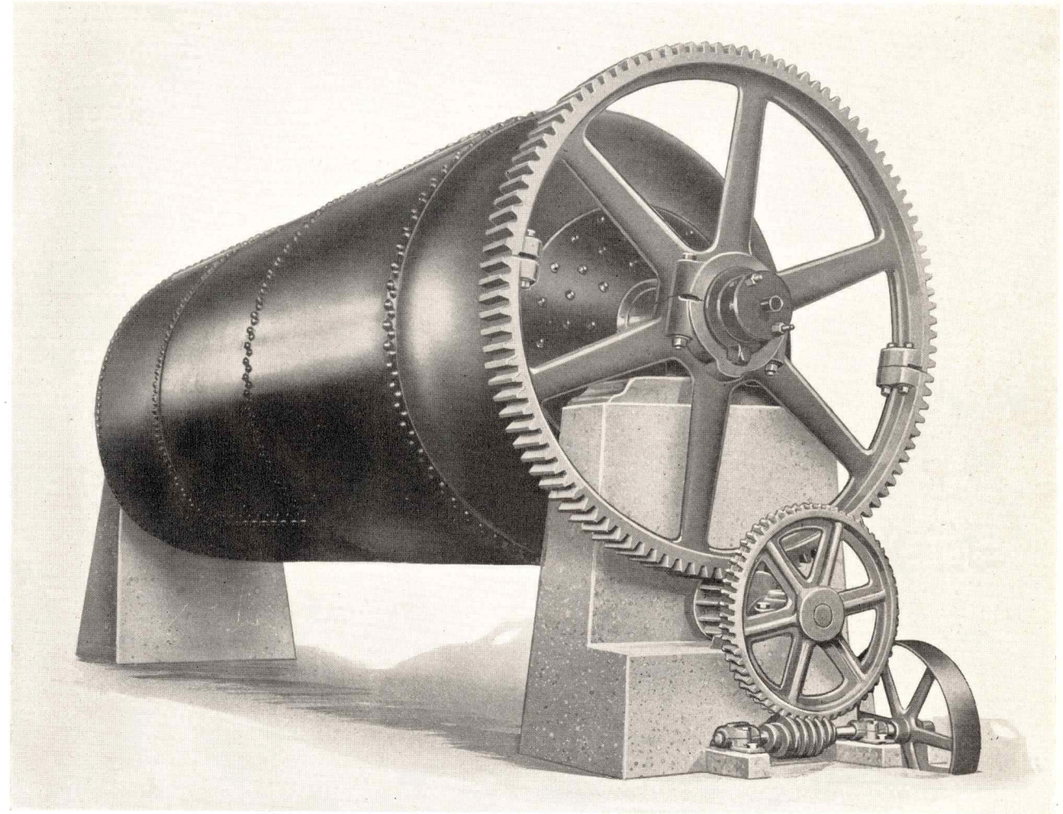
These three pictures, taken in connection with a few of the many export shipments made by us, illustrate and emphasize the importance of thorough-going service all along the line as a cardinal means of holding business.

A shipment of Biggs Globe Rotary Bleaching Boilers for export, showing our careful method of crating and boxing. We know what it means to the customer to have his export shipments properly packed, *strongly boxed* and clearly marked.

In addition to furnishing a complete packing list, giving all weights and dimensions, each Biggs Globe is set up and inspected at our plant, the sheets being marked to show their exact relation to other sheets.

A complete drawing showing such markings is furnished the customer when the shipment goes forward, together with detailed instructions as to the correct method of erecting.





Combination Type Drive for Large Cylinder Rotary

THE Cylinder Rotary Bleaching Boiler shown in the accompanying illustration is equipped with a combination worm and spur gear drive.

We do not recommend for Cylinder Rotaries a complete worm wheel drive, because there is always present more or less expansion when the boilers are hot and it is our belief, based upon long experience and operation, that a solid worm drive cannot successfully meet such expansion.

By using the spur gear keyed to the journal and the spur pinion driving same, the end expansion is allowed to pass through this pair of spur gears, the pinion being about one inch wider face than the spur gear.

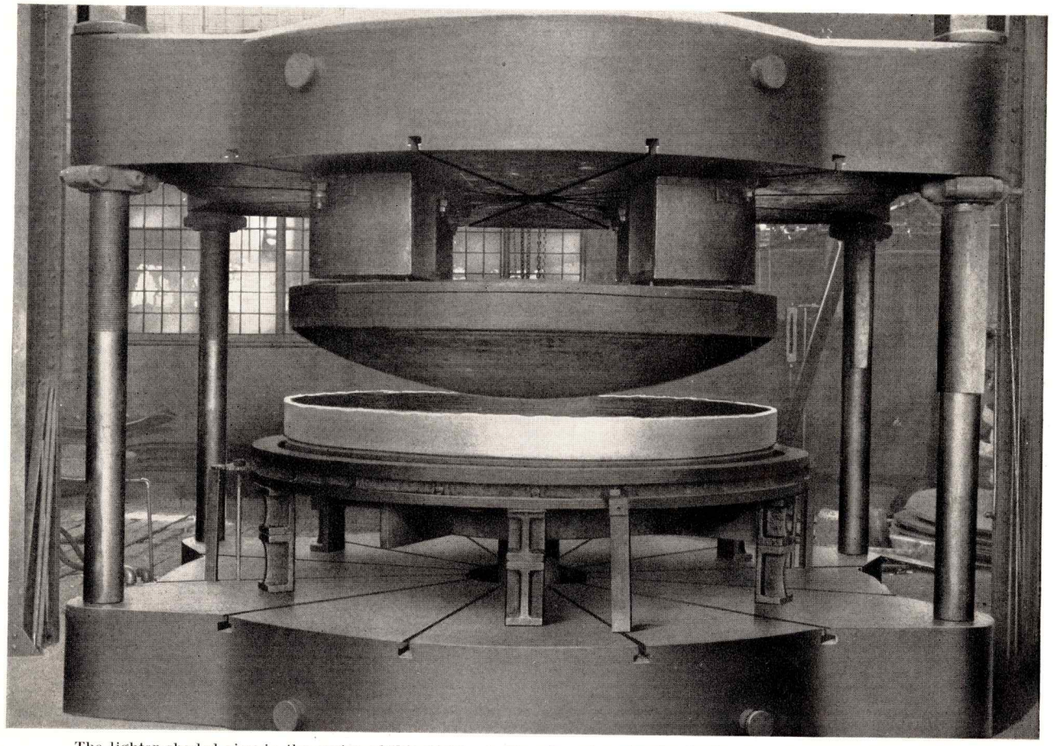
The journal opposite the gear end, as you will note by referring to the cross-sectional view on page 13, is likewise provided with ample clearance for expansion.

The spur gear in this instance is driven by a worm and worm wheel and a tight pulley which is usually belt-connected to motor; the drive is simple in design and the gears are all cast tooth, cast iron gears. The layout is comparatively compact and while the drive is not as elaborate as one consisting of cut steel gears with the worm reduction running in enclosed oil-tight case, the service this drive gives has always been entirely satisfactory.

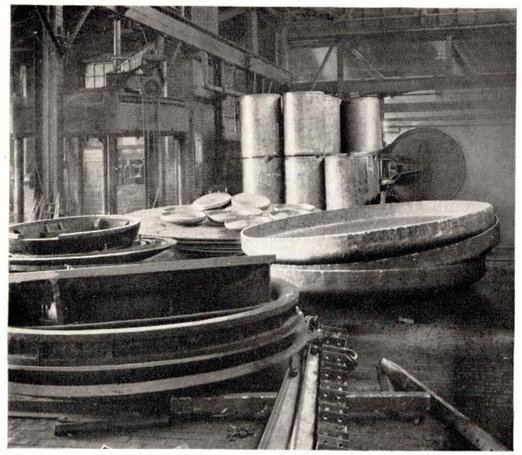
It is a design that will appeal to the *practical* man around the paper mill.

This type of drive, insofar as the gears being of the cast iron, cast tooth construction, resembles our standard spur gear drive illustrated on page 8; both drives are good, having been used for years with complete success.

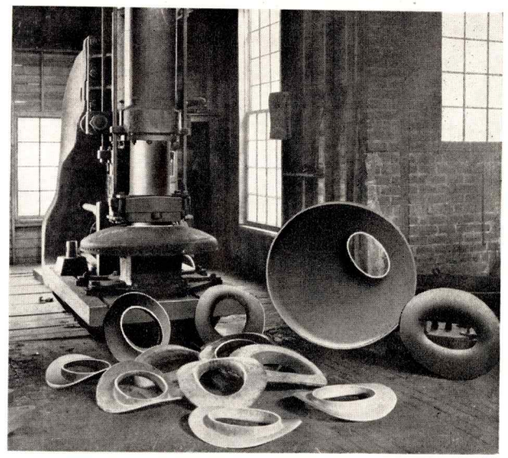
For high-speed operations, it is of course preferable to use the more elaborate cut-tooth steel gears and worm reductions in oil case.



The lighter-shaded ring in the center of this picture is the edge of a circular boiler head 9 feet in diameter, formed from steel 1⅛ of an inch thick. Make these figures real to yourself—that means a circular head more than half-again as wide across as your desk and about ten times as thick as this booklet, and weighing 3,800 pounds. More than that, the flange is made 6 inches deep to permit double riveting—the whole thing is formed from the flat sheet with one upward squeeze of that mighty die. Just like the man in the white apron in the restaurant window makes waffles—only *this* "waffle-iron" works a solid sheet of metal nearly as thick as your two fingers, and exerts a pressure of 300 tons. When completed, it is the head of a 9-foot diameter Cylinder Rotary.

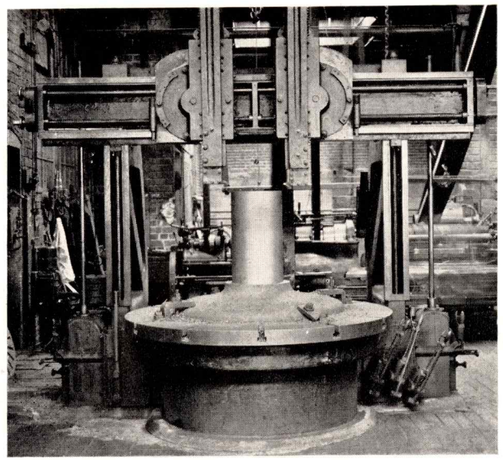


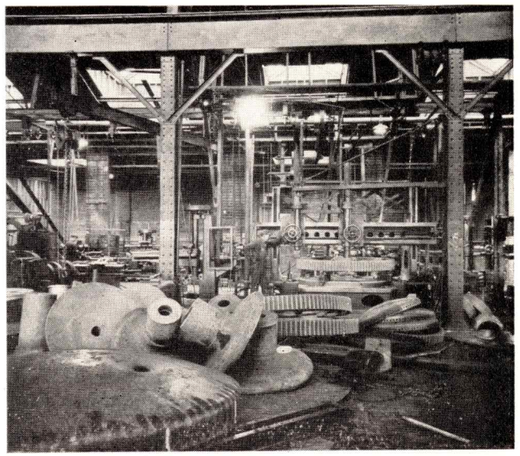
In this picture you see a stack of 9-foot heads flanged and dished, just as they came from the big press at the top of the page. They don't look so large here, but if you were to lie flat in one of them, with your feet against the lower edge and your hands stretched as far as you could reach above your head you wouldn't be able to touch the upper edge of the flange with your finger-tips—unless you were extra tall. The

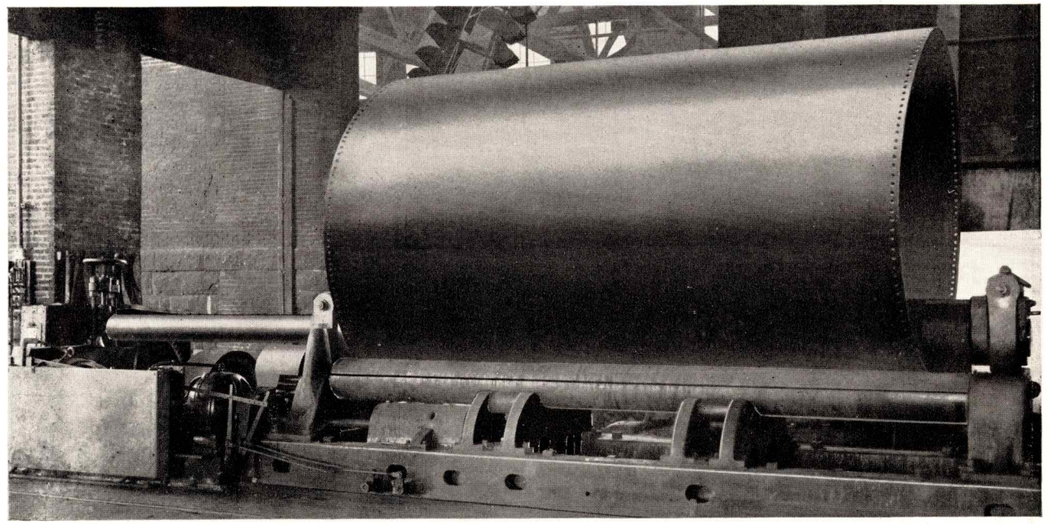


massive steel dies used in pressing these heads are partly shown in the foreground.

The right-hand view above shows how we form unusual pieces such as saddle flanges, nozzles, and odd diameter boiler heads, on our 250-ton sectional flanging press. By using variously-shaped dies, we get a real variety of work, as the finished pieces in the foreground will show.





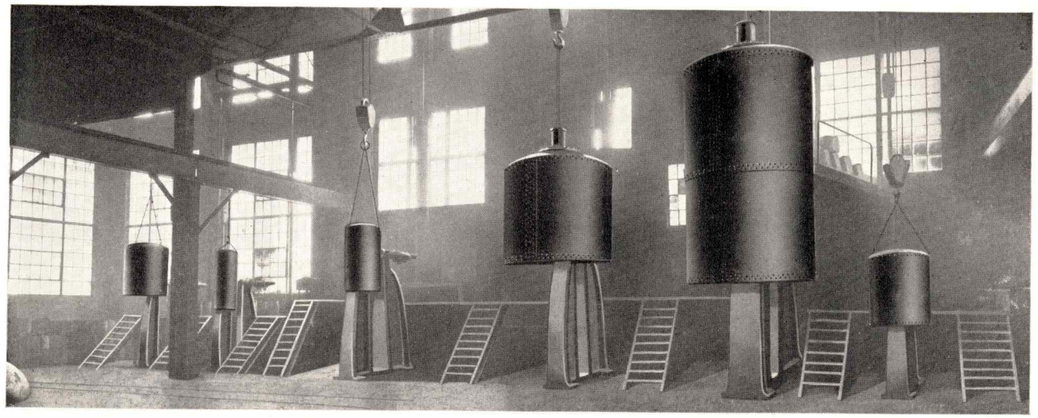


Now the Pieces Begin to Look Like a Cylinder Rotary!

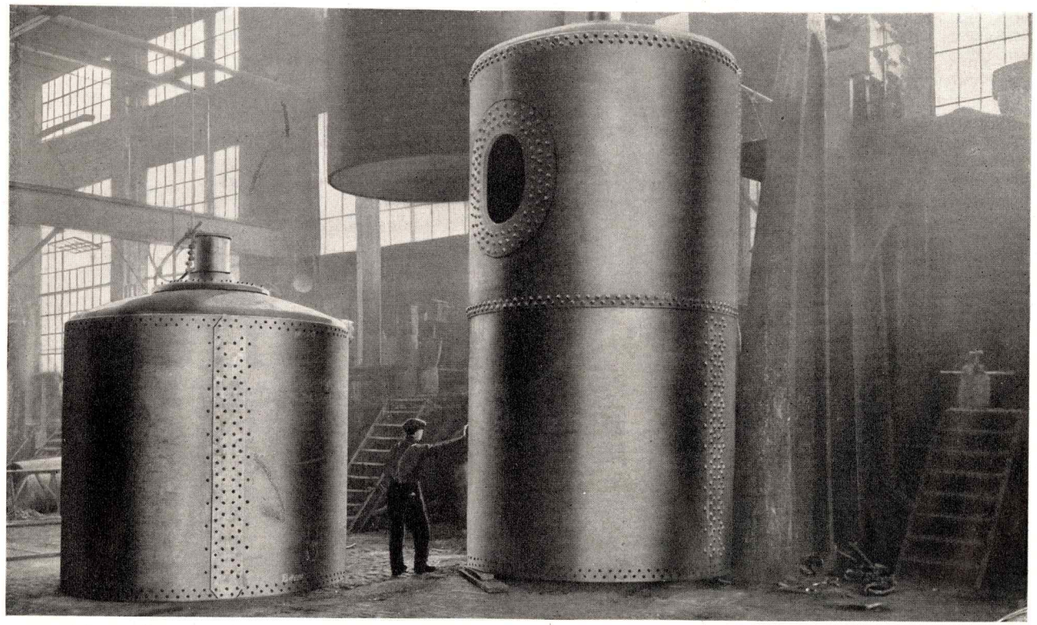
In the upper left-hand corner of this page is a view of one of the boring mills on which we machine the journals for Biggs Cylinder Rotaries. Compare this picture with the "closeup" view on page 13.

The other picture above shows an assortment of journals and gears, ready to be machined. In the background is a 105-tooth spur gear, the main driving gear on a set of standard spur gearing for our large Cylinder Rotaries, being bored out on our 10-foot boring mill to fit a 14-inch diameter journal.

The machine in the lower picture, our large Bending Roll, is another "wizard of power." It catches a flat plate of steel, bigger than the floor of an ordinary room and from a half-inch to an inch and a quarter in thickness, passing it back and forth, cold, between those massive rollers until it has formed the perfect shell for a Biggs Cylinder Rotary Boiler. That's what it was doing when the camera-man got around; the plate in the rolls is one section of Biggs Cylinder Rotary Bleaching Boiler.



Six hydraulic riveters in the Biggs plant. The largest is 18 feet, 6 inches gap and has 150 tons capacity.



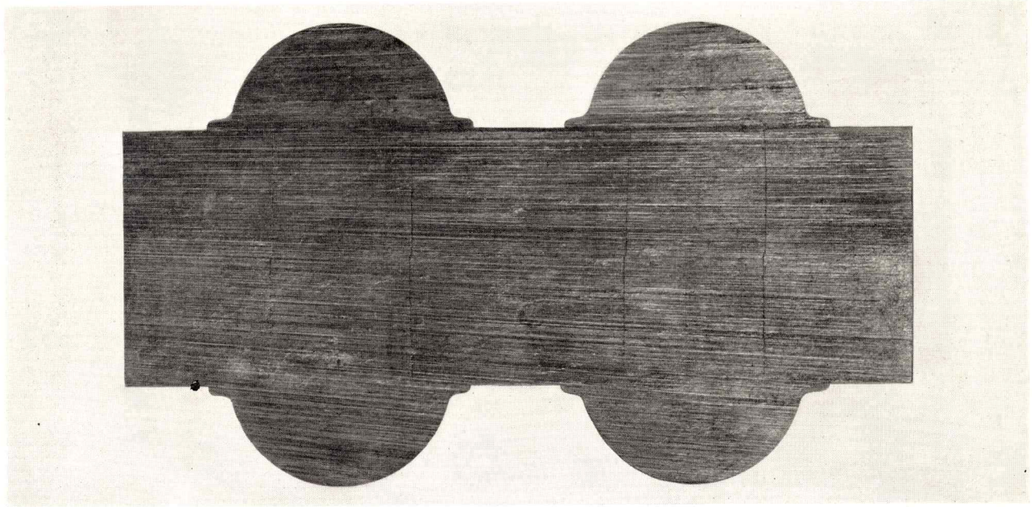
Two sections of an 8-foot x 24-foot Biggs Cylinder Rotary Boiler after leaving the 150-ton riveter shown above. This riveter has a gap of 18 feet, 6 inches. Compare the Rotary with the man standing beside it.

Here's Where that Word "Riveted" Begins to Take on Real Meaning!

You are now face to face with the Biggs "bulls"—six of them. There is no fence with "danger" signs warning you out, though, for these particular "bulls" may be approached without risk; so let's walk up closer.

Seriously now, this is one of the most important steps in the whole Biggs process: for it is here that Biggs Cylinder Rotaries are riveted up, and the riveting, as you know, is the "acid test" of the finished job.

The "bulls" work under terrific hydraulic pressure. The largest of them can exert a pressure of 150 tons (if you can imagine what an awful squeeze that is!) If drives rivets 1½ inches in diameter as readily as you poke your shoestring through the eyelet.



Puzzle: find the Rivet!

WE want you to see exactly what we mean in saying that when Biggs rivets two or more plates of steel, the rivet not only brings the plates solidly together but completely fills the hole.

So we riveted up a section in the regular "Biggs" way and sawed it right down the middle—zip!—and then photographed it.

What you see here is exactly what the camera saw. The picture hasn't been changed or doctored in any way; it represents two pieces of 1-inch boiler plate riveted together with 1¼-inch diameter rivets under *150 tons* hydraulic pressure. You will notice that it is almost impossible to distinguish the lines occupied by the rivet or where the two plates join.

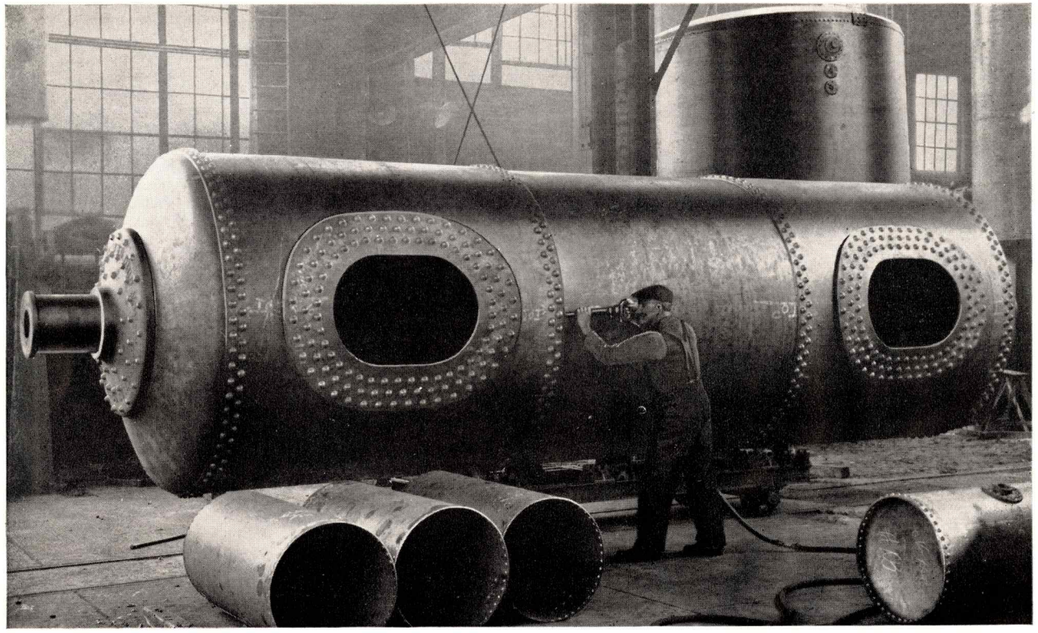
By carefully scrutinizing the rivet hole, or rather the place where the rivet completely fills the hole, you will notice about half way down the illustration, a slight offset. We purposely drilled these rivet holes out of alignment in order to fully demonstrate how completely, even under this condition, rivets completely fill the hole.

In fact, it gives even stronger proof of the thoroughness of Biggs methods, and shows what really happens when 150 tons are applied against a rivet.

The art of proper rivet driving has, we believe, more to do with establishing firmly the reputation of a firm than has any other one operation. It is common topic for conversation among qualified boiler inspectors as to the class of work various shops produce; in other words, these highly-trained, technical and practical men frequently rate the various shops in their own way.

Surely no other men or group of men are more competent to correctly judge the policy of an organization, or its method of doing things, than those who year after year follow the details of construction through various plants.

The remarkable performance of "Biggs" products when put through various tests has won us the highest regard and respect from Engineers and Inspectors with whom we have had the pleasure of associating for the past Thirty-Three Years.



Next after the Riveting comes the Caulking.

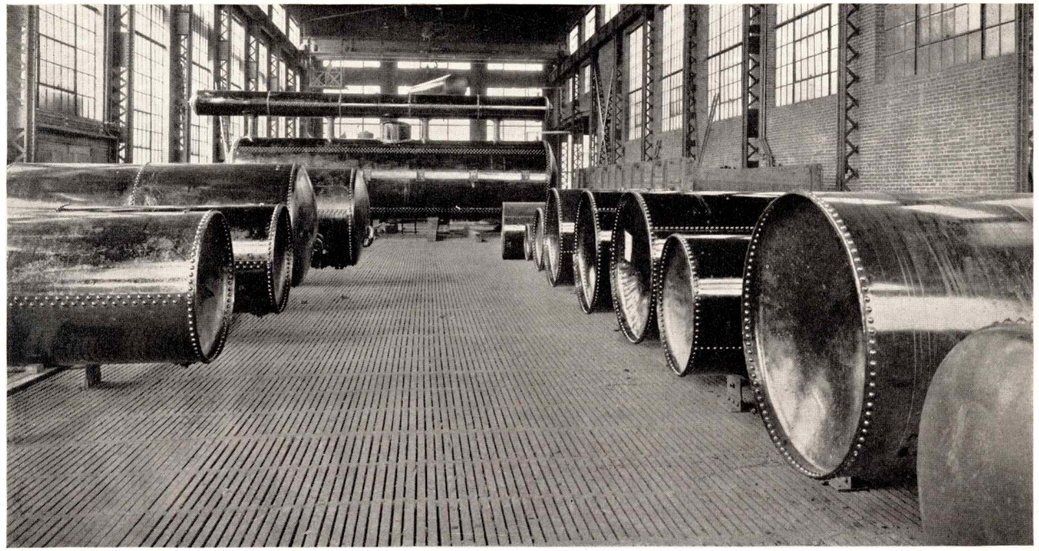
YOU have seen how carefully and exactly the Biggs workers have handled the flat plates of steel in their various stages of construction, and how thoroughly these plates were riveted together. Now, when that is done, the next step is a thorough caulking of the various seams where the plates join.

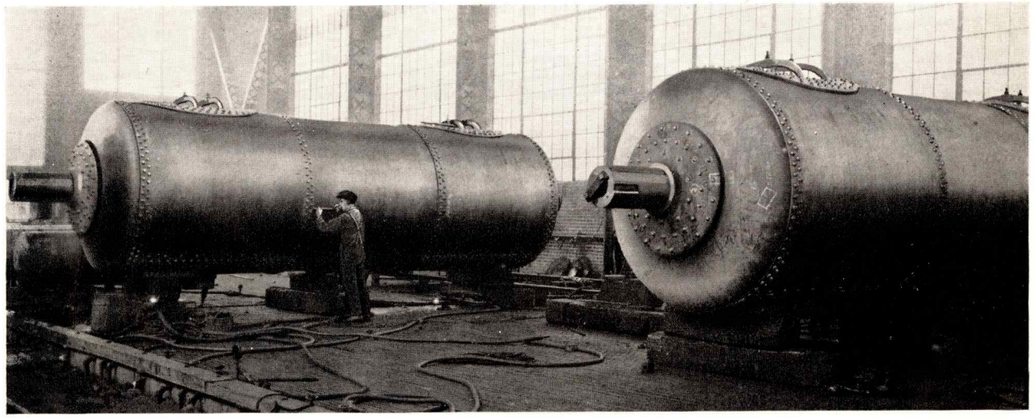
This work is done with a pneumatic caulking tool, of which you will hear from 40 to 50 in this one department—all going at once! You won't be able to hear right for a couple of hours after you get out, but otherwise you will enjoy the experience.

The picture shows an operator caulking one of the seams on a Cylinder Rotary Bleaching Boiler, just before it is to be taken to the Test Block. We will tell you more about the Biggs way of testing in a few moments.

Biggs operators in the Caulking Department are trained by years of experience to neatly caulk and chip the various seams, so that, when they have finished with their work, the entire Rotary Bleaching Boiler is one huge vessel, made of several sheets completely and scientifically joined — *metal-to-metal and bottle-tight.*

The operators in this Department, as well as in the Riveting and Testing Departments, work on a time basis, instead of being paid by piecework; hence they are schooled to see how *thoroughly* they can do their work, instead of how *quickly* they can get it through.





Now for the Final Test!

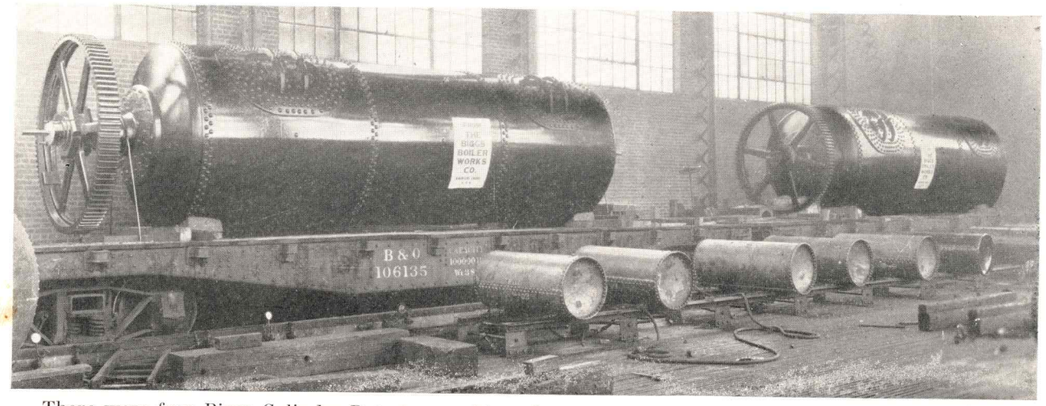
We take nothing for granted; so, to be absolutely sure that all of the various important operations have been properly performed, Biggs Rotaries at this point are subjected to the most critical inspection. If found satisfactory, they are then filled with water and subjected to a hydrostatic test of *50% in excess of the daily working pressure that they are built to withstand.* The lower view shows two Cylinders on Test Block.

Under a cold-water test, the most minute and insignificant leak is instantly detected. The operators in this department are supplied with caulking-tools for touching up and remedying any slight leaks.

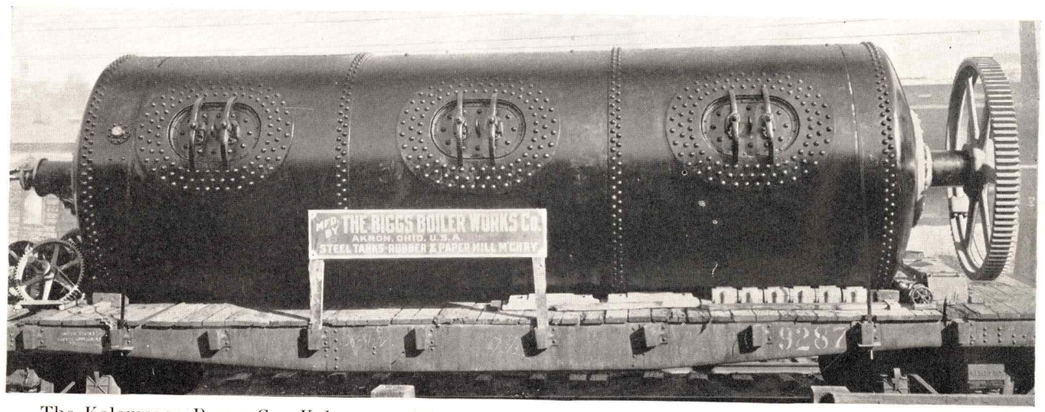
We use as our Test Block an entire building 75 x 350 feet in length, partially illustrated above. This is an extremely modern, well-lighted, new section where Biggs' reputation for good work is safeguarded and maintained throughout.

During the process of testing these Boilers, there is always present a qualified Boiler Inspector who personally inspects the vessel and witnesses the various tests.

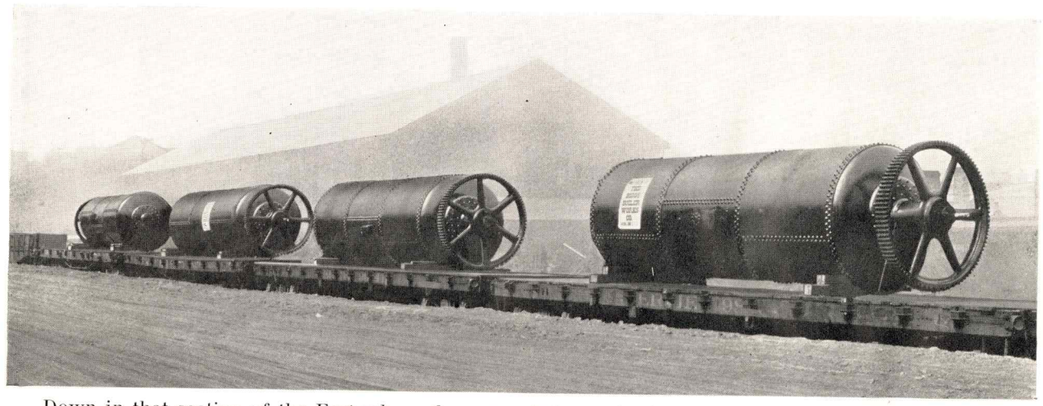
Upon being completed, the Boilers are painted and the various minor parts assembled. The shipment is then loaded by huge electric crane on railroad cars standing within the building.



There were four Biggs Cylinder Rotaries on this order for the Flaxlinum Insulating Co. at St. Paul. The picture shows two of them—taken on our Test Block, just before shipment.



The Kalamazoo Paper Co., Kalamazoo, Mich., recently bought five more Biggs Rotaries each 8 feet diameter x 24 feet long. This is one of them, en route.



Down in that section of the East where the paper industry in America had its start and still flourishes, the list of mills using Biggs Rotaries is about as long as a list of the mills themselves. These four, each 7 x 20 feet, went to the Pequannock Valley Paper Co., at Butler, N. J.

"Where can I see Biggs Rotaries at work?"

STANDING at the shipping room door, you have watched Biggs Rotaries start away on their journey to customers literally everywhere.

Many of you will, we believe, be glad now to continue your "visiting" by following some of these Rotaries right to their destination. There you can watch them in operation, and can talk to those who own and use them.

A question frequently asked—"where can I see Biggs Rotaries at work?"—will be answered for you right here. Lack of space prevents our devoting more than a few pages to this section, but these glimpses of both Cylinders and Globes in service, with the letters from other Biggs customers and the partial list of installations below, will indicate that Biggs equipment enjoys the confidence of a large share of "who's who" in the paper industry.

While expressing sincere appreciation to our good customers and friends who have furnished photographs and kindly letters for this section, our thanks are extended none the less heartily to those who are simply named "among those present." The subjects that we have chosen for the next eight pages were selected solely for the range of sizes and types, geographical location, and for some special interest attaching to each.

A Partial List of "Biggs" Installations

Agasote Millboard Co., Trenton, N. J.
The Akron Paper Co., Akron, Ohio.
Albemarle Paper Co., Richmond, Va.
American Straw Board Co. (10 plants), Akron, Ohio.
American Trading Export Co., Export Engineers, New York City.
The Ancram Paper Co., Ancram, N. Y.
Antioch Paper Co., Antioch, Cal.
Australian Paper Mills, Sydney, Australia.

Bardeen Paper Co., Otsego, Mich.
Beckett Paper Co., Hamilton, Ohio.
Bedford Pulp & Paper Co., Richmond, Va.
Beloit Box Board Co., Beloit, Wisc.
Bergstrom Paper Co., Neenah, Wisc.

California Paper & Board Mill Co., Antioch, Cal.
Central Paper Co., Muskegon, Mich.
J. G. Cherry Co., Tama, Iowa.
Cleveland-Akron Bag Co., Cleveland, Ohio.
The Childsdale Strawboard Mills, Childsdale, Mich.
Columbia Paper Mills Co., Oakmont, Pa.
Coshocton Straw Paper Co., Coshocton, Ohio.
Creamery Package Co., Chicago, Ill.
The Crown Paper Co., Portland, Ore.

Diamond State Fibre Co., Bridgeport, Pa.
Levi Dodge, Delphi, Ind.
Dresden Paper Mills, Dresden, Ohio.

S. O. Edison, McCanna, N. D.
Empire Paper Co., Vincennes, Ind.
Eureka Paper Co., Fulton, N. Y.

Flaxlinum Insulating Co., St. Paul, Minn.
Floriston Pulp & Paper Co., Floriston, Cal.
The Fuji Paper Co., Tokio, Japan.
F. Funke Sons, Evansville, Ind.

Herman Garbe, Shanghai, China.
Gilbert Paper Co., Menasha, Wisc.
Grass Fibre Pulp & Paper Co., Leesburg, Fla.

Hagar Strawboard Co., Xenia, Ohio.
Hamilton Paper Mills, Hamilton, Ohio.
Hamilton & Hansell, Inc., Export Engineers, New York City.
Hawthorne Paper Co., Kalamazoo, Mich.
Hinde & Dauch Paper Co., Sandusky, Ohio.
Hinde & Dauch Paper Co., Fort Madison, Iowa.

Ideal Coated Paper Co., Brookfield, Mass.
Illinois Boxboard Co., Pekin, Ill.
Indiana Board & Filler Co., Vincennes, Ind.
International Alcohol Corp., Fullerton, La.

Jaite Co., Boston, Ohio.

Kalamazoo Paper Co., Kalamazoo, Mich.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.

Lakeside Paper Co., Neenah, Wisc.
Lee Paper Co., Vicksburg, Mich.

Manchester Board & Paper Co., Richmond, Va.
John A. Manning Paper Co., Troy, N. Y.
The Marshall Paper Co., Turner Falls, Mass.
Marshall Bros., Inc., Yorklyn, Del.
Massasoit Co., Fall River, Mass.
Massillon Paper Co., Massillon, Ohio.
Mead Pulp & Paper Co., Chillicothe, Ohio.
Frank P. Miller Paper Co., E. Downingtown, Pa.
Mitsubishi Goshi Kaisha Co., Hankow, China.
Monroe Corrugated Paper Co., Monroe, Mich.
Monroe Falls Paper Co., Monroe Falls, Ohio.
Mt. Vernon Strawboard Co., Mt. Vernon, Ind.
Mitsui & Co., Export Engineers, New York City.
Megargee Paper Mills, Modena, Pa.
Montreal Paper Co., Sorel, P. Q.
Alexander McArthur, Joliett, P. Q.
W. M. Mead, Esq., Chillicothe, Ill.

National Fibre & Insulation Co., Yorklyn, Del.
National Paper Mills & Filler Co., Tama, Iowa.
North Star Mfg. Co., Coffeyville, Kansas.

Olaa Sugar Co., Isles of Hawaii.
Otter River Board Co., Otter River, Mass.
The Ohio Straw Board Co., Urbana, Ohio.

Panelyte Board Co., Trenton, N. J.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Piqua Strawboard Co., Piqua, Ohio.
Provincial Paper Mills Co., Ltd., Thorold, Ont.
Thos. Phillips Co., Akron, Ohio.
Parsons & Whittemore, New York City.
Pequannock Valley Paper Co., Butler, N. J.
The Paraffine Companies, Inc., Antioch, Cal.
The Peoria Strawboard Co., Peoria, Ill.

River Raisin Paper Co., Monroe, Mich.
Roanoke Fibre Board Co., Roanoke Rapids, N. C.
S. D. Rosenbaum, San Francisco, Cal.

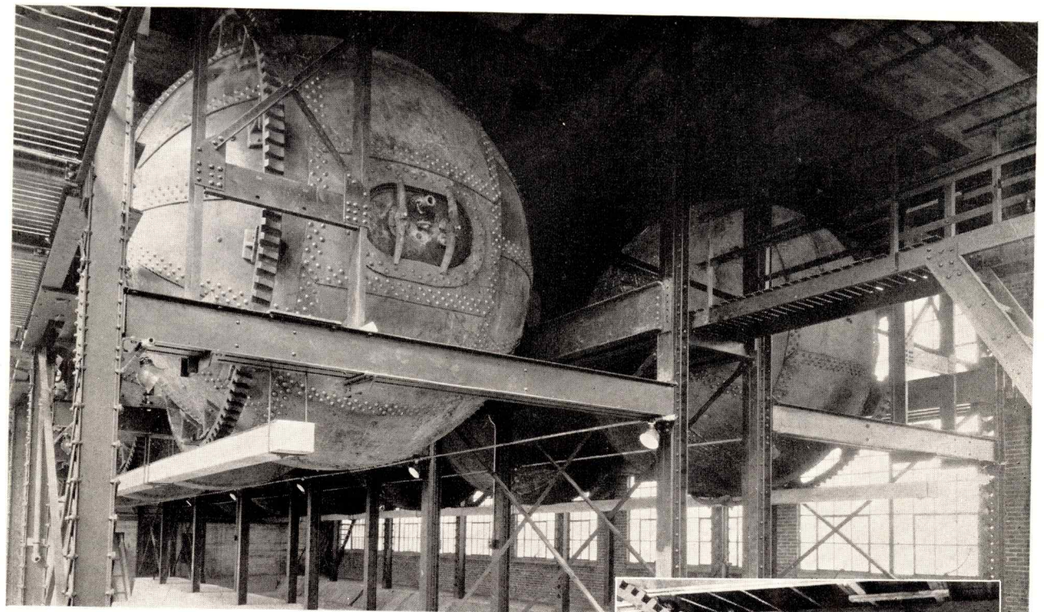
Smith Paper Co., Lee, Mass.
Strathmore Paper Co., Mittineague, Mass.
St. Lawrence Paper Mills, Thorold, Ont.
Standard Paper Mfg. Co., Richmond, Va.
Sterling Paper Co., Hamilton, Ohio.

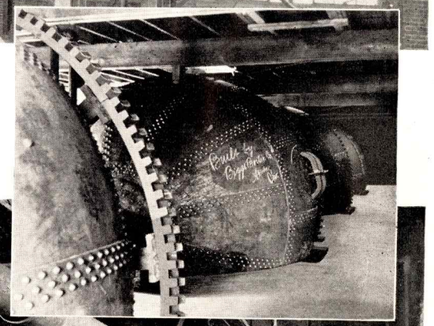
Tennessee Fibre Co., Memphis, Tenn.
Terre Haute Paper Co., Terre Haute, Ind.
Taggart Bros. Co., Watertown, N. Y.
Toronto Type Fdy. Co., Toronto, Ont.
Trinity Paper Co., Dallas, Tex.
Thompson Norris Co., Brookville, Ind.

United Paper Board Co., Tippecanoe City, Ohio.
Union Mills Paper Mfg. Co., New Hope, Pa.
United Paper Board Co., New York City.

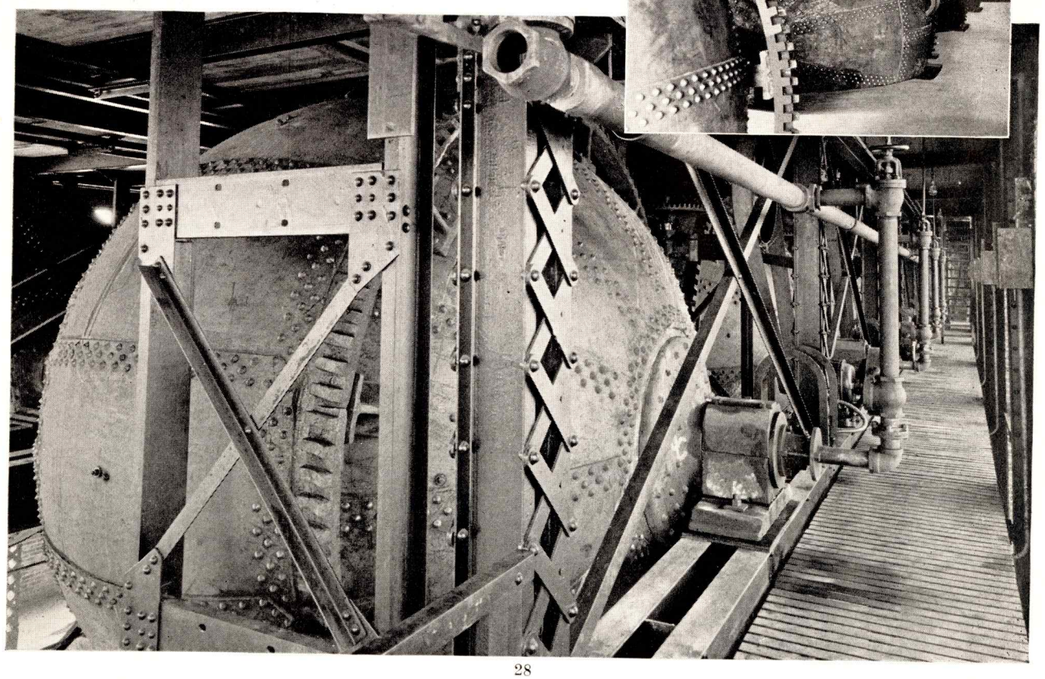
Valve Bag Co. of America, Toledo, Ohio.
Vincennes Board & Paper Co., Vincennes, Ind.

Wardlow Thomas Paper Co., Middletown, Ohio.
Wah Chang Trading Co., for export to Tientsin, China.
Henry Weiss, Esq., Coffeyville, Kansas.
Weis Paper Mill Co., Quincy, Ill.
Wrenn Paper Co., Middletown, Ohio.





The pictures above and below on this page, feature Biggs Globe Rotaries at the Fort Madison, Iowa, mills of The Hinde & Dauch Paper Company. As will be seen from the letter quoted on opposite page, the complete Biggs equipment at these two mills totals 16 Globes; while the Sandusky plant of the same Company is equipped with 10 more—*all Biggs*. The little inset picture on this page at the right shows part of the original Biggs equipment of the Brown Paper Company at Fort Madison, which Company was later absorbed by the Hinde & Dauch organization.



Twenty-Six Biggs Globes Help "H & D" Customers to Ship Goods Safely!

The Hinde & Dauch Paper Company, world-famous makers of fibre shipping boxes and packing material, produce a literally enormous tonnage of corrugated stock with the aid of Biggs Globe Rotary Boilers.

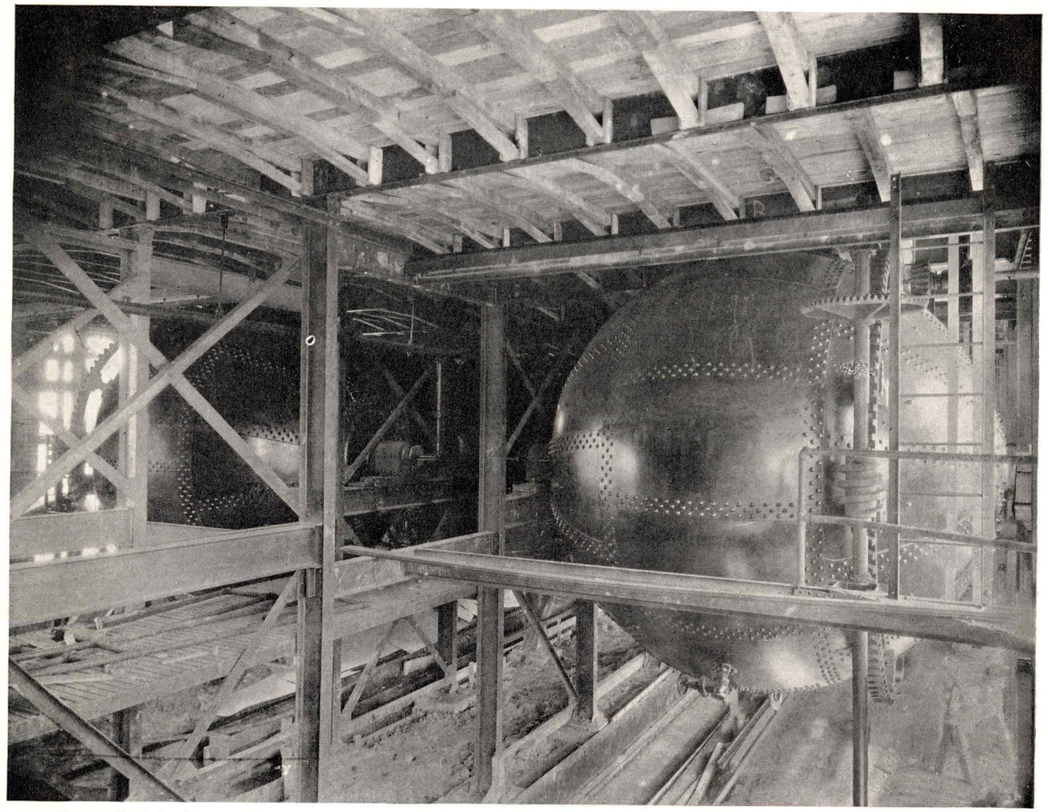
The pictures on opposite page show installations at the Company's No. 1 and No. 2 mills at Fort Madison, Iowa. On this page is a view looking down an aisle at the Sandusky, Ohio, mill.

All told, The Hinde & Dauch Paper Company own and operate twenty-six Biggs Rotary Boilers—an installation in which we take distinct pride, naturally. Our pleasure is all the greater in view of the fact that the complete assembly represents a series of purchases: some of the Fort Madison equipment is quite new, the order having been placed at least partly on the strength of the good service rendered by other Biggs Rotaries bought by the same Company in previous years.

The Hinde & Dauch Paper Company itself fully shares our satisfaction—as proved by a letter received just before we went to press with this book. Signed by Mr. J. W. Harbrecht, Vice-President, it says:

> "It affords the writer a great deal of pleasure to say that we have now installed ten rotaries at Sandusky; four at Fort Madison Mill No. 1; and twelve at Fort Madison Mill No. 2; all of which are of your manufacture and are giving excellent satisfaction.
>
> "We would not hesitate to recommend your Rotaries to anyone requiring this class of equipment; and we have no objection to answering inquiries of prospective customers."

The Hinde & Dauch Paper Company bought more Biggs Rotaries because the first few we sold them had given faithful service over a long period of years. What finer testimonial could one ask?



River Raisin Paper Co., Monroe, Mich., operates 8 Biggs Globe Rotaries, each 14 feet diameter.

"Their Operation has been Most Pleasing"

"The experience we have had in the operation of the eight 14-foot Biggs Globe Rotaries has been most pleasing. These Globes have worked very efficiently, with but slight maintenance cost, and are doing their work in a highly satisfactory manner."

River Raisin Paper Co.

STRATHMORE PAPER COMPANY,
Mittineague, Mass.

We are pleased to say that the Rotary Bleaching Boilers which you have supplied us have been very satisfactory.

We have one boiler you made for us 7′ in diameter and something over 21′ long, two others that are 8′ in diameter and 16′ long. These are used in cooking rag stock and the results are very satisfactory.

THE WARDLOW-THOMAS PAPER CO.,
Middletown, Ohio.

The Biggs 9′ by 22′ rotary boiler which you made for us some four or five years ago has been in continuous use ever since we installed it and is highly satisfactory.

We use it for boiling Rope and Bagging, as these are the principal stocks we use.

HIRSH, STEIN & COMPANY,
110 S. Dearborn Street, Chicago, Illinois.

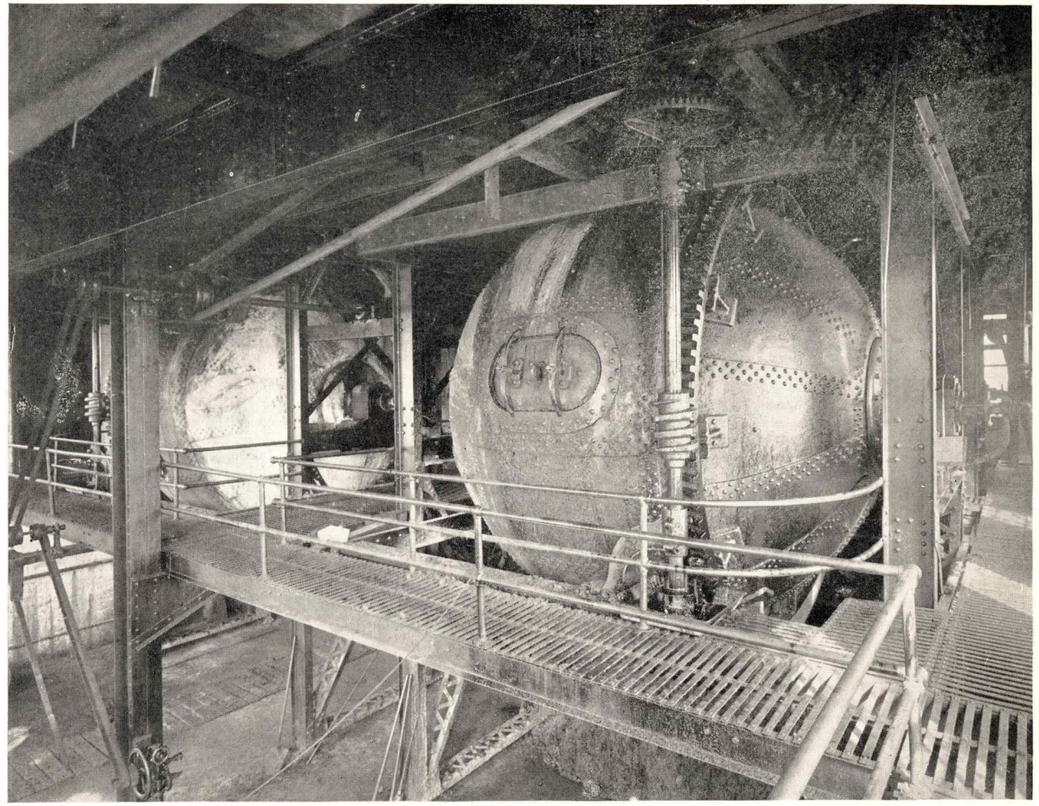
Re. 8′ globe rotary bleaching boiler installed in our factory in May, 1913:

This boiler was installed for experimental work.

We find that 2.4 H. P. is all that is required for 1 R. P. M. with a full load of hide stock of 2,500 lbs. It has not been in constant service but while running has never given us any trouble, and is entirely satisfactory for the work it was intended.

ST. LAWRENCE PAPER MILLS CO., Ltd.,
MONTROSE DIVISION, Thorold, Ontario.

Our three 8′ x 24′ Cylinder Rotary Boilers furnished us in August, 1912, have been in constant use since June, 1913, on book, writing and magazine papers and rags, and have given good satisfaction.



Partial view of the installation of six Biggs Globe Rotary Boilers at the plant of The Coshocton Straw Paper Co., Coshocton, Ohio.

"We are Pleased with our Rotary Installation"

Continuing in a recent letter, The Coshocton Straw Paper Co. writes us very cordially regarding its installation of Biggs Rotaries, two of which are shown in the picture on this page.

"We are pleased with our rotary installation," the Company writes, "and will gladly answer any questions that may be asked by any prospective customers whom you may refer to us."

If the old saying "a pleased customer is the best advertisement" is true—and The Biggs Boiler Works Company certainly believes it *is* true—The Coshocton Straw Paper Company should be an excellent "advertisement" for Biggs! We appreciate the cordial commendation and the spirit that prompted it.

TARENTUM PAPER MILLS,
Pittsburgh, Pa.

We installed one of your 14′ Globe Rotary Bleaching Boilers in 1904, for cooking bagging.

We are pleased to advise it has been giving us entire satisfaction for this purpose.

BOX BOARD & PAPER COMPANY, Inc.,
Richmond, Va.

The Rotary Boiler we bought from you has given us good service, and we consider the construction and operation of same very good.

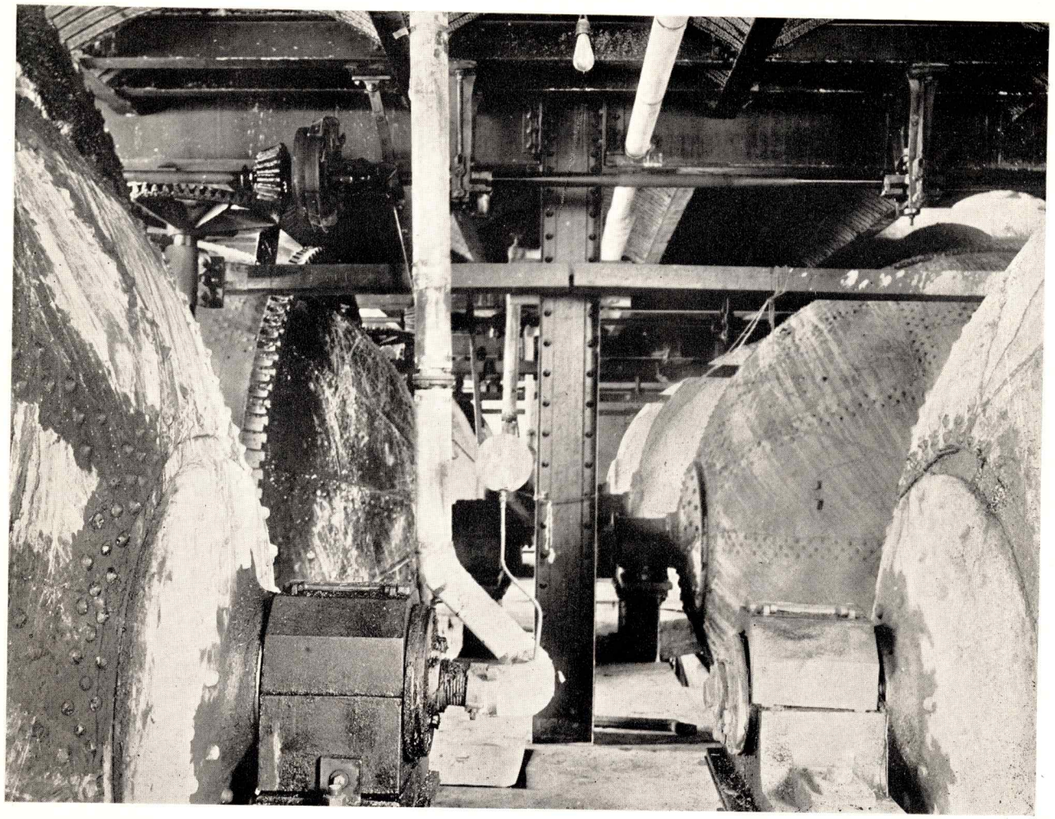
MEGARGEE PAPER MILLS,
Modena, Chester Co., Pa.

We use Biggs Cylinder Rotary Bleaching Boilers for cooking cotton rags, and are very well pleased with same.

THE BELOIT BOX BOARD COMPANY,
Beloit, Wis.

Your boilers have given us excellent service since the day they were installed.

We use these bleaching boilers to cook our mixed, news and kraft papers.



It's a long sweep from front to back in the Rotary Room of The United Paper Board Co.; the camera caught eight Biggs Globe Rotaries, working in two long rows. Purchases like this indicate the owner's satisfaction more than anything else could!

THE THOMPSON & NORRIS CO. OF INDIANA,
Brookville, Indiana. W. D. Bradt, Manager.

The 14 ft. Globe Rotary Bleaching Boiler which you have just installed for us is now in operation and is working very satisfactorily.

This makes the eighth installation of Biggs Rotaries that we have in use in our plant at Brookville and we are pleased to advise that the cost of maintenance has been practically nothing on these machines.

Our first installation consisted of two Biggs Standard 14 ft. Globe Rotary Bleaching Boilers under date of July 7, 1902 and these Boilers have been run continually since the day they were installed.

The original gearing is still in use without a single replacement. *The worms and segments are worn thin and we have been expecting any day within the last five years to be compelled to replace them, but so far replacement has not been necessary.*

We cheerfully recommend Biggs Rotaries to anyone in need of such equipment.

MAC SIM BAR PAPER COMPANY,
Otsego, Michigan.

Regarding the two 8′ diameter x 24′ long Cylinder Rotary Bleaching Boilers, we wish to say that same have been satisfactory.

STANDARD PAPER MANUFACTURING COMPANY,
Richmond, Va.

You furnished us with two Cylinder Rotary Bleaching Boilers in December, 1901, size 6′ diameter x 22′ long, and we have been using these boilers since that time with very satisfactory results.

Since then we bought two more boilers of the same size from a concern in the East. We also bought from you in the summer of 1914 two more Cylinder Rotary Bleaching Boilers, size 7′ in diameter x 15′ long, making six boilers in all.

We are glad to say that we consider the last two boilers that we bought from you the best that we have for our purposes, as we find that they dump better than the two boilers which we bought in the East. I will state that we use these boilers exclusively for cooking rags.

If you care to refer parties to us who are contemplating buying this class of machinery, we will be very glad to recommend your boilers.

THE HOWARD PAPER COMPANY,
Urbana, Ohio.

We take pleasure in stating that we have received satisfactory results in the treatment of rag stock with the two 8′ dia. x 24′ long Cylinder Rotary Bleaching Boilers you furnished us in June, 1909.

THE BECKETT PAPER COMPANY,
Hamilton, Ohio.

We have had two Biggs Cylinder Rotary Boilers 8′ x 24′ in continuous service since we put them in in 1906, and have had absolutely no trouble of any kind.

We boil rag stock in these rotaries, using a liquor composed of soda ash and lime.

As far as we can see, these rotary boilers ought to last a lifetime.

THE WRENN PAPER COMPANY,
Middletown, Ohio.

We are using two of your Rotary Bleaching Boilers, one installed in 1906 six feet diameter 24 feet long, and one installed in 1909 7 feet in diameter and 21 feet long, both of them of the horizontal type.

They have been very satisfactory.

We use these boilers for cooking cotton rags only.

BARDEEN PAPER COMPANY,
Otsego, Michigan.

We installed one of your Rotary Bleaching boilers in 1906, 8′ in diameter by 18′ long. Same has been in constant use since.

We have cooked all kinds of rags in it, no papers, and it has given us entire satisfaction.

WESTERN PAPER MAKERS' CHEMICAL CO.,
Kalamazoo, Michigan.

With reference to the 23 ft. 7 inch by 13 ft. 6 inch Special Digestor, and the Flanged Steel Storage Tank built for us, we wish to say that this equipment has been used in the manufacture of our Soaps and Chemicals for the past eight months, and has given entire satisfaction.

As advised you at the time this work was completed, we are well satisfied with the workmanship and quality, as proved by our order of a few weeks ago to you, for a duplicate of this Special Digestor for our Easton, Pa. Plant.

In conclusion, we wish to say that you are at liberty to call on us at any time, should any of your prospective customers desire a reference.

OLAA SUGAR COMPANY LIMITED,
Olaa, Hawaii, T. H.

We acknowledge with thanks your letter of July 31, in regard to proposals for additional machinery to increase the capacity of our paper mill.

Should we decide to go ahead with this work we will again take the matter up with you.

In regard to the matter of obtaining a photograph of our present installation we shall be very glad to comply with your request, if it is possible to get a good one. The difficulty will be the want of light as they are in a very dark place. However if we have any success you will get one.

Our two boilers were installed as you are aware in 1919 and since that time have given excellent service, in fact there has been so little trouble with them, that we almost forget tney are there.

ARTHUR D. LITTLE, Inc.,
Cambridge, Mass.

We have a letter from the Olaa Sugar Company in which they state that the paper mill, for which you furnished some of the equipment, is in operation and that better paper is being made than they ever expected to obtain from bagasse, and at a less cost than was originally estimated.

I know you will be interested in the above in connection with the equipment which you furnished.

SUMMERS LINEN COMPANY,
Port Huron, Michigan.

Regarding the 6′ x 14′ Cylinder Rotary Bleaching Boiler which you supplied to us, we beg to advise that we have used this boiler since the date you supplied it, and as far as the writer knows, it has given entire satisfaction in every respect.

We are not aware of having to pay out anything at all for repairs on same, and can safely say that the machine has done its work in the most satisfactory manner.

The machine is used in one of the processes of preparing linen for commercial purposes.

THE W. B. OGLESBY PAPER COMPANY,
Middletown, Ohio.

We are pleased to say we have been using two of your make of Rotary Boilers, since 1906. They have always given excellent satisfaction and we have not paid out any money whatever in repairs.

We have the very best of reports from the insurance inspectors on these boilers, therefore, we have no hesitancy in speaking a good word for them.

SMITH PAPER COMPANY,
Lee, Mass.

Your Rotary Boiler 7 ft. diameter x 24 ft. long, furnished us in 1907, has given us perfect satisfaction which is certainly all that could be said.

We have been using this boiler mostly for a high grade of cotton stock with occasional transfers to linen and had equally good results with both fibres.

Our recent order to you for two more boilers of approximately the same size, which were installed during the summer of 1914, would be sufficient evidence of our opinion of your work.

NORTHERN INSULATING COMPANY,
St. Paul, Minn.

The 7′ in diameter x 21′ long Cylinder Rotary Bleaching Boilers furnished by you November, 1910, have been in constant use, most of the time night and day.

We use them to digest flax fibre, which is used for the manufacture of our insulating board — Flaxlinum.

We handle about 12,000 tons in these digestors per year, dry weight.

We have had no trouble or expense of any kind with them.

HENRY WEIS,
Waterloo, Iowa.

The several Rotary Bleaching Boilers you have built for me for the paper mills at Coffeyville, Kan., Beloit, Wis., and Quincy, Ill., have been in constant use since they were installed at each of the mills and have given very good satisfaction, and so far as I know each Rotary is in very good condition.

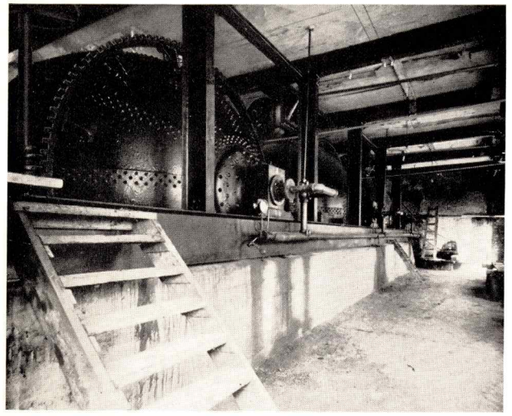
LEE PAPER COMPANY,
Vicksburg, Michigan.

We are pleased to say that the four Rotary boilers which were installed in 1905 have been in continuous operation ever since and have given excellent satisfaction. The cost of maintenance has been trifling; very pleased with their operation.

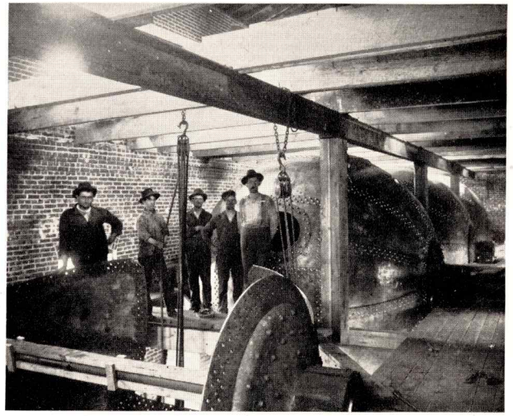
THE ALBEMARLE PAPER MFG. COMPANY,
Richmond, Va.

Concerning the 7′-6″ x 24′-0″ Cylinder Rotary Bleaching Boiler bought from you in 1904, desire to say this Boiler is giving entire satisfaction, and has been in constant use ever since it was erected.

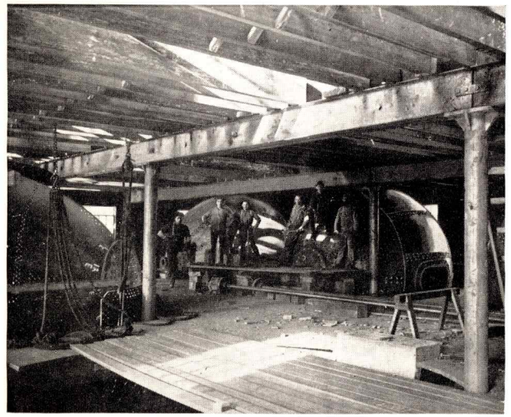
We cook old cotton rags in this boiler.



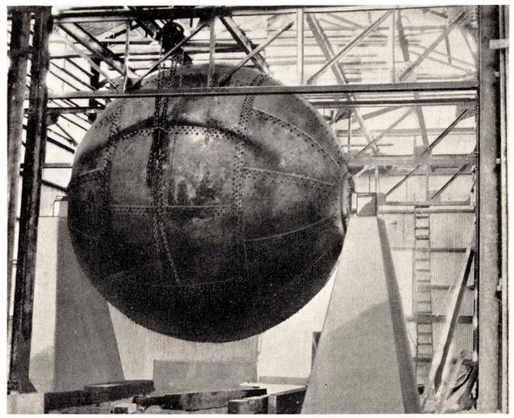
Rotary Room at The Massillon Paper Co., Massillon, Ohio. As the letter on this page will show, these Biggs Globe Rotaries are still "going strong" after over 8 years' continuous service.



"Our Biggs Globes look as though they had just begun their usefulness," writes the Mt. Vernon Strawboard Co., Mt. Vernon, Ind., a part of whose installation is illustrated here. See letter below.



Empire Paper Co., Vincennes, Ind., bought their first Biggs Globes in 1898; this picture was taken while the equipment was being installed. The letter printed on this page is up-to-date, though, and shows that our customer is still more than pleased with his investment.



If you want to see how large this Biggs Globe Rotary really is, turn back to page 16 and see how it looked in our plant, compared with the full-grown man standing beside it. It was purchased by the Grass Fiber Co., Leesburg, Fla., and is shown here in place, ready for work. Size, 18 feet diameter.

THE MASSILLON PAPER CO.,
Massillon, Ohio.

Three 14-foot Biggs Globe Rotaries installed for us in July, 1914, were put in operation about October 1, 1914, and have been operated continuously since that time.

They have not given us any trouble at all and appear to be well constructed in every way. We are exceedingly well pleased.

MT. VERNON STRAWBOARD COMPANY,
Mt. Vernon, Indiana.

We have 8 Biggs Rotaries. Four were installed about 1904, and the other four in 1912. These rotaries have been in constant use and the expense for repairs has been so light that we have kept no record of it.

They look as though they had just begun their usefulness.

BERGSTROM PAPER COMPANY,
Neenah, Wisconsin.

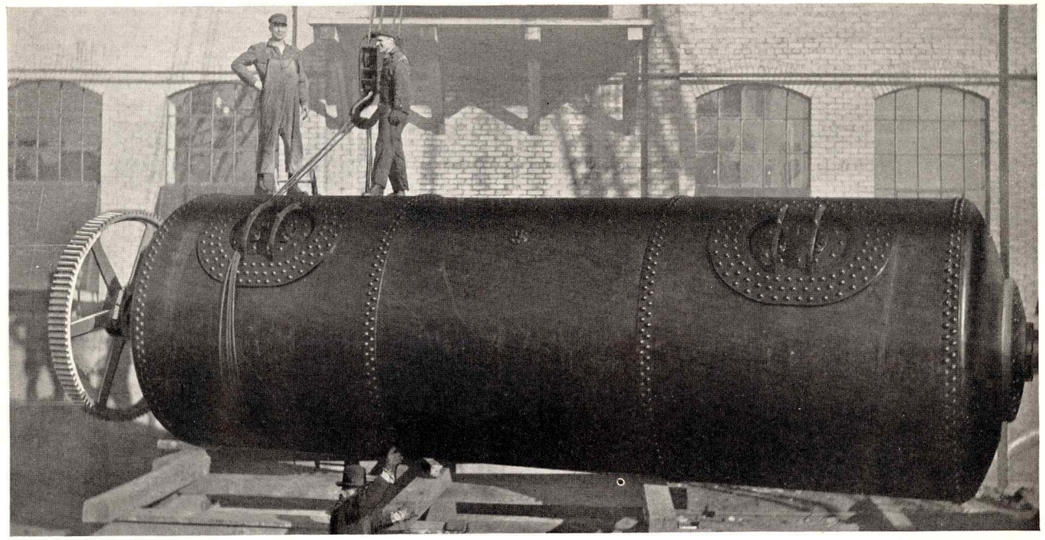
The two 8′ x 24′ Biggs Cylinder Rotary Boilers which you furnished us about two years ago, have been in constant use and have given entire satisfaction.

No leaks have developed in the joints at all and if we had use for further equipment of this kind, we should certainly advise and unless price prevented, would give you the preference in placing our order.

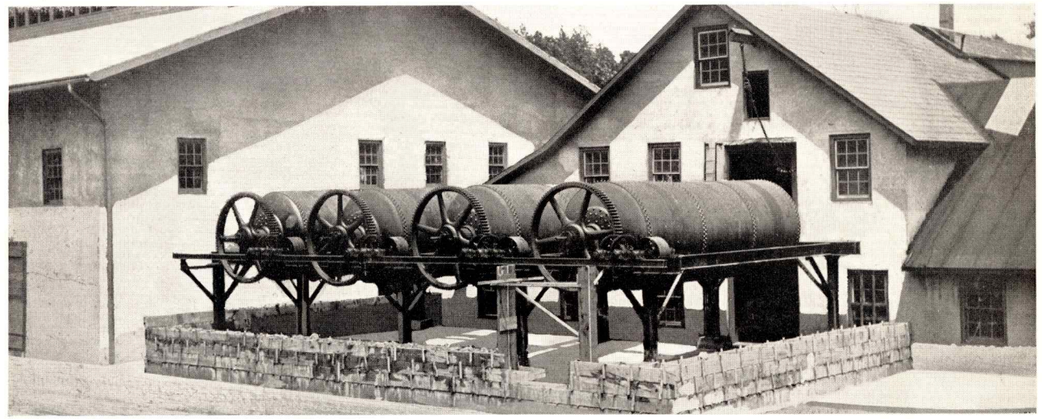
VINCENNES BOARD & PAPER COMPANY,
Vincennes, Indiana.

The Globe Rotary Bleaching Boilers which you furnished us in 1898 have been entirely satisfactory in every way.

The repairs have been very light and the service has been all that we could desire.



Another Biggs Cylinder Rotary being installed in plant of Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.



Pequannock Valley Paper Co., Butler, N. J.; this picture shows how the Biggs Cylinder Rotaries, illustrated on page 26, looked when they got down to business! That they really *are* not only business-*like*, but business-*builders*, is shown by the cordial letter reproduced here.

"We Like the Rotaries Very Much"

(Views of the Pequannock installation are given above and on page 26, lower picture)

THE PEQUANNOCK VALLEY PAPER CO.,
Butler, N. J.

We are using four of your Cylinder Rotary Bleaching Boilers, 7′ in diameter, 20′ long, and we are using them for cooking jute and linen.

They were installed in 1909, as you know, and they have never given us a particle of trouble in any way. We like the installation and also the rotaries very much.

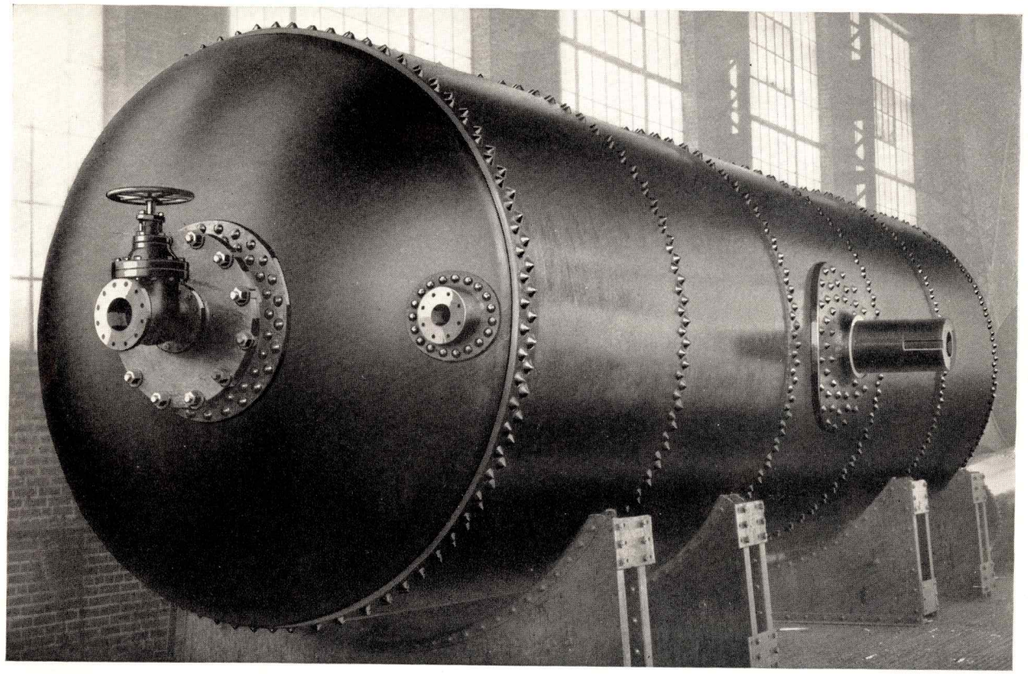
We certainly think that you understand building rotary boilers, as these are working fine, and we can recommend them to anyone wishing to install rotary boilers.

THE CLEVELAND-AKRON BAG COMPANY,
Cleveland, Ohio.

Regarding the merits of your Rotary Bleaching Boilers, wish to state that we have in use at our mill at Boston, Ohio, four of your 14′ diameter Globe Rotary Bleaching Boilers, and one of the same size Bleachers in our mill at Cleveland, Ohio.

The first Globe Bleacher was installed in our mill at Boston, Ohio, in 1900, the second one in 1901, the third in 1904, and the fourth one in 1906.

The expense of maintenance and upkeep of these Boilers has also been very satisfactory and they are economical to operate.



Biggs Digesters

(Welded and Riveted)

This illustration shows a 9′ 6″ x 34′ Revolving Digester being tested preparatory to shipment.

The Digester, as will be noted, is equipped with heavy cast steel journals, in this instance attached to the shell of the Digester instead of on the heads as on a standard Cylinder Rotary Bleaching Boiler. The construction is extra-heavy; the heads are made of 1⅛″ steel with rivets 1¼″ in diameter.

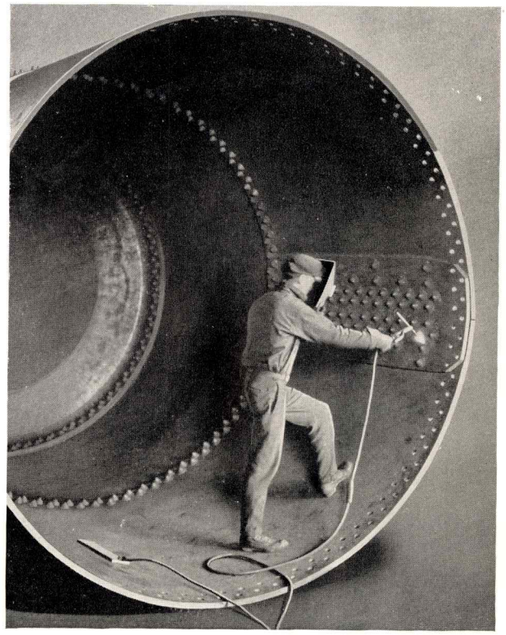
The Digester is hung in a vertical position, being counterbalanced, and is provided with a gear-train so as to secure the necessary agitation by revolving while in operation.

In addition to driving the rivets under hydraulic pressure of 150 tons, often *each individual rivet head and all seams* on the inside of the Digester are electrically welded so as to prevent the penetration of the sulphuric content bleaching liquor.

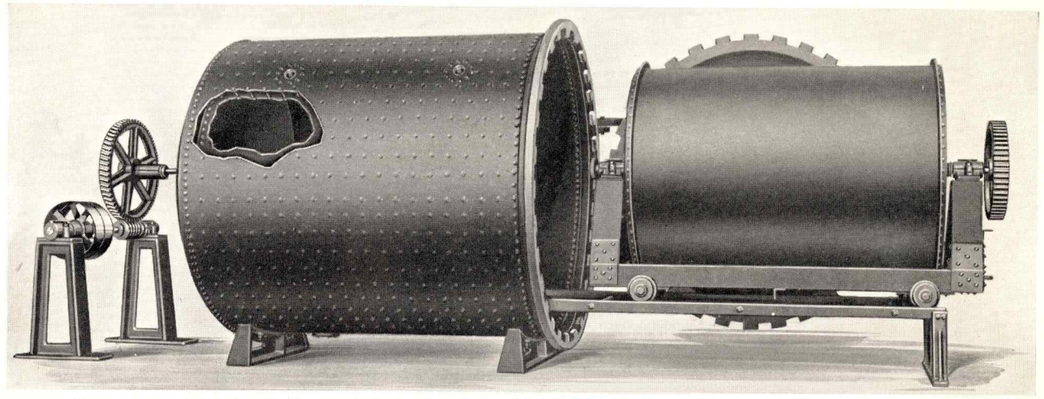
This type of construction, we sincerely believe, is ideal. The *strength* of the vessel can be *accurately* figured from the *efficiency of the riveted joints.* The welding acts as a sealing agent, making the entire vessel practically one solid sheet of metal.

Having capacity for fabricating 1½″ steel plates, we can construct all special types and sizes of Digesters, both stationary and revolving. Our experience likewise permits us to assist in solving special problems.

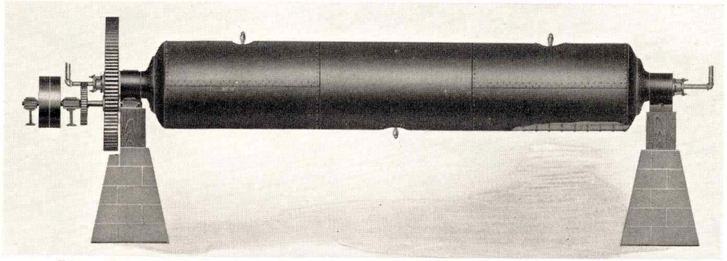
The view at right shows our operator electrically welding one of the rivets in the longitudinal seam of a Digester. The upper edge of the butt strap, as will be noted, has already been welded, as will all joints on the inside when the job is completed.



Electrically Welding
Riveted Digester

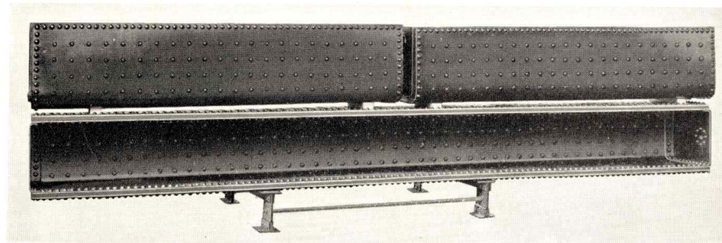


Biggs Jacketed, Double Shell, stay bolted vulcanizer, with Simplex Boltless Quick-Opening Door. Can be opened and closed by one man in 30 seconds, by throwing a single lever. No other manual work is involved. Steam pressure sustained equally over the entire area of door. Endorsed by Insurance Companies. Write for special Bulletins.

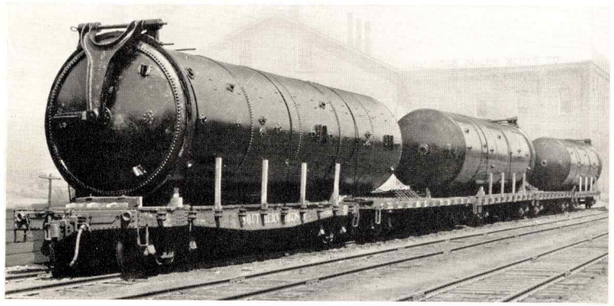


Biggs Rotary Devulcanizer—for reclaiming old rubber stock. Adapted to special manufacturing processes, depending on customer's requirements. Widely used.

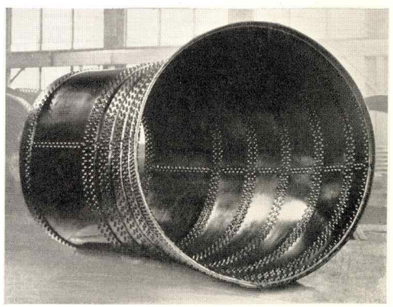
Cone-Bottom Tank. Made in all sizes and for all requirements.



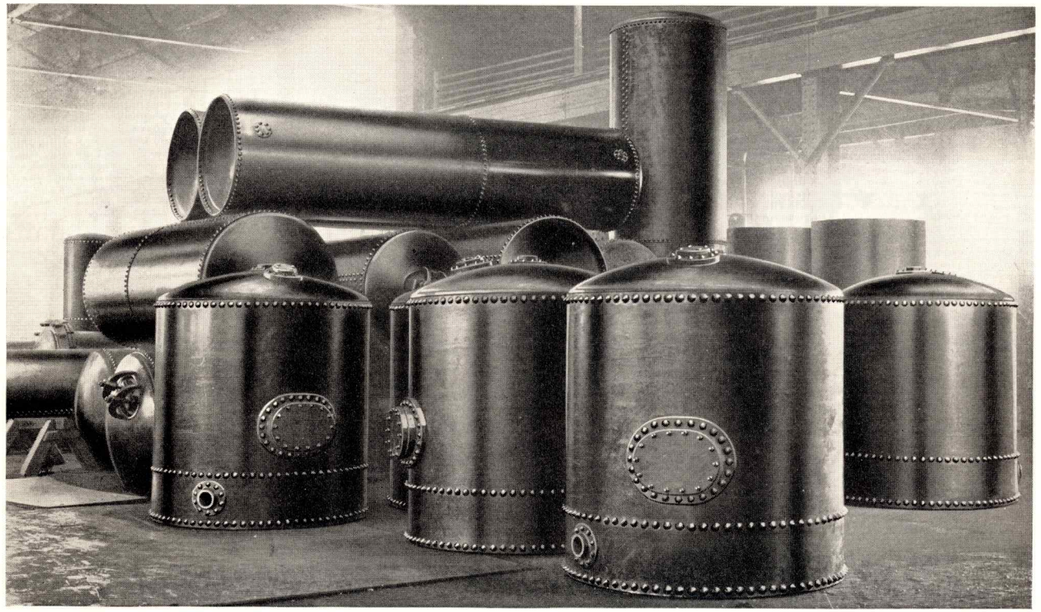
Steam-Jacketed Tanks—used in various manufacturing processes. Can be built in any size desired. Please write us in detail about your problem.



Shipment of 10-foot dia. Vulcanizers with Simplex Quick-Opening Doors. Note size of Vulcanizers, contrasted with cars on which they are loaded. See additional description, top of page.



Section of Riveted Steel Pipe Elbow 9 ft. dia. We can furnish according to customer's specifications.



Biggs Steel Tanks

Even though you were interested in Rotary Bleaching Boilers alone, you would still be impressed, as you traveled through our plant, with the related things that we produce in large volume—riveted steel tanks, for example, such as you see above.

There are several kinds of tanks in this picture—each serving some particular purpose. Those in the very front are special tanks, with jacketed bottoms. The longer ones at the top are pressure and storage tanks.

It is a really impressive thing—the volume of Riveted Steel Tanks that is always going over the Biggs Test Block and out to the loading floor. Visitors at our plant frequently express surprise and interest—even though they come, as *you* might, to see some other feature of Biggs production.

With our hydraulically-equipped plant, we can fabricate all types of steel plate construction. We furnish many companies with their entire requirements of tanks used in connection with special processes where the success of the job depends largely upon the tightness and reliability of the tanks themselves.

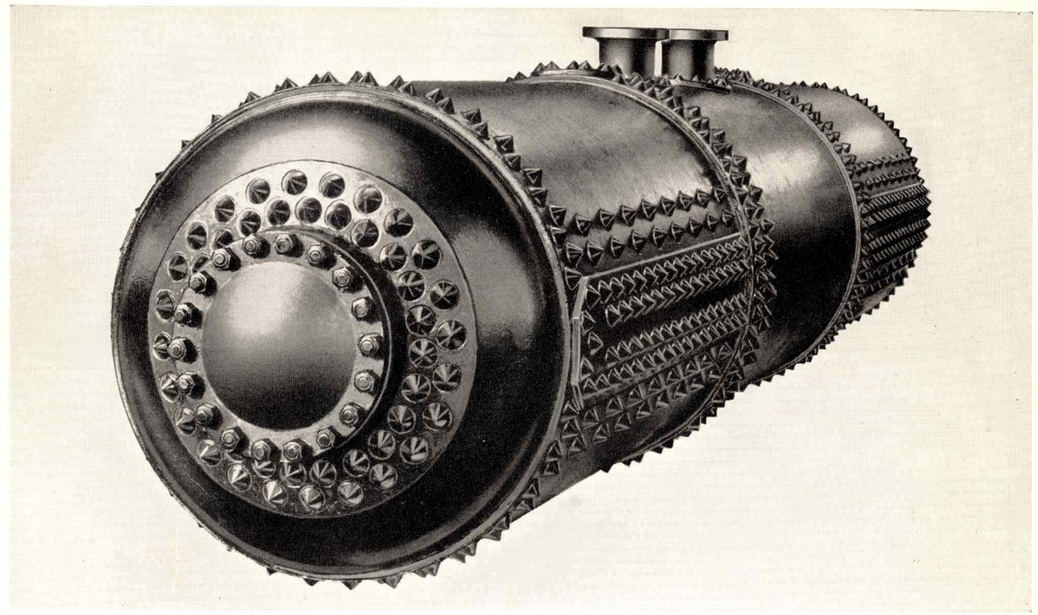
Biggs High Pressure Tanks

(Illustrated at top of next page)

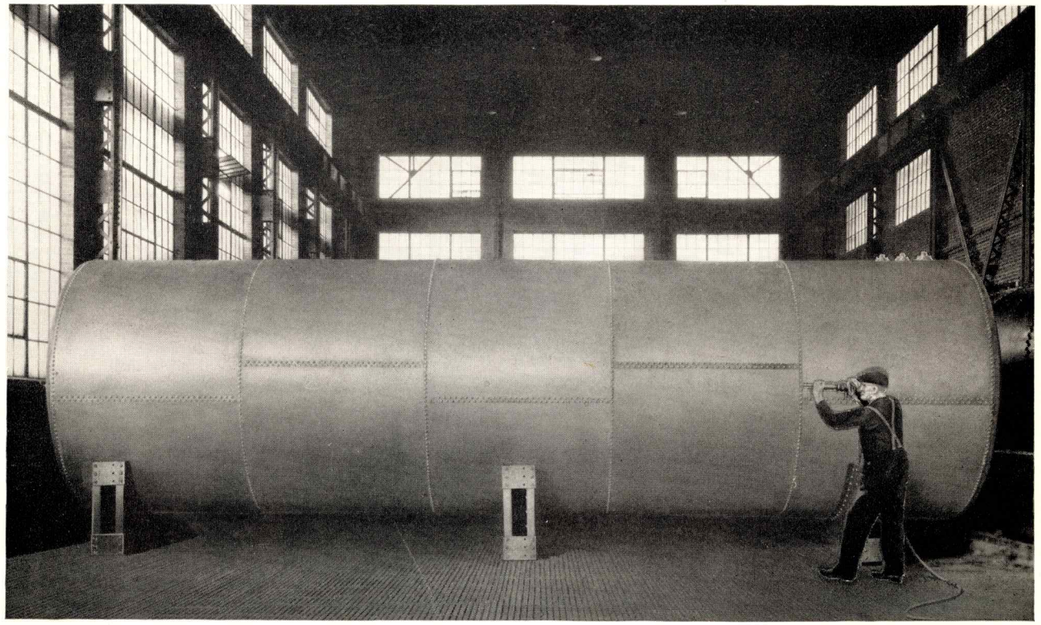
Biggs Heavy-Duty High Pressure Tanks, furnished in the general style shown at the top of page 39, are made with shell plates 1¼-inch thick and with rivets 1½-inch diameter. The longitudinal seam is double-butt-strap, quadruple staggered riveted.

Tanks of this type are designed for working pressures up to 500 pounds, and upon completion are tested to a hydrostatic pressure of 750 pounds.

Our heavy-duty hydraulic equipment permits our fabricating the heaviest types of steel plate construction and includes work where tight construction is absolutely necessary—such as oil stills, tanks for gasoline recovery systems, digesters, etc.



Biggs High-Pressure Tank—see description on opposite page. High-pressure vessels of this type are used in certain phases of the oil industry and in other work where completely reliable tank service, under tremendous internal pressure, can be secured. Designed and constructed for working pressure of 500 pounds; tested to hydrostatic pressure of 750 pounds.



Biggs Riveted Steel Storage Tank—for gasoline, oil, etc., either above ground or below. Furnished in various dimensions; capacities up to 25,000 gallons. Picture shows careful method of caulking—described in detail on pages 24 and 25.

THE COMMERCIAL PRINTING
AND LITHOGRAPHING COMPANY
AKRON, OHIO