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, 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; Plunging 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, 250 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 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 cooperation 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 fiber, 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 12-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 11-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 Globe 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

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Thickness of Material</th>
<th>Capacity in Cubic Feet</th>
<th>Approximate Shipping Weight, Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'-6&quot;</td>
<td>1/2&quot;</td>
<td>8&quot;</td>
<td>14</td>
</tr>
<tr>
<td>4'-6&quot;</td>
<td>1/2&quot;</td>
<td>8&quot;</td>
<td>110</td>
</tr>
<tr>
<td>5'-6&quot;</td>
<td>1/2&quot;</td>
<td>8&quot;</td>
<td>260</td>
</tr>
<tr>
<td>6'-6&quot;</td>
<td>1/2&quot;</td>
<td>8&quot;</td>
<td>900</td>
</tr>
<tr>
<td>7'-6&quot;</td>
<td>1&quot;</td>
<td>8&quot;</td>
<td>1200</td>
</tr>
<tr>
<td>8'-6&quot;</td>
<td>1&quot;</td>
<td>11&quot;</td>
<td>700</td>
</tr>
<tr>
<td>9'-6&quot;</td>
<td>1&quot;</td>
<td>11&quot;</td>
<td>900</td>
</tr>
<tr>
<td>10'-6&quot;</td>
<td>1&quot;</td>
<td>11&quot;</td>
<td>1450</td>
</tr>
<tr>
<td>11'-6&quot;</td>
<td>1&quot;</td>
<td>11&quot;</td>
<td>1455</td>
</tr>
</tbody>
</table>

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 15 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—11 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 furnished 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 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 at 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 3, and are designed to withstand the corrosive action of chemicals.

Table of Capacities and Weights, Standard Sizes

<table>
<thead>
<tr>
<th>Diameter x Length</th>
<th>Thickness</th>
<th>Capacity in Cubic Feet</th>
<th>Approximate Shipping Weight, Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'0&quot; x 16'0&quot;</td>
<td>3&quot;</td>
<td>470</td>
<td>21,500</td>
</tr>
<tr>
<td>6'0&quot; x 16'0&quot;</td>
<td>3 1/2&quot;</td>
<td>525</td>
<td>22,500</td>
</tr>
<tr>
<td>6'0&quot; x 16'0&quot;</td>
<td>4&quot;</td>
<td>580</td>
<td>23,000</td>
</tr>
<tr>
<td>7'0&quot; x 16'0&quot;</td>
<td>3 1/2&quot;</td>
<td>720</td>
<td>26,000</td>
</tr>
<tr>
<td>7'0&quot; x 16'0&quot;</td>
<td>4&quot;</td>
<td>800</td>
<td>27,000</td>
</tr>
<tr>
<td>7'0&quot; x 22'0&quot;</td>
<td>3 1/2&quot;</td>
<td>950</td>
<td>28,000</td>
</tr>
<tr>
<td>7'0&quot; x 22'0&quot;</td>
<td>4&quot;</td>
<td>1,020</td>
<td>28,500</td>
</tr>
<tr>
<td>8'0&quot; x 22'0&quot;</td>
<td>3 1/2&quot;</td>
<td>1,200</td>
<td>30,000</td>
</tr>
<tr>
<td>8'0&quot; x 22'0&quot;</td>
<td>4&quot;</td>
<td>1,320</td>
<td>30,500</td>
</tr>
<tr>
<td>9'0&quot; x 26'0&quot;</td>
<td>3 1/2&quot;</td>
<td>1,540</td>
<td>31,000</td>
</tr>
<tr>
<td>9'0&quot; x 26'0&quot;</td>
<td>4&quot;</td>
<td>1,680</td>
<td>32,000</td>
</tr>
<tr>
<td>9'0&quot; x 26'0&quot;</td>
<td>4 1/2&quot;</td>
<td>1,740</td>
<td>32,500</td>
</tr>
</tbody>
</table>

We build any size Rotary Bleaching Boiler that you may require.
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 formula 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.

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!
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 journal.

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 newspaper paper!

In this mammoth press, the red-hot plate of steel is 'shaped' or formed into exact shape by heavy cast steel dies, accurately machined. The tremendous pressure under which they are formed ensures 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 plates are punched or drilled that makes possible the perfect matching of these rivet holes. After the plates are punched or drilled, they are beveled for canting edge; then they are inspected and assembled, as illustrated on following pages.
Eighteen-foot Globe

This is the largest Globe Rotary Boiler ever built—18 feet diameter. Note the relative size of a full-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.

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.

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 23 tons and move it one thirty-second of an inch with absolute certainty.
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 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.

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.

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 steel, 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 Biggs Boiler Works Company

The lighter-shaded ring in the center of this picture is the edge of a circular boiler head 2 feet in diameter, formed from sheet 1/4 of an inch thick. Make these figures real to yourself, that means a circular head more than half-an-inch wide and sheet two times as thick as this book! And weighing 500 pounds. More than that, the ring is made from steel sheet of the same thickness! The entire thing is formed from the flat sheet with one operation of a huge machine. The result of that machine is a solid ring of 1200 pounds which "waffle-iron" works a solid sheet of metal nearly as thick as your two fingers, and exerts a pressure of 384 tons. When completed, it is the head of a 14-foot diameter Cylinder Rotary.

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 18-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 20-foot Biggs Cylinder Boiler Boiler after leaving the 250-ton riveter shown above. This riveter has a gap of 18 feet, 6 inches. Compare the riveter with the man standing inside 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 Boilers 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!) It drives rivets 1½ inches in diameter as readily as you poke your shoe string through the eyelet.

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 1½-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 rivets completely fill 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 300 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 cranes on railroad cars standing within the building.
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 con-
tinue your "outing" 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
paragraphs of both cylinders and service in en,
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?
"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 effi-

ciently, with but slight maintenance cost, and are doing their work in a highly satisfactory manner."

River Raisin Paper Co.

STRATHMORE PAPER COMPANY, Malden, Mass.

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

We have one boiler made for us 7' in diameter and something over 21' long; two others that are 6' in diameter and 18' 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 constant 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, 118 S. Dearborn Street, Chicago, Illinois.

Re. Globe rotary bleaching boiler installed in our factory in May, 1913:

This boiler was installed for experimental work. We found that 2 1/4 H.P. is all that is required for a boiler 6' in diameter and weighing 5,000 lbs.

It 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 22' Cylinder Rotary Boilers furnished us in August, 1912, have been in constant use since then, on paper, writing and magazine papers and rags, and have given good satisfaction.

Megargel Paper Mills, Middletown, Ohio.

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

"We are Pleased with our Rotary Installation"

Continuing in a recent letter, The Coshoeaton 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 Coshoeaton Straw Paper Co. should be an excellent "advertisement" for Biggs! We appreciate the cordial commendation and the spirit that prompted it.

Box Box Board Company, Milton, 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.
The Biggs Boiler Works Company

It's a long sweep from front to back in the Rotary Room of the United Paper Board Co.; the owners caught eight Biggs Globe Rotaries, working in two long rows. Pur- chase looks like this indicates 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 had 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, 1905 and these Boilers have been run continually since that time with very satisfactory results.

Since then we have bought two more boilers of the same size from a concern in the East. We also bought from you the two more Cylinder Rotary Bleaching Boilers, 24 in diameter, 12 ft. 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. We 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 Rotaries to any one in need of such equipment.

MAG SIM BAR PAPER COMPANY,
Ozcego, Michigan.

Regarding the 2 ft. diameter x 21 ft. long Cylinder Rotary Bleaching Boilers, we wish to say that same have been satisfactory.

STANDARD PAPER MANUFACTURING COMPANY,
Richardson, Va.
You furnished us with two Cylinder Rotary Bleaching Boilers in December, 1901, size 6 diameter, 22 feet long, and we have been using these boilers since that time with very satisfactory results.

Since then we have bought two more boilers of the same size from a concern in the East. We also bought from you the two more Cylinder Rotary Bleaching Boilers, size 6 in diameter, 10 ft. 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 reflect better than the two boilers which we bought in the East. We 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 Rotaries to any one in need of such equipment.

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 ft. diameter 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 ft. diameter, 21 ft. in continuous service since we put them 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.

BARDEN PAPER COMPANY,
Ozcego, Michigan.
We installed one of your Rotary Bleaching boilers in 1906, 6 ft. diameter by 10 ft. long. Same has been in satisfactory operation.

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 2 ft. 7 in. by 13 ft. 6 inch Special Digester, and the Flanged Steel Storage Tank built for us, we wish to say that this equipment has contributed to the manufacture of our Soups and Chems 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 for a duplicate of this Special Digester.

In conclusion, we wish to say that we are at liberty to let anyone know that any of your prospective customers desire a reference.

OALA SUGAR COMPANY LIMITED,
Oahu, Hawaii, T. H.
We acknowledge with thanks your letter of July 31, in regard to proposals for additional machinery to increase the capacity of your 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 equipment, it will be very glad to comply with your request, if it is possible to get a suitable one, and will send it you at once. However if we have any success you will get one.

Our two boilers were installed as you are aware in 1909 and since that time we have given excellent service, just as they have been so little trouble with them, that we almost forget they are there.

ARTHUR D. LITTLE, Inc.,
Cambridge, Mass.
We have a letter from the Oala 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, coming from bagasse, and at a less cost than it was originally anticipated.

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

SMITH PAPER COMPANY,
Law, 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 satisfaction with your work.

NORTHERN INSULATING COMPANY.
St. Paul, Minn.
The 7 ft. diameter x 21 ft. long Cylinder Rotaries Bleaching Boilers furnished by you, November, 1914, have been in satisfactory operation ever since their installation and day.

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

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

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

HENRY WEIS,
Waterloo, Iowa.
The several Biggs Bleaching Boilers you have built for me for the paper mills of Coffeyville, Kan., Bond, Wis., and various others have been in good use since they were installed at each of the mills and have given very satisfactory service, and so far as I know each Boiler is in very good condition.

LEE PAPER COMPANY,
Vicksburg, Michigan.
We are pleased to say that the four Rotary boilers which were installed in 1912 have been in continuous operation ever since and have given excellent satisfaction. The machine has been trifling: very pleased with their operation.

THE ALBEMARLE PAPER MFG. COMPANY,
Richmond, Va.
Concerning the 7'6" x 24'6" 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.

SUMMERS LINEN COMPANY.
Fort Harrison, Michigan.
Regarding the 8' x 14' 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 hesitation in speaking a good word for them.

SHARP PAPER COMPANY.
St. Louis, Mo.
Your Rotary Boiler 7 ft. diameter x 24 ft. long, furnished us in 1907, has been in 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 satisfaction with your work.

NORTHERN INSULATING COMPANY.
St. Paul, Minn.
The 7 ft. diameter x 21 ft. long Cylinder Rotaries Bleaching Boilers furnished by you, November, 1914, have been in satisfactory operation ever since their installation and day.

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

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

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

HENRY WEIS,
Waterloo, Iowa.
The several Biggs Bleaching Boilers you have built for me for the paper mills of Coffeyville, Kan., Bond, Wis., and various others have been in good use since they were installed at each of the mills and have given very satisfactory service, and so far as I know each Boiler is in very good condition.

LEE PAPER COMPANY,
Vicksburg, Michigan.
We are pleased to say that the four Rotary boilers which were installed in 1912 have been in continuous operation ever since and have given excellent satisfaction. The machine has been trifling: very pleased with their operation.

THE ALBEMARLE PAPER MFG. COMPANY,
Richmond, Va.
Concerning the 7'6" x 24'6" 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.
The Biggs Boiler Works Company

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.

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.

THE MASSELMON 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 have been 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 1901, 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 in fact, had we further equipment of this kind, we should certainly advise and unless prices proved otherwise, 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.

If you want to see how large this Biggs Globe Rotary really is, turn back to page 11 and you'll find it. It was purchased by the Grove Fiber Co., Lanesburg, Fla., and is shown here in place, ready for work. Size, 18 feet diameter.

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

If you wish to see how large this Biggs Globe Rotary really is, turn back to page 11 and you'll find it. It was purchased by the Grove Fiber Co., Lanesburg, Fla., and is shown here in place, ready for work. Size, 18 feet diameter.

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

"We Like the Rotaries Very Much"

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

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

The four of your Cylinder Rotary Bleaching Boilers, 7 feet diameter, 20' long, and we are using them for cooking jute and linen.

They were installed in 1906, as you know, and they have never given us a particle of trouble of any kind. 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 RAG 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 in our mill at Cleveland, Ohio.

The first Globe Boiler was installed in our mill at Boston, Ohio, in 1906, 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 we are economical to operate.
**Biggs Digesters**

(Welded and Riveted)

This illustration shows a 9' 6" x 34' Revolving Biggs 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 1 1/2" steel with rivets 1/4" 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, 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 1 1/2" 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, 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 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 manufacture 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 3/4-inch thick and with rivets 1/8-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.
The Complete Products of

THE BIGGS BOILER WORKS CO.

Include:

ROTARY BLEACHING BOILERS
DIGESTERS
RIVETED STEEL TANKS FOR
STORAGE AND PRESSURE
Gasoline and Oil Storage
Pneumatic Water-Supply
Hot Water Storage
High Pressure
Air Receivers
Mixing Tanks
Steam-Jacketed Tanks and Kettles

VULCANIZERS
With “Simplex” Boltless,
Quick-Closing Doors

Oil Refinery Equipment
Brick Hardening Cylinders
Sugar Plantation Machinery
Paint-Making Machinery
Flumes
Smokesacks
Penstocks
Riveted Steel Pipe
Retorts

Kiers

GENERAL STEEL PLATE
CONSTRUCTION OF EVERY
DESCRIPTION
Capacity 1 1/2-inch Plate

HEATERS
Feed Water
Oil
Refinery
Sugar Juice
Etc.

STILLS
Chemical
Oil Refinery

Creosoting Cylinders
Rubber Machinery
Rotary Dryers
Oil Separators
Glue Mixers
Agitators
Incinerators
Autoclaves
Digesters

THE COMMERCIAL PRINTING
AND LITHOGRAPHING COMPANY
ATLANTA, 1902