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Erie City Vertical Water-Tube Boiler



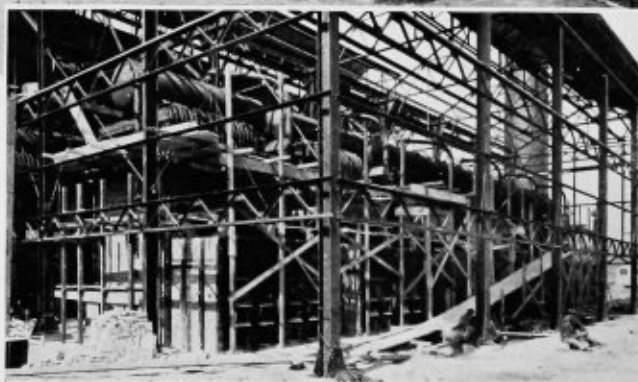
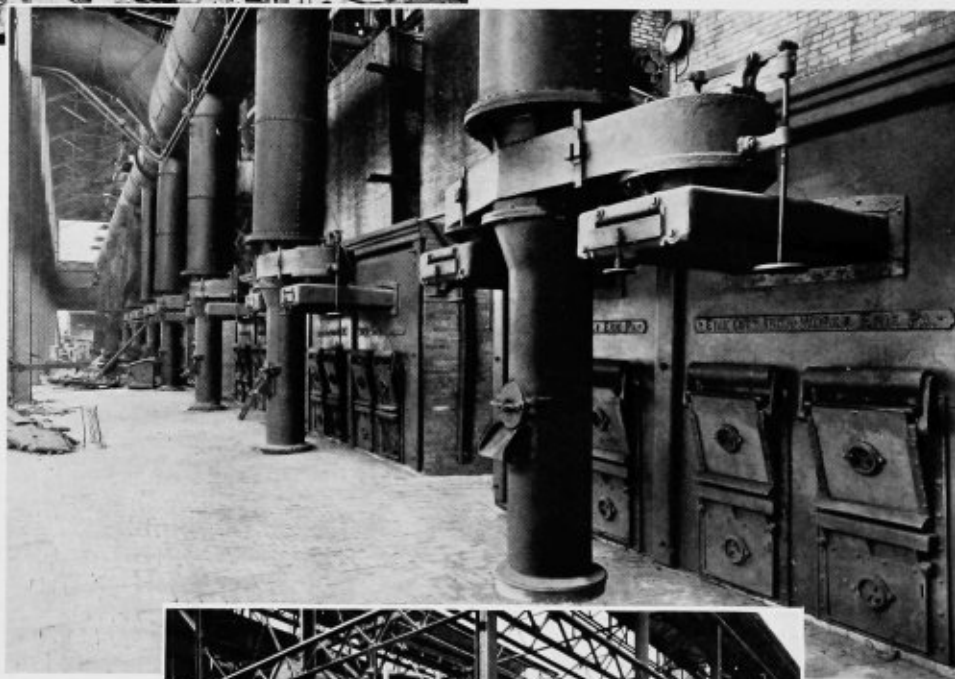
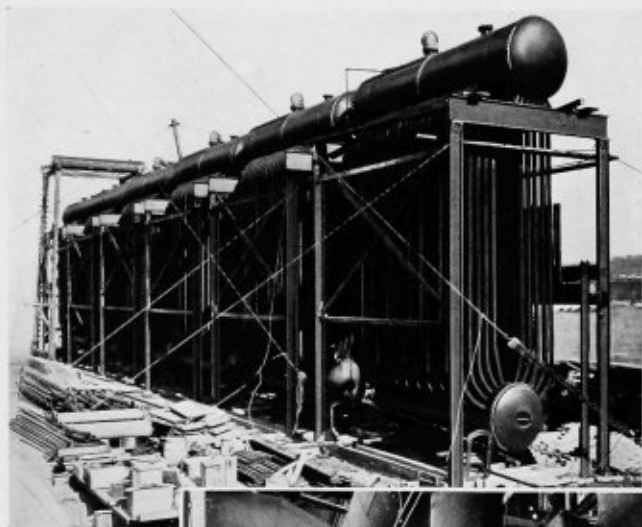
Manufactured by

Erie City Iron Works

Erie, Pennsylvania, U. S. A.

8294

ERIE CITY VERTICAL WATER-TUBE BOILER



INSTALLATION AT THE ALIQUIPPA PLANT OF JONES & LAUGHLIN STEEL CO.

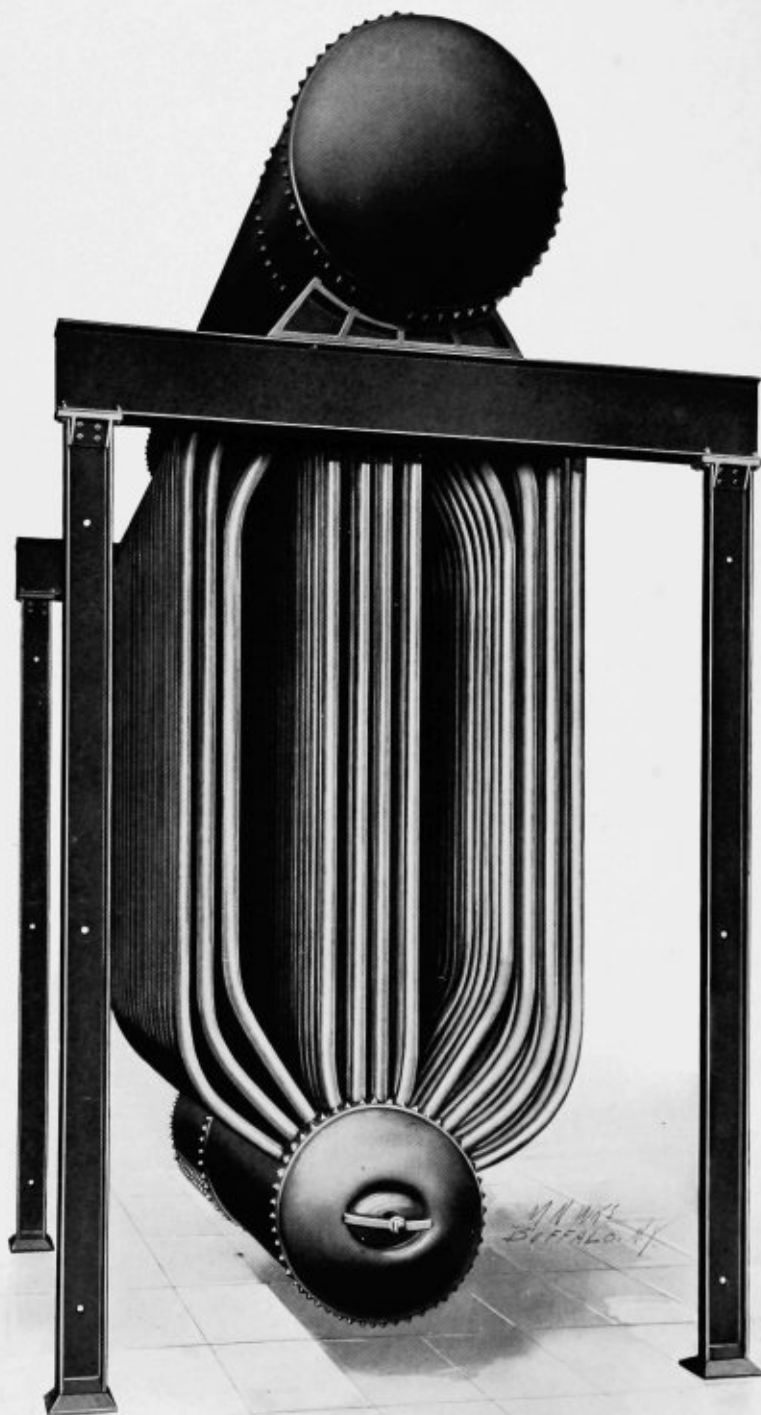
ERIE CITY IRON WORKS, ERIE, PENNSYLVANIA

INTRODUCTION

A LONG dissertation on the subject of steam boilers may prove interesting reading for those who have the leisure for it, but to the busy prospective owner of a steam plant, whose time for detail is limited, the assurance of an abundance of DRY STEAM at the lowest possible cost is more attractive.

THE ERIE CITY VERTICAL WATER-TUBE BOILER IS PROTECTED BY
U. S. PATENT NO. 965983, DATED AUGUST 2, 1910

ERIE CITY VERTICAL WATER-TUBE BOILER



THE BOILER SUSPENDED ON STEEL FRAME

THE ERIE CITY VERTICAL WATER-TUBE BOILER

IN this boiler there are two horizontal drums—one drum placed directly above the other; the two drums are connected by a series of tubes, the combination of drums and tubes being supported by a heavy frame of steel beams. A wall of masonry surrounds the boiler and, extending forward, forms the furnace, which is lined with fire-brick and faced with a substantial metal front.

THE DRUMS

The drums are of ample dimensions, the upper drum being the larger in diameter, and, carrying a solid body of water over the tubes, affords a large liberating surface. This drum is provided at each end with a *steam storage compartment*, a unique and wonderfully valuable arrangement, which, combined with other important features, places the Erie City Vertical Water-Tube Boiler in a class by itself, and justifies the claim that it is *unequaled* by any water-tube boiler on the market for the production of *dry steam* at a *minimum cost* for fuel and maintenance.

The lower drum is not supported from below, but by the tubes which connect it with the upper drum, the curved tubes insuring ample facility for expansion and contraction.

Each drum is provided with a man-head, and the drums being of large diameter afford ready access for installation and inspection.

THE TUBES

The illustration shows a space between the rear bank and the middle bank and between the middle and front bank of tubes. These two spaces, or chambers, are wide enough to permit a man to enter them for the purpose of inspection and cleaning, and for repairs, if necessary.

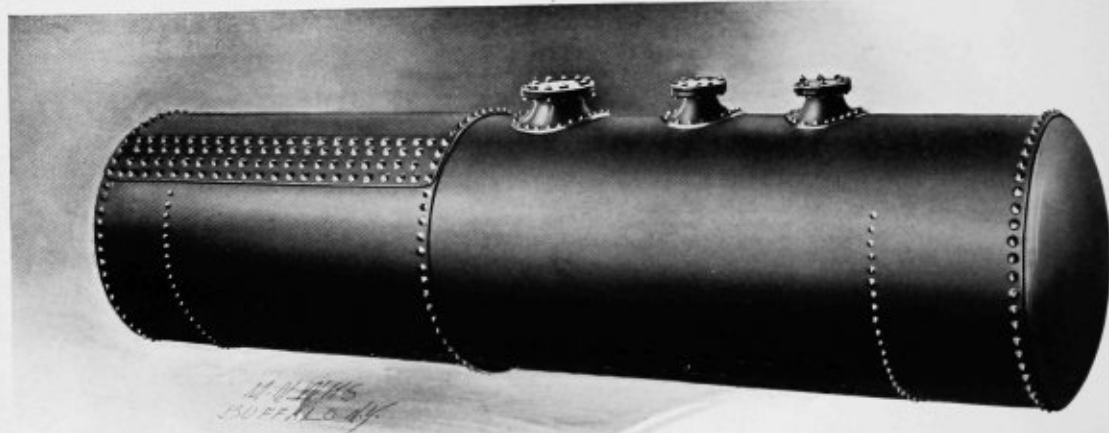
The engraving illustrates also the curve of the tubes and the entry of each tube into the drum at right angles to the horizontal plane of the shell. The curved tubes are all bent to a 27-inch radius, making it possible to use either an air or hydraulic turbine tube cleaner, which can be passed through them easily, for the purpose of removing any scale or other deposit. The tubes being practically vertical, a large proportion of any scale-forming matter in the water will drop away and pass into the lower drum.

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MATERIAL

The drum shell plates are of the best open-hearth homogeneous flange steel. The tubes are of mild steel and are hot-rolled and seamless, of the best standard manufacture, every tube being carefully inspected and subjected to a high-test pressure at the tube mills.

The rivets are of mild steel, and conform to standard specifications.



THE UPPER DRUM

CONSTRUCTION

The shell-plates are rolled to a true circle, the longitudinal seams are double butt-strapped. The edges of the plates are bevel planed, and the end of the lap strip is scarfed on a special milling machine—an innovation and improvement in boiler construction which, we believe, is peculiar to our product.

The rivet holes are reamed true, and the rivets are driven by powerful machinery, the seams being caulked inside and outside of the shell with a large curve round-nosed tool, insuring tight seams and permanent construction.

The tube holes are cut and reamed in exact alignment at the proper angle to admit the tubes, and are so spaced as to leave ample ligament of metal.

The heads of the drums are made of the same material as the shell, and are dished to a large radius over finished formers by heavy hydraulic pressure, producing the best practical work, and avoiding the necessity for any internal bracing.

Steam and water openings in the drums are reinforced with pressed-steel nozzles, and flanges thoroughly riveted and caulked.

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MANHOLES

A manhole is placed in the shell of the upper drum, and is reinforced with a heavy pressed-steel saddle double riveted to the inside of the shell. The manhole in the lower drum is placed in the head of the drum, the metal of the head being flanged in by hydraulic pressure over finished blocks, forming a symmetrical opening with ample radius. Each manhole opening is provided with a heavy pressed-steel plate or cover, with bridge, bolt, and nut.

FACTOR OF SAFETY OF FIVE

The steam drums when completed are subjected to both steam and water pressure, and are thoroughly tested and inspected while under pressure, and the boiler throughout, with all its component parts, is designed and built to withstand an actual pressure five times greater than the maximum working pressure.

FURNACE

The location of the furnace at the front of the boiler affords an opportunity to throw an arched roof of fire-brick over the fire, forming an anterior combustion chamber where the preliminary process of liberating the gases in the fuel can be effected, and the admixture of the proper amount of air through the grate area; the furnace product can thus be utilized at its full value the instant it comes in contact with the tubes. The design of the furnace also provides room for ample grate surface adapted to the various forms and grades of fuel, and makes possible the advantageous use of the very best as well as of the cheaper qualities of coal; or, if wood is to be used as fuel, the grates can be easily adapted for the purpose; or, if oil or gas are to be burned, the introduction of a fire-brick covering over the grate surface and the building of a perforated bridge wall of fire-brick at the rear of the furnace can be easily and quickly accomplished.

STOKERS

The Erie City Boiler lends itself readily to the several designs of stokers now on the market, or it can be easily adapted to the use of blast furnace or coke-oven gases without derangement for hand-firing, if desired.

CASING

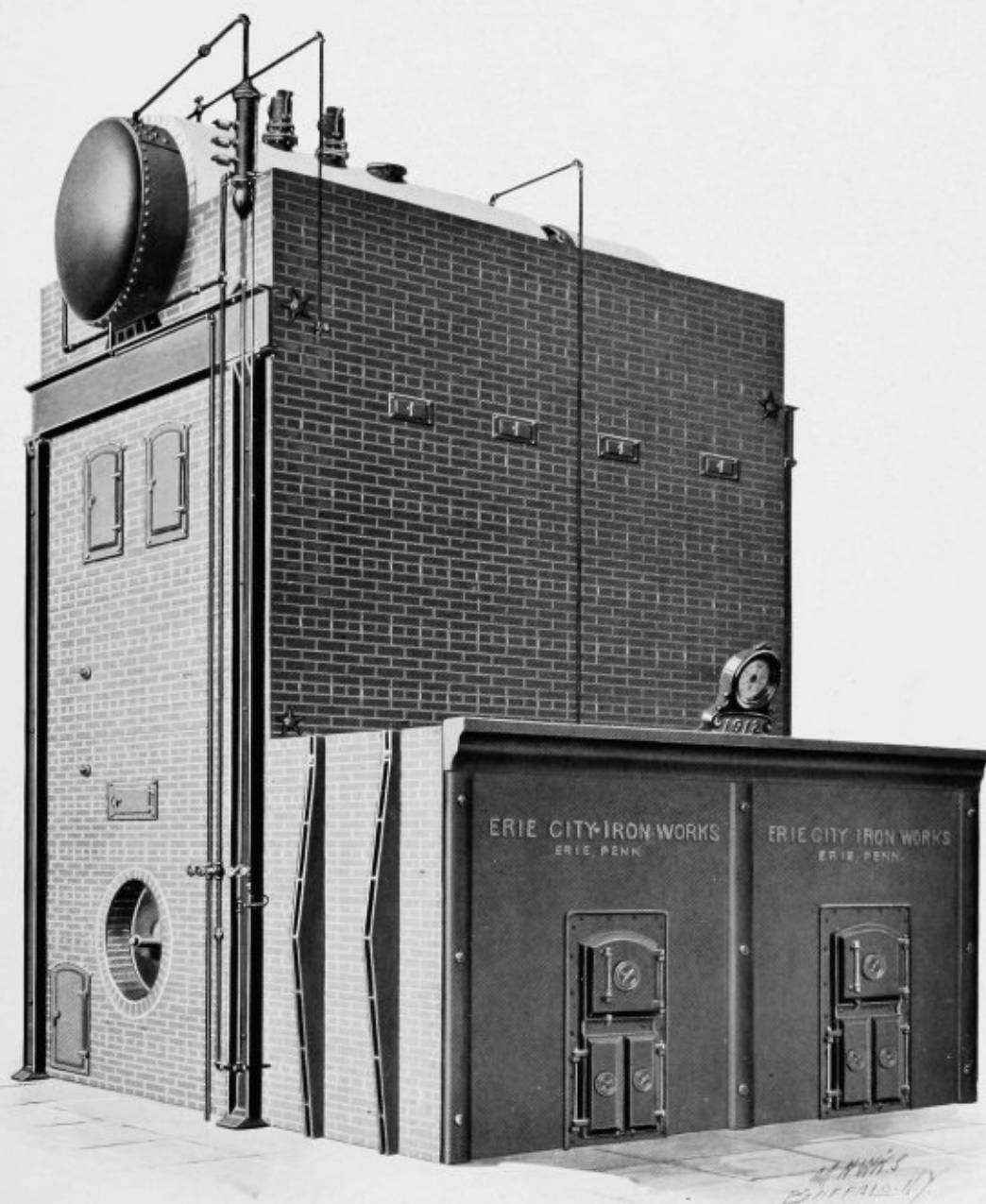
In the setting of a boiler, a very important matter is the prevention of the uncontrolled entrance of air to the furnace. The losses resulting from this cause

ERIE CITY VERTICAL WATER-TUBE BOILER



THE BOILER WITH BRICK SETTING, INCOMPLETE

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THE BOILER WITH BRICK SETTING, COMPLETE

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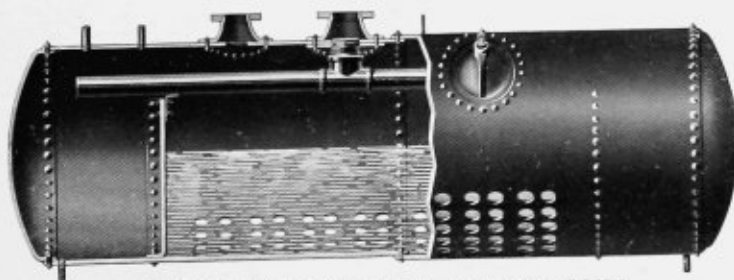
THE BOILER WITH STEEL CASING, COMPLETE

ERIE CITY IRON WORKS, ERIE, PENNSYLVANIA

are generally underestimated, and the extreme importance of providing a tight-fitting enclosure around the boiler and the furnace has resulted in the adoption of a metal casing on the outside of the masonry setting. In designing the Erie City Boiler, this subject received very careful consideration, and in some of the most successful installations a steel casing is used with a lining of nine-inch fire-brick. This lining is laid on a slight angle, forming a dead-air chamber between the brick wall and the metal casing. This metal casing prevents almost absolutely the entrance of cold air, and, to a very large degree, the otherwise considerable loss in efficiency by radiation.

CIRCULATION

The fact that there are in this boiler but two drums, one placed directly above the other, with the tubes in a nearly vertical position, insures very rapid circulation with all of its attendant benefits. Each individual tube is a steam-producing member limited only by its own full area value, and unrestricted either directly or indirectly by nipples or collars or cross-over connecting pipes, so indispensable in boilers having two or more steam drums. The water level is carried at the center line of the upper drum, affording the largest possible disengaging surface. The tubes entering the drum at a point considerably below this level, ample depth of water over the ends of the tubes is assured, and the very remarkable steadiness of the water level observed in actual practice and the absence of "spouting" is conclusive proof that the boiler is designed on scientifically correct lines.

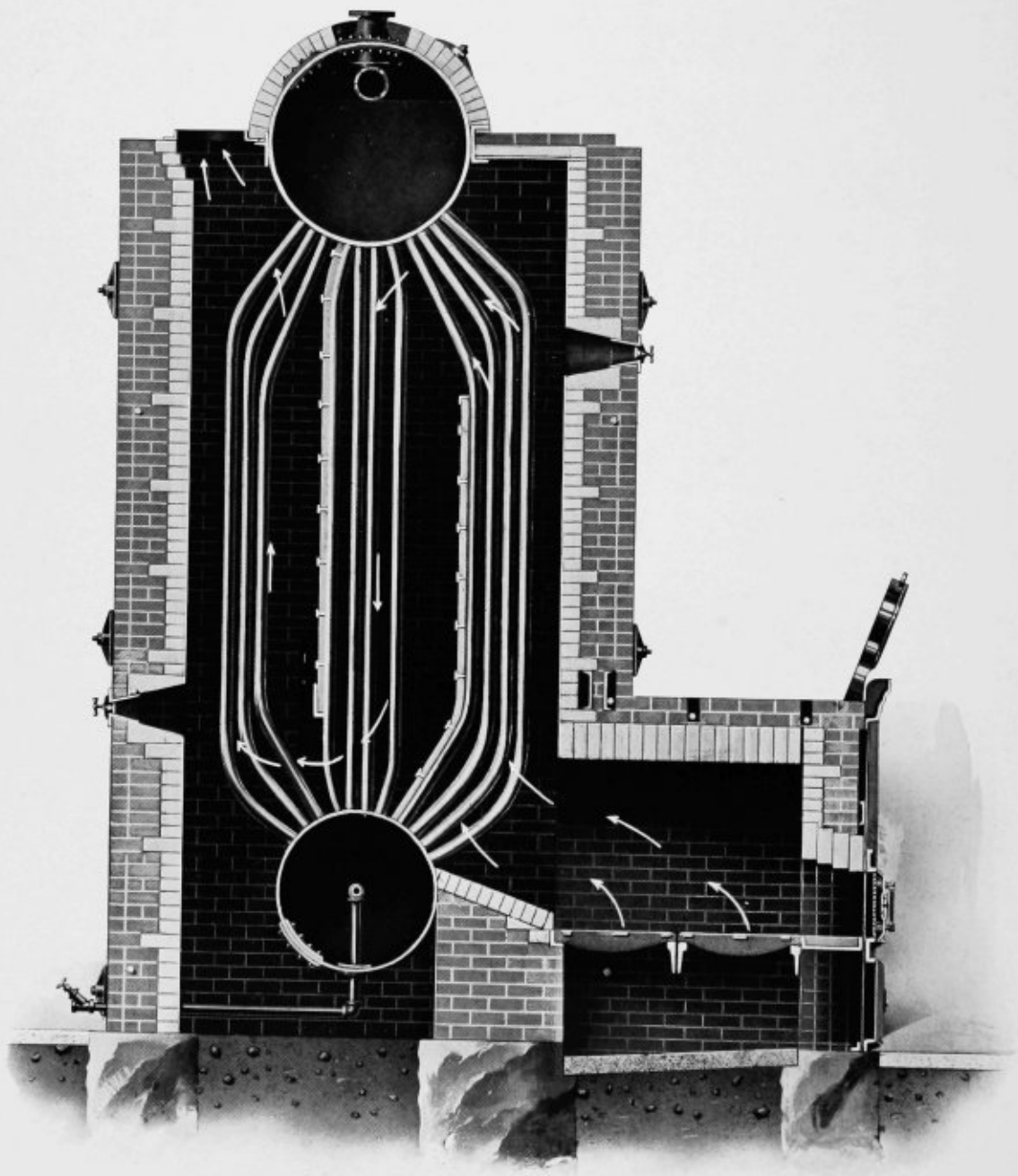


SECTIONAL VIEW OF UPPER OR STEEL DRUM

STEAM OUTLET

Reference has been made on a previous page to the steam-storage compartment at each end of the upper drum. The two compartments are connected by a steam pipe placed near the top of the drum. This pipe is of ample size for the capacity of the boiler and is open only at the ends with central discharge through a heavy pressed-steel nozzle riveted to the top of the shell.

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SECTIONAL VIEW OF BOILER AND FURNACE

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BLOW-OFF

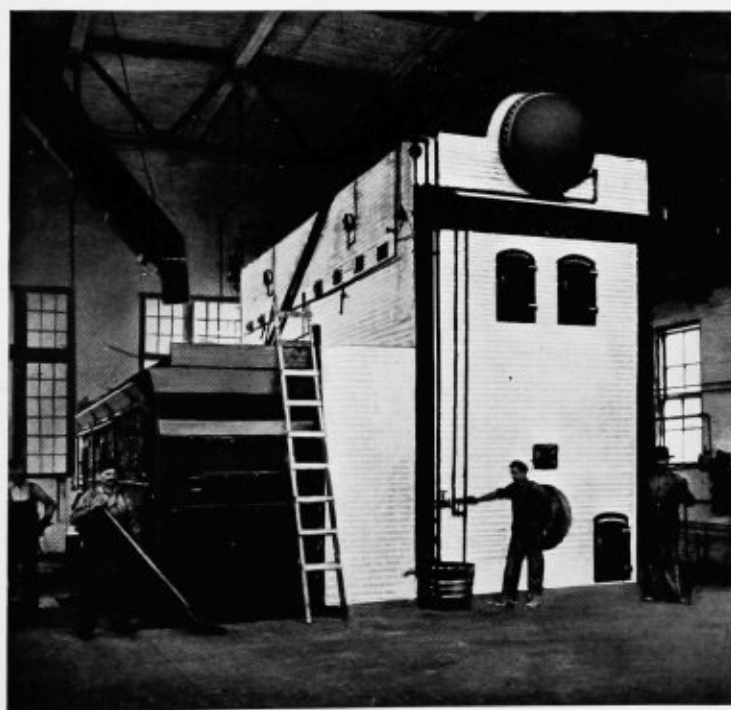
Two blow-off openings are provided on the bottom of the lower drum, reinforced with heavy steel flanges riveted to the *outside* of the shell, to avoid the accumulation of sediment or scale about the opening.

FEED INLET

The feed water entering the lower drum and distributed through a double discharge is taken up through the front bank of tubes, passing down through the tubes in the middle and rear bank to the lower drum, to be taken up again and over the same course, as the generation of steam requires.

CLEANING

Two access doors are located directly under the horizontal supporting beams and a third near the floor line. These doors are placed at the side of the setting to insure convenient access for cleaning and inspection and for the removal of tubes when necessary.



INSTALLATION OF MOSAIC TILE COMPANY'S PLANT,
ZANESVILLE, OHIO

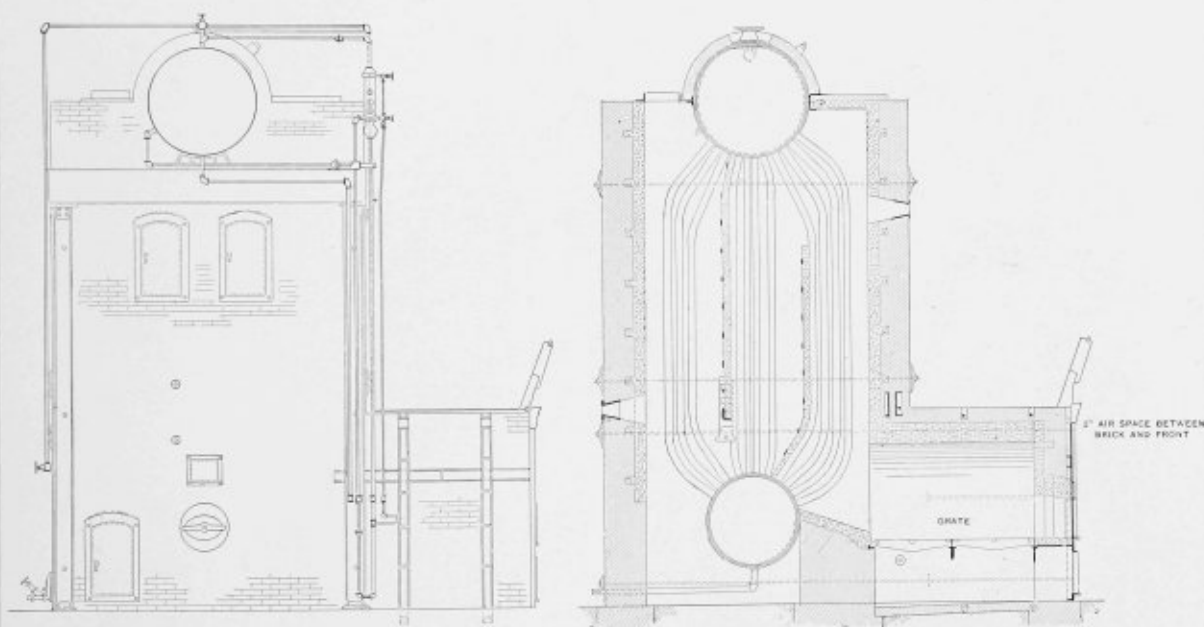
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SIDE VIEW OF BOILER WITH STEEL CASING

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A steam blower with pipe is furnished with each boiler. The tubes are nested in parallel rows and so placed that when the steam blower is brought into commission the work of cleaning can be thoroughly accomplished. The tubes being vertical, or nearly so, there is not the same opportunity for the dust and soot to settle on the top or on one side, and being symmetrically spaced, any one tube can be easily removed when repairs become necessary, but the rapid circulation of the water through the tubes, and the absence of steam pockets, reduce to a minimum the necessity for repairs to the boiler.

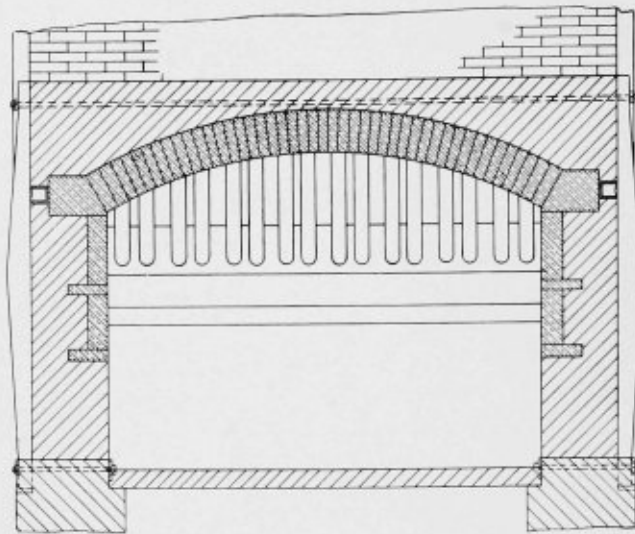


BAFFLING

The fire-brick baffle tiling is made in sections and is firmly held in place by a special device which long use under varying conditons has proven most efficient.

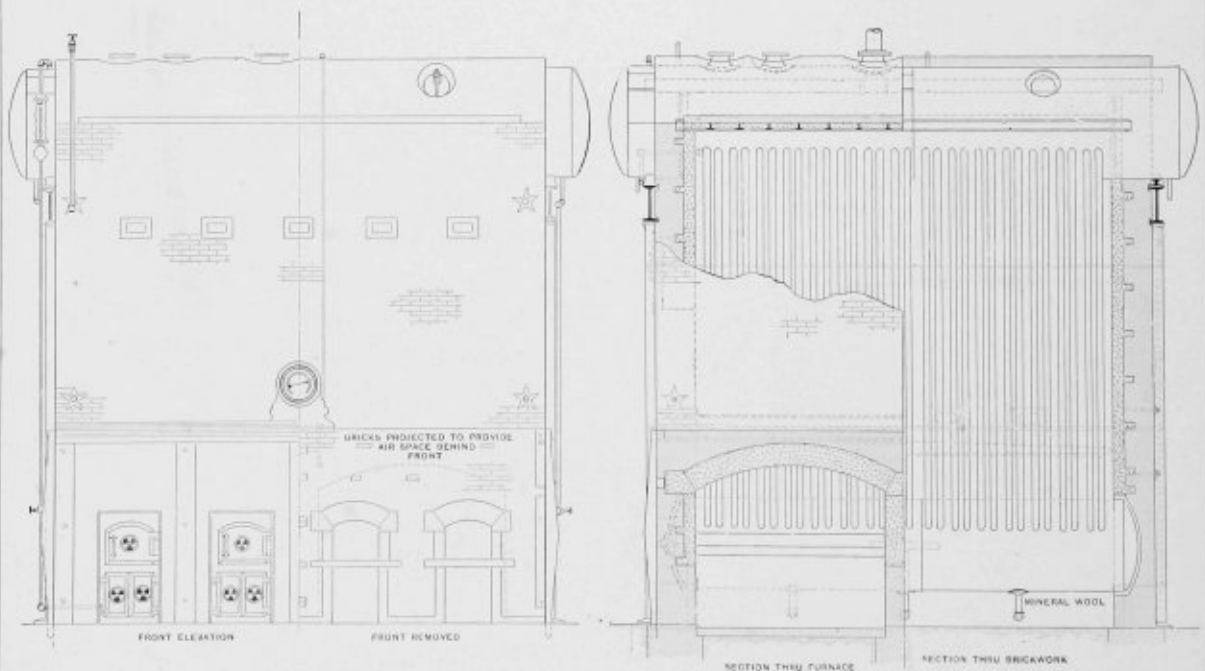
The engraving illustrates the location of the baffle tile and the manner in which they are supported. The bottom row of tile at the back of the first bank of tubes rests on the shell of the lower drum. The tile at the back of the middle bank of tubes are carried on a cast-iron angle bar. This bar rests in cast-iron brackets built into the side walls of the setting. The brackets having pockets in them permit of changing the draft opening on this bank of tubes without disturbing the masonry.

ERIE CITY VERTICAL WATER-TUBE BOILER

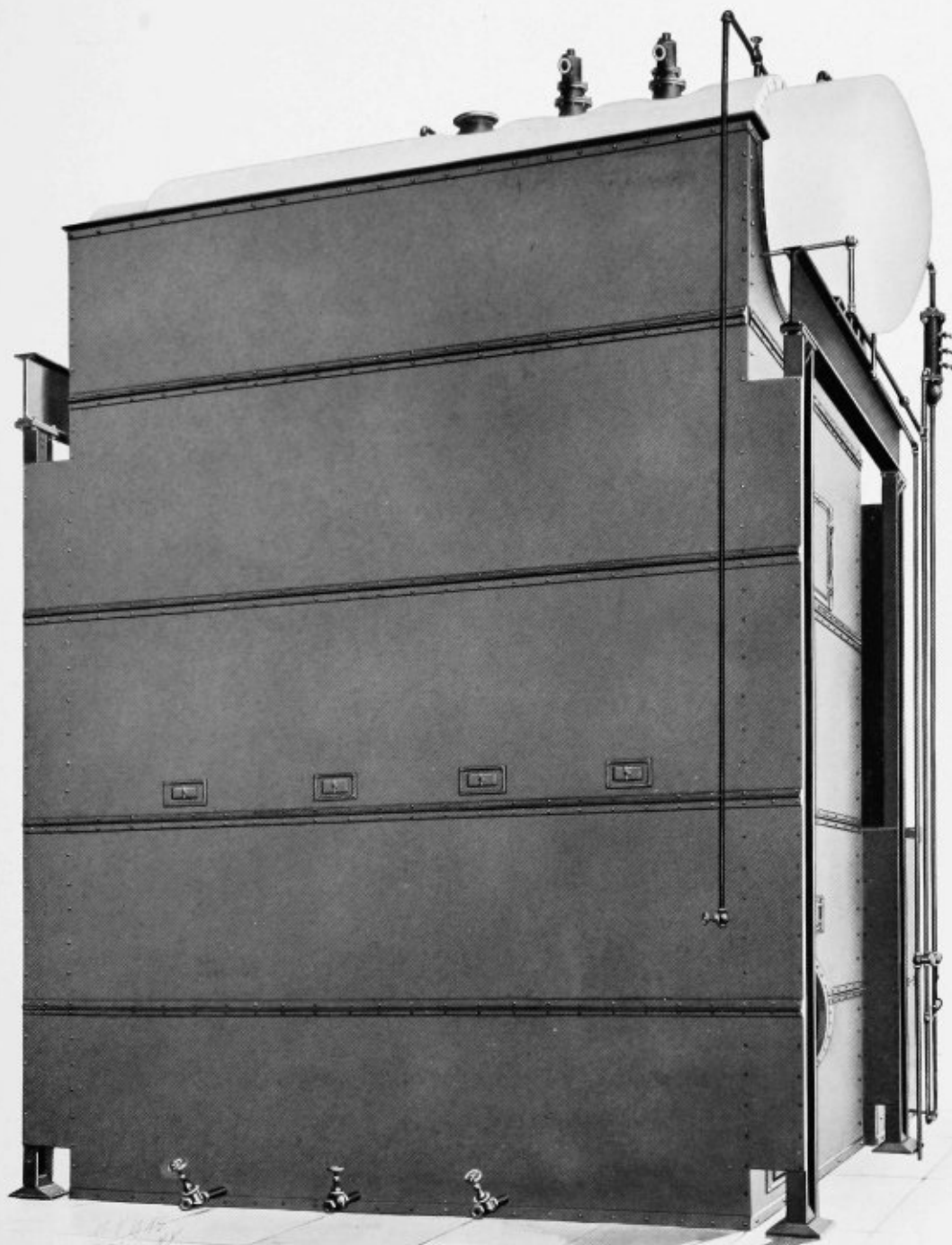


ARCHES

Ample provision is made for holding the arches and preventing trouble from expansion, the brick skew-backs being supported by cast-iron angles, held in place by heavy cast-iron buck-stays and binding rails — all contributing to the complete setting of the boiler and its successful operation.

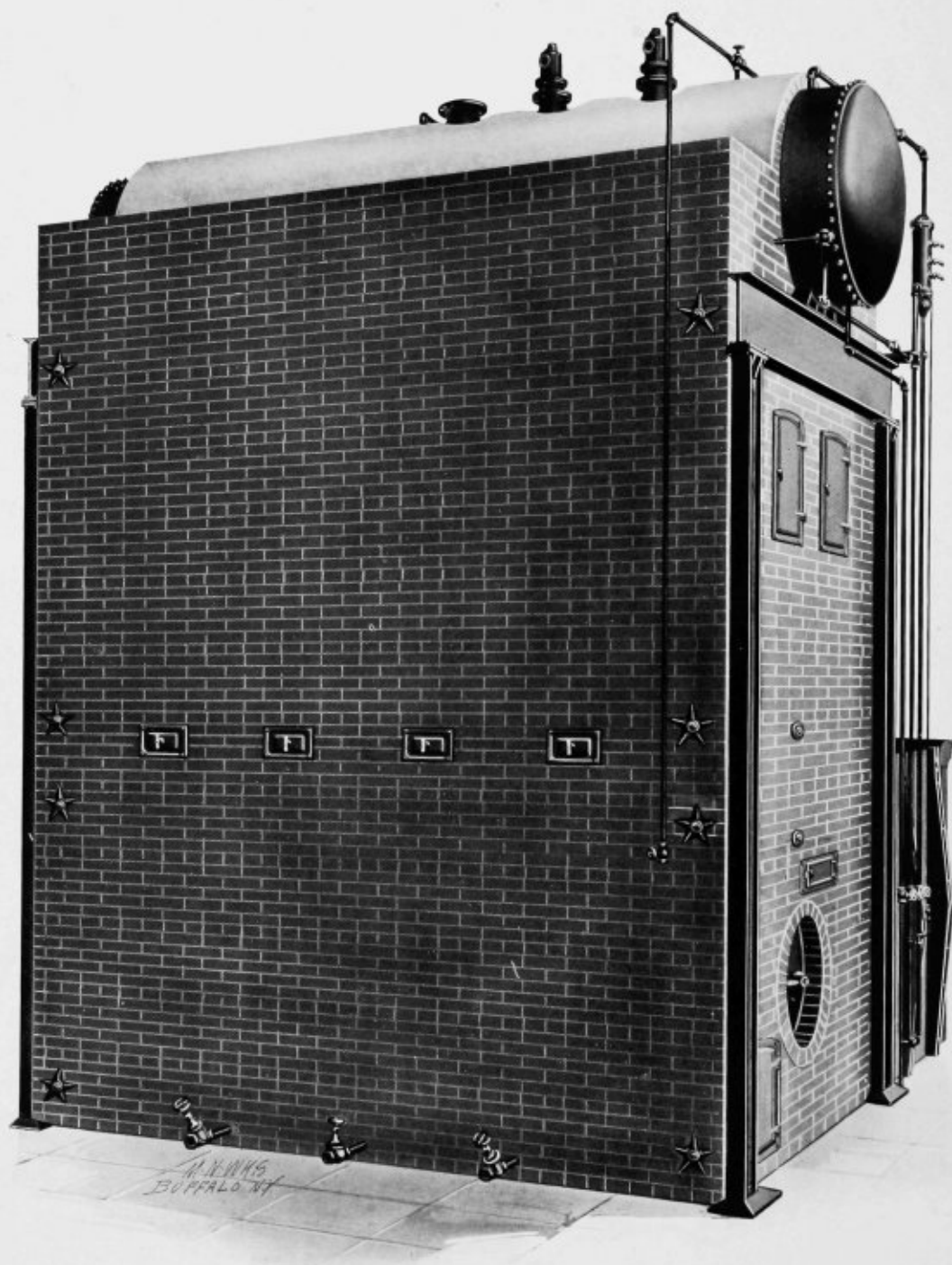


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REAR VIEW OF BOILER WITH STEEL CASING

ERIE CITY VERTICAL WATER-TUBE BOILER



REAR VIEW OF BOILER WITH BRICK SETTING

ERIE CITY IRON WORKS, ERIE, PENNSYLVANIA

DRY STEAM

Too much emphasis cannot be placed upon the importance of the *quality* of steam, and the production of *dry steam* at a minimum expenditure of time and fuel is the end to which boiler experts are now bending their energies. Rapid steaming may be effected at an apparently low cost for production—more apparent than real when due consideration is given to the importance of dry steam, as in all cases where steam is to be used as a prime mover every ounce of moisture in a given quantity of steam reduces its effective value.

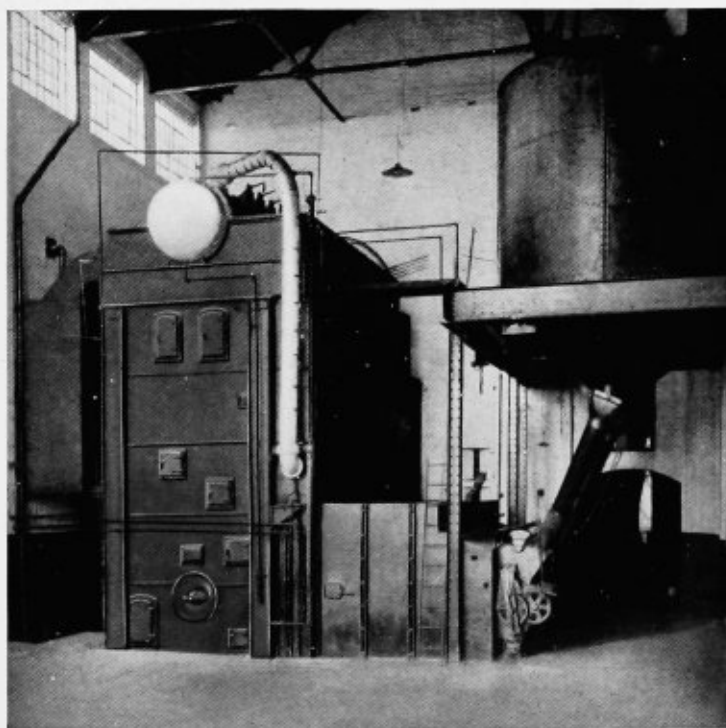
SUPERHEATED STEAM

Superheated steam is becoming more and more an important factor in steam-power installations, and with the introduction of the poppet-valve engine, which makes possible the use of high-temperature steam, a boiler which can be readily equipped with a superheater will receive special consideration. This boiler is especially designed for the application of a superheater, and we strongly recommend its use.

CONCLUSION

The simplicity in construction of the Erie City Vertical Water-Tube Boiler is its charm, and the wonderful results obtained in the production of dry steam at a minimum cost of fuel and maintenance commands the attention and admiration of steam engineers.

These vertical water-tube boilers constitute one line of our standard manufacture, and are carried in stock at our works for prompt shipment.

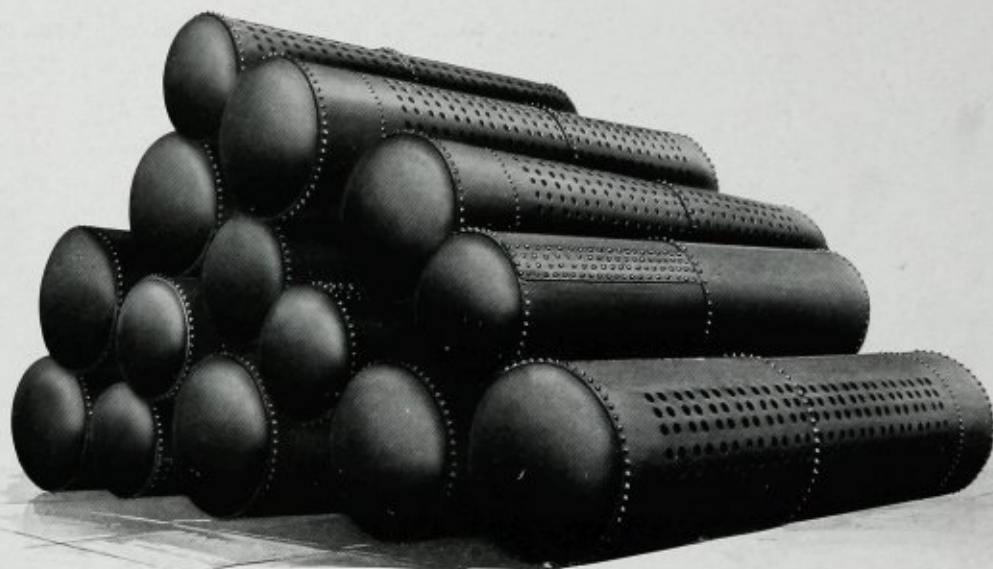


INSTALLATION AT HAMMERMILL PAPER COMPANY'S PLANT,
ERIE, PENN.



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ERIE CITY VERTICAL WATER-TUBE BOILER



WE CARRY THESE BOILERS IN STOCK FOR PROMPT SHIPMENT

Erie City Iron Works

Manufacturers of

Steam Engines and Boilers and Feed Water Heaters

Horizontal and Vertical Water-Tube Boilers

Lentz Engines