B. WARREN.

WATER TUBE BOILER.

APPLICATION FILED OCT. 14, 1911. RENEWED JULY 31, 1912.

1,054,726.

Patented Mar. 4, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

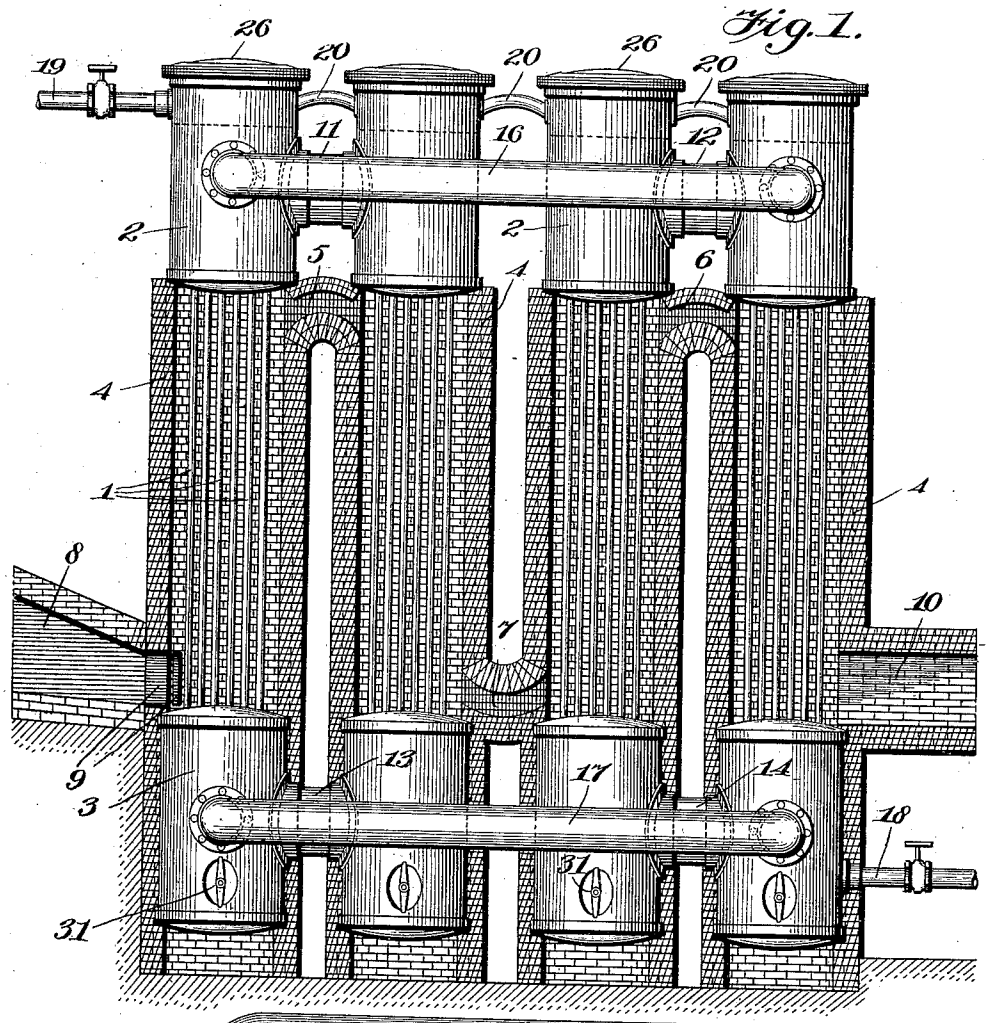
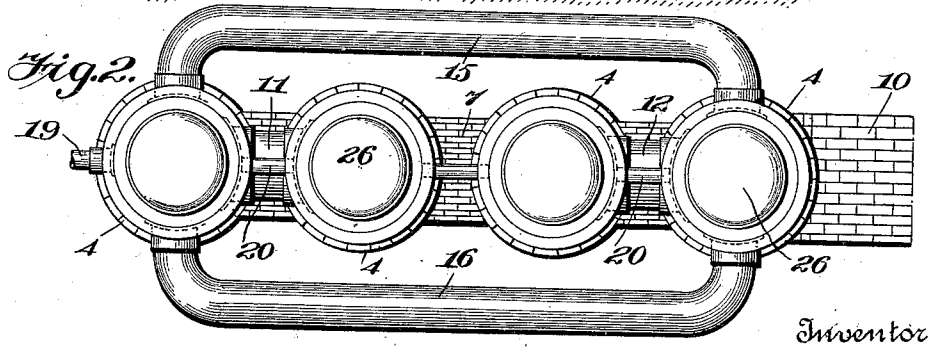


Fig. 2.



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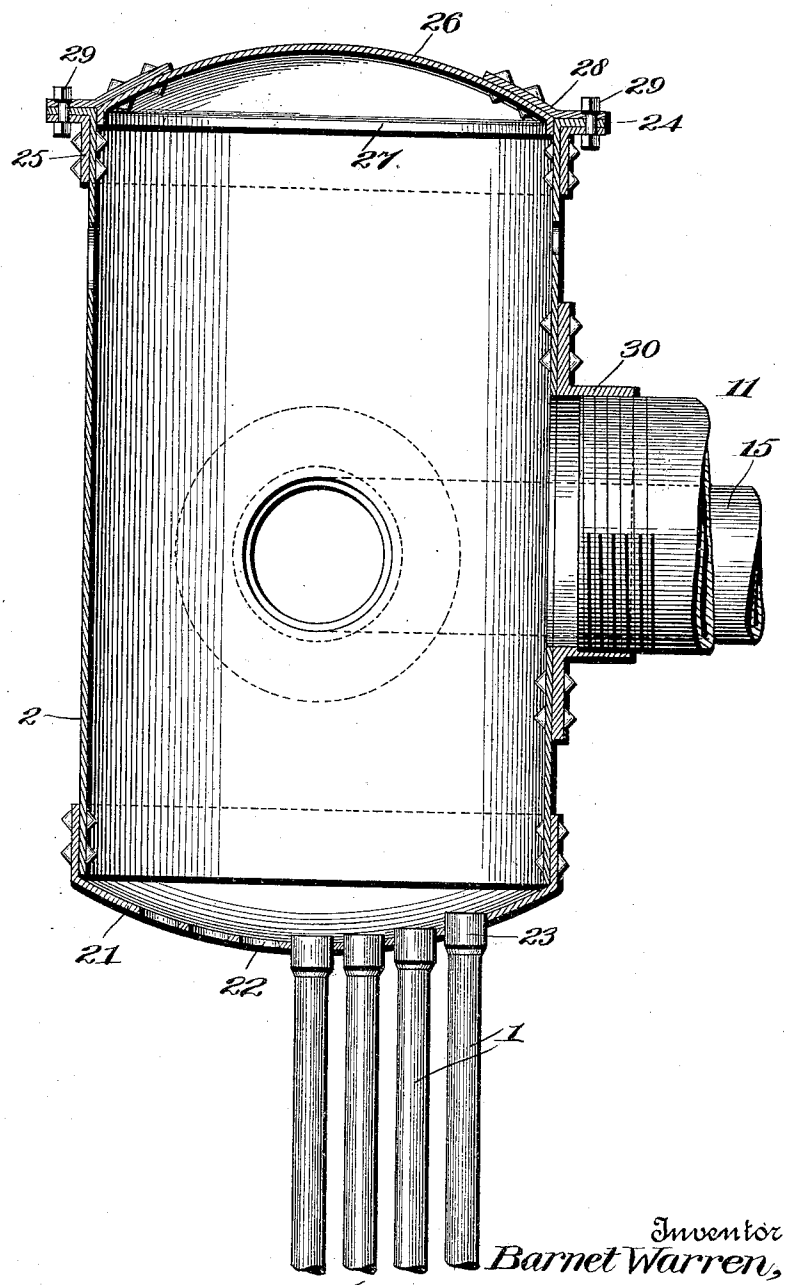
2 SHEETS—SHEET 2.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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WATER-TUBE BOILER.

1,054,726. Specification of Letters Patent. Patented Mar. 4, 1913.

Application filed October 14, 1911, Serial No. 654,765. Renewed July 31, 1912. Serial No. 712,572.

To all whom it may concern:

Be it known that I, BARNET WARREN, a citizen of the United States, residing at Mobile, in the county of Mobile and State of Alabama, have invented certain new and useful Improvements in Water-Tube Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to boilers, and has for its purpose the construction of a boiler of the vertical tubular type comprising units by having the tubes thereof arranged in a series of substantially independent banks, and each unit having a separate, independent, protecting and supporting masonry structure, to the end of economy in erection and convenience in repair.

The invention further proposes a novel system of water circulation between the several boiler units for effecting a more thorough and rapid circulation than is now obtained, and to increase the general efficiency of the boiler as a whole.

With these and other objects in view the invention consists in the novel details of construction and combinations of parts more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals designate like parts in all the views:—Figure 1 is a side elevational view, partly in section, of the boiler complete. Fig. 2 is a top plan view of Fig. 1, and Fig. 3 is a central vertical sectional view of one of the drums, and showing the several pipe connections in elevation.

Referring to the construction in detail, the boiler consists of a quadruple series of units, each comprising a bank of vertically disposed water tubes 1 secured at their upper and lower ends to drums 2 and 3 respectively. The tubes of each bank are inclosed by a separate and independent cylindrical column 4 constructed of masonry or brick, as preferred. Each of said masonry columns 4 supports the upper drum 2 of its respective bank of tubes and provides a heating chamber, and at its lower end is the corresponding lower drum 3 built therein after any approved manner. By having the masonry columns built individually and separate, said columns are readily accessible for the purpose of repairing; and there is the further advantage that the heated gases from the furnace are confined entirely among the tubes and are caused to take a course giving the maximum efficiency. The first and second, and third and fourth masonry columns 4 are brought into communication at the upper ends thereof by arched masonry flues 5 and 6 respectively; and in like manner the second and third columns are brought into communication by a flue 7. The first column 4 communicates with a furnace 8 immediately above the lower drum 3 by flues 9, and in a similar manner the last column 4 opens into a relatively larger flue 10 that leads to the smoke stack.

With the foregoing arrangement the several columns and their communicating flues provide a tortuous passageway for the products of combustion issuing through the furnace flues 9, and as illustrated said products of combustion are caused to travel the full length of each series of banks of water tubes.

The first and second, and third and forth drums 2 are brought into direct communication by short tubes 11 and 12 whose cross sectional area is each equal to the cross sectional area of all of the tubes in any one bank. In like manner the corresponding pairs of lower drums 3 are connected by the tubes 13 and 14. The first and fourth drums of the upper series are connected by a pair of long tubes 15 and 16 that are disposed on opposite sides thereof; and in like manner the corresponding drums of the lower series are connected by long tubes 17. There is no water connection between the second and third units. The circulating system between the first and second, and third and fourth drums affords what may be termed the primary or local circulating system, while the longer tube connection between the first and last units affords a secondary or general circulating system. The latter system operates in conjunction with, but does not interfere with the local system. The rising water in the first bank of tubes passes through the short connection 11 from the upper drum to the upper drum of the second unit, thence down the second bank of tubes into the lower drum thereof, and from there back into the first lower drum. Thus the first and second units have independent circulating connections. The second couple, the third and fourth units, have substantially the same circulating connections. The

water rising in the first bank of tubes causes a slow circulation from the first top drum to the fourth top drum, and this movement causes a return circulation from the bottom drum of the fourth unit to the lower drum of the first unit. The reason for having the boiler divided into two separate circulating sets is first, that the water may be heated gradually before it reaches the hottest part of the fire, and secondly by having the circulation through a short system, it is much more rapid, thereby increasing the steaming capacity. The feed water enters through the pipe 18 into the lower drum of the last unit, and the steam pipe 19 leads off from the upper drum of the first unit. The steam chambers of the several upper drums are brought into communication by the pipes 20. On account of the water entering the lower drum of the last unit, and the comparatively slow movement of the water, the greater part, if not all of the scale, is deposited in this part of the boiler, and as the temperature is moderate such deposit would be soft and easily removed.

Each of the upper drums 2 consists of a cylindrical shell having a fixed end 21 provided with a plurality of perforations 22 to receive the enlarged ends 23 of the several tubes 1 (see Fig. 3). At its upper end the wall of the shell 2 is constructed with an annular flange 24 that is reinforced by a ring of angle iron 25, said ring being securely riveted to the shell in the manner shown. A cover 26 is removably secured to the upper end of the drum shell and is constructed with a flanged rim 27, which fits tightly within said shell. The cover 26 is secured through the medium of an annular plate 28 that is riveted thereto, and is designed to be supported by the reinforced flange 24, and in which position it may be removably secured through the medium of bolts 29. A flanged collar 30 is riveted to one side of the drum, and has screw-threaded therein the pipe 11 which communicates with the next adjacent drum. In a similar manner one end of the pipe 15 is secured. The object in having the upper drums provided with removable covers is for the purpose of enabling the boiler units to be conveniently repaired. With this arrangement the several tubes of any one bank may be separately removed, access being had to the upper ends of said tubes by removing the drum covers. The lower ends of the tubes may be conveniently reached through the access afforded by the man-holes 31, one of which is provided for each of the lower drums 3. Each of the tubes 1 has the enlarged end portion 23 thereof of comparatively slight length for the purpose of enabling any tube to be conveniently withdrawn through its respective aperture 22, since any formation of scale on the tube length would not interfere with such withdrawal.

It is obvious that those skilled in the art may vary the details of construction and arrangement of parts without departing from the spirit of my invention, and therefore I do not wish to be limited to such features except as may be required by the claims.

What I claim is:—

1. In a water-tube boiler the combination of quadruple units comprising each a pair of drums, a bank of tubes connecting and communicating with said drums, and a masonry column surrounding said tubes and closed at either end by said drums and providing a heating chamber; communicating flues between said columns providing therewith a tortuous passageway; primary communicating connections between the first and second pairs of said units; and secondary communicating connections between the first and fourth units, substantially as described.

2. In a water-tube boiler section or unit the combination of a bank of vertically disposed tubes; a vertically disposed drum secured to the upper ends of said tubes and communicating therewith; a drum secured to the lower ends of said tubes; and a masonry column surrounding said tubes, said column supporting the upper drum from the bottom thereof and built around and closely against the lower drum and providing with said drums a heating chamber, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

BARNET WARREN.

Witnesses:
C. D. HENDERSON,
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