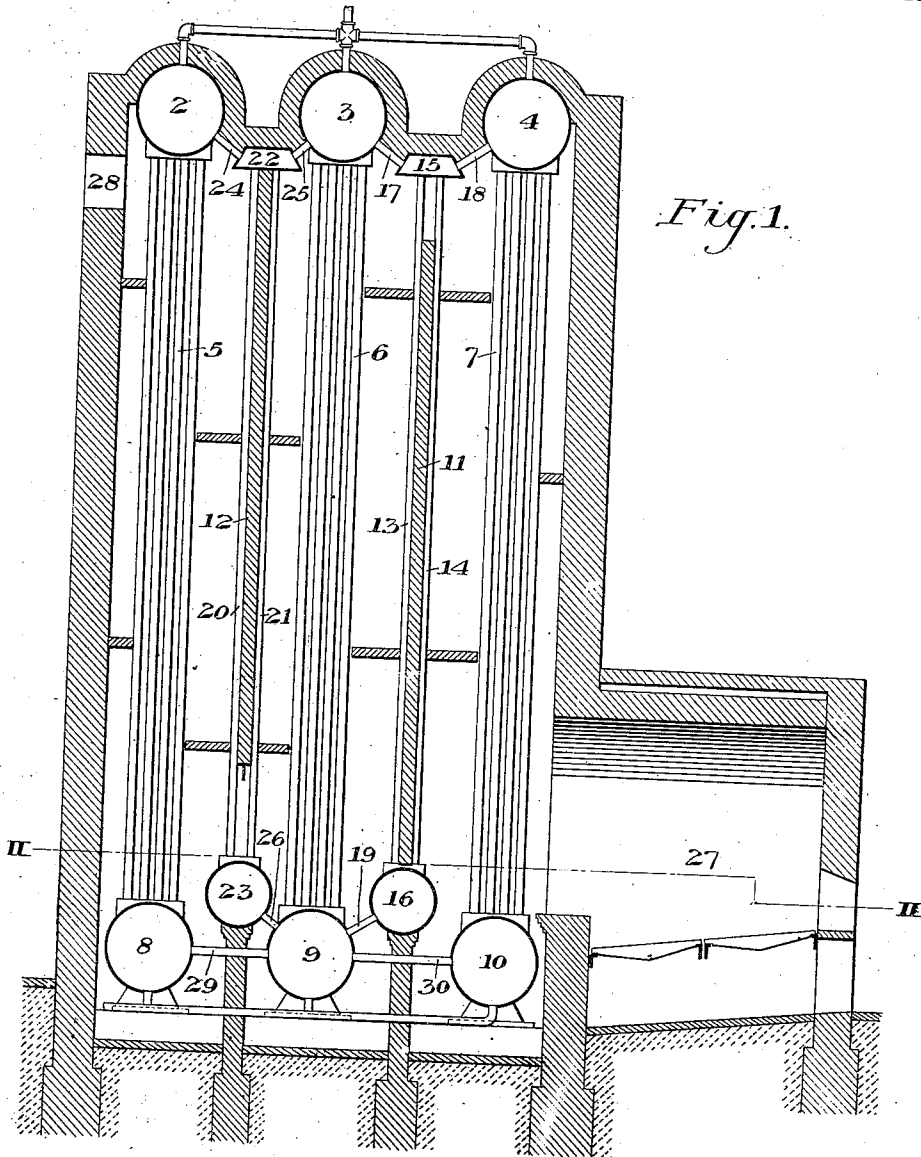


J. E. BELL.
 WATER TUBE BOILER.
 APPLICATION FILED APR. 4, 1905.

935,884.

Patented Oct. 5, 1909.
 4 SHEETS—SHEET 1.



WITNESSES

R. A. Baldersey.
Warren W. Swartz

INVENTOR

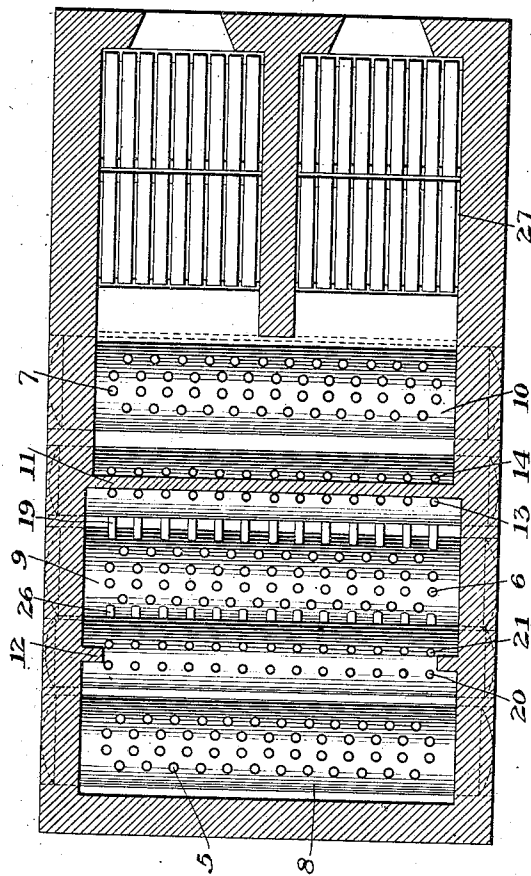
J. E. Bell
by Baldersey & Swartz
his attys.

935,884.

J. E. BELL.
WATER TUBE BOILER.
APPLICATION FILED APR. 4, 1905

Patented Oct. 5, 1909.
4 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

R. A. Balderson
Warren W. Swartz

INVENTOR

J. E. Bell
by Balderson & Swartz
his attys

APPLICATION FILED APR. 4, 1906.

4 SHEETS—SHEET 3.



R. A. Calderwood
Warren H. Swartz

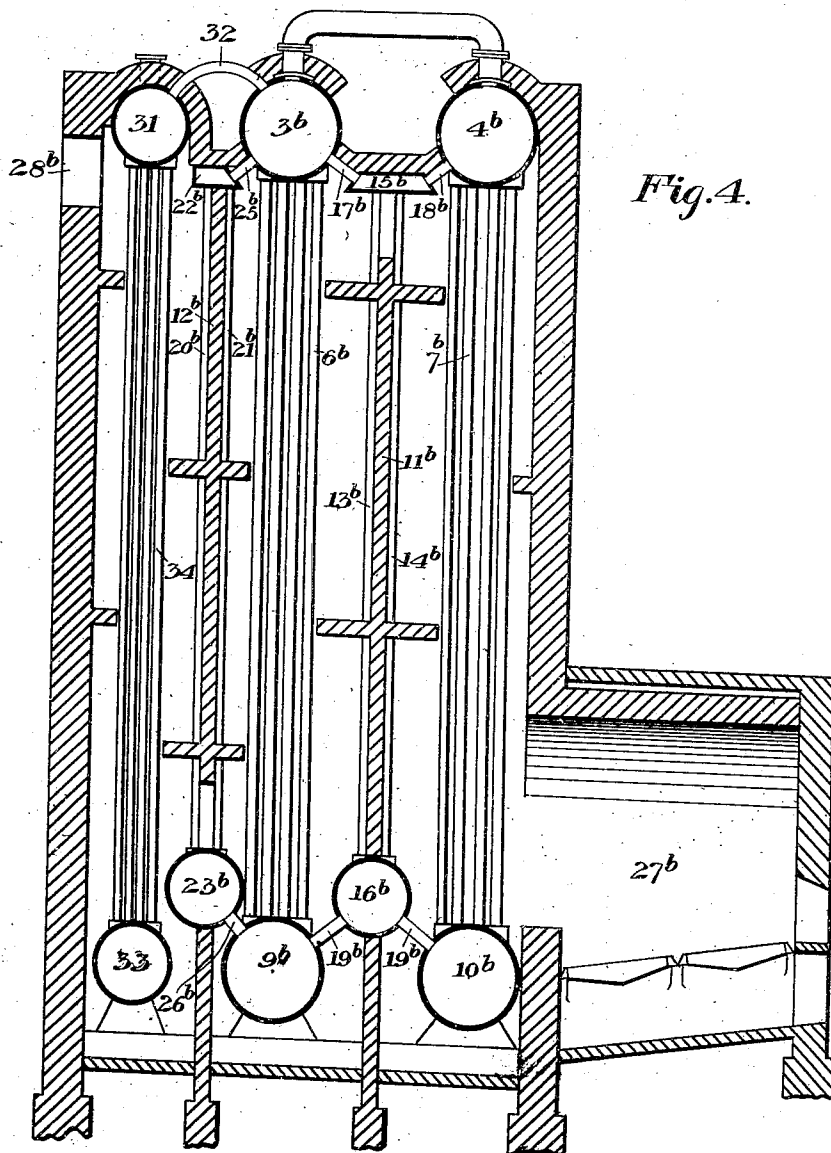
J. E. Bell
by Balkans & Ryones
his atty

J. E. BELL.
WATER TUBE BOILER.
APPLICATION FILED APR. 4, 1905.

935,884.

Patented Oct. 5, 1909.

4 SHEETS—SHEET 4.



Witnesses;
R. A. Baldwin
Warren W. Swartz

Inventor;
J. E. Bell
by Nathan Rymer
his atty.

UNITED STATES PATENT OFFICE.

JOHN E. BELL, OF BARBERTON, OHIO, ASSIGNOR TO THE BABCOCK & WILCOX COMPANY,
OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

WATER-TUBE BOILER.

935,884.

Specification of Letters Patent.

Patented Oct. 5, 1909.

Application filed April 4, 1905. Serial No. 253,835.

To all whom it may concern:

Be it known that I, JOHN E. BELL, of Barberton, Summit county, Ohio, have invented a new and useful Water-Tube Boiler, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional side elevation showing one form of my improved boiler; Fig. 2 is a horizontal section on the line II—II of Fig. 1; and Figs. 3 and 4 are views similar to Fig. 1 showing modified forms of the invention.

My invention relates to the class of water tube boilers wherein transverse upper and lower drums are connected by banks of water tubes, and is designed to provide a new and improved boiler of this type by which the water-heating surface may be increased with little or no increase in the space occupied.

In the drawings, referring to the forms of Figs. 1 and 2, I show three upper transverse steam and water drums 2, 3 and 4 connected by banks of tubes 5, 6 and 7 with corresponding mud drums 8, 9 and 10. The drums extend transversely of the baffles 11 and 12 which are provided to give up and down passes to the gases. The baffles are preferably held in place by water tubes; thus I have shown the baffle 11 as extending between two rows of tubes 13 and 14 which are connected at their upper ends to headers 15, and at their lower ends to a transverse drum or receptacle 16. The headers 15 are connected by pipes or nipples 17 and 18 with the water spaces of the drums 3 and 4 and the supplemental drum 16 is connected to one of the mud drums, in this case the middle mud drum, by tubes 19. I have shown the baffle 12 as correspondingly held between two rows of water tubes 20 and 21, connected at their upper ends to headers 22, and at their lower ends to an auxiliary water drum 23. The header 22 is connected to the water spaces of the drums 2 and 3 by tubes or nipples 24 and 25 and the drum 23 is connected to one of the mud drums, in this case the middle mud drum, by tubes 26. The baffle 11 extends upwardly from the drum 16 for a portion of the length of the tubes 13 and 14, while the partition 12 extends down from the headers 22 leaving a space between

its lower end and the drum 23. Instead of small separate headers as shown at 15 and 22 I may employ one header extending across the boiler parallel to the drums, or I may employ a drum or water box. The word "drum" in this specification is used without restriction to a cylindrical shape. The flame and gases pass from the furnace 27, pass up among the tubes 7, thence across and down among the tubes 6, and thence up among the tubes 5 to the offtake 28. The mud drums are connected by tubes 29 and 30.

In Fig. 3 I show a form similar to that of Fig. 1, except that only two steam and water drums are employed with two main banks of tubes. In this case the headers 22^a are retained as in the first form, but are of course connected only to the drum 3^a by the tubes 25^a. In this form I have not shown the drums 9^a and 10^a as connected except through the auxiliary drum 16^a and the tubes 19^a. The use of the tubes in connection with the baffle, in the rear of the second bank may also be employed in a superheater boiler. Thus in Fig. 4 I show substantially the same construction as in Fig. 3, but with a superheater added. This superheater is shown as having an upper drum 31 connected to drum 3^b by tubes 32. The drum 31 is connected with the lower steam drum 33 by superheating tubes 34, the structure being in the last pass of the gases passing to the outlet 28^b. The steam may be taken from the lower drum or the drums 31 and 33 may be provided with transverse partitions which give the steam back and forth passes between the drums; in which case the superheated steam may be taken off from the upper drum.

In any of the forms the water may be fed into the rear part of the boiler, preferably either into the rear mud drum or the rear upper drum.

The advantages of my invention result from the increase in heating surface without materially enlarging the structure, by the use of the tubes and diaphragm in the rear of the second bank of tubes, and from the support for the baffle or diaphragm.

Either drum 16 or 23 may be connected to the mud drum at either side thereof, or to both; the tubes 24 or 25 may be omitted; the vertical tubes may be either straight or curved at their ends, one row of tubes may

be used in connection with the baffle, and many other changes may be made without departing from my invention.

I claim:—

- 5 1. A water tube boiler having at least two transverse steam and water drums connected by banks of tubes to a lower transverse mud drum or drums, a baffle between the two banks of tubes, a baffle in the rear of the
10 second bank, and tubes adjacent to the rear baffle and connected to the circulation at their upper and lower ends; substantially as described.
- 15 2. A water tube boiler having at least two transverse steam and water drums with banks of tubes connecting them to two lower transverse mud drums, a baffle between the two banks of tubes, a baffle in the rear of the second bank, and two rows of tubes, one on
20 each side of the rear baffle, said tubes being connected to the circulation at their upper and lower ends; substantially as described.
- 25 3. A water tube boiler having at least two transverse steam and water drums connected by banks of tubes to at least two mud drums, a baffle between the banks of tubes, a baffle in the rear of the second bank of tubes, rows of water tubes arranged to hold the baffles in place, and connections between the upper
30 and lower ends of the tubes and the boiler proper; substantially as described.
- 35 4. A water tube boiler having at least two transverse steam and water drums, connected by banks of tubes to at least two transverse mud drums, a baffle between the banks of tubes, a baffle in the rear of the second bank of tubes, and two rows of tubes holding each baffle in place, said tubes being connected at their upper ends to the boiler and
40 leading at their lower ends into chambers connected to the mud drums; substantially as described.
- 45 5. A water tube boiler having at least two transverse steam and water drums connected by banks of tubes to at least two mud drums, a baffle between the banks, two rows of tubes one on each side of the baffle, a lower chamber into which said tubes connect, connections between the chamber and at least one
50 of the mud drums, water-circulators between the steam and water drums, a connection between the water-circulators and the baffle tubes, a baffle in the rear of the second bank, two rows of tubes one on each side of said
55 baffle, a lower chamber into which the baffle tubes lead, a connection from said chamber to a mud drum, and a chamber at the upper end of the rear baffle tubes connected to the water space of a steam and water drum;
60 substantially as described.
6. A water tube boiler having three transverse steam and water drums connected by banks of tubes to three transverse mud drums, baffles between the banks rows of

tubes on each side of the baffles, lower chambers in which the baffle tubes lead, connections between said chambers and a mud drum or drums, and water-circulators between at least two of the steam and water drums, the front baffle tubes being connected
70 to said water-circulators; substantially as described.

7. In a steam boiler, the combination of a steam drum, a plurality of headers connected therewith and arranged substantially parallel with a plane tangential to said drum and at opposite sides of a plane drawn through the axis of the said drum substantially perpendicularly to the plane of said headers, a mud drum, a header connected therewith
80 and arranged substantially parallel with a plane tangential to said mud drum, and tubes connecting said headers; substantially as described.

8. In a water tube boiler, a transverse steam and water drum, submerged water chambers connected therewith and arranged on opposite sides of the drum, a transverse mud drum, tubes connecting the steam and water drum with the mud drum, vertically
90 extending tubes leading downwardly from the submerged water chambers, and connection between the lower ends of the water tubes and the mud drum; substantially as described.

9. In a water tube boiler, a transverse steam and water drum connected by a bank of tubes to a transverse mud drum, four water chambers extending transverse to the setting on opposite sides of the said bank, the upper chambers being connected with the lower by vertically extending tubes, the upper chambers being connected with the water space of the steam and water drum, and at least one of the lower chambers being connected
105 with the mud drum; substantially as described.

10. In a water tube boiler, a transverse steam and water drum connected by a bank of tubes to a transverse mud drum, four water chambers extending transverse to the setting on opposite sides of the said bank, the upper chambers being connected with the lower by vertically extending tubes, the upper chambers being connected with the water space of the steam and water drum, and at least one of the lower chambers being connected with the mud drum, and baffles extending on each side of the bank of water tubes and between the upper and lower water chambers; substantially as described.

In testimony whereof, I have hereunto set my hand.

JOHN E. BELL.

Witnesses:

MARY E. HAMLEN,
W. T. LUCAS.