

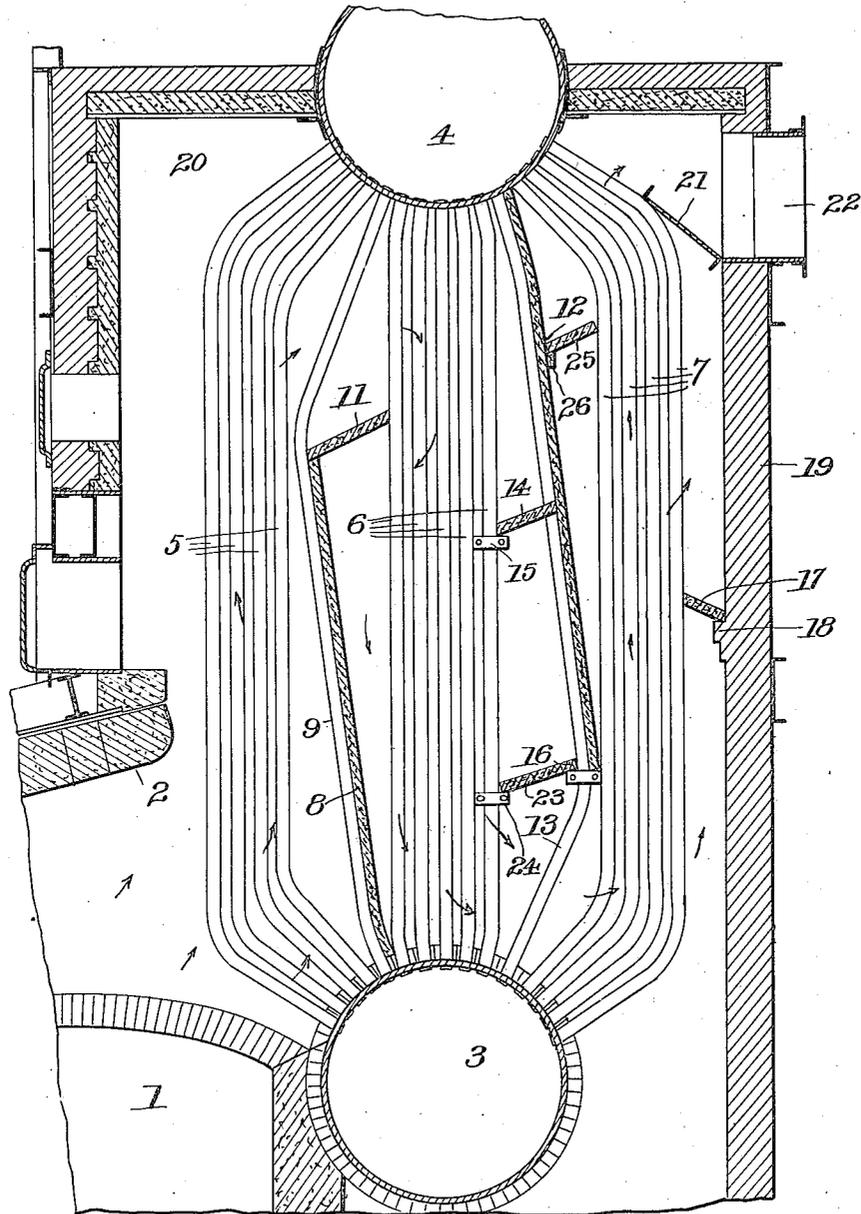
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F. C. STIMMEL

VERTICAL WATER TUBE BOILER

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UNITED STATES PATENT OFFICE.

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VERTICAL WATER-TUBE BOILER.

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To all whom it may concern:

Be it known that I, FREDERICK C. STIMMEL, a citizen of the United States, residing at Chattanooga, in the county of Hamilton and State of Tennessee, have invented certain new and useful Improvements in Vertical Water-Tube Boilers, of which the following is a full, clear, and exact specification.

This invention relates to vertical water tube boilers of the type having upper and lower drums connected by three sets of tubes, one set being arranged centrally between the other two sets.

It is the object of the present invention to increase the heating capacity of boilers of this type by an improved arrangement of baffles supported on water tubes arranged between and entirely separate from the three sets or nests of vertical boiler tubes.

The invention will be first hereinafter described in connection with the accompanying drawing, which constitutes part of this specification, and then more specifically defined in the claims at the end of the description.

In the accompanying drawing a vertical section of a boiler embodying the present invention is shown. In this figure 1 designates the fire box and 2 the transversely inclined baffle member or roof of said fire box for directing the gases or products of combustion therefrom towards the lower end portion of the first set or bank of water tubes 5 extending from the mud drum 3 to the combined steam and water drum 4. The central vertical nest or set of tubes is indicated at 6, and the set of tubes at the other side of said central tubes at 7.

Between the central set of tubes 6 and the opposite sets 5 and 7 at the front and rear sides thereof baffle supporting water tubes 9 and 13, respectively, are arranged in rows and extending from the lower drum 3 to the upper drum 4. These baffle supporting tubes 9 and 13 constitute additional water circulating means as well as baffle supporting means.

The major portions of said baffle supporting tubes 9 and 13 are inclined or arranged at an angle to the vertical so that the baffle plates or tiles 8 and 12, respectively, may rest against them and stay in place by their own weight or by gravity. As shown in the drawing, the tubes 9 and 13 are inclined so

that their major portions are arranged substantially parallel to each other, the major portions of the tubes 9 extending from the lower portions of the tubes 6 of the central nest of boiler tubes towards the tubes 5 of the front set of boiler tubes, while the major portions of the tubes 13 extend from the upper ends of the tubes 6 towards the boiler tubes 7.

The baffle plate or tile 8 extends from the top of the drum 3 and rests against the inner faces of the tubes 9 along their longer or major inclined portions which preferably reach up about two-thirds of the distance between said drum 3 and the drum 4. A cross baffle 11 is inclined inwardly and upwardly from the upper end of the baffle plate 8, on which it rests, to the central set of tubes 6.

The baffle plate 12 engages the outer faces of the longer or major inclined portions of the tubes 13, being supported on one or more brackets 16 on said tubes and extending from said brackets, which are preferably arranged about one-third of the distance between the lower drum 3 and upper drum 4, up to the bottom of said upper drum. A cross baffle 14 extends inwardly from an intermediate point on the inner face of the baffle plate 12 to the central set of boiler tubes 6, being supported on one or more brackets 15 secured to the rear row of said tubes 6. The cross baffle 14 is inclined so as to lie substantially parallel to the cross baffle 11, and is preferably arranged on a slightly lower level than said cross baffle 11.

On the inner face of the rear wall 19 of the circulating chamber 20 of the boiler there is a ledge 18 for supporting a cross baffle 17 which extends inwardly and upwardly from said wall to the rear bank of boiler tubes 7. Said ledge 18 is preferably arranged about midway of the length of the tubes 7, that is, about half way between the lower drum 3 and upper drum 4.

The chimney outlet 22 is located at the upper end of the rear wall 19, and from its lower edge another baffle 21 extends inwardly and upwardly to rest against the upper portions of the tubes 7 in spaced relation to the roof of the chamber 20.

The course of the gases or products of combustion through the boiler is indicated by arrows. From the fire box 1, said gases are directed through the lower portions of the tubes 5 of the front set or nest by the

5 baffle 2, and are thrown back by the baffle
 8 so as to again traverse said tubes in rising
 towards the upper ends of the latter where
 said gases are a third time drawn through
 10 the tubes 5. At this point the gases cross
 over the baffle 11 and pass through the cen-
 tral bank of tubes 6 at the upper ends there-
 of and are thrown back by the upper portion
 of the baffle 12. In the downward course of
 15 the gases between the baffles 8 and 12, the
 cross baffles 14 and 11 cause them to pass
 forwardly through the central nest of tubes
 6, and the lower portion of the baffle 8 throws
 said gases rearward again so that they pass
 20 for a third time through said central nest of
 tubes 6 before escaping from below the baffle
 plate 12 to the rear set of boiler tubes 7. The
 suction from the chimney outlet 22 in the
 upper end of the rear wall 19 of the circu-
 25 lating chamber 20 draws the gases through
 the lower portions of the rear set of tubes
 7, and as said gases pass upward along said
 rear wall 19 they encounter the baffle 17 and
 are deflected forwardly thereby so that they
 30 again pass through the tubes 7. After pass-
 ing up along the rear face of the baffle plate
 12, the gases must a third time traverse the
 tubes 7 before escaping through the chimney
 outlet 22. Such portion of the gases as pass
 35 upward along the rear wall 19 between the
 cross baffles 17 and 21 are directed through
 said tubes 7 again by said baffle 21 before
 reaching the outlet 22.

Additional cross baffles 23 and 25 may be
 35 used to advantage, as shown in the drawing,
 for compelling the gases to envelope the
 lower ends of the tubes 6 of the central set
 and the upper straight portions of the tubes
 7 of the rear set of boiler tubes, respectively.
 40 The cross baffle 23 may be supported on the
 same bracket 16 which supports the baffle
 12, and a similar bracket 24 on the rear tube
 of the central set 6 of boiler tubes. The
 cross baffle 25 may be supported on a ledge
 45 26 formed on or suitably attached to the rear
 face of the baffle 12, and rest against the
 front tube of the rear set 7 of boiler tubes.

It will thus be seen that the arrangement
 of baffles shown causes the gases to travel a
 50 tortuous passage through each of the three
 sets or nests of boiler tubes, so that complete
 circulation of said gases around the heating
 surfaces of each tube must take place before
 said gases can escape. The boiler is thus
 55 given a maximum efficiency for the amount
 of fuel burned, the additional baffle-sup-
 porting tubes 9 and 13 contributing also to
 the high capacity of the boiler.

I claim:—

60 1. In a vertical water tube boiler having
 a central set of tubes and two other sets of
 tubes at opposite sides of said central set,
 the combination with baffle supporting
 means arranged between said central and
 65 other sets of tubes and having their major

portions inclined in the same direction, of
 baffles engaging said inclined portions of
 said supporting means and maintained in
 contact therewith by their own weight.

2. In a vertical water tube boiler having 70
 a central set of tubes and two other sets of
 tubes at opposite sides of said central set,
 the combination with baffle supporting
 means arranged between said central and
 75 other sets of tubes and having their major
 portions inclined in the same direction, of
 baffles engaging said inclined portions of
 said supporting means and extending along
 the same, and cross baffles inclined in the op-
 80 posite direction from said first mentioned
 baffles and extending from the latter to op-
 posite sides of the central set of tubes.

3. In a vertical water tube boiler having 85
 a central set of tubes and two other sets of
 tubes at opposite sides of said central set,
 the combination with baffle supporting wa-
 ter tubes arranged between said central and
 other sets of tubes and having their major
 portions inclined in the same direction, of
 90 baffles extending along said inclined portions
 of said supporting tubes and supported in
 inclined positions thereon.

4. In a vertical water tube boiler, the
 combination with upper and lower drums, of 95
 three sets of boiler tubes extending from one
 drum to the other, baffle supporting means
 extending upwardly from the lower drum
 between the central and front sets of boiler
 tubes, other baffle supporting means extend- 100
 ing downwardly from the upper drum be-
 tween the central and rear set of boiler
 tubes, said baffle supporting means being in-
 clined in the same direction on opposite
 105 sides of the central set of tubes, and baffles
 extending along and supported on said sup-
 porting means.

5. In a vertical water tube boiler, the com-
 bination with upper and lower drums, of 110
 three sets of boiler tubes extending from one
 drum to the other, baffle supporting means
 extending upwardly from the lower drum
 between the central and front set of boiler
 tubes, other baffle supporting means extend- 115
 ing downwardly from the upper drum be-
 tween the central and rear set of boiler
 tubes, said baffle supporting means at oppo-
 site sides of the central set of tubes being
 inclined in the same direction, baffles extend-
 120 ing along said supporting means, and cross
 baffles inclined in the opposite direction
 from said first mentioned baffles and extend-
 ing from the latter to opposite sides of the
 central set of tubes.

6. In a vertical water tube boiler, the com- 125
 bination with upper and lower drums, of
 three sets of boiler tubes extending from
 one drum to the other, baffle supporting
 water tubes extending from the lower to the
 upper drum between said central and other
 130 sets of boiler tubes, the major portions of

said baffle supporting tubes being inclined in the same direction and extending upwardly from the lower drum in front of the central set of tubes, and downwardly from the upper drum in rear of said central set of boiler tubes, respectively, and baffles extending along and supported against said inclined major portions of said supporting tubes.

7. In a vertical water tube boiler, the combination with upper and lower drums, of three sets of boiler tubes extending from one drum to the other, baffle supporting water tubes extending from one drum to the other between said central and other sets of boiler tubes, the major portions of said baffle supporting tubes being inclined in the same direction and extending upwardly from the lower drum in front of the central set of boiler tubes, and downwardly from the upper drum in rear of said central set of boiler tubes, respectively, baffle plates extending along and supported against said inclined major portions of said supporting tubes, the baffle plate in front of the central set of boiler tubes extending from the top of the lower drum upwardly and spaced at its upper end from the bottom of the upper drum, the baffle plate in rear of said central set of boiler tubes extending from the bottom of said upper drum downwardly and spaced at its lower end from the top of the lower drum, and cross baffles extending from said baffle plates to opposite sides of the central set of boiler tubes.

8. In a vertical water tube boiler having a central set of tubes and two other sets of tubes at opposite sides of said central set, the combination with baffle-supporting means arranged between said central and other sets of tubes, of baffle plates engaging said supporting means and extending along said sets of tubes, one of said baffle plates extending to the lower ends of said tubes and terminating at a point spaced below their upper ends, and the other baffle plate extending to the upper ends of said tubes and terminating at a point spaced above their lower ends, the upper end portion of the first baffle plate and the lower end portion of the second baffle plate being spaced from the central set of tubes, a cross baffle extending from the upper end portion of the first baffle plate to said central set of tubes, and another cross baffle extending from the lower end portion of the second baffle plate to said central set of tubes, for the purpose specified.

9. In a vertical water tube boiler having a central set of tubes and two other sets of tubes at opposite sides of said central set, the combination with baffle-supporting means arranged between said central and other sets of tubes, of baffle plates engaging

said supporting means and extending along said sets of tubes, one of said baffle plates extending to the lower ends of said tubes and terminating at a point spaced below their upper ends, and the other baffle plate extending to the upper ends of said tubes and terminating at a point spaced above their lower ends, the upper end portion of the first baffle plate and the lower end portion of the second baffle plate being spaced from the central set of tubes, a cross baffle extending from the upper end portion of the first baffle plate to said central set of tubes, another cross baffle extending from the lower end portion of the second baffle plate to said central set of tubes, and still another cross baffle extending between the central set of tubes and an intermediate point on the second baffle plate.

10. In a vertical water tube boiler having a plurality of sets of tubes and a flue outlet in the upper portion of its rear wall, the combination with a baffle plate extending along said tubes between the rear set and the next set thereof, said baffle plate reaching to the upper ends of said tubes but terminating at a point spaced away from their lower ends, and a cross baffle extending between the rear set of tubes and an intermediate point on said baffle plate.

11. In a vertical water tube boiler having a plurality of sets of tubes and a flue outlet in the upper portion of its rear wall, the combination with a baffle plate extending along said tubes between the rear set and the next set thereof, said baffle plate reaching to the upper ends of said tubes but terminating at a point spaced away from their lower ends, a cross baffle extending between the rear set of tubes and an intermediate point on said baffle plate, and another cross baffle extending between the rear wall of the boiler and said rear set of tubes at a different level from that occupied by the first cross baffle.

12. In a vertical water tube boiler having a plurality of sets of tubes and a flue outlet in the upper portion of its rear wall, the combination with a baffle plate extending along said tubes between the rear set and the next set thereof, said baffle plate reaching to the upper ends of said tubes but terminating at a point spaced away from their lower ends, a cross baffle extending between the rear set of tubes and an intermediate point on said baffle plate, and two cross baffles extending between the rear wall of the boiler and said rear set of tubes, one arranged above and the other below said first mentioned cross baffle.

In testimony whereof I have signed my name to this specification.

FREDERICK C. STIMMEL.