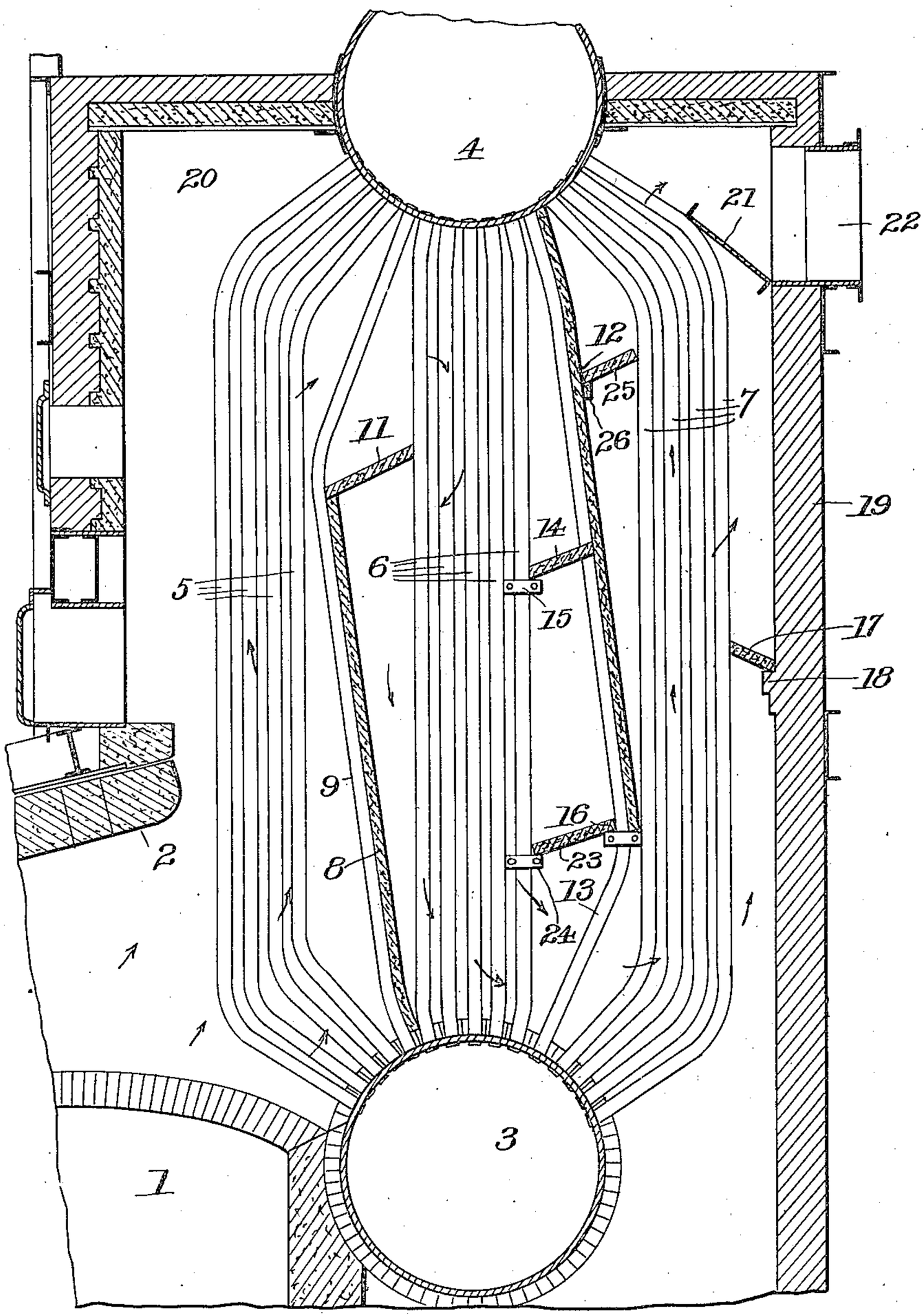
June 19, 1923. 1,459,561

F. C. STIMMEL

VERTICAL WATER TUBE BOILER

Filed July 24, 1922



Inventor
Frederick C. Stimmel,
By Geo. A. Hutchinson,
Attorney.

Patented June 19, 1923. 1,459,561

UNITED STATES PATENT OFFICE.

FREDERICK C. STIMMEL, OF CHATTANOOGA, TENNESSEE, ASSIGNOR TO THE CASEY-HEDGES CO., OF CHATTANOOGA, TENNESSEE, A CORPORATION OF OHIO.

VERTICAL WATER-TUBE BOILER.

Application filed July 24, 1922. Serial No. 577,065.

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 blank 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

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 the tubes 5. At this point the gases cross over the baffle 11 and pass through the central bank of tubes 6 at the upper ends thereof and are thrown back by the upper portion of the baffle 12. In the downward course of 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 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 circulating 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 again pass through the tubes 7. After passing 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 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 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. 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 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 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 given a maximum efficiency for the amount of fuel burned, the additional baffle-supporting tubes 9 and 13 contributing also to the high capacity of the boiler.

I claim:—

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 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 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 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 opposite direction from said first mentioned baffles and extending from the latter to opposite sides of the central set of tubes.

3. 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 water tubes arranged between said central and other sets of tubes and having their major portions inclined in the same direction, of 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 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 extending downwardly from the upper drum between the central and rear set of boiler tubes, said baffle supporting means being inclined in the same direction on opposite sides of the central set of tubes, and baffles extending along and supported on said supporting means.

5. 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 means extending upwardly from the lower drum between the central and front set of boiler tubes, other baffle supporting means extending downwardly from the upper drum between the central and rear set of boiler tubes, said baffle supporting means at opposite sides of the central set of tubes being inclined in the same direction, baffles extending along said supporting means, and cross baffles inclined in the opposite direction from said first mentioned baffles and extending from the latter to opposite sides of the central set of tubes.

6. 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 the lower to the upper drum 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 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.