

No. 727,480.

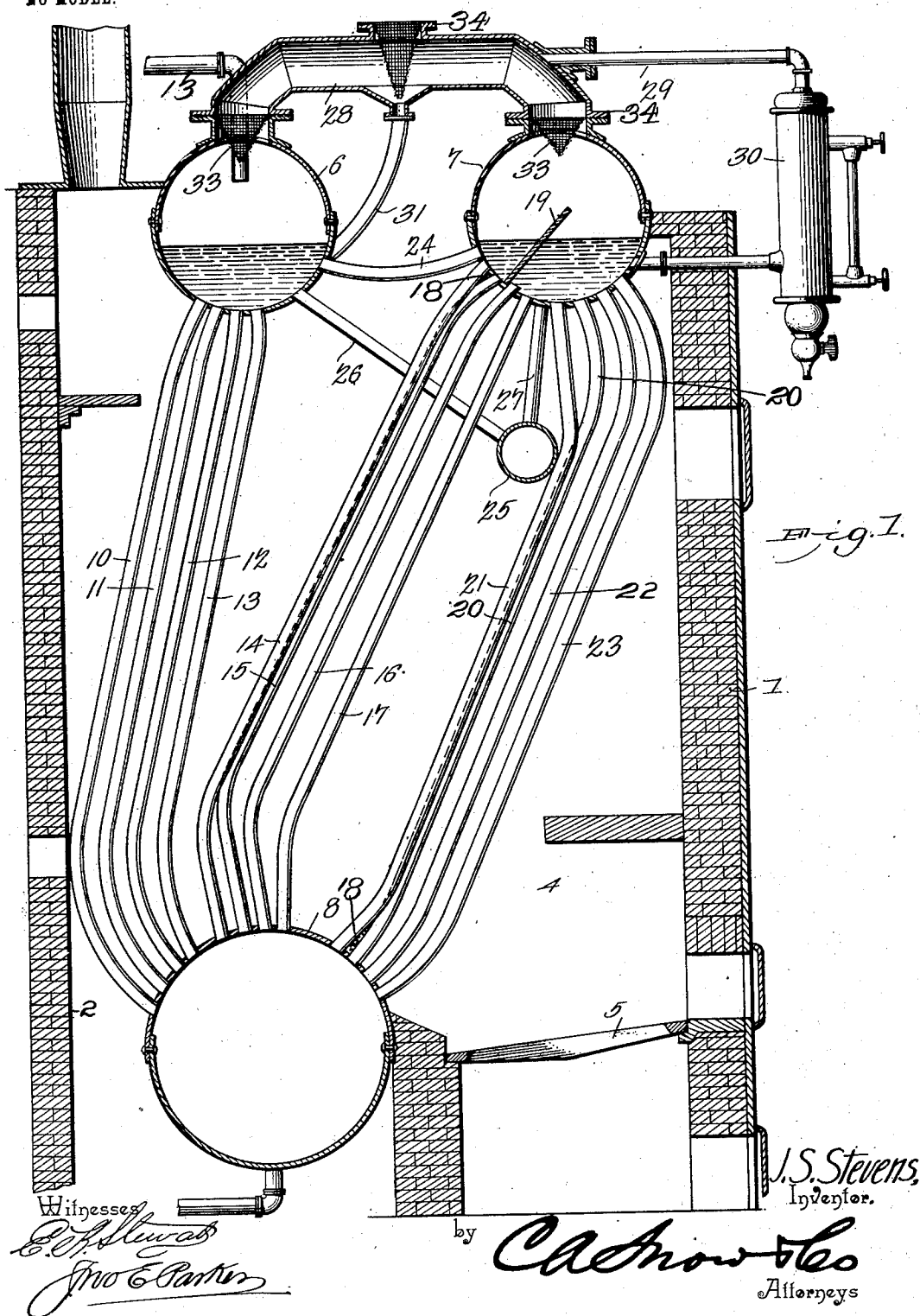
PATENTED MAY 5, 1903.

J. S. STEVENS.
TUBULAR BOILER.

APPLICATION FILED OCT. 13, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



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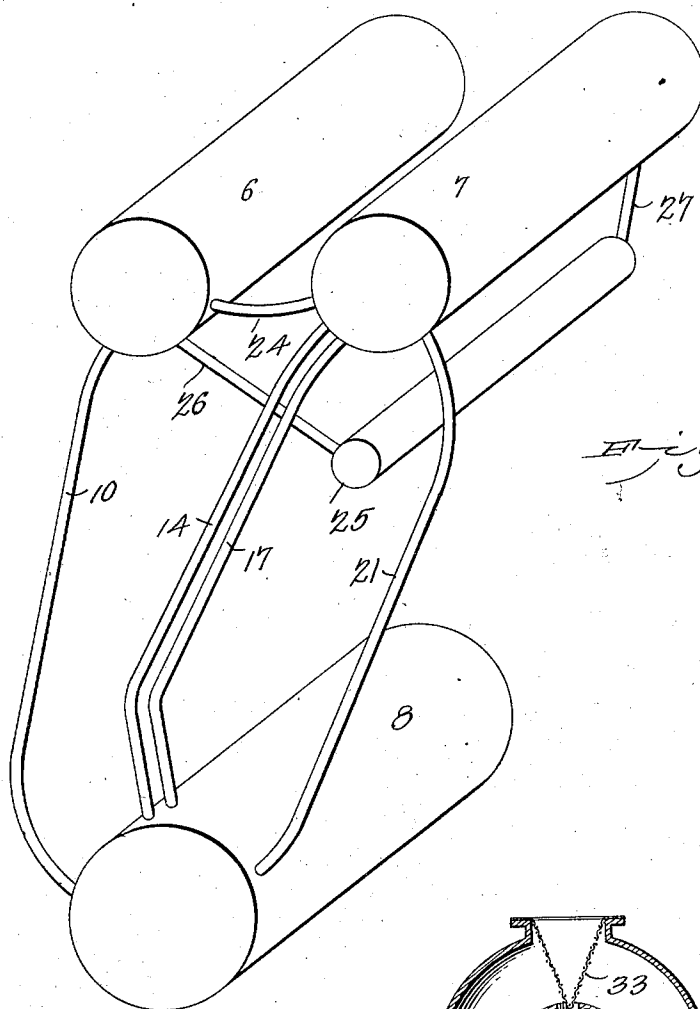


Fig. 2.

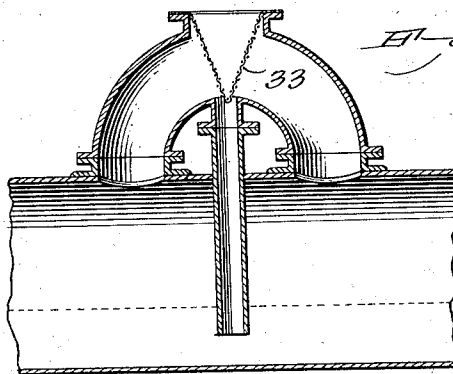


Fig. 3.

Witnesses
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UNITED STATES PATENT OFFICE.

JAMES S. STEVENS, OF PUEBLO, COLORADO.

TUBULAR BOILER.

SPECIFICATION forming part of Letters Patent No. 727,480, dated May 5, 1903.

Application filed October 13, 1902. Serial No. 127,160. (No model.)

To all whom it may concern:

Be it known that I, JAMES S. STEVENS, a citizen of the United States, residing at Pueblo, county of Pueblo, and State of Colorado, have invented a new and useful Tubular Boiler, of which the following is a specification.

The invention relates to certain improvements in water-tube boilers; and it has for its principal object to provide a construction of tubular boiler in which the products of combustion will be directed into contact with all portions of the tubes and in which the circulation of the water will be continuous and follow a number of cycles in order that it may be thoroughly exposed to the action of the heat and quickly vaporized without waste of fuel.

A further object of the invention is to improve the construction and arrangement of the baffle-plates between the banks of tubes in order that the flame and products of combustion may be directed into intimate contact with the entire length of said tube.

With these and other objects in view the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a sectional elevation of a water-tube steam-boiler constructed in accordance with the invention. Fig. 2 is a perspective diagram illustrating the water circulation. Fig. 3 is a sectional elevation of a steam-drum, illustrating the application thereto of a strainer for preventing the entrance of liquid to the steam-pipe.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In the drawings, 1 designates the front wall of a furnace, and 2 the rear wall thereof, and within said furnace is a combustion-chamber 4 and a grate 5. In the upper portion of the furnace are two parallel steam-drums 6 and 7, and in the lower portion, at a point to the

rear of the grate-wall, is a mud-drum 8 of much larger area than either of the upper drums 6 and 7. The upper drum 6 and lower drum 8 are connected by a rear bank of tubes arranged in rows, there being four of such rows in the present instance, as indicated at 10, 11, 12, and 13 of Fig. 1. The upper drum 6 is connected by the feed-pipe 13' to a source of water-supply, through which water is fed to the boiler and thence descends from the upper drum 6 through the rear bank of tubes to the mud-drum 8. The mud-drum and the upper drum 7 are connected by a central bank comprising a plurality of rows of tubes 14, 15, 16, and 17, the tubes of the rear rows 14 and 15 being arranged closely together for almost their entire length to form a water-tube baffle-plate. At a point near the lower ends of the tubes the tubes of the rear row are bent at a greater angle than those of the row 15, only a slight space being left for the passage of the products of combustion and this space being partly filled with asbestos or similar material, as indicated at 18, in order to force the products of combustion to travel the full length of the central bank of tubes. The bending of the rear tubes 14 in the manner described is quite advantageous in that the tube is presented to the mud-drum in a radial line from the center of the drum and may be connected without straining and without danger of leakage. In the upper drum 7 is a division-plate 19, extending between the two rows of tubes 15 and 16 in order to divide the current of water. The upper and lower drums 7 and 8 are further connected by the front bank, comprising tubes 20, 21, 22, and 23, the tubes of the rear rows 20 and 21 being closely arranged in order to form a baffle-plate and slightly separated from each other at their upper ends to form a passage for the products of combustion and in order that they may be properly connected to the upper drum. The spaces between the upper ends of the tubes 14 and 15 may be filled with asbestos or similar material in order to prevent the passage of the products of combustion.

The water-space of the upper drums may extend to a point coincident with the horizontal axes of the drums; but the water-line is always above all of the tubes. A connecting-pipe 24 leads from one drum to the other

at a point below the water-line, while there may be any desired number of such tubes to facilitate circulation of the water.

At a point to the rear of the baffle-plate 5 formed by the tubes 20 and 21 and immediately below the point where such tubes separate is a water-drum 25, connected at one end to the drum 6 by a pipe 26 and at the opposite end being connected to the drum 7 10 by a pipe 27, said water-drum serving as an auxiliary to the baffle-plate and deflecting the products of combustion against the water-tubes of the central bank.

The tops of the drums are connected to an 15 enlarged pipe 28, serving as a steam-dome and from which leads the main steam-pipe 29 to the engine or other point where the steam is to be utilized. The steam-dome and the forward drum 7 are connected in the usual 20 manner to a gage 30, and the central portion of the dome 28 is connected by a drain-pipe 31 to one of the upper drums.

The products of combustion from the fire-box travel up in contact with the front bank 25 of tubes until the spaced portions of the baffle-plate formed by the tubes 20 and 21 is reached and thence are deflected by the drum 26 against the central bank of tubes, following downwardly until they pass through the 30 spaces between the tubes 14 and 15 and thence upwardly in contact with the rear bank of tubes to the escape-flue.

The feed-water enters the drum 6 and passes down through the rear bank of tubes 35 to the mud-drum, a portion of the water traveling up through the tubes 14 and 15 of the central bank to the front drum 7 and thence through tube 24 to the rear drum 6. A further circulation is maintained from the 40 mud-drum up through the central bank of tubes and return to the mud-drum through the tubes 16 and 17 of the central bank, a portion of the water also passing down through the pipe 26 to the water-drum 25 and thence 45 upwardly through the pipe 27 to the rear drum 6. The plate 19 divides the water between the tubes 15 and 16, or it might be placed between the tubes 14 and 15 to afford an increased outlet for the water entering the 50 front drum through the forward bank of tubes.

The water is circulated continuously, and the connections between the tubes and the drums are such as to afford a number of 55 courses for the water, so that it is rapidly heated and soon passes off in the form of vapor.

In order to prevent the passage of water to the steam-dome and to the engine or other 60 point at which the steam is utilized, I employ a strainer at the points of connection of the steam-drum with the upper drums 6 and 7. Each strainer is in the form of a perforated cone formed of sheet metal and has at its 65 base portion a peripheral flange 34, fitting between the bolting-flanges of the drums. These

strainers serve to prevent the passage of liquid, and the steam is thoroughly dried.

As an additional precaution a strainer 33 70 is also placed at the point of connection between the steam-dome and the main steam-pipe leading from the boiler, and immediately below this cone, the lower wall or bottom of the dome is depressed to form a drip-chamber, with which communicates the drain-pipe 31 to 75 convey the water back to the boiler proper.

In some cases, especially where one of the upper drums is dispensed with in order to decrease the capacity of the boiler, the steam-dome may be connected to a single drum in 80 the manner indicated in Fig. 3, the operation remaining the same, although in this instance the opposite ends of the pipe which forms the steam-dome are both connected to the same drum. In both structures the auxiliary drain- 85 pipe is preferably extended to a point below the water-line in order to prevent the passage of steam from the drum directly to the steam-dome.

Having thus described my invention, what 90 I claim is—

1. The combination in a steam-boiler, of a pair of upper drums communicating with each other, a lower mud-drum, a plurality of banks of tubes extending from the mud-drum 95 to the front of the upper drums, a rear bank of tubes extending from the mud-drum to the upper rear drum, and a division-plate disposed in the upper front drum at a point between the tubes which form the central or 100 intermediate bank, dividing the drum into two compartments.

2. The combination in a steam-boiler, of the upper front and rear drums, a water-feed pipe communicating with the rear drum, wa- 105 ter-tubes extending directly between the two drums, a lower mud-drum, a plurality of banks of tubes of which the rear bank connects the upper rear drum to the mud-drum and the forward bank connects the mud-drum 110 to the upper front drum, a central bank of tubes connecting the mud-drum to the upper front drum, and a division-plate in said upper front drum disposed at a point between the ends of the tubes of the central bank. 115

3. The combination in a steam-boiler, of front and rear upper drums, a lower mud-drum, front and intermediate banks of tubes extending from the mud-drum upwardly to the front drum, a rear bank extending from 120 the mud-drum upwardly to the rear drum, and an inclined division-plate arranged in the front drum at a point midway of the tubes which form the intermediate bank.

In testimony that I claim the foregoing as 125 my own I have hereto affixed my signature in the presence of two witnesses.

JAMES S. STEVENS.

Witnesses:

JEPHTHA MILTON WITT,
WILLIAM D. KOEN.