No. 728,996. PATENTED MAY 26, 1903.

H. SEE.

WATER TUBE STEAM BOILER.

APPLICATION FILED FEB. 8, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 4.

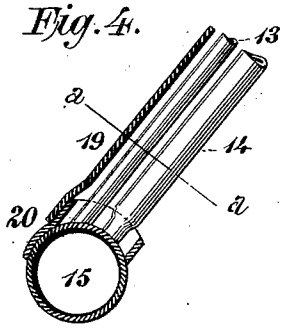


Fig. 5.

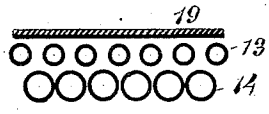


Fig. 1.

Fig. 6.

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WATER TUBE STEAM BOILER

APPLICATION FILED FEB. 8, 1902.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

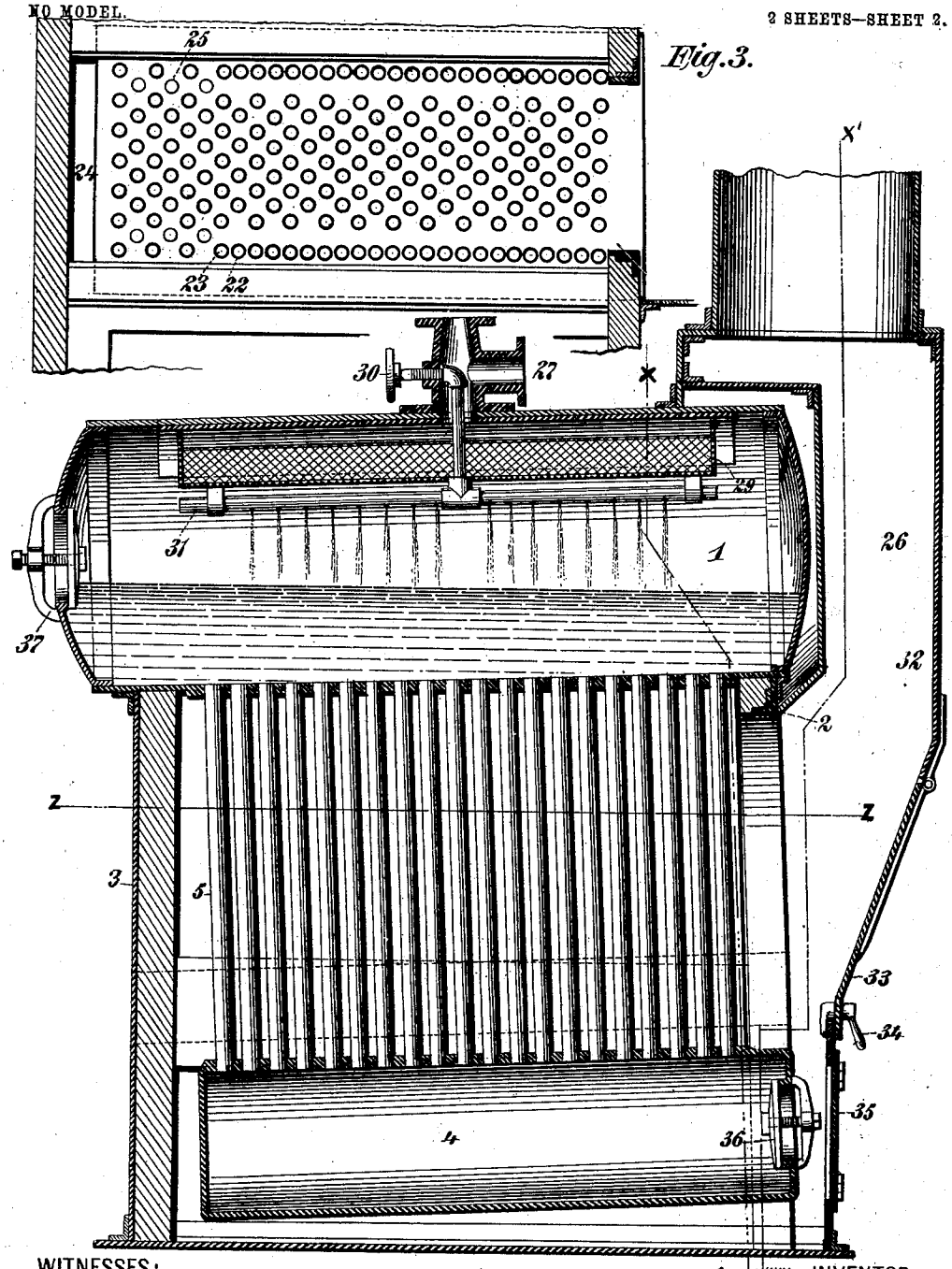


Fig. 2.

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No. 728,996. Patented May 26, 1903.

UNITED STATES PATENT OFFICE.

HORACE SEE, OF NEW YORK, N. Y.

WATER-TUBE STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 728,996, dated May 26, 1903.

Application filed February 8, 1902. Serial No. 93,130. (No model.)

To all whom it may concern:

Be it known that I, HORACE SEE, of the city, county, and State of New York, have invented a new and useful Improvement in Water-Tube Steam-Boilers, of which the following is a specification.

My invention relates to a water-tube boiler; and it consists, first, in the construction whereby the entire generating tube system is suspended from the steam-drum by being attached thereto at the upper ends of the tubes; second, in the supporting of the water-pockets at the lower ends of said tubes; third, in the arrangement between and in rear of the two furnaces of a mixing-chamber for the gases of both; fourth, in the combination with said furnaces of the central group of tubes provided with means for preventing the gases passing between said tubes until after they have traversed said mixing-chamber; fifth, in the construction and arrangement of the subvertical side tubes, and, sixth, in the various combinations and instrumentalities more particularly pointed out in the claims.

In the accompanying drawings, Figure 1 shows on the left a partial vertical section taken in the direction of the arrow on the line $x\ x$ of Fig. 2 and on the right a partial vertical section on the line $x'\ x'$ of Fig. 2. Fig. 2 is a longitudinal section on the line $y\ y$ of Fig. 1. Fig. 3 is a horizontal section on the line $z\ z$ of Fig. 2. Fig. 4 is a detail view showing a modification in the arrangement of the subvertical side tubes. Fig. 5 is a section on the line $a\ a$ of Fig. 4. Fig. 6 is a diagram showing the arrangement of three furnaces and two sets of vertical tubes in accordance with my present invention.

Similar numbers of reference indicate like parts.

1 is the steam-drum, which is supported upon the end walls 2 and 3. 4 is the main water-pocket, which is suspended from the drum 1 by means of the generating-tubes 5. The drum and pocket are preferably inclined longitudinally, as shown in Fig. 2, and therefore the tubes 5 are also slightly subvertical, so that the water will wipe the tubes in its movement through them. On each side of the tubes 5 are the furnaces (one of which is shown at 6) supported on the side walls (one of which is shown at 7) and the center walls 8 and 9 and provided with grate-bars 10. The suspended pocket 4 lies in the chamber formed between the center walls 8 and 9 and is disposed below the grate-bars, as shown. Because suspended from the steam-drum in the manner described the pocket 4 is free to move up and down, and thus the contraction and expansion of its supporting-tubes are permitted. In order to maintain the alinement of the said tubes, the pocket 4 is supported upon links 11 and 12, (two on each side,) pivoted to brackets on the center walls 8 and 9. Links on one side only of the pocket may be used, if desired.

At each side of the boiler is a double set of inclined generating-tubes, one set being shown on the left of Fig. 1, and the tubes being represented at 13 and 14. These tubes at their upper ends are connected to the steam-drum 1 and at their lower ends they carry wing-pockets 15 and 16, which pockets are connected to the outer walls by means of the links 17 and 18. The pockets 15 and 16 are thus suspended from the steam-drum 1 by subvertical tubes which are free to expand and contract and which are kept in alinement by links 17 and 18.

From what has now been explained it will be apparent that the whole generating tube system of this boiler is supported from the steam-drum and that the weight of the pockets is carried by the tubes. Inasmuch as the pockets are free to move, the tube system by which they are suspended is free to expand and contract, and its proper alinement is maintained by the links 11 12 17 18.

Outside of the tubes 13 14 is the casing-plate 19, which is secured at its upper end to the steam-drum, but which at the wing-pocket is provided with a sliding joint 20. Hence the presence of this plate does not impede the expansion and contraction of the tubes 13 14. There is an intermediate plate 21, the function of which is to ward off the heat from the tubes 13 of the outer row, so that said tubes may become the down-comer, while the inner row of tubes 14 form the up-comer. In this way an efficient circulation of water in the tubes 13 and 14 is secured. Instead of using this arrangement of tubes 13 and 14 I may employ the arrangement shown in Figs. 4 and 5, whereon the outer series of tubes are

brought into close contact to form the wall or partition. The plate 21 is then omitted, because the wall formed of the inner tubes serves to guard the outer tubes 13 from the heat. Consequently by this arrangement the same result already explained, whereby the outer tubes 13 form the down-comer and the inner tubes 14 the up-comer, is secured.

Referring now to the center tubes 5, and particularly to Figs. 1 and 3, it will be observed that the second longitudinal row of tubes on each side of the group are bent outwardly at their middle portions, so as to lie between the tubes of the outer row. Thus in said figures the tubes 22 of the second row are bent outwardly to fill the intervals between tubes 23 of the first or outer row. The peripheries of the tubes belonging to the rows 22 23 then come in close contact to form partitions on each side of the group of tubes 5. These partitions extend for a part of the distance from the front of the boiler to the rear, so that in rear of the group of tubes 5 there is formed a chamber 24. This chamber in Fig. 3 is shown containing a number of tubes 25. This, however, is not essential. In other words, the chamber may be entirely empty of tubes or it may contain tubes with free spaces between them, as represented at 25 in Fig. 3.

The gases from the furnaces proceed rearwardly the boiler outside of the walls formed by the tubes 22 23 of the inner group 5 until they reach the mingling-chamber 24. Then they proceed in the opposite direction, but through the space between the tubes 5 to the smoke-box 26, and so to the chimney. In this way the gases are held for a long time in contact with the tubes, and their temperature at the point of exit is correspondingly reduced.

The steam is taken from the steam-drum by the pipe 27. Within the drum, secured to the outer portion thereof, is a curved baffle-plate 28, which forms an inverted trough closed by a wire screen 29. Steam condensing on the inner side of the steam-drum above the baffle-plate will fall on the convex surface thereof, and so flow to the water below, while any water which gets through the wire-netting will flow down off the lower edges of the baffle-plate.

In order to reduce the number of joints in the shell of the steam-drum, the feed-water pipe is introduced through the steam-pipe, as shown at 30, and connects with the approximately horizontal pipe 31 inside the drum. Pipe 31 admits water near the center line of the drum, and in this way the downward movement of water through the tubes and to the water-pocket 4 is assisted. The casing 32 on the front of the boiler is provided with a hinged door 33, secured by a fastening-button 34, so that said door may be opened to obtain access to the tubes 5. There is also provided a door 35 for allowing access to the manhole in the end of the water-pocket 4, and this manhole is closed by the usual cover and clamp 36. A manhole 37, also provided with a cover and clamp, is arranged in the rear of the drum 1.

For the purpose of cleaning out the central chamber, in which the water-pocket 4 is located, doors are provided in the walls 8 and 9, one of which is shown at 38. Steam or compressed-air pipes, one of which is shown at 39, may also be led into said chamber for the purpose of cleaning it out by jets of air or steam.

It is to be understood that I do not limit myself to a boiler of this kind having the mingling-chamber 24 at the back and the smoke-box 26 at the front of the boiler, inasmuch as it is obvious that the position of these parts can be reversed. So, also, I may use more than two furnaces. Thus in Fig. 6 I show two drums 1 1*, connected by horizontal tubes 40. From these drums are supported pockets 4 4* by the tubes 5 5*. From the drums 1 1* extend subvertical tubes to the wing-pockets 15 16. It is obvious that in this case there may be three furnaces, two located, respectively, on the outer sides of the wing-pockets and one disposed between them. In Fig. 1 the door for affording access to the grate is shown at 41 and the ash-pit opening at 42.

I claim—

1. In a water-tube boiler, a steam-drum, a plurality of groups of generating-tubes depending therefrom, and a plurality of water-pockets, each pocket being wholly supported and freely suspended from said drum by an associated group of tubes, substantially as described.

2. In a water-tube boiler, a steam-drum, a group of substantially vertical generating-tubes depending therefrom, a group of inclined generating-tubes depending from said drum on each side of said vertical group, and water-pockets; each pocket being wholly supported and freely suspended from said drum by an associated group of tubes, substantially as described.

3. In a water-tube boiler, a steam-drum, two groups of generating-tubes depending therefrom, a water-pocket wholly supported and freely suspended from said drum by each group of tubes, and a furnace disposed between said water-pockets, substantially as described.

4. In a water-tube boiler, a steam-drum, two groups of generating-tubes depending therefrom, a water-pocket wholly supported and freely suspended from said drum by each group of tubes and a furnace disposed between said water-pockets, one of said pockets being located entirely below the grate of said furnace, substantially as described.

5. In a water-tube boiler, a support, generating-tubes depending from said support, a water-pocket wholly supported and freely suspended by said tubes and means for guiding said pocket in the line of longitudinal contraction and expansion of said tubes during

its movement due to said contraction and expansion, substantially as described.

6. The combination in a water-tube boiler, of a steam-drum, a plurality of generating-tubes depending therefrom, water-pocket carried at the lower end of said tubes, a fixed wall and a pivoted link connecting said water-pocket to said wall, substantially as described.

7. The combination in a water-tube boiler of two furnaces, a passage between said furnaces communicating at one end with both of said furnaces and at the other end with the uptake, and generating-tubes disposed in said passage, substantially as described.

8. The combination in a water-tube boiler of two furnaces provided with a combustion-chamber in rear of and common to both furnaces, a passage between said furnaces and communicating at one end with said chamber and at the other end with the uptake, and generating-tubes disposed in said passage, substantially as described.

9. The combination in a water-tube boiler of two furnaces provided with a combustion-chamber in rear of and common to both furnaces, a passage between said furnaces and communicating at one end with said chamber, and at the other end with the uptake, and generating-tubes disposed in said passage and in said chamber, substantially as described.

10. The combination in a water-tube boiler of two furnaces, a passage between said furnaces communicating at one end with both of said furnaces and at the other end with the uptake, and generating-tubes disposed in said passage; the walls of said passage being formed by outer rows of said generating-tubes placed in close contact, substantially as described.

11. The combination in a water-tube boiler of two furnaces, a passage between said furnaces communicating at one end with both of said furnaces and at the other end with the uptake, a steam-drum above said passage, and generating-tubes depending from said steam-drum and disposed in said passage, substantially as described.

12. The combination in a water-tube boiler of two furnaces, a passage between said furnaces communicating at one end with both of said furnaces and at the other end with the uptake, a steam-drum above said passage, generating-tubes depending from said steam-drum and disposed in said passage, and inclined generating-tubes also depending from said drum and extending over said furnaces, substantially as described.

13. The combination in a water-tube boiler of two furnaces, a steam-drum above them, two groups of inclined generating-tubes depending from said drum and extending respectively over said furnaces, a water-pocket wholly supported and freely suspended by each of said groups of tubes, two partitions extending downwardly from said drum and between said furnaces and rearwardly from the front wall of said furnaces but not reaching the rear wall, vertical generating-tubes depending from said drum and disposed in the space between said partitions, and a water-pocket between said furnaces wholly supported and freely suspended by said vertical tubes, substantially as described.

14. The combination in a water-tube boiler with the furnace, steam-drum and water-pocket 15, of the parallel rows of generating-tubes 13, 14, whereby said pocket is suspended from said drum, the inner row of said tubes being placed in juxtaposition to form a wall, and the outer casing 19 secured to said drum and provided with a sliding joint 20, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HORACE SEE.

Witnesses:
WILLIAM MOLLOY,
HARRY A. MOSER.