March 22, 1938. W. W. WISE 2,111,655

BOILER

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FIG. 8

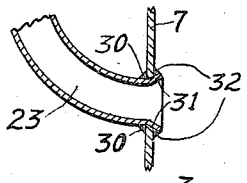


FIG. 9

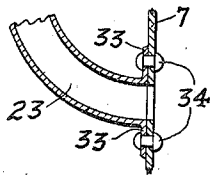
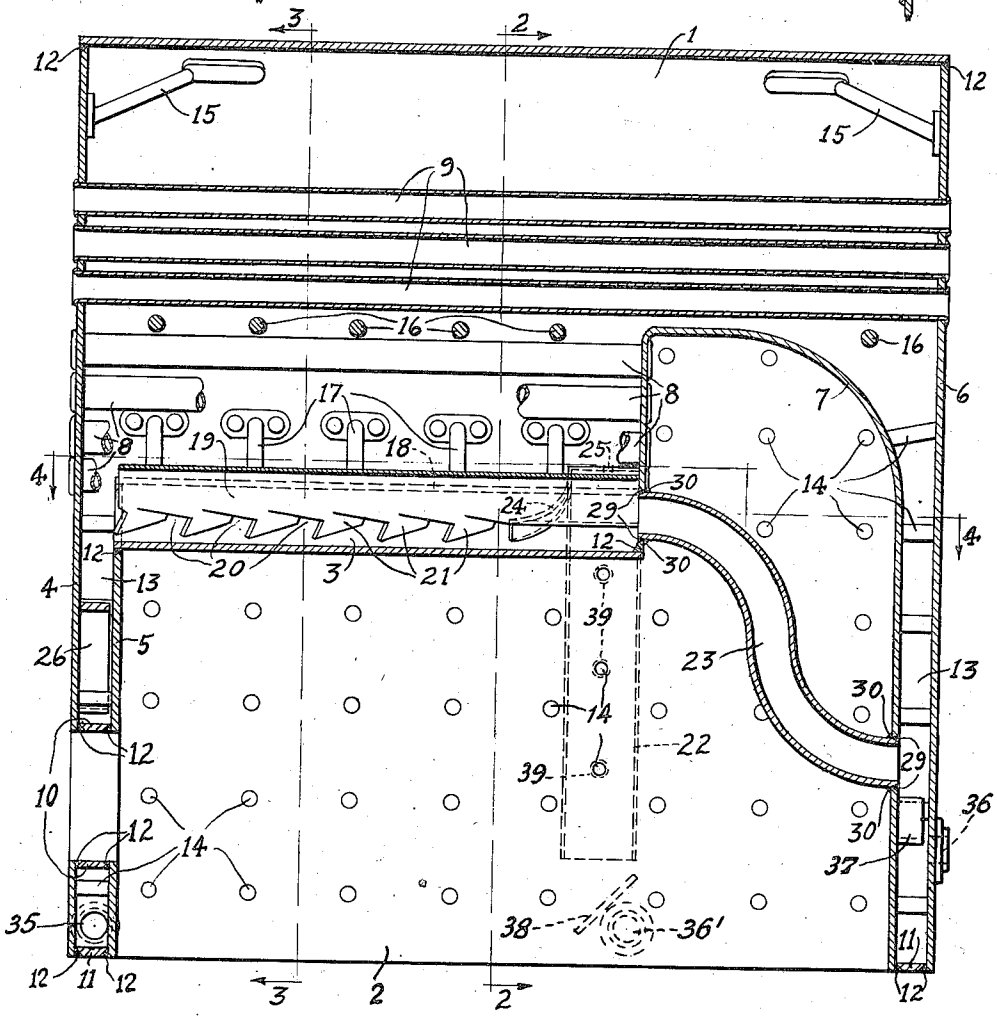


FIG. 1



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March 22, 1938. W. W. WISE 2,111,655

BOILER

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FIG. 7

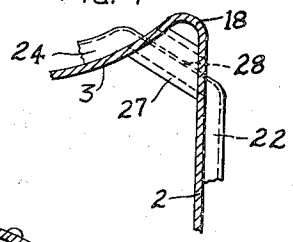


FIG. 2

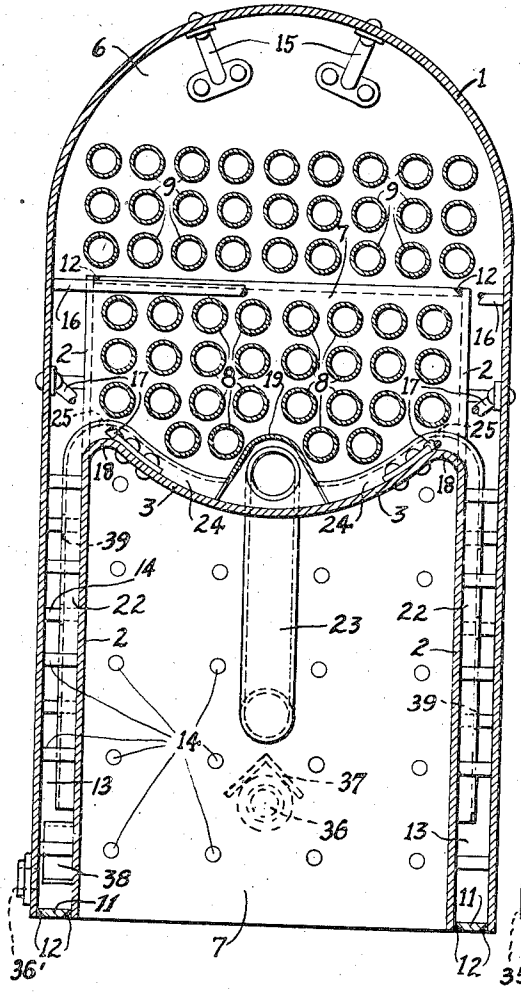
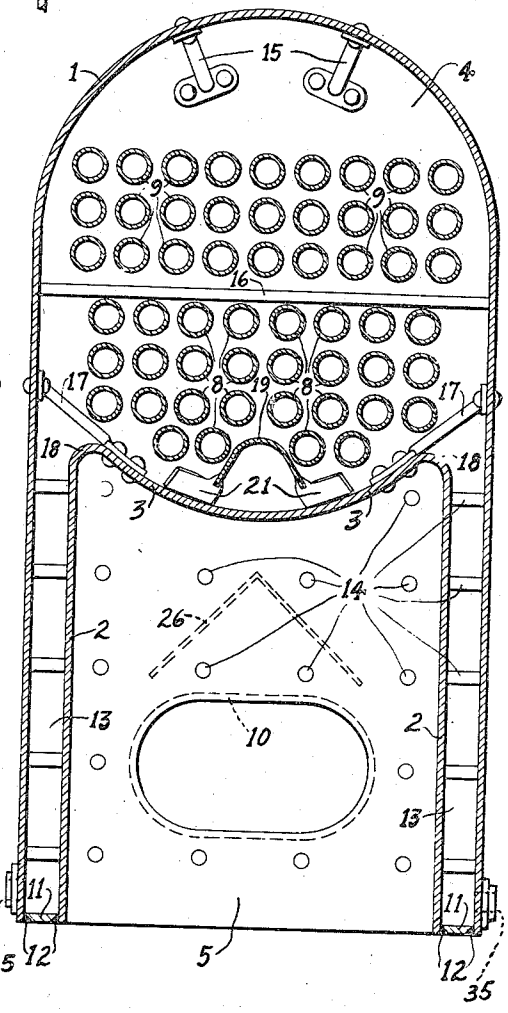


FIG. 3



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BOILER

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FIG. 5

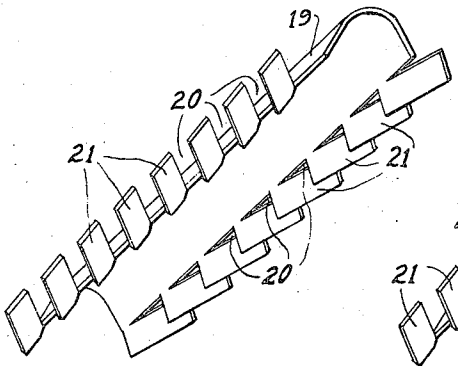


FIG. 6

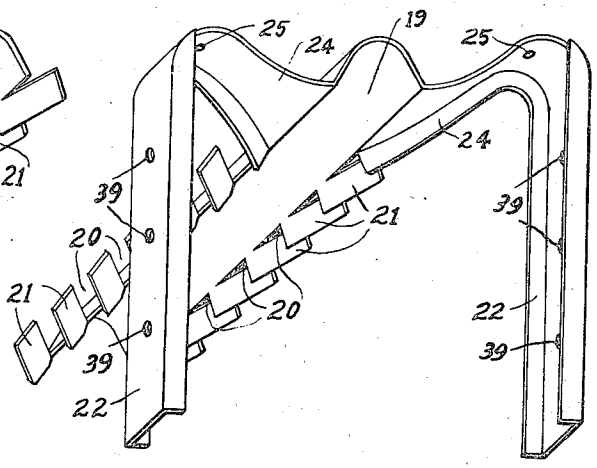
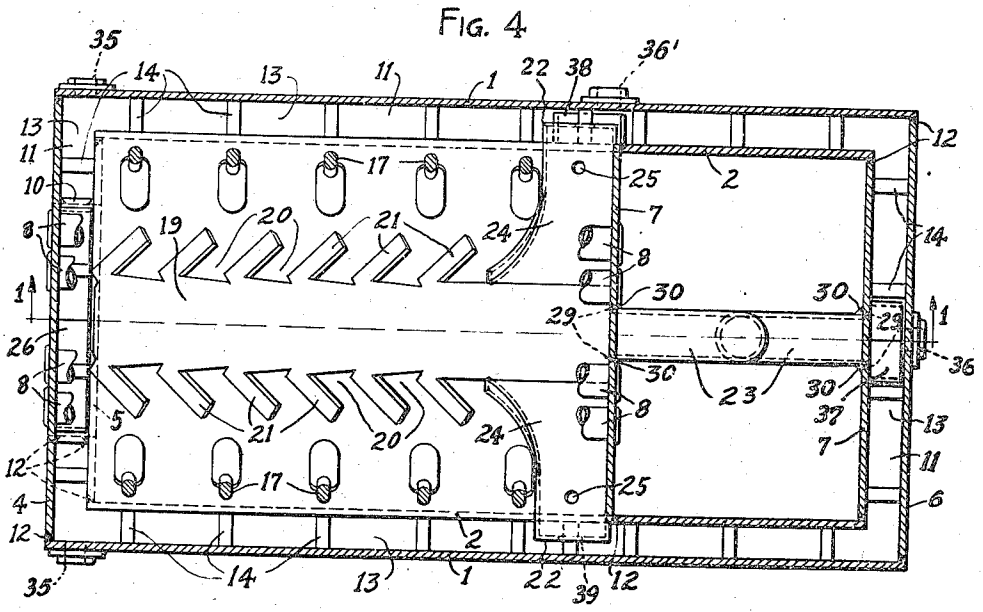


FIG. 4



WITNESSES:

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Patented Mar. 22, 1938 2,111,655

UNITED STATES PATENT OFFICE

2,111,655

BOILER

William Washington Wise, Chattanooga, Tenn.

Application June 21, 1937, Serial No. 149,444

21 Claims. (Cl. 122—410)

The invention relates to improvements in boilers of the internally fired type having water legs, and a fire box the top of which is concave upward; and has for its main object an automatic water circulating system which prevents the accumulation of mud in the bottom of that portion of the fire box sheet which is concave upward by conveying the mud to the bottom of the water legs, thereby preventing deterioration of the fire box sheet due to excessive temperatures caused by the accumulation of mud, and at the same time, increasing the heating efficiency.

It is to be understood that the type of boiler illustrated in the description and accompanying drawings is only one of many in which the invention may be used, and it is not intended that the invention shall in any wise be limited thereby, but only by the appended claims.

A number of forms of the invention are illustrated by the accompanying drawings, in which Figure 1 is a vertical, longitudinal, central, sectional view taken on the line 1—1 of Figure 4; Figure 2 is a vertical cross section on the line 2—2 of Figure 1; Figure 3 is a vertical cross section on the line 3—3 of Figure 1; Figure 4 is a horizontal sectional view along the line 4—4 of Figure 1; Figure 5 is a detailed view in the perspective of the horizontal portion of the circulating device; Figure 6 is a detailed perspective view of one form of the complete circulating device; Figure 7 is a fragmentary section on the line 2—2 of Figure 1 showing a slight modification of construction; and Figures 8 and 9 are fragmentary sections along the line 1—1 of Figure 4 showing slight modifications of construction.

The essential features of the boiler shown consist of an outer U-shaped wrapper sheet 1, an inner fire box sheet 2 the top portion 3 of which is concave upward, a front end tube sheet 4, a front end fire box header plate 5, a rear end outer tube sheet 6, an inner sheet 7 bent to form the rear end fire box header plate and inner rear end tube sheet, a lower set of tubes 8, an upper set of tubes 9, a fire door ring 10, and a bottom plate or mud ring 11.

The different sheets or plates and fire door ring heretofore mentioned are preferably secured to each other at their edges by welds as shown at 12. The parts forming the water legs 13 are held in their proper places under the force of internal boiler pressure by numerous stay bolts 14. Likewise the upper portions of sheets 4 and 6 are held in place by braces 15, and the upper portions of the outside wrapper sheet 1 are held in place by through rods 16 and braces 17. Braces 17 also serve to keep the upper portion of the fire box sheet 2 from collapsing at the reverse bends 18, under the force of high internal boiler pressure, thereby making this type of boiler adaptable to high pressures.

Of course, in order to complete the boiler, a smoke box is provided at the front end to convey the flue gases from the lower set of tubes 8 to the upper set of tubes 9, and at the rear end a suitable duct is provided to connect the upper set of tubes 9 to a smoke stack which disposes of the flue gases and at the same time causes a draft.

The boiler as thus described has the defect of accumulating mud in the bottom of the portion 3 of the fire box sheet which is concave upward.

In order to prevent the accumulation of mud on the fire box sheet, I provide a horizontal duct 19 through which the water flows toward the fire door end of the boiler. This duct has openings 20 through which the mud passes into the stream of water, and fins 21 which serve to prevent the water from leaving the duct through openings 20. The water may be propelled by means of one or more vertical ducts 22 on each side of the fire box, or by means of the tube 23, or by both. The vertical ducts 22 are connected to the horizontal ducts 19 by means of downwardly inclined ducts 24. At the summit of the vertical ducts 22, holes 25 may be provided to allow the steam to escape without going through the downwardly inclined ducts 24.

Over the fire door ring 10, I provide a mud baffle 26 to prevent the mud conveyed to that end of the boiler by the horizontal duct 19 from accumulating on the fire door ring 10. The mud will pass down the sides of the V-shaped mud baffle 26 to the bottom of the water legs 13 where it can be removed periodically through openings 35 provided for that purpose.

In case hollow braces 27 (see Figure 7) are used in lieu of, or in conjunction with braces 17 to strengthen the reverse bends 18 of the fire box sheet, the vertical ducts 22 are preferably connected to the downwardly inclined ducts 24 by means of upwardly inclined ducts 28 extending along the interior of the hollow braces 27, instead of running the duct work over the reverse bends 18 of the fire box sheet.

The V-shaped mud baffle 26, ducts 22, 24, and 28, and some or all of the fins 21 of duct 19 are preferably secured to the boiler by tack welds.

The horizontal duct 19 and fins 21 can be made from a single sheet of metal by curving it to the proper shape to form the duct 19, then cutting the fins 21 from the bottom edges of duct 19 but leav-

ing them attached to the duct at an upper corner of each fin, and then twisting these connecting corners so as to incline the fins 21 as shown, thus providing the openings 20.

The tube 23 is preferably bent to an S-shape as shown to provide for expansion. It is secured to plate 7 at its ends, either end of which may be secured by means of welds 29 and 30 (see Figure 1), or by means of flange 31 and welds 32 and 30 (see Figure 8), or by means of flange 33 and rivets 34 (see Figure 9).

In Figures 1, 2, and 4, feed water openings 36 and 36' are shown on the end and side of the boiler respectively, either of which openings may be used. When the feed water opening is located near the bottom opening, either of the tube 23, or of one of the vertical ducts 22, I prefer to use a baffle 37 or 38 to prevent the cold feed water from directly entering the tube 23, or the vertical duct 22.

This invention may be used in connection with either high pressure or low pressure boilers; however, I prefer to use it in connection with high pressure steam boilers, because in them more mud is formed due to the precipitation of dissolved minerals at high temperatures which accompany high pressures.

Stay bolts or braces may be placed through holes provided for them in any part or parts of the duct work, as shown at 39, without departing from the spirit of the invention.

I claim:

1. In a boiler having water legs, and a fire box having a top which is concave upward, the combination of an inclined water circulating tube and a substantially horizontal circulating duct, said tube extending through the fire box and opening at its lower end into the water space of the boiler, and at its upper end into said horizontal duct which is in the water space of the boiler, and which extends from the upper end of said tube to its own open end at a water leg of the boiler along the upper side of the lowest part of said fire box top, said horizontal duct having openings and fins at the bottom of its sides.

2. In a boiler having water legs, and a fire box having a top which is concave upward, the combination of a plurality of substantially vertical water circulating ducts and a substantially horizontal circulating duct, said vertical ducts being arranged in the water space of the boiler on opposite sides of the fire box, and opening at their lower ends into the water space of the boiler, and being connected at their upper ends by ducts to the sides of said horizontal duct which is in the water space of the boiler, and which extends from said connecting ducts to its own open end at a water leg of the boiler along the upper side of the lowest part of said fire box top, said horizontal duct having openings and fins at the bottom of its sides, the interior of each duct being in open communication with the duct to which it is connected.

3. In a boiler which has water legs, and a fire-box having a top which is concave upward, the combination of an inclined water circulating tube, a plurality of substantially vertical water circulating ducts, and a substantially horizontal circulating duct, said tube extending through the fire box and opening at its lower end into the water space of the boiler, and at its upper end into said horizontal duct which is in the water space of the boiler and which extends from the upper end of said tubes to its own open end at a water leg of the boiler along the upper side of the lowest part of said fire box top, said horizontal duct having openings and fins at the bottom of its sides, said vertical ducts being arranged in the water space of the boiler on opposite sides of the fire box, and opening at their lower ends into the water space of the boiler, and being connected at their upper ends by ducts to the sides of said horizontal duct, the interior of each duct being in open communication with the interior of the duct to which it is connected.

4. In a boiler which has water legs, and a fire box having a top which is concave upward, the combination of a substantially horizontal circulating duct in the water space of the boiler and means for propelling water through said duct which has openings and fins at the bottom of its sides, and which extends along the upper side of the lowest part of said fire box top to its own open end at a water leg of the boiler.

5. The invention as defined in claim 2, the duct work having a hole at substantially the summit of each vertical duct.

6. The invention as defined in claim 3, the duct work having a hole at substantially the summit of each vertical duct.

7. The invention as defined in claim 2, stay bolts or braces extending through holes in the duct work.

8. The invention as defined in claim 3, stay bolts or braces extending through holes in the duct work.

9. The invention as defined in claim 2, the connecting ducts (which connect the vertical ducts to the horizontal duct) extending along the interior of hollow braces which connect the fire box sides to the fire box top.

10. The invention as defined in claim 3, the connecting ducts (which connect the vertical ducts to the horizontal duct) extending along the interior of hollow braces which connect the fire box sides to the fire box top.

11. The invention as defined in claim 1 in combination with a baffle so located in the water space of the boiler as to prevent direct flow of the feed water to the inclined tube.

12. The invention as defined in claim 3 in combination with a baffle so located in the water space of the boiler as to prevent direct flow of the feed water to the inclined tube.

13. The invention as defined in claim 2 in combination with a baffle so located in the water space of the boiler as to prevent direct flow of the feed water to the entrance of one of the vertical ducts.

14. The invention as defined in claim 3 in combination with a baffle so located in the water space of the boiler as to prevent direct flow of the feed water to the entrance of one of the vertical ducts.

15. The invention as defined in claim 1 in combination with a guard so located as to prevent accumulation of mud on the fire door ring of the boiler.

16. The invention as defined in claim 2 in combination with a guard so located as to prevent accumulation of mud on the fire door ring of the boiler.

17. The invention as defined in claim 3 in combination with a guard so located as to prevent accumulation of mud on the fire door ring of the boiler.

18. The invention as defined in claim 4 in combination with a guard so located as to prevent accumulation of mud on the fire door ring of the boiler.

19. In a boiler having a water leg, and a fire

door opening through said water leg, a guard so located in the water space of the boiler as to prevent accumulation of mud on the fire door ring.

20. The invention as defined in claim 19, the guard being so inclined as to deflect the mud to one side of the fire door ring.

21. The invention as defined in claim 19, the guard having substantially the shape of an inverted V so as to deflect mud to opposite sides of the fire door ring, said guard being narrower than the width of the water leg to provide a space for the escape of steam.

WILLIAM WASHINGTON WISE.