Sept. 15, 1931. H. J. KERR 1,823,050

BOILER

Filed Aug. 20, 1926

Fig. 1.

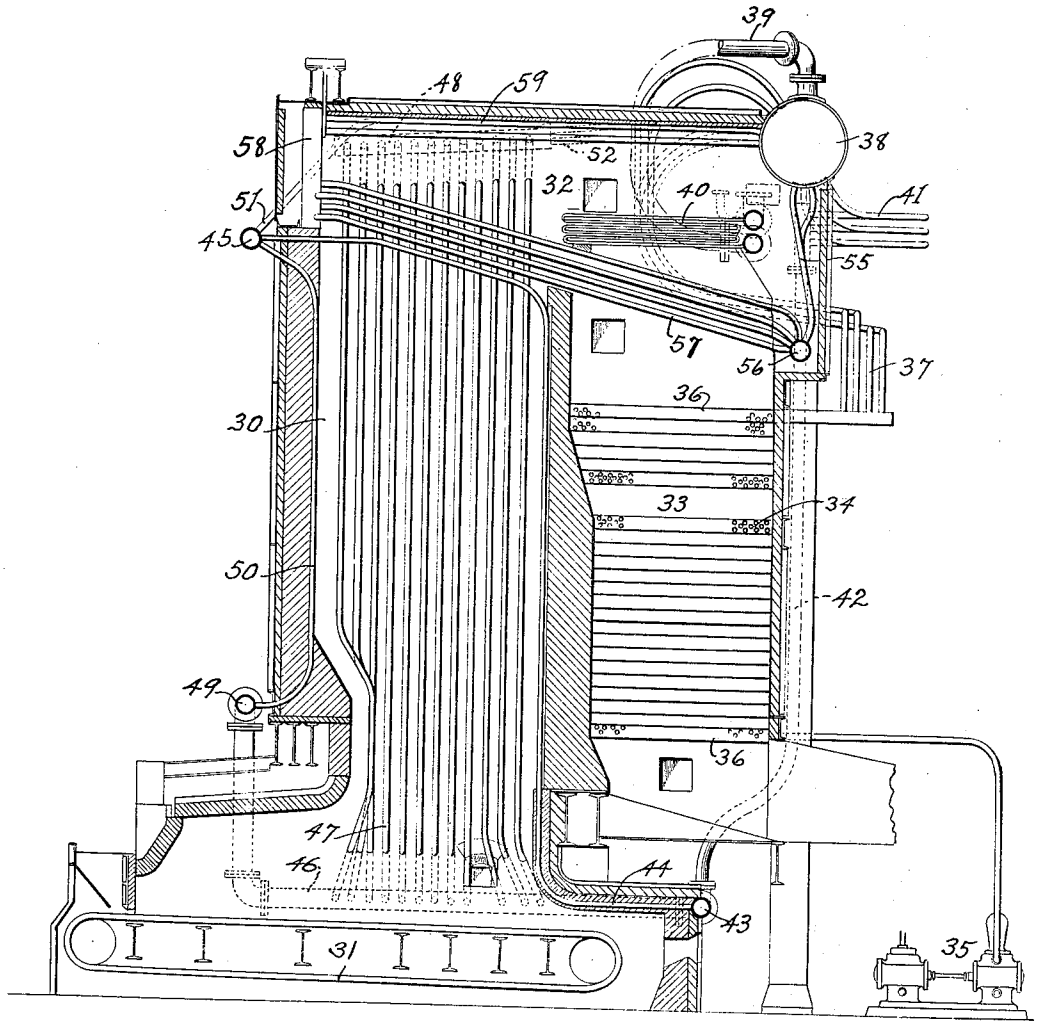
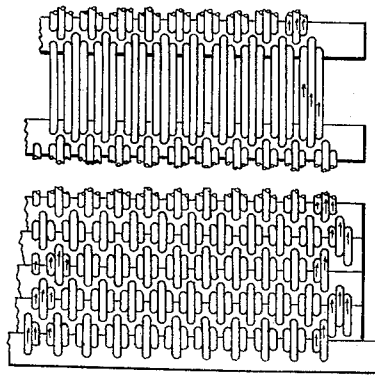


Fig. 2.



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BOILER

Application filed August 20, 1926. Serial No. 130,369.

This invention relates to a water tube boiler which comprises two natural or gravity circulation systems, one of which is through furnace wall cooling tubes. The invention will be understood from the description in connection with the accompanying drawings, in which Fig. 1 is a vertical section through an illustrative embodiment of the invention; Fig. 2 is a detail view.

In the drawings reference character 30 indicates a vertically extending passage in a furnace that is provided with a chain grate stoker 31, and a passage 32 above the rear wall of the furnace leads to the downwardly extending flue 33, in which transverse water tubes 34 connected to headers 36 in series are located. The feed water pump 35 feeds water into the lowest header 36 of the series, and tubes 37 lead from the uppermost header of the series to the transverse steam and water drum 38. A tube 39 leads from the steam space of the steam and water drum 38 to the superheater 40, and tubes 41 lead from the water space of the steam and water drum 38 to pipes 42, one on each side of the furnace, which pipes lead to the mud drum 43 on the outside and at the lower end of the furnace. A row of tubes 44 leads from the mud drum 43 upwardly along the inside of the rear wall of the furnace, thence across the same to the header 45 outside of the furnace. The mud drum extends along the sides of the furnace as shown at 46, and water tubes 47 are connected to the mud drum and pass along the inside walls of the furnace in an upward direction, thence out through the walls of the furnace and connect to headers 48. A drum 49 is disposed across the front of the furnace and is connected to the drums 46 on each side of the furnace. Tubes 50 lead from the drum 49 through the front wall of the furnace upwardly along the inside of the same, and thence outwardly to the header 45. The headers 45 and 48 are connected by tubes 51 and 52 to the steam and water drum 38.

Tubes 55 lead from the water space of the steam and water drum 38 to the header 56 located near the rear side of the flue 33, and tubes 57 connect this drum to a series of vertically disposed headers 58, the tubes 57 extending across the upper end of the flue 33 and the upper end of the furnace, so that the hot gases from the furnace make two passes across these tubes. The tubes 57 are preferably inclined so that their upper ends extend across the furnace 30. The headers 58 are connected by tubes 59 to the steam and water drum 38.

The operation of the boiler is as follows: Water is fed by the pump 35 into the lowermost header 36 and passes upwardly in succession through the tubes 34 and headers 36 to the uppermost one from which the hot water or the steam and water pass through the tubes 37 to the steam and water drum 38. Natural circulation of water is provided not only through the furnace wall tubes, but also through the tubes 57 that extend across the furnace and flue. Gravity circulation of water from the drum 38 through the furnace wall tubes is effected by means of the tubes 41, pipes 42, mud drums 43, 46 and 49, thence through the furnace wall tubes 44, 47 and 50, from which steam and water pass into the headers 45 and 48 and through tubes 51 and 52 back to the drum 38. Natural or gravity circulation of water from the drum 38 through the cross tubes 57 is effected by means of the tubes 55, the header 56, thence through tubes 57, from which steam and water pass into the headers 58 and through tubes 59 back to the drum 38.

I claim:

1. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a natural circulation system, steam generating tubes in said flue, a pump adapted to force steam and water through said flue tubes in a direction counter to the flow of gases through the flue, and a small bank of tubes extending across said passage near the upper end thereof.

2. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which

hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a natural circulation system, steam generating tubes in said flue, a pump adapted to force steam and water through said flue tubes in a direction counter to the flow of gases through the flue, and a small bank of tubes extending across said passage near the upper end thereof and across the top of said flue and forming part of a circulation system.

3. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a natural circulation system, steam generating tubes in said flue, a pump adapted to force steam and water through said flue tubes in a direction counter to the flow of gases through the flue, a superheater disposed adjacent said passage and across said flue near the upper ends thereof, and tubes disposed between said superheater and source to screen the superheater.

4. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a circulation system, a small bank of tubes extending across said passage near the upper end thereof and forming part of a circulation system, steam generating tubes in said flue, a pump adapted to force steam and water through said flue tubes, and a connection between said flue tubes and one of said circulation systems.

5. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a circulation system, a small bank of tubes extending across the top of said passage and forming part of a circulation system, said systems having a common steam and water drum, steam generating tubes in said flue and connected to said drum, and a pump adapted to force steam and water through said flue tubes and to discharge the mixture into said drum.

6. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a natural circulation system, some of which extend across said passage, tubes connected in series located in said flue and connected to said circulation system and a pump to force water through said last named tubes.

7. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a natural circulation system, some of which extend across said passage, tubes connected in series located in said flue and connected to said circulation system, a pump to force water through said last named tubes, and tubes of another natural circulation system extending across said passage and said flue.

8. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a natural circulation system, some of which extend across said passage, tubes connected in series located in said flue and connected to said circulation system, a pump to force water through said last named tubes, tubes of another natural circulation system extending across said passage and said flue, and a common drum to which all of said tubes are connected.

9. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, vertically extending steam generating tubes in the walls of said passage and forming part of a natural circulation system, steam generating tubes in said flue, a pump adapted to force steam and water through said flue tubes in a direction counter to the flow of gases through the flue and a small bank of tubes extending across said passage and flue near the upper end thereof.

10. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a natural circulation system, steam generating tubes in said flue, a pump adapted to force steam and water through said flue tubes in a direction counter to the

flow of gases through the flue and a small bank of horizontally disposed tubes extending across said passage and flue near the upper end thereof.

11. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a circulation system, steam generating tubes in said flue, a pump adapted to force steam and water through said flue tubes in a direction counter to the flow of gases through the flue, a superheater disposed adjacent the top of said furnace and tubes disposed between said superheater and source to screen said superheater.

12. In combination, a furnace having a source of heat adjacent the bottom thereof, a vertically extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a circulation system, a small bank of tubes extending across the top of said passage and forming part of a circulation system, said systems having a common steam and water drum, steam generating tubes in said flue and connected to said drum and steam and water circulators extending across the roof of said furnace above said passage and said flue and communicating with said drum, and a pump adapted to force steam and water through said flue tubes and discharge the mixture into said drum.

13. In combination, a furnace having a source of heat adjacent the bottom thereof, an upwardly extending passage through which hot gases from said source may rise, a downwardly extending flue connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a natural circulation system, tubes in said flue, a pump adapted to force water through said flue tubes in a direction counter to the flow of gases through the flue, and a small bank of tubes extending across said passage and flue near the upper end thereof.

14. In combination, a furnace having a source of heat, an upwardly extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a natural circulation system, tubes in said flue, a pump adapted to force water through said tubes in a direction counter to the flow of gases through the flue, and a small bank of steam generating tubes extending across and beyond said passage near the upper end thereof.

15. In combination, a furnace having a source of heat, an upwardly extending passage through which hot gases from said source may rise, a flue having a downwardly extending portion connected at its top to said passage, steam generating tubes in the walls of said passage and forming part of a natural circulation system, tubes in said flue, a pump adapted to force water through said tubes in a direction counter to the flow of gases through the flue, a small bank of steam generating tubes extending across and beyond said passage near the upper end thereof, and a superheater above said bank of tubes.

HOWARD J. KERR.

4

CERTIFICATE OF CORRECTION.

Patent No. 1,823,050. Granted September 15, 1931, to

HOWARD J. KERR.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 11, beginning with the word "near" strike out all to and including the word circulation in line 12 and insert instead and across said flue near the upper ends thereof and forming part of a circulation; same page, line 21, claim 3, strike out the word "natural", and lines 26 and 27, same claim, strike out "said passage and across said flue near the upper ends thereof" and insert instead the top of said flue; line 37, claim 4, before "circulation" insert the word natural; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of November, A. D. 1931.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.