(No Model.)

F. L. WATEROUS.
UPRIGHT TUBULAR BOILER.

No. 489,051. Patented Jan. 3, 1893.

Fig. 1.

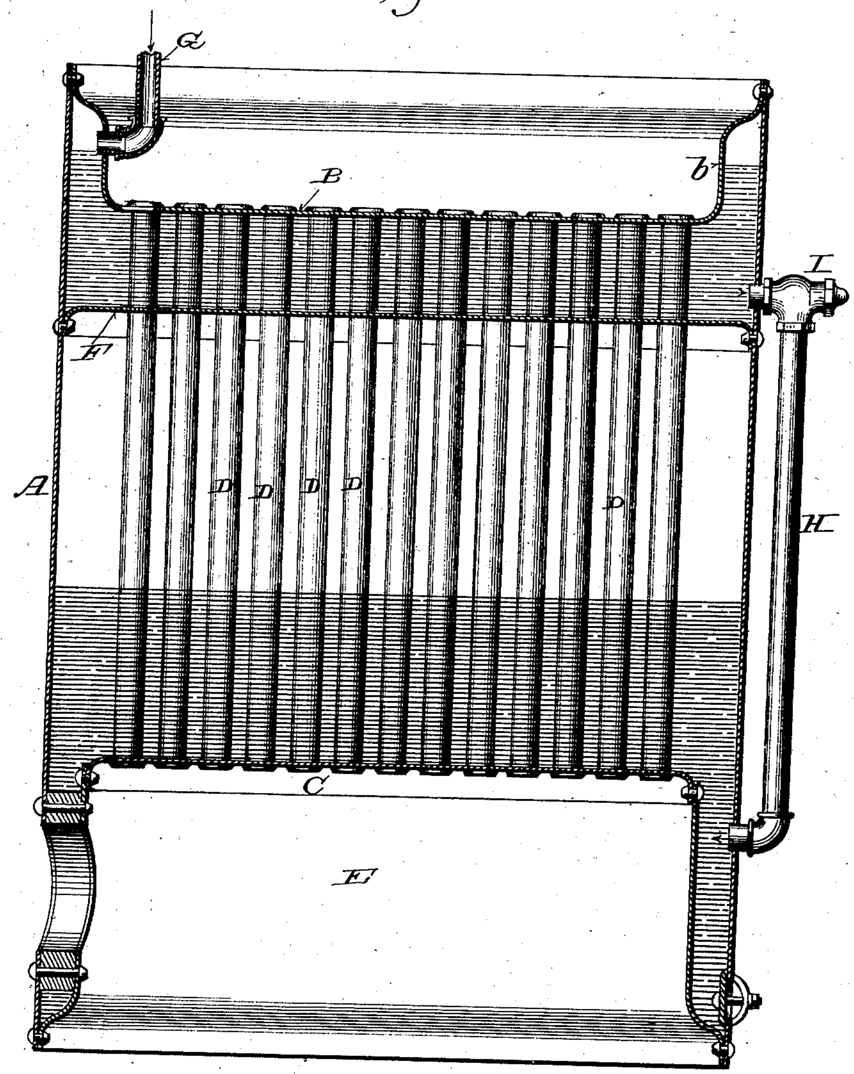
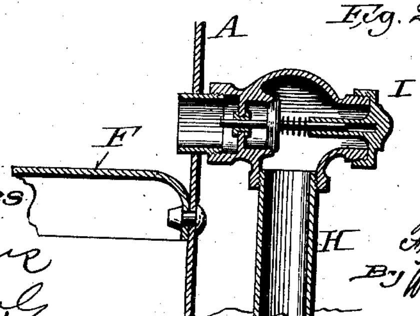


Fig. 2.



Witnesses
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UNITED STATES PATENT OFFICE.

FREDERICK L. WATEROUS, OF SOUTH ST. PAUL, MINNESOTA.

UPRIGHT TUBULAR BOILER.

SPECIFICATION forming part of Letters Patent No. 489,051, dated January 3, 1893.

Application filed April 14, 1892. Serial No. 429,109. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK L. WATEROUS, of South St. Paul, in the county of Dakota and State of Minnesota, have invented certain new and useful Improvements in Upright Tubular Boilers; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention consists essentially of certain improvements or modifications in the boiler shown, described and claimed in Letters Patent No. 400,529, granted to me April 2, 1889. Its object is to protect the joints of the tubes or flues in the upper flue sheet and incidentally to heat the water as it is fed into the boiler.

It consists essentially of providing a water chamber around the upper ends of the tubes, connected by a pipe having a compression valve or other suitable device with the lower portion of the boiler, and of certain other peculiarities of construction and arrangement hereinafter specifically set forth and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in both figures.

Figure 1 is a vertical medial section of a boiler embodying my improvements, and Fig. 2 is a similar section on an enlarged scale of a suitable form of compression valve for use in connection with my improvements.

A represents the shell, B the upper head or flue sheet, C the lower head or flue sheet, D D the tubes or flues secured at the ends in the usual manner in said flue sheets, and E the fire box of an upright tubular boiler, which may be of the usual or any suitable form and construction.

F is a horizontal diaphragm or partition plate, located a short distance below the upper flue sheet B, and inclosing therewith around the upper ends of the tubes D D, a water and steam tight chamber below which said tubes pass through the usual steam space and thus superheat the steam when the boiler is in operation.

To afford a larger water space between the flue sheet B and partition F, to insure at all times contact of water with the upper ends of the tubes where they join said flue sheet, and to relieve the boiler of strain due to any unequal expansion and contraction of said flue sheet, and the shell A to which it is attached, I prefer to turn said flue sheet upwardly and then outwardly around its edge, so as to form between it and the shell, an annular space extending above that portion of the flue sheet to which the tubes are attached.

G is a feed pipe through which water is forced into said chamber, and H is a pipe leading out of said chamber into the leg or lower portion of the boiler. This pipe H is provided with a compression valve I, shown in detail in Fig. 2, which opens outwardly from said chamber against a spring or other suitable device, by which the passage of water from said chamber is sufficiently opposed or retarded to keep said chamber constantly filled, or hold the water therein in contact with the upper flue sheet around the tubes.

In operation, water is pumped or forced through the pipe G, into said chamber, and filling the same above the upper ends of the tubes, is forced therefrom against the resistance of the compression valve I, through pipe H, into the lower portion of the boiler; the valve I being properly regulated to hold the water in said chamber above the upper ends of the tubes or in contact with the flue sheet B around said tubes. Water being thus kept constantly in contact with the upper ends of the tubes and upper flue sheet, prevents their becoming over heated and the joints from becoming loose and leaky. In passing through said chamber in contact with the tubes, the water is incidentally heated before it passes into the boiler, and the device thus serves to heat the feed water, as well as to preserve the upper ends of the tubes, the upper flue sheet and the joints between them.

I claim:

1. In an upright boiler, a water chamber around the upper ends of the tubes, and a connection between said water chamber and the lower portion of the boiler, provided with a compression valve whereby water in said chamber is held in contact with the upper flue sheet, substantially as and for the purposes set forth.

2. In an upright tubular boiler, a water chamber inclosed around the upper ends of the tubes between the upper flue sheet and a diaphragm located a short distance below it, and a connection leading out of said chamber below said flue sheet into the lower portion of the boiler and provided with a compression valve by which water in said chamber is held in contact with said flue sheet, substantially as and for the purposes set forth.

3. In an upright tubular boiler, the combination with the shell, of the upper flue sheet bent upwardly and outwardly at its edge, which is joined to the shell and forms therewith an annular space above the upper ends of the tubes, a diaphragm located a short distance below said flue sheet and inclosing therewith a water chamber around the upper ends of said tubes, and a pipe leading out of said chamber into the lower portion of the boiler and constructed and arranged to hold the water in said chamber in contact with said flue sheet around the upper ends of the tubes, substantially as and for the purposes set forth.

4. In an upright boiler, a water chamber inclosed around the upper ends of the tubes, and a connection between said chamber and the lower portion of the boiler, provided with a back pressure or retarding device, whereby water is caused to rise in said chamber and is held in contact with the upper flue sheet around the upper ends of said tubes, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

FREDERICK L. WATEROUS.

Witnesses:
W. HOHM,
CHAS. N. BELL.