

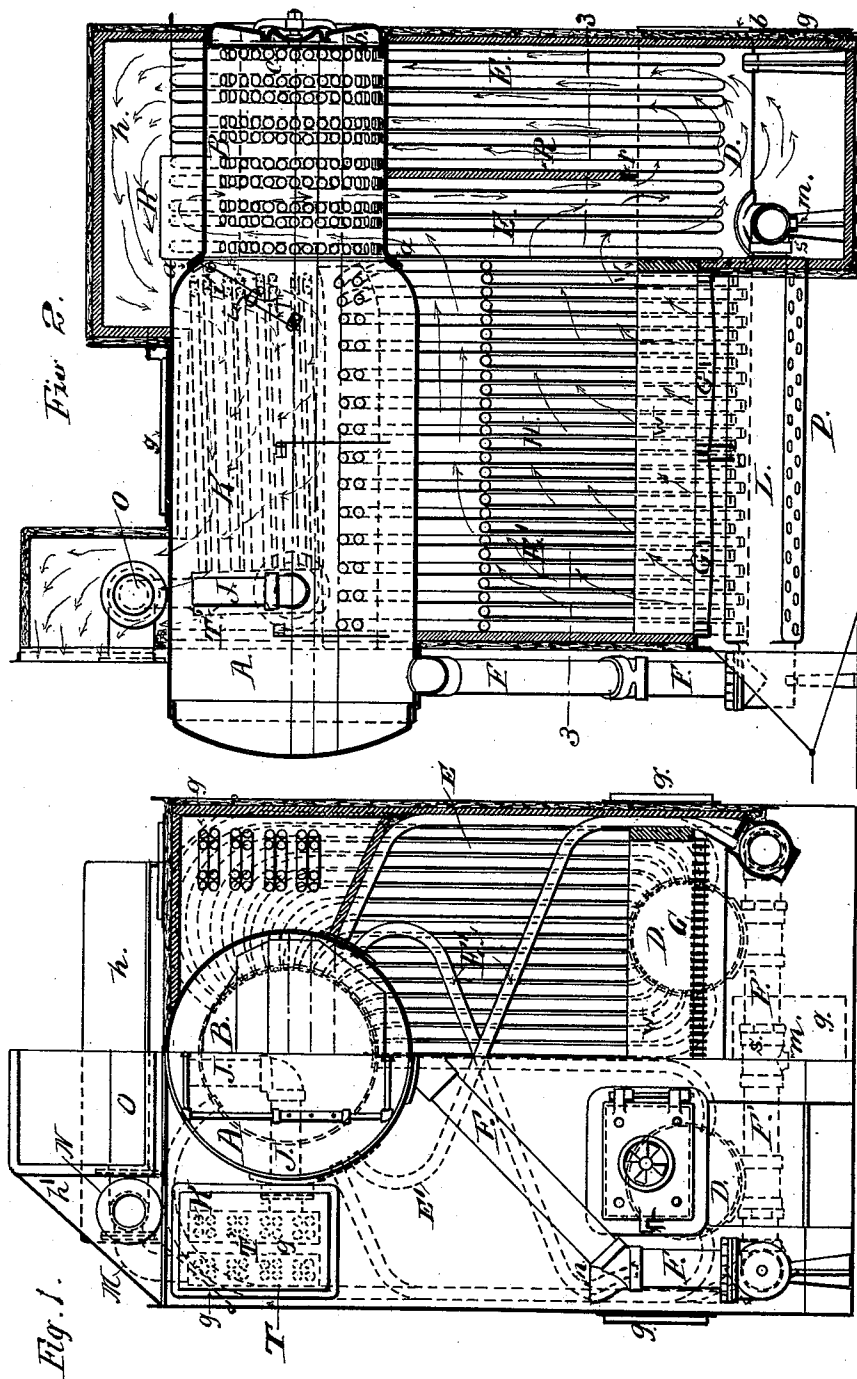
(No Model.)

2 Sheets—Sheet 1.

W. COWLES.
WATER TUBE BOILER.

No. 465,164.

Patented Dec. 15, 1891.



Witnesses
P. G. Keloe
C. J. Sawyer

Inventor
William Cowles
By his Attorneys
Philip Phelps & Co.

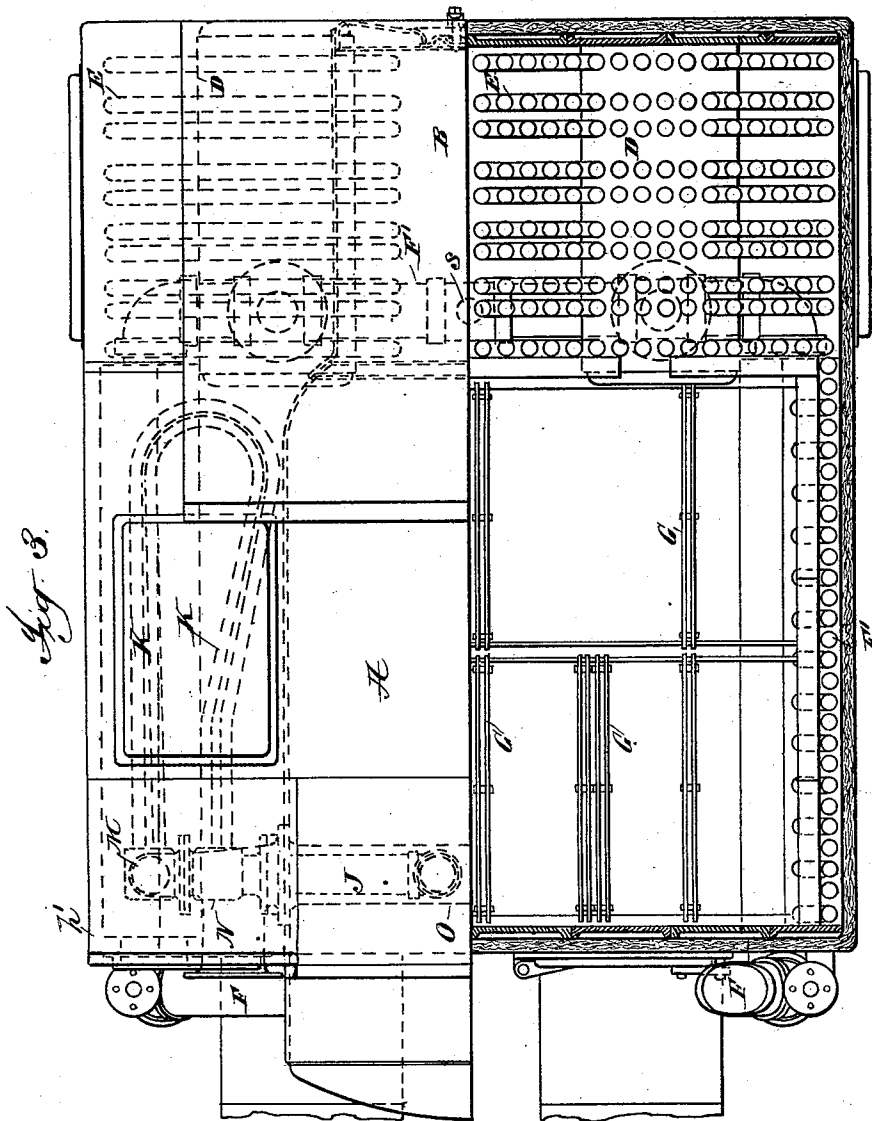
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UNITED STATES PATENT OFFICE.

WILLIAM COWLES, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE COWLES
ENGINEERING COMPANY, OF JERSEY CITY, NEW JERSEY.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 465,164, dated December 15, 1891.

Application filed June 13, 1890. Renewed May 23, 1891. Serial No. 393,893. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM COWLES, a citizen of the United States, residing at Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Water-Tube Boilers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 This invention relates to steam-boilers, and especially to that general class of steam-boilers in which the water is caused to circulate through circulating-tubes between one or more water-drums or manifolds located at or
15 near the bottom of the boiler and one or more steam-drums or manifolds located at or near the top of the boiler.

While the improvements constituting my invention are of general application in this
20 class of boilers, they have been designed especially as improvements in the type of boiler covered by United States Patent No. 396,545, granted to me January 22, 1889, it being the object of the present invention to improve
25 the general construction of boilers of this type and render them more compact and convenient in use, and especially to provide a boiler in which the heat shall be employed so as to produce a greater economy of operation.

30 With these objects in view my invention consists in various constructions and combinations of parts, all of which will be more particularly described in the specification and pointed out in the claims.

35 In order to aid in a more ready understanding of the detailed description of the construction and organization of the boiler hereinafter given, a brief general description of the organization of the boiler will first be
40 given. The furnace end of the boiler consists, essentially, of a horizontal cylindrical shell extending longitudinally of the boiler over the furnace and one or more manifolds located in the lower part of the boiler and connected to the shell by circulating-tubes.
45 There will preferably be employed two of these manifolds located below the furnace, and the circulating-tubes connected to the manifolds and shell are preferably so arranged that the alternate tubes from each
50 manifold cross over the furnace below the

shell, and are secured to the shell on the opposite side of the center of the boiler from their respective manifolds, the other circulating-tubes from each manifold extending to the shell on the same side as the manifold.
55 In the upper part of the boiler is a steam drum or drums, and in the lower part of the boiler two water-drums, one on each side, these steam and water drums extending rearward from the shell and furnace and the water-drums communicating with the manifolds on their respective sides. At the front of the boiler, outside the casing, downcast pipes extend downward from the end of the shell
60 on each side and communicate with the manifolds, these downcast pipes being provided with elbows, into which enter the feed-pipes, so that the feed-water is projected directly downward in the downcast pipes.
65 The manifolds thus form a part of the main circulating circuit in the boiler from the shell to the water-drums, the circulation between the shell and manifolds taking place upward through the circulating-pipes and downward through the downcast pipes. These manifolds are connected at their rear ends by an equalizing or cross-over pipe, which connects the two sides of the boiler and is provided with a "dead-middle" and bottom blow-off. In the
80 upper part of the boiler, on each side of the shell, are located other manifolds provided with superheater-tubes, through which the steam passes from the shell to the steam-pipe. The hot gases from the rear end of the boiler
85 are made to pass over and around the shell and superheater-tubes, and finally pass to the stack or flue through a second uptake at the front and top of the casing. The circulating-tubes are expanded into the water and
90 steam drums and are arranged in rows, with space between alternate rows for the removal and replacement of any of the tubes without disturbing any of the others or any permanent part of the boiler, this alternate arrangement of spaces resulting in a very compact
95 construction of the rear end of the boiler. The construction of the boiler in all essential particulars, except as above stated, is the same as that of the patent above referred to,
100 and need not be herein described.

The construction and organization, the

novel features of which have thus been outlined, will now be described in detail, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a front view, half in elevation and half in section, of a boiler constructed and organized according to the present invention with a furnace-manifold and water-drum on each side of the boiler and a single steam-drum. Fig. 2 is a longitudinal section of the same, taken on the axes of the shell and steam-drum. Fig. 3 is a top view, half in plan and half in section, the section being taken on line 3 3 of Figs. 1 and 2.

Referring now to said drawings, A is the shell, and B the steam-drum, extending longitudinally of the boiler, these parts being flanged conically at the ends *a*, as shown, and riveted or welded together to form a single steam and water chamber, the steam-drum being provided with flanged plate-heads *b* and man or hand holes *c*, giving access to the same. At the bottom of the boiler are the manifolds L and water-drums D, one at each side of the boiler, the water-drums D being provided with plate-heads and man-holes similar to those of the steam-drum. Casing-doors *g* are provided for access to other parts of the boiler.

A series of circulating-tubes E connect the steam and water drums, these circulating-tubes being arranged in pairs of rows, as shown, with space between alternate rows for the removal and insertion of any tube. These circulating-tubes E are bent at the ends, as shown, to allow of expansion and contraction, and are sprung into place and expanded into the steam and water drums, as in the patent above referred to. Another series of circulating-tubes E' connect the shell A and the manifolds L at each side of the boiler, these tubes being arranged, as shown, with alternate tubes from each manifold crossing over the furnace H beneath the shell, and secured to the latter on the opposite side thereof from their respective manifolds, the other tubes from each manifold extending directly upward and curving inward to the shell on the same side of the latter as the manifold.

Downcast pipes F extend from the front end of the shell A on each side outside the casing to the lower part of the boiler, where they communicate with the manifolds L, these downcast pipes being provided with elbows, as shown, entered by the feed-pipes *n*, which extend downward therein, so that the feed-water is projected directly down the pipes F and no cold water enters the shell. The manifolds L and water-drums D at each side of the boiler are in direct communication, and the equalizing or cross-over pipe F' extends between the rear ends of the manifolds, thus connecting the two sides of the boiler. This cross-over pipe F' has a dead-

middle part *s*, in which the sediment collects, and a bottom blow-off *m*, through which the sediment is removed.

The furnace H is of usual construction, provided with the grates G and the bridge-wall *w*. The fire-tile deflectors R in and over the tube-nests are supported by the cast-iron bar *r* and cause the fire and hot gases to circulate between the tubes, as indicated by the arrows on the drawings.

In the upper part of the boiler, on each side of the shell A, are located manifolds T, provided with superheater-tubes K, these manifolds T communicating with the shell or steam-chamber A through pipes J at each side of the boiler. From the manifolds T the steam passes through pipes M to the steam-pipes N, located inside the casing at the top of the boiler, the steam-pipes on opposite sides being connected, preferably, by a pipe O, extending transversely of the boiler. At the rear of the shell, over the mouth of the steam-drum, are placed baffle-plates *j*, consisting, preferably, of two or more sheet-metal plates secured in an inclined position and overlapping one another, so as to deflect the water downward and allow the steam to escape upward between the plates, as indicated by the arrows *i*. The hot gases, after circulating among the tubes E and around the steam-drum B at the rear end of the boiler, pass to the removable uptake *h*, and thence over and around the shell and superheaters, and are finally released to the stack through a second uptake *h'* at the front and top of the casing, as shown by the arrows in Fig. 2, the heat of these gases thus being fully utilized as they pass over the steam-chamber and superheaters.

The general operation of the boiler thus organized is substantially the same as in the patent above referred to, as will be readily understood from the above description, except that the manifolds L and tubes E' form a part of the circulating system. The steam does not pass directly to the steam-pipe, but through the superheating-manifolds T. No description of the operation of the boiler, therefore, need here be given.

It will be seen that by my improvements I secure a greater economy of operation, the heat of the furnace being more completely and directly utilized by the use of the furnace-manifolds L and the circulating-tubes extending over the furnace and by the superheaters and the circulation of the hot gases from the rear to the front end of the boiler, and that I secure a more compact arrangement of the circulating-tubes at the rear end of the boiler and a more convenient construction of downcast tubes and feed-pipes, the latter being placed at the front end of the boiler outside the casing.

What I claim is—

1. In a steam-boiler, the combination, with horizontal steam and water drums and verti-

cal or substantially vertical circulating-tubes connecting said drums, of the shell A, communicating with said drums and forming a steam-chamber, and superheaters through which the steam passes from the steam-chamber, substantially as described.

2. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, communicating with said drums and forming a central steam-chamber, and superheaters on each side of the boiler, through which the steam passes from the steam-chamber, substantially as described.

3. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, located over the furnace and communicating with said drums to form a steam-chamber, and superheaters located between said shell and the boiler-casing and over the furnace, through which the steam passes from the steam-chamber, substantially as described.

4. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, communicating with said steam-drum to form a steam-chamber, and a manifold or manifolds with which the shell is connected and which communicate with the water drum or drums, substantially as described.

5. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, communicating with said steam-drum, and horizontal manifold L on each side of the boiler, with which the shell is connected and which communicates with the water-drums, substantially as described.

6. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, communicating with said drums to form a chamber for steam and water, and downcast pipe or pipes F, located outside the casing and connecting said shell and water drum or drums, substantially as described.

7. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, communicating with said steam-drum, a manifold L, communicating with the water-drum, and circulating-tubes and downcast pipe F, connecting said shell and manifold, substantially as described.

8. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, communicating with said steam-drum, manifolds

L, communicating with the water-drums, and circulating-tubes and downcast pipes F, connecting said shell and manifolds, substantially as described.

9. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, communicating with said steam-drum, manifolds L at each side of the boiler communicating with the water-drums, circulating-tubes and downcast pipes F, connecting said shell and manifolds, and equalizing or cross-over pipe F' between said manifolds, substantially as described.

10. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, located over the furnace and communicating with said steam-drum to form a steam-chamber, horizontal manifolds L on each side of the boiler, and circulating-tubes E', connecting said steam-chamber and manifolds and passing over the furnace below the chamber, substantially as described.

11. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, located over the furnace and communicating with said steam-drum to form a steam-chamber, horizontal manifolds L on each side of the boiler, and circulating-tubes E', connecting said steam-chamber and manifolds, alternate tubes from each manifold being crossed over the furnace below the chamber, substantially as described.

12. In a steam-boiler, the combination, with horizontal steam and water drums, of vertical or substantially vertical circulating-tubes connecting said drums and located in rows, with space between alternate rows for the removal and insertion of any tube without disturbing any of the others, substantially as described.

13. In a steam-boiler, the combination, with horizontal steam and water drums, of vertical or substantially vertical circulating-tubes connecting said drums, said tubes being located in nests on each side of the boiler and arranged in rows, with space between alternate rows for the removal and insertion of any tube without disturbing any of the others, substantially as described.

14. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, forming a steam-chamber, the downcast pipe or pipes F outside the casing connecting said shell with the water drum or drums, and the feed pipe or pipes n, entering said downcast pipe or pipes, substantially as described.

15. In a steam-boiler, the combination of the steam-chamber A, manifolds L on each side

of the boiler, circulating-tubes and downcast pipes F, connecting said chamber and manifolds, and the equalizing or cross-over pipe F', substantially as described.

5 16. In a steam-boiler, the combination, with horizontal steam and water drums and vertical or substantially vertical circulating-tubes connecting said drums, of the shell A, forming a steam-chamber, downcast pipes F, connecting said shell and water-drums, and cross-

over pipe F', having a dead-middle s, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM COWLES.

Witnesses:

C. J. SAWYER,

J. J. KENNEDY.