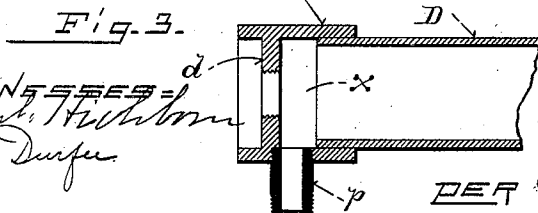
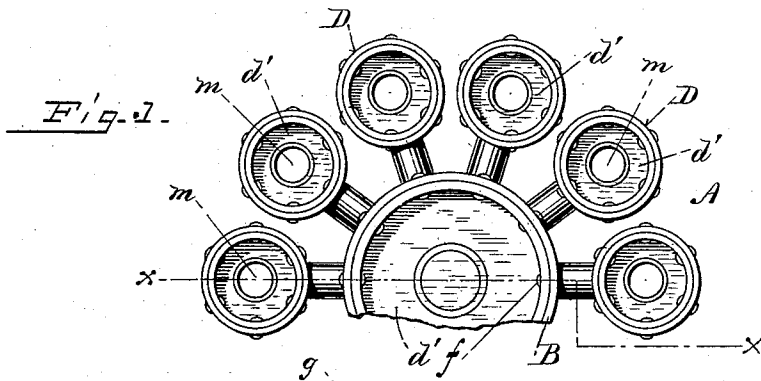
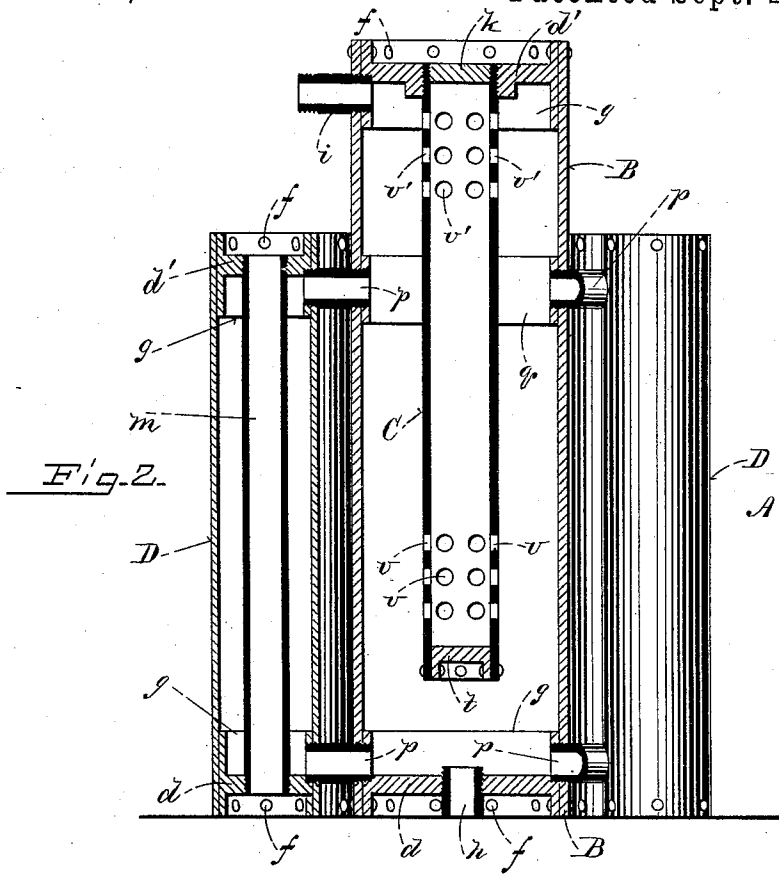


(No Model.)

W. B. FOWLER.
BOILER FOR MARINE ENGINES.

No. 483,000.

Patented Sept. 20, 1892.



WITNESSES:
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UNITED STATES PATENT OFFICE.

WALTER B. FOWLER, OF LAWRENCE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO LEWIS SAUNDERS, OF SAME PLACE.

BOILER FOR MARINE ENGINES.

SPECIFICATION forming part of Letters Patent No. 483,000, dated September 20, 1892.

Application filed March 24, 1892. Serial No. 426,223. (No model.)

To all whom it may concern:

Be it known that I, WALTER B. FOWLER, of Lawrence, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Boilers for Marine Engines, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which said invention appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a top plan view of a portion of my improved boiler; Fig. 2, a vertical transverse section of the same, taken on line *xx* in Fig. 1; and Fig. 3, a longitudinal section of a portion of one of the circulation-tubes, showing a method of disposing the head or cap.

Like letters of reference indicate corresponding parts in the different figures of the drawings.

My invention relates especially to vertical tubular boilers; and it consists in certain novel features hereinafter fully set forth and claimed, the object being to produce a simpler, cheaper, and more effective device of this character than is now in ordinary use.

The nature and operation of the improvement will be readily understood by all conversant with such matters from the following explanation.

In the drawings, A represents the boiler considered as a whole.

The boiler consists of a main or central cylinder B, the ends of which are closed by sunken or depressed heads *d d*, secured to the inner wall of the cylinder by rivets *f*. These heads have an inwardly-projecting annular reinforcing-flange *g*. The head *d* is provided centrally with a supply-port *h*, and the head *d* is tapped laterally through its flange *g* and the cylinder B by a discharge-duct *i*. A series of circulation-tubes or supplemental cylinders D is arranged in a circle around the cylinder B, each cylinder D being provided with riveted depressed heads *d d* of the same construction as the heads of the main cylinder B. The heads *d d* of the cylinder D are connected by open draft-flues *m*, turned centrally through said heads. The tubes D are less in length than the main cylinder B and are connected

therewith at their tops and bottoms by horizontally-arranged circulation-ducts *p*, which are screw-threaded and are turned through the tube-walls and the adjacent reinforcing-flanges *g* of the heads, said ducts opening flush with the heads *d d* of the supplemental cylinders or tubes. The upper circulation-ducts *p* are turned through a reinforcing-ring *q*, which is shrunk into the main cylinder B. Said ring, however, may be omitted, if desired, its purpose being simply to strengthen the walls of the main cylinder at the coupling-point and permit lighter material to be employed in forming said cylinder. A tube C is pendent vertically from the main-cylinder head *d* and extends within a determined distance of the lower head *d* of said cylinder. Said head *d* is tapped centrally to receive the threaded end of said tube, and the upper end of said tube is also tapped to receive a screw-plug *k*, which is turned therein to close the same. The lower end of the tube C is closed by a depressed head *t*, riveted therein, and for a short distance above said head the walls of said tube C are provided with a series of perforations *v*. Like perforations *v* are formed in the tube-walls adjacent to the main-cylinder upper head *d*. The hot air and products of combustion from the fire-box passing through the flues *m* and around the cylinders, water circulates through the ducts *p* between said cylinders.

The peculiar construction of the heads and reinforcing-flanges enables very light material to be employed in constructing the cylinders.

The upper portion of the main cylinder B serves all the purposes of a steam-chest. The pendent tube C within said cylinder serves to create a circulation of water in the main cylinder therethrough. Condensation of the steam which enters the ports *v* falls in the tube C and passes out the lower ports *v*.

A constant circulation is maintained within the main cylinder by the pendent tube, and it is found that its use serves to practically prevent the water therein from boiling, rendering the boiler noiseless, while not depreciating from its steam-generating qualities. Moreover, I find that the steam in the upper portion of the main cylinder or steam-chest

is rendered much drier by the use of the perforated tube.

In Fig. 3 the head d is shown greater in diameter than the circulation-tube D. Said tube D is admitted into the flange g of the head as far as the duct p and is secured by shrinking the head on or by welding. A space x , greater in diameter than the tube D, is left directly opposite the mouth of the connecting-duct p . This I find of much advantage in accelerating the circulation, the water from the ducts apparently racing in said spaces.

Having thus explained my invention, what I claim is—

1. In a tubular boiler, a main cylinder, a series of supplemental cylinders, circulation-ducts connecting said supplemental cylinders with the main cylinder, and a pipe pendent within said main cylinder and provided with circulation-openings near its top and bottom, substantially as and for the purpose set forth.

2. In a tubular boiler, a main cylinder having its ends closed by inwardly-depressed heads, through which the supply and discharge ports, respectively, open, and a tube pendent within said cylinder from one of said heads; said tube having its ends closed and provided with circulation-openings in its walls adjacent said ends, substantially as and for the purpose set forth.

3. A tubular boiler for marine engines, comprising a series of tubes arranged around a main cylinder and connected thereto by circulation-ducts, the ends of said cylinders and tubes being closed by inwardly-depressed heads flush with said ducts, flues connecting the heads of each tube, a tube pendent within said main cylinder from one of its heads and provided with circulation-openings, and a supply and discharge port for said main cylinder, substantially as described.

4. In a tubular boiler, a main cylinder pro-

vided with a supply and discharge port and having its ends closed by inwardly-depressed heads, in combination with a perforated pipe projecting into said cylinder from one of said heads and having closed ends, substantially as and for the purpose set forth.

5. In a tubular boiler, a main cylinder provided with inwardly-depressed heads having reinforcing-flanges, a supply and discharge port for said cylinder, a perforated pipe projecting into said cylinder from one of said heads, a series of supplemental cylinders shorter than and arranged around said main cylinder and connected therewith by radial circulation-ducts, inwardly-depressed flanged heads secured in said supplemental cylinders, and flues opening through said heads, all being arranged to operate substantially as described.

6. The main cylinder B, having closed ends, the shorter circulation-tubes D, provided with flues, and the horizontal ducts p , connecting said tubes and cylinder, in combination with the tube C, pendent from the upper cylinder-head, said tube having closed ends and its walls perforated above and below the top of the circulation-tubes, substantially as and for the purpose set forth.

7. A boiler-tube provided with an inwardly-depressed head having a reinforcing-flange welded onto said tube, having an enlarged space between the end of said tube and head, substantially as described.

8. The tube D, in combination with the head d , having the flange g secured around said tube and forming the space x , and the duct p , opening into said space, substantially as described.

WALTER B. FOWLER.

Witnesses:

JOHN S. GILE,

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