

(No Model.)

N. G. HERRESHOFF.
STEAM BOILER.

No. 605,784.

Patented June 14, 1898.

Fig. 1.

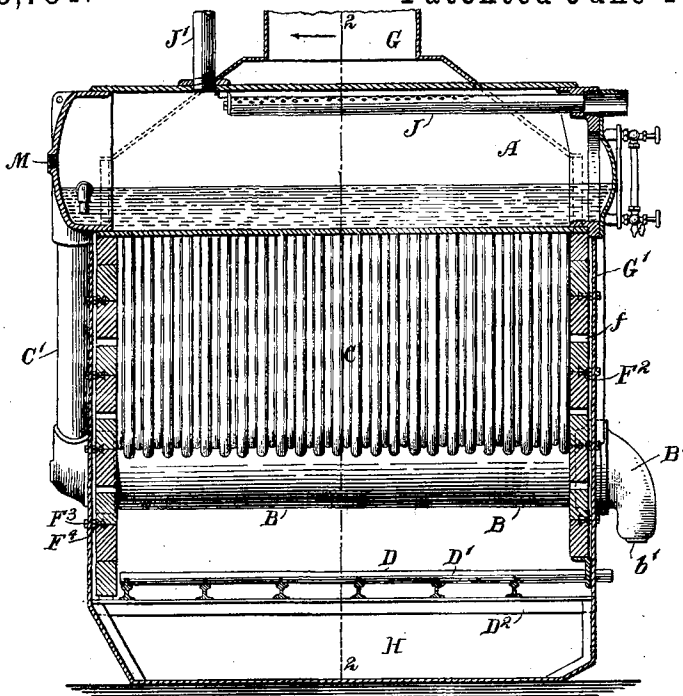
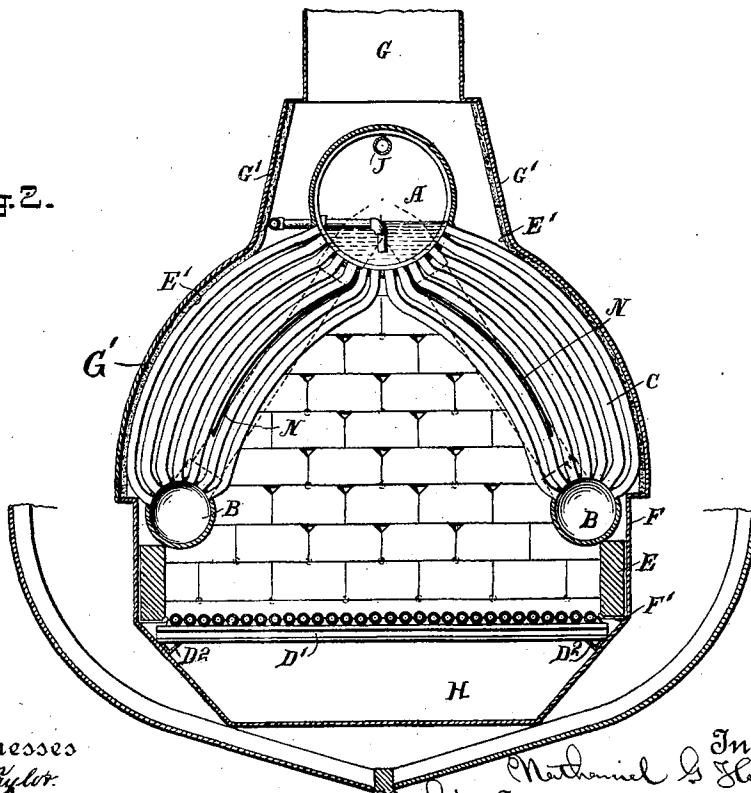


Fig. 2.



Witnesses
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By his Attorney
Thomas Spear Watson

UNITED STATES PATENT OFFICE.

NATHANIEL GREENE HERRESHOFF, OF BRISTOL, RHODE ISLAND, ASSIGNOR
TO THE HERRESHOFF MANUFACTURING COMPANY, OF SAME PLACE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 605,784, dated June 14, 1898.

Application filed September 28, 1897. Serial No. 653,287. (No model.)

To all whom it may concern:

Be it known that I, NATHANIEL GREENE HERRESHOFF, a citizen of the United States, residing at Bristol, in the county of Bristol and State of Rhode Island, have invented a certain new and useful Improvement in Steam-Boilers, of which the following is a specification.

The improvement is based on what is commonly known as the "Du Temple" form of boiler. The fire-surface is presented mainly by small bent tubes which extend in inclined directions to the right and left and downward from a central horizontal drum or cylindrical shell and connect to two smaller horizontal drums, one on each side. Two large pipes also extend outward and downward from the upper and central drum and connect also to the lower side drums. The water circulates actively, moving upward and inward through the small pipes, which are very efficiently heated by radiation from the fire below and also by the active circulation of the gaseous products of combustion among them. The steam separates from the water in the upper and central drum, and the water descends in the large inclined pipes, which are arranged at the back end, and flows forward in the side drums to rise again through the pipes, maintaining an active circulation in this manner so long as the boiler is in operation. I have devised important improvements in the details, one of the principal of which is the lowering of the grate or the elevation of the side drums, or both, so that the grate is considerably below the lowest portions of the side drums and is allowed to extend out under such drums, thus giving a much more extended grate-surface than is attained by the ordinary arrangement, which places the grate upon a level with the centers of the side drums. I bevel the ash-pan at each side, corresponding approximately with the inclination of the adjacent portions of the yacht or steam vessel in which it is placed. I arrange the sheet-metal baffle-plates near the innermost of the series of inclined pipes. I provide a depending pocket at the front of each of the side drums, with provisions for emptying the same as often as desired by blowing off.

The accompanying drawings form a part of

this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a longitudinal central vertical section, and Fig. 2 is a cross-section on the line 2 2 in Fig. 1.

Similar letters of reference indicate corresponding parts in both the figures where they appear.

I have shown in Fig. 2 the lower portion of the hull of a steam vessel in which the boiler is used.

A is the upper and central drum; B B, the lower drums, one on each side, arranged parallel with the upper drum A.

C is the series of bent tubes which connect A and B on each side, and C' C' are the larger tubes, one on each side, which carry down the water and maintain the circulation.

D is the grate, and E E are the thick and efficient fire-brick sides protecting the considerable spaces intervening between the grate and the drums B. The bricks forming these sides E are supported on shelves F' of metal extending inward from the casing F.

G is the stack, performing its ordinary functions, and G' the upper portion of the boiler-casing, which may be composed of thin sheet-iron lined with non-conducting material E', of asbestos, mineral wool, or the like, secured by cement or by wire-netting and rivets or by both these means.

I have shown the grate as formed by cylindrical bars supported at short intervals on efficient bearers D', which are held upon angle-irons D² at the sides of the ash-pit H. These sides are beveled at an angle of about forty-five degrees, as shown.

N N are baffle-plates extending downward about three-fourths of the distance from the upper drum A to the lower drum at each side. These plates are curved to correspond to the curvature of those tubes C which are immediately adjacent thereto. They are arranged near the inner face or the series of tubes on each side. Two tiers or some other small number of tubes lie between them and the fire; but these are sufficient to defend the baffle-plates from the direct radiant heat from the fire. The greater proportion of the tubes in each series lie outside of the baffle-

plates and abstract the heat from the gases in their final upward flow to the stack. Provision is made for active circulation of the water in all the tubes. The innermost are easily accessible from the interior of the furnace for repairs or replacement.

The feed-pipe is arranged to introduce the feed-water at the rear end of the drum A near the junction of the descending pipe C'. However the feed-water may be heated, it is always cooler than the general interior of the boiler and tends to descend. The feed introduced at this point contributes to the descent of the dense water in the pipes C', so that it is certain to be thoroughly mingled with the general mass of water therein before it is distributed upward through the small pipes C, in which the change of the water into steam is mainly induced. It is important that the water be well up to the temperature before it enters any of the pipes C in order that it may commence to be changed into steam at a low point in such pipe and thus contribute by its levity to the activity of the circulation.

A capacious pocket B' is bolted on the front end of each side drum B. In the base of each pocket is a nozzle b', which may be valved and connected with a pipe (not shown) for conveying away mud and water. These pockets form quiet places in which the solid matter in the water may accumulate. They should be blown out at intervals, depending on the quality of the water.

I attach importance to the baffle-plates N N in the combination because they afford a cheap and tight bar to the escape of the hottest gases from the top of the central space over the fire and allow very free passage for the escape near the base at each side.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. The grate may be extended laterally beyond the ordinary line farther or less far than shown. There may be more or less space than shown for the thickness of the stratum of burning coals and for the circulation of the gases between the upper surface of the grate and the lowest portions of the side drums.

I have shown two pipes through which the steam may be taken from the boiler, one, the horizontal pipe J, extending along within the drum A, near the top, and perforated on the

upper side. The other, J', is vertical and is shown as taking the steam entirely from one point. The steam may be taken from either of these or from both. The vertical delivery J' may connect with a horizontal pipe perforated similarly to J. Other details may be varied within reasonable limits.

I do not in this patent claim the air-passages f through the fire-brick walls which constitute the back and front of the boiler, nor the recesses at the mid-thickness of those bricks and channels connecting therewith receiving bolts F², each extending outward through the outer casing G' and secured by nuts F³ F⁴, because they are claimed in a separate patent of even date herewith.

There may be three tiers of tubes C between each baffle-plate N and the fire instead of the two shown. Three may be preferable.

I claim as my invention—

1. In a steam-boiler, in combination with a central drum, side drums at a lower level, and a set of water-tubes between said central drum and each of said side drums, a fire-grate extended under said side drums so as to expose the same to the fire-gases, and baffle-plates arranged to concentrate the fire-gases at the lower portions of said water-tubes, substantially as described.

2. In a steam-boiler, in combination with a central drum, side drums at a lower level, and a set of water-tubes between said central drum and each of said side drums, a fire-grate extended under said side drums so as to expose the same to the fire-gases, and baffle-plates arranged between said water-tubes and extending downward from the said central drum so as to concentrate the fire-gases at the lower portions of said water-tubes while at the same time exposing said tubes to the fire-gases partly within the fire-chamber and partly within the flues outside said baffle-plates, said flues having their intakes at the lower ends and their gas-discharge openings at the upper ends thereof, substantially as described.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

NATHANIEL GREENE HERRSHOFF.

Witnesses:

C. W. YOUNG,
CHAS. B. EDWARDS.