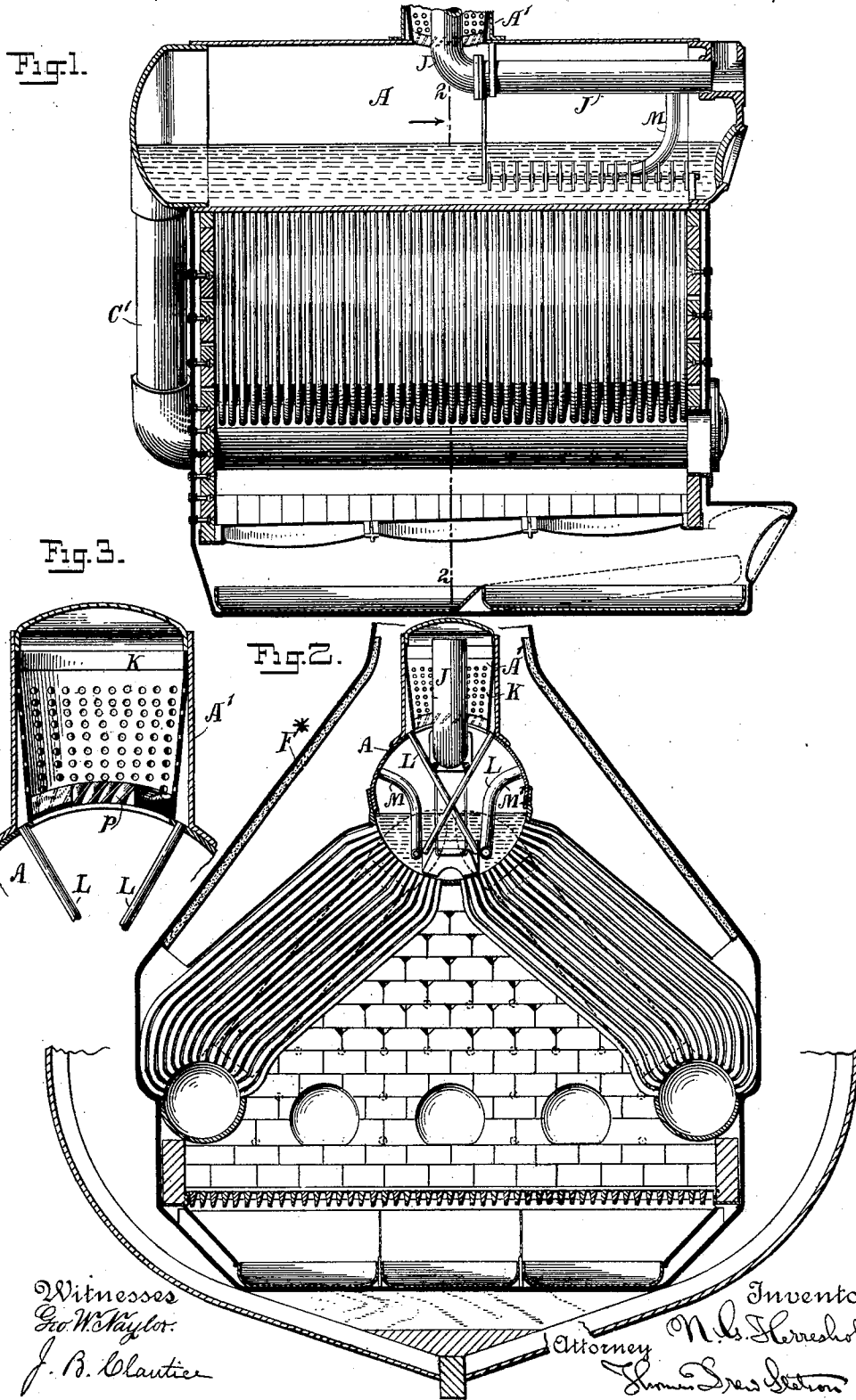


(No Model.)

N. G. HERRESHOFF.
STEAM BOILER.

No. 605,785.

Patented June 14, 1898.



Witnesses
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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. 605,785, dated June 14, 1898.

Application filed September 28, 1897. Serial No. 653,288. (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.

My improvement relates to dry-steam separators, and is intended for use in connection with steam-boilers more especially designed for steam vessels of moderate size, as yachts and torpedo-boats, and I will describe it as thus applied; but it may be of service in many other situations.

I provide for efficiently separating the unevaporated water from the steam and returning it to the boiler at points below the water-line, so that I can obtain practically dry steam from a boiler with a fire vigorously forced.

I have illustrated my invention as applied to what is known as the "Du Temple" form of boiler, in which the fire-surface is presented mainly by tubes more or less bent and connecting three horizontal cylinders, shells, or drums, the middle one being the highest and largest, the tubes, properly bent, extending therefrom to the lower cylinders or drums on each side, respectively.

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 central longitudinal vertical section, and Fig. 2 a transverse vertical section on the line 2 2 in Fig. 1. Fig. 3 shows, on a larger scale, a partial section corresponding to Fig. 2, but with the series of inclined deflectors in elevation not sectioned. The steam-pipe is also omitted to more clearly show the perforated conical screen.

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

A' is a dome on the boiler shell or drum A, providing an elevated space, from which the steam is taken through an internal pipe J and connected in the obvious manner. The liberal aperture obviously required in the upper portion of the cylindrical shell A to communi-

cate properly with the interior of the dome A' is of less diameter than the interior of the dome, but is much larger than the pipe J, which stands in the center. A continuous series of inclined deflectors P are mounted in the annular space thus provided, leaving a clear space above in which the steam traverses helically in consequence of the inclination which its several particles have received in passing the deflectors P below.

K is a conical strainer or foraminous sheet of thin metal arranged within the dome, as clearly shown in Figs. 2 and 3, and L L are small pipes leading down from the space outside of such perforated conical screen and opening into the interior of the boiler-shell A at points below the water-line.

When the boiler is in operation and steam is being taken away, it enters the pipe J at the top by traversing upward in the interior of the dome A'. As it ascends in the dome it is deflected through the inclined passages and performs a helical movement. The centrifugal force of the particles of water which may be very liberally mingled with the steam when the steam is generated rapidly by the fire on my extended grate causes such denser particles to be separated from the steam by being thrown against the conical screen. So soon as such water passes outward through this screen it is free to flow down in the quiet angular space surrounding this screen, between it and the interior of the dome, and it soon flows down quietly through the pipes L L and mingles with the water in the boiler.

It will be understood that my boiler may have all the ordinary appurtenances—clothing, safety-valves, gage-cocks, &c.

There is an intimate relation between the parts in that the broad grate extending under the lower drums B B generates much steam therein, requiring a large amount of dense water flowing down the rear tubes C' and sending up water so mingled with steam through the small tubes C, thus attaining unusually rapid circulation with extraordinary efficiency, but delivering the steam unusually wet. My peculiarly compact and efficient means for separating completes the coöperative combination.

I attach importance to the extension of the material of the upper drum A sufficiently inward within the base of the dome A' to constitute the bottom of the annular space exterior to the conical foraminous screen K within the dome, for the reason that it not only constitutes an efficient support for said screen and for the pipes L and the annular series of inclined deflectors P, but also because it increases the strength of the drum A, causing it to become less weakened than it would be if the aperture in said drum were, as in ordinary boilers, the full size of the base of the dome.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. I have shown two tubes L L. One may suffice or more may be used. They perform the important function of providing a passage through which the water separated from the steam in the dome may quietly descend and mingle again with the water in the boiler. The lower end being below the lowest water-line of the boiler avoids any possibility that steam can rise through that passage, and thus create a steam-current in opposition to such descent.

I do not in this patent claim the broad grate in a plane below the side drums and extending outward under the same, because such is made the subject-matter of a separate application for patent filed September 28, 1897, Serial No. 653,287; neither do I claim in this patent the peculiarities of the furnace-wall and the provisions for preventing back draft, such being made the subject of a separate application for patent filed January 11, 1898, Serial No. 666,307.

I claim as my invention—

1. In a dry-steam separator, a dome or inclosing casing, a deflector located at the base thereof, presenting an inclined passage to impart a helical movement to the ascending current of steam and leaving a circular clear space above said deflector, in combination with a foraminous screen K, in the interior near the periphery of the dome or casing, and against the inner face of which the steam is whirled in circulating contact, a lower water-discharge external to the screen, and a dry-steam-education pipe leading from the upper part of the dome or casing, substantially as herein specified.

2. In a dry-steam separator, a dome or inclosing casing closed at the top, a deflector located at the base thereof, presenting an inclined passage to impart a helical movement to the ascending current of steam and leaving an annular clear space above said deflector, in combination with a foraminous screen K extending around in the interior near the periphery, a lower water-discharge external to the screen, and a dry-steam-education pipe leading downward from the upper part of the

dome or casing in the axis thereof, substantially as herein specified.

3. In combination with a steam-boiler having a water-surface insufficient for the proper disengagement of the steam, the dome A' extending upward from the body of the boiler, the steam-pipe J extending downward from near the top in the center of the dome, a foraminous screen K in the interior near the periphery of the dome leaving an annular space exterior thereto, a pipe L leading downward from such exterior space to a point below the water-level in the boiler, and a series of inclined deflectors P arranged in the bottom of the annular space between such screen and the central pipe leaving the upper portion of such space clear, adapted to impart a helical motion to a large quantity of steam ascending therethrough while requiring little vertical height in the series, all arranged for joint operation substantially as herein specified.

4. In combination with a steam-boiler having a water-surface insufficient for the proper disengagement of the steam, the dome A' extending upward from the body of the boiler, a pipe J extending downward in the center, the foraminous screen K in the interior near the periphery of the dome, leaving an annular space exterior thereto, the pipe L leading downward from such exterior space to a point below the water-level in the boiler, and a substantially annular series of inclined deflectors P arranged in the base of the dome between such screen and the central pipe, adapted to impart a helical motion to the steam ascending therethrough leaving an unobstructed space above such deflectors in which the particles of water may freely move tangentially to reach the screen, all substantially as herein specified.

5. In a steam-boiler, a dome A' covering a portion of the drum or body A outside of the aperture for such dome and a foraminous screen K extending around within the dome and joined to the body at the edge of the aperture, in combination with a series of inclined deflectors P arranged to cause the steam rising through it to travel helically in a clear space above so that the inclosing foraminous screen shall receive the particles of water and allow them to move outward through it and descend in a quiet space outside thereof, and one or more pipes L communicating between such quiet space and a point in the body or drum below the water-line, such pipes being set in the portion of the boiler-shell within the dome, all substantially as herein specified.

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

NATHANIEL GREENE HERRESHOFF.

Witnesses:

C. W. YOUNG,
LEWIS H. DE STOLL.