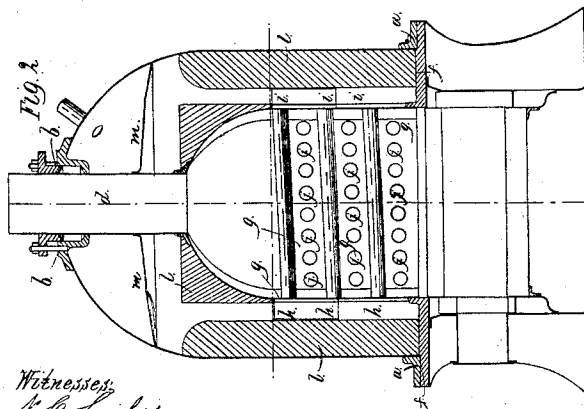
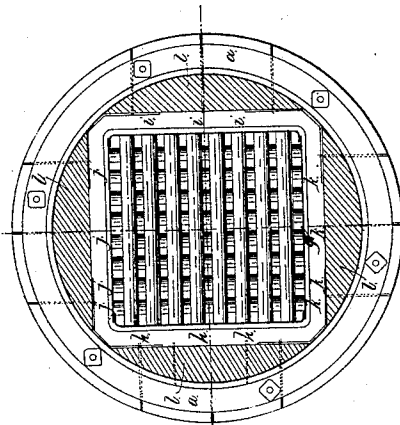
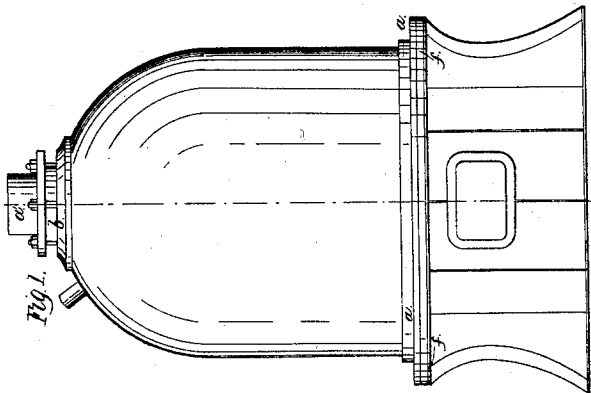


G. A. STONE & J. A. WHIPPLE.
STEAM BOILER.

No. 27,843.

Patented Apr. 10, 1860.



Witnesses,
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J. B. Stone

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UNITED STATES PATENT OFFICE.

GEORGE A. STONE, OF ROXBURY, AND JAS. A. WHIPPLE, OF BOSTON, MASSACHUSETTS.

STEAM-BOILER.

Specification of Letters Patent No. 27,843, dated April 10, 1860.

To all whom it may concern:

Be it known that we, GEORGE A. STONE and JAMES A. WHIPPLE, the former of Roxbury, in the county of Norfolk, and the latter of Boston, in the county of Suffolk, both in the State of Massachusetts, have invented certain new and useful Improvements in Steam-Boilers, and that the following specification, taken in connection with the drawings, is a full, clear, and exact description thereof.

In the drawings Figure 1, is an elevation of a boiler made according to the principles of our invention and Figs. 2, and 3, are respectively vertical and horizontal sections through the same.

The boiler contrived by us is designed principally for use as a portable boiler, but it may be made on a large scale and the principles of our invention may be embodied in a variety of forms.

The objects aimed at by us and which we believe we have attained are as follows: First, a large quantity of effective heating surface in a small space. Second, a conformation of boiler which can be constructed of requisite strength without the use of stays or socket bolts, while at the same time but a small quantity of water is contained within the boiler, so that it will when filled, be light, proportionally speaking and with reference to its evaporating power, and thirdly, a construction of boiler, which will admit of repair and also of the removal of scale, when there is no space left for the removal of tubes or the use of scaling instruments. And having these ends in view, we have made a boiler with a cylindrical shell, and in which the fire surface is composed chiefly of tubes so disposed that they act as braces to and sustain the tube chamber; we have lined the inside of the shell with wood so as to fill up the water spaces partially and we have so combined the shell, tube box, uptake and sole plate that the shell may readily be removed, so as to expose the tube box for the purpose of cleaning and repair.

With a view of obtaining a good circulation and preventing the lodgment of steam inside the tubes, we have inclined them in certain directions and so arranged them with

respect to the water spaces that when the boiler is in action, there shall be an upward current of steam and water on two sides of the tube box, and a downward current of water on the other two sides.

We will now proceed to describe our invention by reference to the drawings. The shell of the boiler, it will be perceived is cylindrical, with a dome top; it therefore needs no staying and the lower edge of the shell is flanged or has a flange such as *a* riveted to it; to the upper part of the shell, is secured by bolting or riveting a stuffing box *b*, with an ordinary gland and space for packing and large enough to receive an uptake *d*, to which the chimney (not represented in the drawings) is to be secured or with which the chimney is to connect; the flange is to be secured by screw bolts and nuts (as plainly shown in the drawings) to a sole plate *f*, thus making a joint which may be broken and refitted between the shell and the heating surface which is attached to the sole plate; and to this sole plate is to be riveted or bolted firmly a tube box such as *g*; this tube box is rectangular and has a domed top, and the tubes extend across it from side to side, each row being disposed at right angles to the one above or below it or nearly so, as shown in the drawings—and the interiors of the tubes connecting with the space between the shell and tube box, which is the water space of the boiler. These tubes are not horizontal but inclined upward from *h*, toward *i*, and the rows at right angles thereto proceeding upward from *j*, toward *k*.

To the lower side of the sole plate is to be secured a fire box made in any proper manner; that shown in the drawings will answer well, and this box is to be fitted with grate bars, a fire door and an ashpit. A proper steam pipe is to be secured to the upper part of the dome and the boiler is to be provided with a safety valve.

Now it needs no explanation to show that this boiler needs no stays if the sole plate be sufficiently strong; if it be not it can be stayed (to the tube box) or strengthened by angle iron beams. The drawings show that the boiler has a large heating surface

and on consideration it will appear that by removing the nuts on the bolts that attach the shell to the sole plate, and by slacking the screws in the stuffing box, the shell may be lifted off the tube box, so that both the tubes and the tube box as well as the interior of the shell will be open for cleansing and repair. By this method of attaching the shell to the uptake and tube box, another advantage is secured, namely, that the unequal expansion of the tube box and shell is compensated, and there is no straining of the one by the expansion of the other. It would further appear that the boiler would contain a quantity of water, greater than was desirable, when the boiler was to be mounted on a carriage as for a fire engine and to obviate this, we have inserted within the shell a lining of wood such as *l*, *l*, disposed as it were in staves.

This lining may be held in place by bolts or in any proper manner, but we prefer that shown in the drawings, where each stave is shown as attached to its neighbor by bent pieces of sheet iron and such a lining will serve two purposes—first, to fill up the water space and thereby diminish the weight, and second, as an internal lagging to prevent the radiation of heat from the steam and water, and we intend to use it for both these purposes in various forms and arrangements of boilers, and in some cases to cover the whole interior of the shell of the boiler with it.

By inclining the tubes a continuous current of hot water or steam or either or both of them through the tubes is secured so that no lodgment of steam can take place within them and by arranging the rows of inclined tubes in the manner described, there will be a continuous flow into the tubes from the water on two sides of the tube box, and a continuous flow from the interior of the tubes into the water space on the other two sides of the tube box, thus obviating conflicting currents, and causing the tubes to be filled solidly with water. As the water space is small compared with the evaporative power of the boiler and the circulation will be active, some priming may be expected and with the view of meeting such a contingency and of making the steam space as small as is consistent with the proper working of the boiler, we have arranged in the dome above the water level, a foam plate such as *m*, attached to the shell and extending across the steam space and embracing the uptake, a part of its periphery being cut away, over that portion of the water space of the boiler, in which the water descends to supply the tubes. This plate will serve to deflect the current of steam and water rising on two sides of the tube box, causing them to pass under it to

the other two sides where the water will descend to keep up the circulation in the tubes, and the steam will rise over the edge of the plate into the steam space above.

It will be perceived that the foam plate slopes down toward its open part, which is for the purpose of conducting the water (which rises with the steam) in a downward direction, and in this way to take advantage of its momentum (as well as its gravity) to carry it down, the steam rising in consequence of its specific levity. The plate may also be horizontal or even inclined upward toward its open part, and will serve the purpose described but not so fully, as when sloped as specified; for the reasons explained. This foam plate may be secured to the uptake and extend to the shell, but we prefer the mode of attaching it to the shell, and encircling the uptake as closely as possible in order to prevent the ascent of water between the edge of the plate and shell of the boiler,—the only intended opening in the plate being where shown in the drawings.

The joint between the flange on the shell and the sole plate may be made tight with india-rubber packing or in any other proper manner and as before stated the principles of our invention may be carried out under a great variety of forms.

We are aware of the fact that a boiler has been used about the harbor of New York, which had an upright cylindrical shell, and a rectangular tube box within, with tubes crossing at right angles so as to stay the box; but these tubes were horizontal and the shell was solidly and permanently attached to the uptake, and to the tube box or a continuation thereof. It was impossible to clean this boiler or repair it properly and there was no proper circulation through its tubes, and the boiler was removed from the boat and replaced by an ordinary single return horizontal flue boiler.

We claim as of our invention—

1. The combination of tubes sloping upward and arranged in rows relatively to each other, substantially as specified, with water spaces, connecting with these tubes, and substantially surrounding a vertical tube box; the combination being substantially such as described for the purposes specified.

2. We claim combining the shell of a boiler with the heating surface, or evaporating surface thereof by means of a stuffing box, and a joint substantially such as are specified, for the purposes set forth.

3. We claim combining with a boiler shell an inside lining of wood or other non-conducting material, arranged therein substantially in the manner, and for the purposes described; and

4. We claim in combination with a tube
box supporting tubes arranged substantially
in the manner described, and with the steam
space of a boiler, a foam plate, arranged sub-
stantially in the manner set forth, and for
5 the purpose described.

In testimony whereof we have hereunto
subscribed our names in the city of Boston,

on this twenty ninth day of August, A. D.
1859.

GEORGE A. STONE.
JAMES A. WHIPPLE.

In presence of—
BENJ. F. COOKE,
JNO. L. HUNTER.