2 Sheets—Sheet 1.

W. C. LANG.

CIRCULATING APPARATUS FOR STEAM BOILER.

No. 180,601. *Fig 1* Patented Aug. 1, 1876.

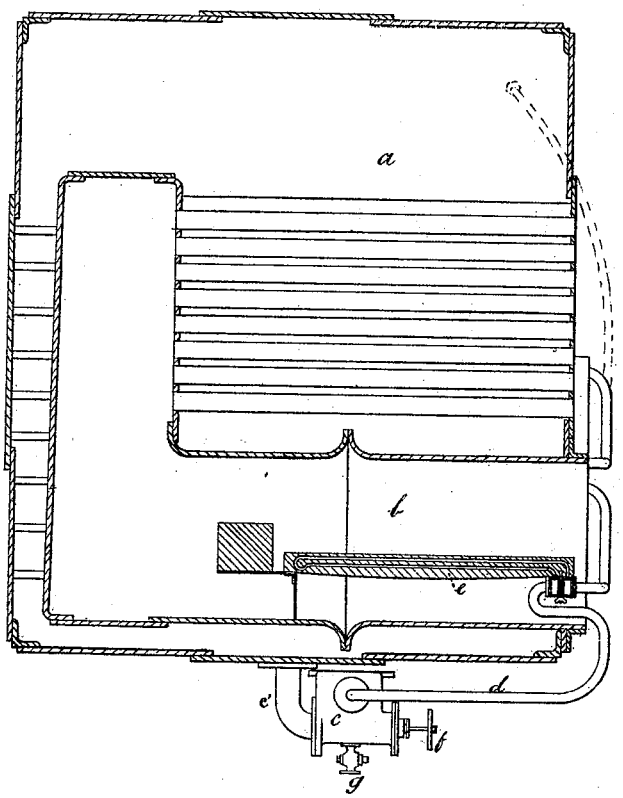
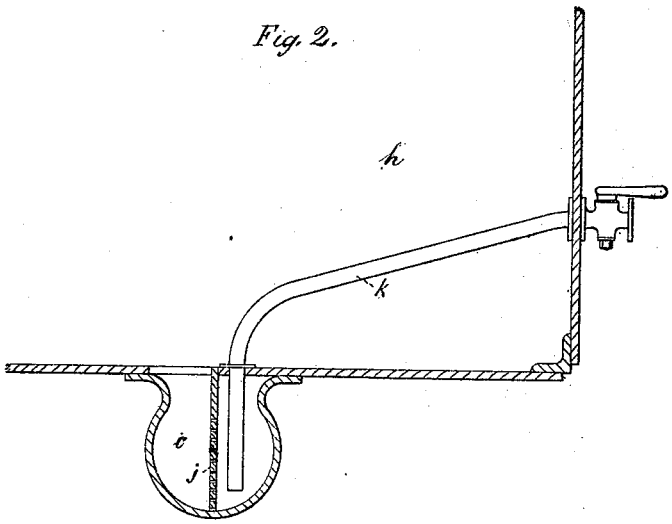


Fig. 2.



Witnesses

W. B. Johnson

J. Johnson

Inventor

W. C. Lang

2 Sheets—Sheet 2.

W. C. LANG.

CIRCULATING APPARATUS FOR STEAM BOILER.

No. 180,601. Patented Aug. 1, 1876.

Fig 3

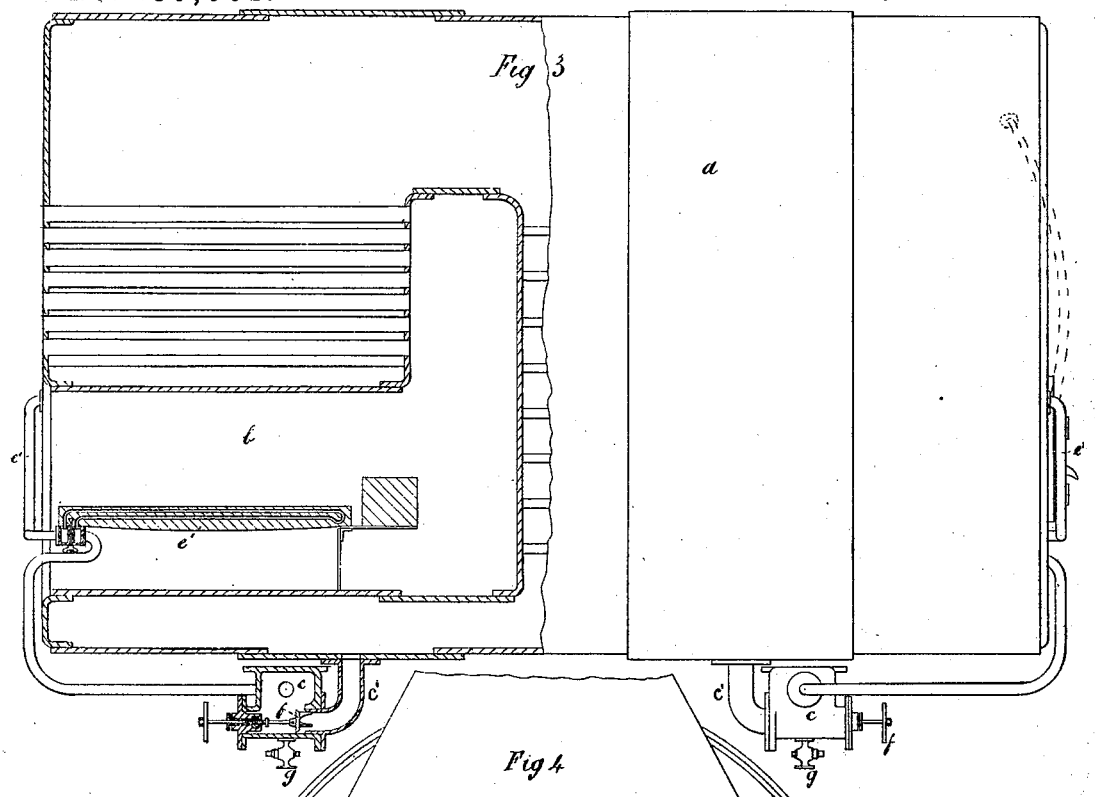
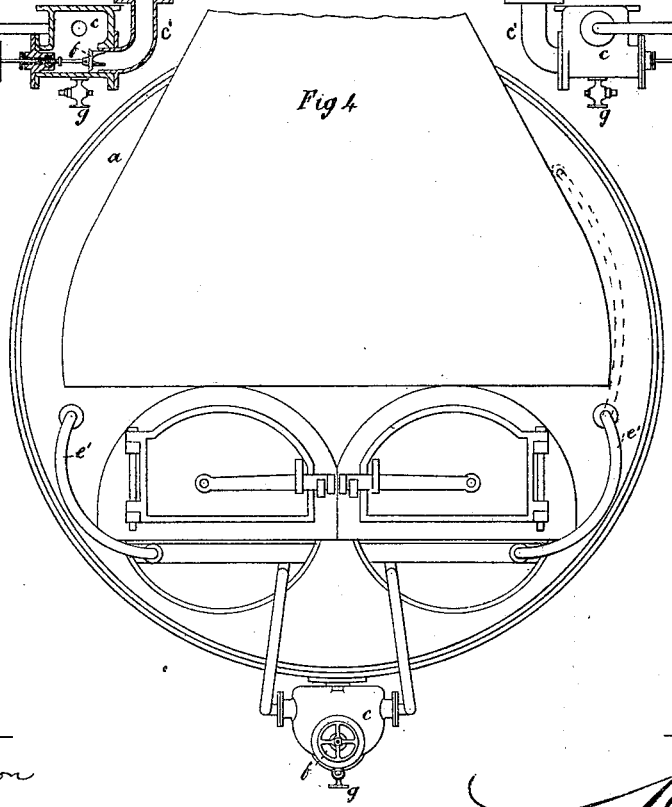


Fig 4



Witnesses

W. B. Johnson

J. Johnson

Inventor

Wm. C. Lang

UNITED STATES PATENT OFFICE.

WILLIAM C. LANG, OF LIVERPOOL, ENGLAND.

IMPROVEMENT IN CIRCULATING APPARATUS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **180,601**, dated August 1, 1876; application filed July 24, 1875.

To all whom it may concern:

Be it known that I, WILLIAM CUNNINGHAM LANG, of Liverpool, in the county of Lancaster, England, have invented Improvements in, and applicable to, Steam-Boilers, of which the following is a specification:

My invention relates to that class of steam-boilers in which the water is caused to circulate through the shell of the boiler from a lower to a higher level; and has for its object the prevention of leakage, corrosion, pitting, and deterioration of steam-boilers, (more especially marine boilers,) due to unequal expansion and contraction of the shell caused by the lower temperature of the water, which lies near the bottom of the boilers.

For the above purposes I cause the water to circulate from the lowest portion of the boiler through the shell, thence upward into the water-space—at a higher level, preferably—at a point near the steam-space, or into the steam-space itself. To insure that the water shall be caused to circulate from the bottom of the boiler to a higher level—that is, to a position where there is a higher temperature—I attach to the lowest portion of the boiler one or more water-boxes, and connect them, by suitable pipes, with the boiler, so as to draw the comparatively cold water from the sides of the boxes, and deliver it into the upper part of the boiler; and in order to prevent the water in the boiler from descending in a straight column into the boxes, I provide the boxes with a baffle-plate.

I will now proceed to describe my invention by referring to the accompanying drawing, which forms part of this specification, and in which—

Figure 1 is a view, partly in section and partly in elevation, of a single-ended marine boiler, having my improvements applied, the water-box being provided with a stop-valve and sediment-cock. Fig. 2 is a vertical section of a portion of a boiler and the water-box, provided with the baffle-plate. Fig. 3 is a side view, partly in section and partly in elevation, of a double-ended boiler, having my improvements applied. Fig. 4 is an elevation of one end of the boiler, &c., shown in Fig. 3.

Like letters of reference indicate like parts in each.

a represents a boiler, which may be of any approved form, and is provided with a furnace, *b*. To the lowest part of the boiler I secure a water-box, *c*, which connects with the bottom of the boiler, either directly, as shown in Fig. 2, or, preferably, by means of a short pipe, *c'*, and with the upper part of the boiler (preferably at or near the steam-space) by a circulation-pipe, *e'*. Passing through a gland on the water-box *c* is a rod, provided with a hand-wheel, by means of which a stop-valve, *f*, situated within the water box, may be operated to shut off the connection between the bottom of the boiler and water-box, when desired. I also provide the water-box with a cock, *g*, through which any mud or sediment collecting in the box may be drawn off. When the connection between the water-box and boiler is direct, it is desirable to break up the column of descending water, and for this purpose I interpose between the inlet and exit pipe a perforated plate or diaphragm, *j*, termed a "baffle-plate." To insure the circulation of the water, pans, pumps, or other well-known mechanical appliances, may be interposed between the water-box and the upper part of the boiler—that is, in the length of pipe *e'*; or heat may be made the medium for inducing and maintaining the circulation—as, for instance, pipes passing alongside or through the fire-places. For the purpose of completely illustrating the devices in connection with a marine boiler, I have elected to show hollow fire-bars, marked *e*, such devices being deemed best adapted to the purpose. The circulation-pipes *e'* are, by preference, caused to enter the boiler at a higher level than shown on the drawings, and when the circulation is caused by means of hollow fire-bars, check-valves may be placed in the circulation-pipes below such fire-box.

The operation of these devices is as follows: The cold water from the bottom of the boiler sinks into the water-box *c*, descends upon one side of the baffle-plate *j*, and passes through the perforations of the baffle-plate, which break up, equalize, and check the column of water, and on reaching the opposite side of

the baffle-plate, enters the circulation-pipe e', passes or is drawn thence by any of the several suitable means enumerated, and is delivered into the upper part of the boiler. When it is desirable to interfere with the circulation taking place through the water-box, the valve f is forced in to cut off the connection between the boiler and box. The sediment accumulating in the water-box may be blown off by means of cock g in the ordinary manner of clearing mud-drums.

I am aware that water has been caused to circulate through the shell of a boiler from a lower to a higher level; and also that hollow grate-bars have been used with circulating boilers, and do not herein claim such subject-matter; but

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In combination with a steam-boiler, the water-box c, communicating with the lowest portion of the boiler, and provided with the baffle-plate, the circulation-pipe, and suitable means for establishing and maintaining the circulation of the water in the boiler, substantially as specified.

2. In combination with a steam-boiler, the box c, substantially as herein described, provided with the cock g, connected with the boiler by the circulation-pipes c' e', the pipe c' being controlled by the valve f arranged within the box, substantially as and for the purpose specified.

WM. C. LANG.

Witnesses:
W. B. JOHNSON,
J. JOHNSON.