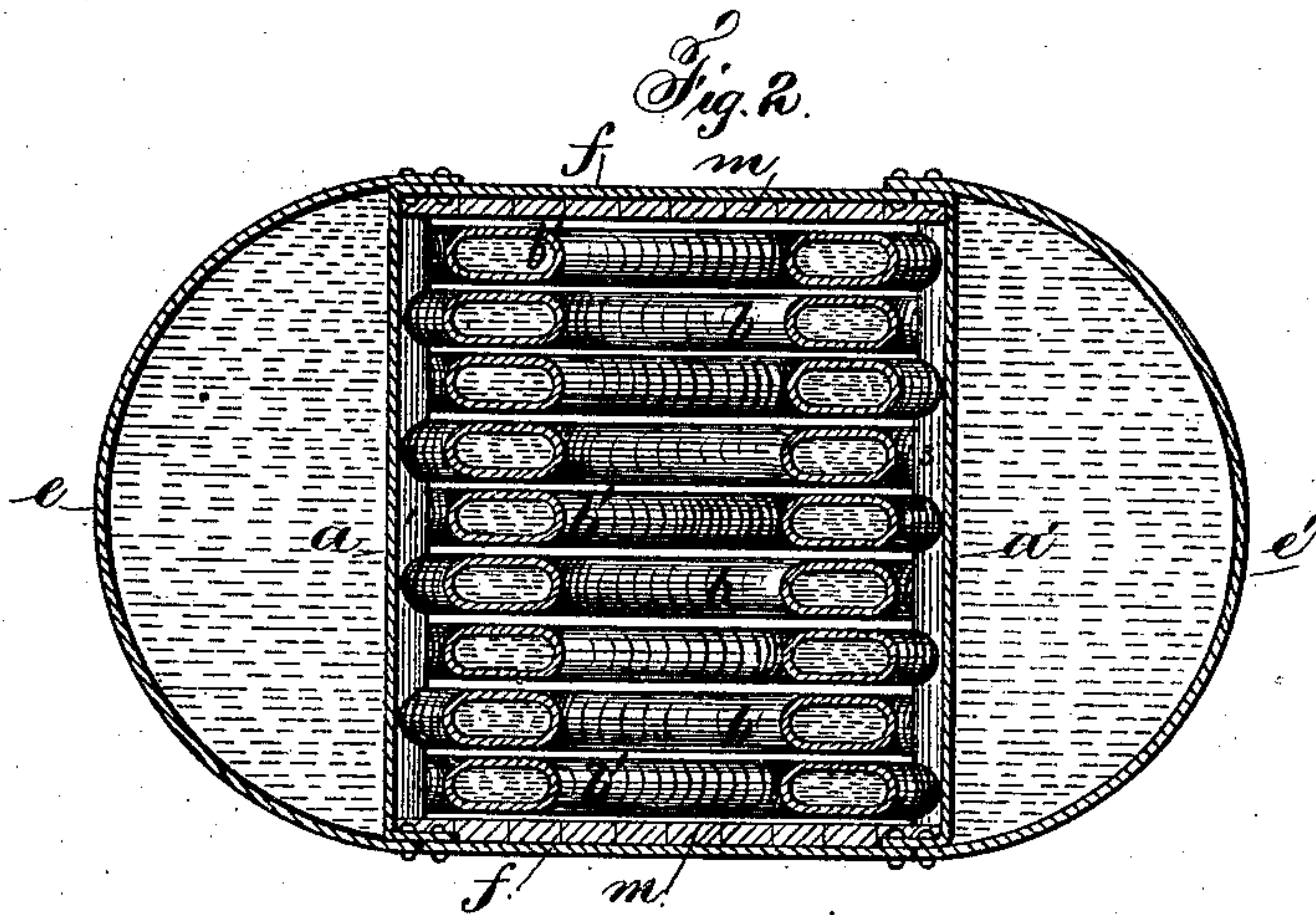
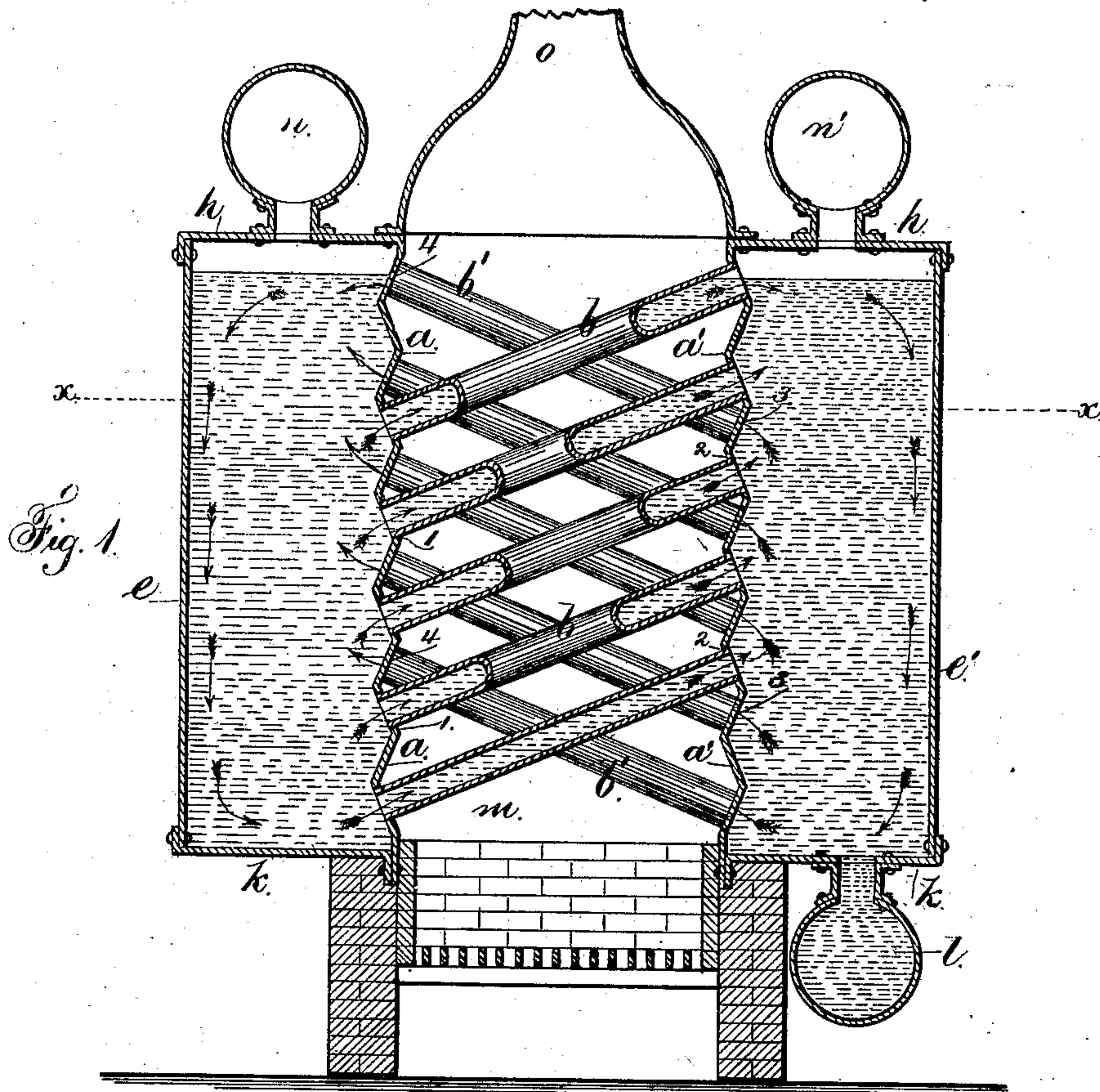


(No Model.)

J. L. BOGERT.
STEAM BOILER.

No. 255,484.

Patented Mar. 28, 1882.



Witnesses
Harold Ferrell
Chas. Smith

Inventor
per John L. Bogert
Lemuel W. Ferrell atty.

UNITED STATES PATENT OFFICE.

JOHN L. BOGERT, OF FLUSHING, NEW YORK.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 255,484, dated March 28, 1882.

Application filed December 16, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. BOGERT, of Flushing, in the county of Queens and State of New York, have invented an Improvement in Steam-Boilers, of which the following is a specification.

Steam-boilers have been made with two intersecting ranges of inclined tubes placed above the fire and passing into the angles of the fire-chamber, and water has circulated through these.

My invention is made for obtaining a very strong and compact boiler with a large extent of heating-surface, and for promoting a rapid circulation of water through the pipes without the risk of foaming.

I employ two vertical tube-sheets, corrugated horizontally and facing each other, with ranges of inclined pipes passing each other at opposite inclinations, the corrugations being at the same angle to a vertical plane as the tubes are to a horizontal plane, in order that the tube-sheets may be at right angles to the tubes at the places where such tubes pass through the sheets, to allow of the ends being swelled and turned in the manner usual in inserting boiler-flues; and I provide a water chamber or boiler at each corrugated tube-sheet in the form of half-cylinders, in order that the boiler may resist pressure without requiring as many stay-bolts as usual in tubular boilers, thus simplifying and rendering less expensive this improved boiler.

In the drawings, Figure 1 is a vertical section of the improved boiler, and Fig. 2 is a horizontal section of the same at the line *xx*.

The tube-sheets *a a'* are intended to occupy a vertical, or nearly vertical, position. They are corrugated or bent in alternately-opposite directions, each bend being wider than the diameter of the tubes employed. The tube-sheets are perforated for the passage of the tubes *b b'*, such perforations being in the flat portions of the bends, and such bends or corrugations being at right angles to the axes of the tubes. The tubes *b* extend upwardly from the flat portions 1 of the sheet *a* to the flat portions 2 of the sheet *a'*, and the tubes *b'* extend upwardly from the flat portions 3 of the tube-sheet *a'* to the flat portions 4 of the

tube-sheet *a*, the holes being so disposed that the ranges of tubes *b'* are intermediate between the ranges of tubes *b*. The tubes are secured at their ends by swelling and turning, as usual.

The boiler-shells *e e'* are semicircular, and they are riveted to the flanges of the tube-sheets *a a'*, and these shells are preferably extended across, or are connected from one to the other, as at *f*, so that any pressure that might tend to separate the semi-cylindrical boilers is taken on the connecting-plates *f*, instead of upon the tubes.

The top *h* and bottom *k* of each semi-cylindrical portion of the boiler are made in any suitable manner. They will usually be flat and braced with suitable tie-bolts, and the steam is taken away by pipes, as usual.

The fire-chamber is below the circulating-tubes. It may be made of fire-brick, with ordinary grate-bars. There will usually be a blow-off and feed-pipe at *l*, below the boiler.

I prefer to line the connecting-plates *f* with fire-brick, as at *m*. The connections *f* might be hollow water-spaces; but these will add to the expense of the boiler and require to be heavily braced with tie-bolts.

Suitable man-holes are provided in the semi-cylindrical boilers, also doors in the plates *f* to give access to the tube-space.

The water will circulate in the tubes in the directions indicated by the arrows, and will form eddies as it passes out of the upper ends of one range of pipes and descends and enters the lower ends of another range, as indicated by the arrows.

There is ample space in the semi-cylindrical boilers for the steam to rise, although the circulation is short and rapid. If the water-level is as high as the upper end of the highest tubes, the water will circulate through all the tubes; otherwise steam will issue from the highest tubes into the boilers. Steam-drums may be provided, as at *n n'*, and the products of combustion be taken off by the contracted funnel, as at *o*.

I claim as my invention—

1. In a boiler, two water-chambers having their inner plates corrugated, in combination with ranges of tubes inclined in opposite di-

rections, the ends of such tubes passing through the plates at right angles to the surfaces, substantially as set forth.

2. In a boiler, the combination, with two
5 semicircular shells, of the corrugated tube-sheets and the ranges of tubes inclined in opposite directions, with their ends passing through the tube-sheets, and being at right angles to the surfaces where such tubes pass
10 through, so as to connect the water-chambers, substantially as set forth.

3. In a boiler, the semi-cylindrical shells and corrugated plates, in combination with the ranges of tubes inclined in opposite directions, and the connecting-plates *f*, substantially as
15 specified.

Signed by me this 10th day of December,
A. D. 1881.

JOHN L. BOGERT.

Witnesses:

GEO. T. PINCKNEY,

WILLIAM G. MOTT.