3 Sheets—Sheet 1.

C. HART.

Upright Tubular-Boiler.

No. 216,953. Patented July 1, 1879.

Fig. 2.

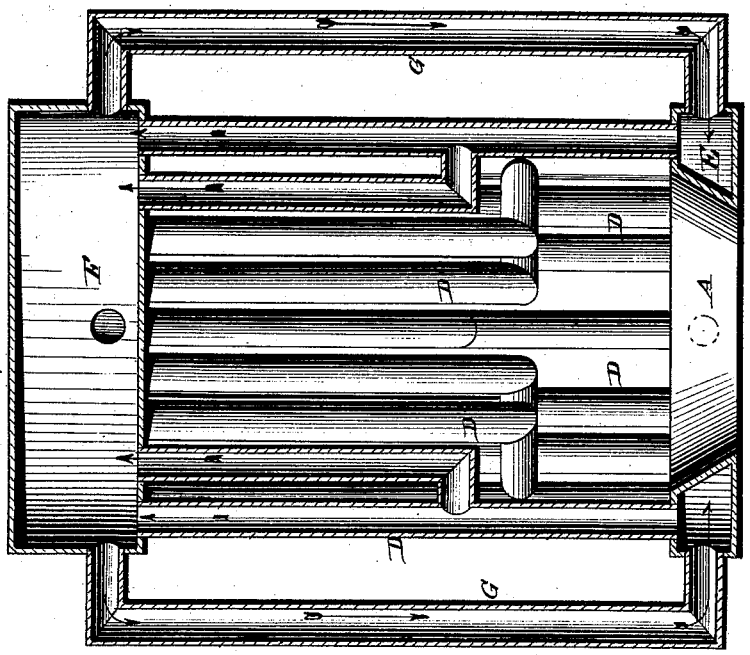
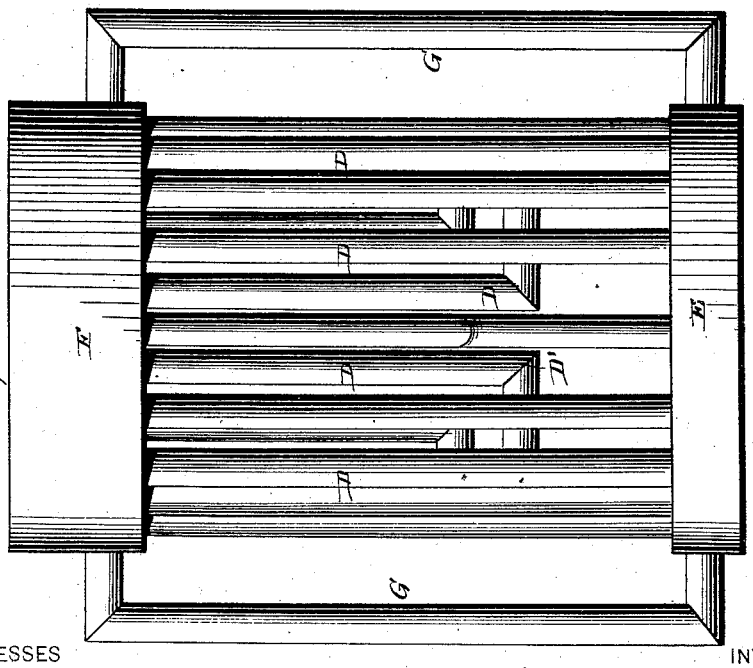


Fig. 1.



WITNESSES

E. L. Nottingham.

F. C. M. Cleary.

INVENTOR

Clinton Hart

By Dreggett and Dreggett

ATTORNEYS

3 Sheets—Sheet 2.

C. HART.
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Fig. 4.

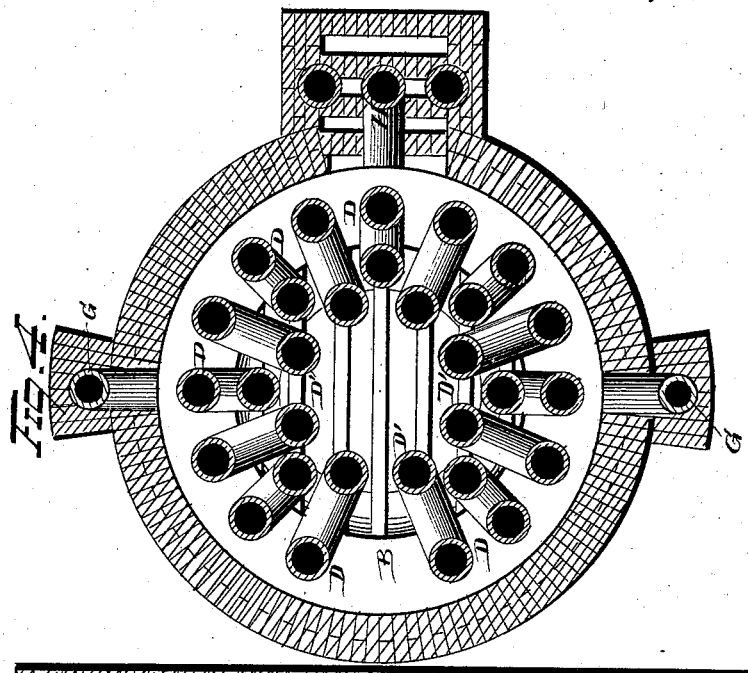
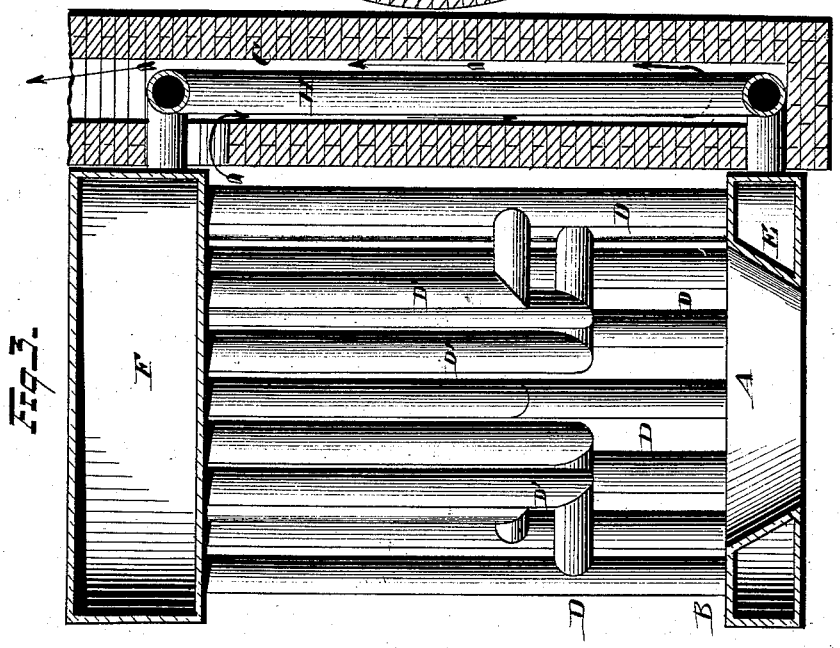


Fig. 3.



WITNESSES

E. F. Nottingham

F. O'M. McCleary.

INVENTOR

Clinton Hart

By Foggett and Foggett

ATTORNEYS

3 Sheets—Sheet 3.

C. HART.

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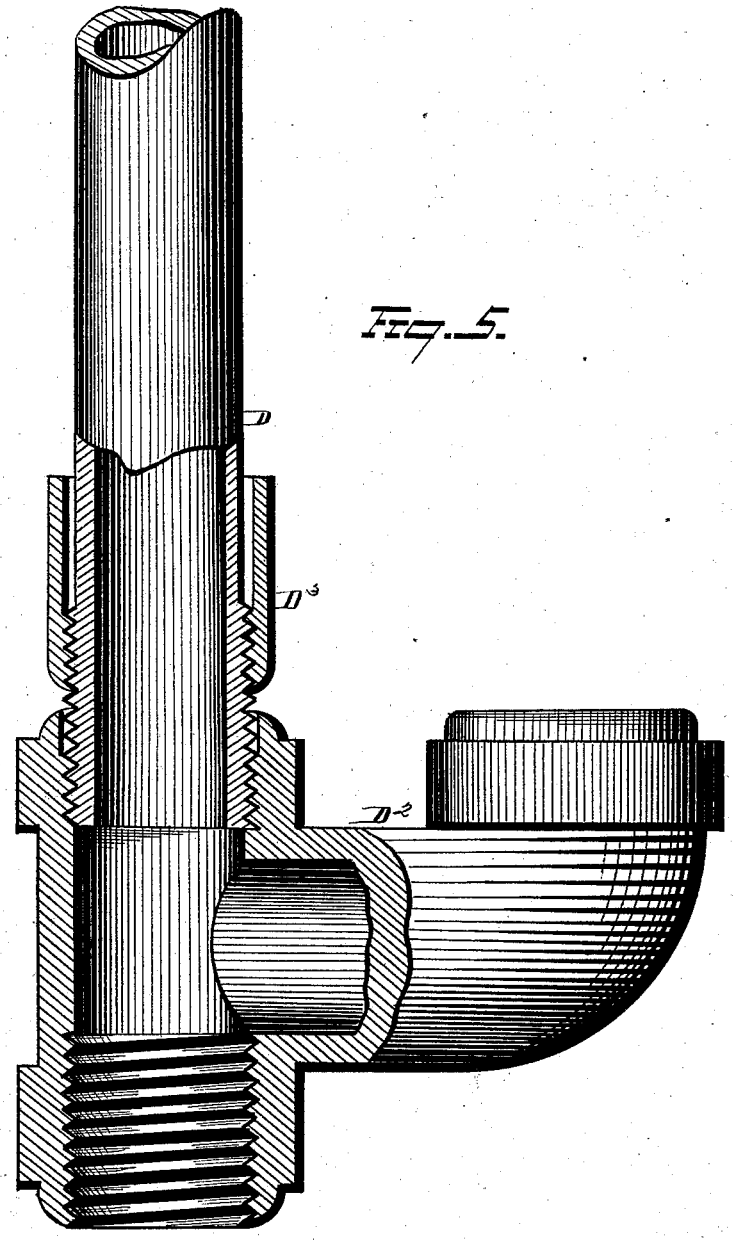
Fig. 5.



WITNESSES

E. F. Nottingham

F. O. McCleary

INVENTOR

Clinton Hart

by Fraggett and Fraggett

ATTORNEYS.

UNITED STATES PATENT OFFICE.

CLINTON HART, OF CLEVELAND, OHIO.

IMPROVEMENT IN UPRIGHT TUBULAR BOILERS.

Specification forming part of Letters Patent No. **216,953**, dated July 1, 1879; application filed April 26, 1879.

To all whom it may concern:

Be it known that I, CLINTON HART, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Upright Tubular Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to upright tubular boilers; and it consists of the parts and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 is a front elevation of an upright tubular boiler embodying the principles of my invention. Fig. 2 is a section by a vertical plane passed through the circulating-pipes. Fig. 3 is a central section by a vertical plane passed through the furnace-door and the flue. Fig. 4 is a central section by a horizontal plane. Fig. 5 is a separate view of joint D^2 and the adjacent pipes.

A is the fire-pot, located at the base of the furnace-space; B, the furnace-door; C, the furnace-flue. D are vertical main water-tubes, connecting the water-chambers E and F at the bottom and top of the boiler, respectively. The lower water-chamber is made annular, and its inner side constitutes the fire-pot, as shown.

The tubes D surround the furnace-space, and from them may project at intervals supplemental tubes D^1, connecting with the tubes D by suitable joints. The function of these supplemental tubes is to provide greater area of heating-surface for the water in its passage to the upper chamber, and by reason of their location, as they are projected inwardly toward the vertical central portion of the combustion-chamber, they are subjected to great heat.

The products of combustion may circulate freely around the pipes D and D^1, inasmuch as they are all inclosed within the outer wall or casing which bounds the furnace-space or combustion-chamber. In this way the water will become rapidly heated, and as it becomes heated will rise to the top of the boiler.

In order, therefore, to secure the proper circulation outside of the tubes D and D^1, I provide circulating-pipes G, which unite the boiler-spaces E and F outside of the combustion-chamber, so that as the hot water rises the cooler portions will descend through the pipes G, and a circulation will thereby be maintained up through the pipes D and D^1 and down through the pipes G. I also propose to locate similar circulation-pipes H within the flue C, in order that the escaping products of combustion may be utilized to heat the water in the pipes H as the same circulates in the pipes between the two ends of the boiler.

The flue C may be of any suitable arrangement. For instance, it may be such as to cause the products of combustion to leave the combustion-chamber near the top of the pipes D, and then descend and discharge near the bottom of the pipes H, or it may be made to rise again upon the opposite side of the pipes H and discharge at or near the top, the arrangement of the flue not being material to my invention.

The pipes D and D^1 may be of any ordinary construction, as also the joints D^2, by which the pipes D^1 are united to the pipes D; but I prefer that the joints D^2 shall be made each in a single casting, substantially as shown in Fig. 5.

So also the pipes D and D^1 may be screwed into the boiler-plates at the top and bottom, and also into the joints D^2, in the usual manner, leaving the balance of the thread exposed to the heat of the furnace; but I prefer to form a shield, D^3, which is screw-tapped through a small portion only of its length, while the plain portion is of sufficient length to cover the otherwise exposed portion of the screw-thread upon the pipes. In this way it is apparent that the threads may be preserved, and at the same time an extra thickness added to the pipe near the joints to sustain the deleterious effects of the high heat and prevent it from coming upon the pipe at the joints. It also serves as a jam-nut to thoroughly bind the parts together and insure a tight joint.

What I claim is—

1. In an upright boiler, the combination of the upper and lower water-chambers, the main connecting-pipes, and the supplemental pipes, which connect the main pipes with the upper chamber, said supplemental pipes located near the vertical central portion of the combustion-chamber, substantially as set forth.

2. In an upright boiler, the combination of the upper and lower water-chambers, the main connecting-pipes, and the supplemental pipes, which respectively connect the latter with the upper chamber, said main and supplemental pipes being secured together in pairs by the single castings D^2, with which both pipes of each pair have direct screw-thread engagement, substantially as set forth.

3. In an upright boiler, the combination of the upper and lower water-chambers, the main connecting-pipes, and the supplemental pipes, which are located near the vertical central portion of the combustion-chamber and connect the main pipes with the upper chamber, said main and supplemental pipes directly engaging with the castings D^2, and having their joints therewith provided with the shields D^3, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLINTON HART.

Witnesses:

JNO. CROWELL, Jr.,

WILLIAM E. DONNELLY.