B. Holly,

Steam-Boiler Water-Tube.

No. 53,617. Patented Apr. 3, 1866.

Fig. 2.

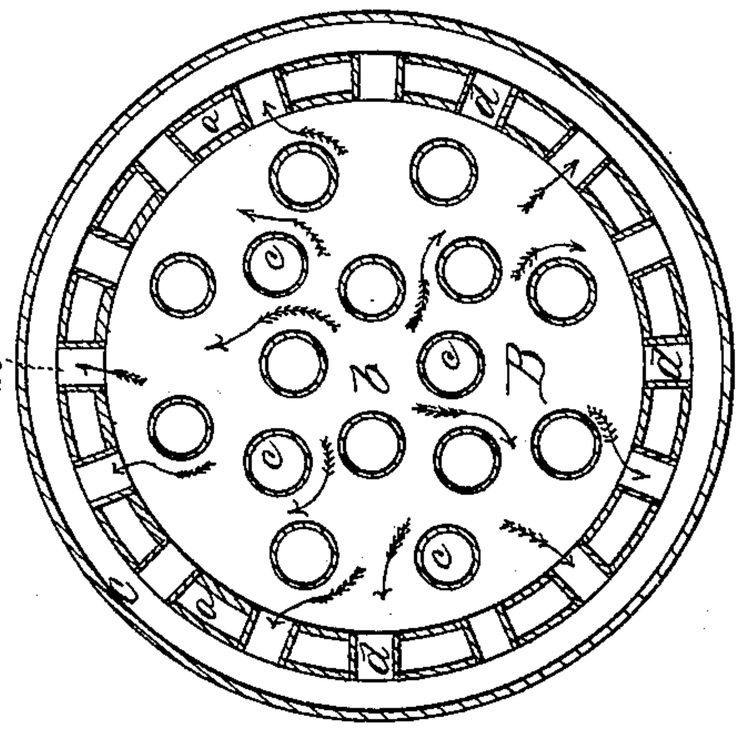
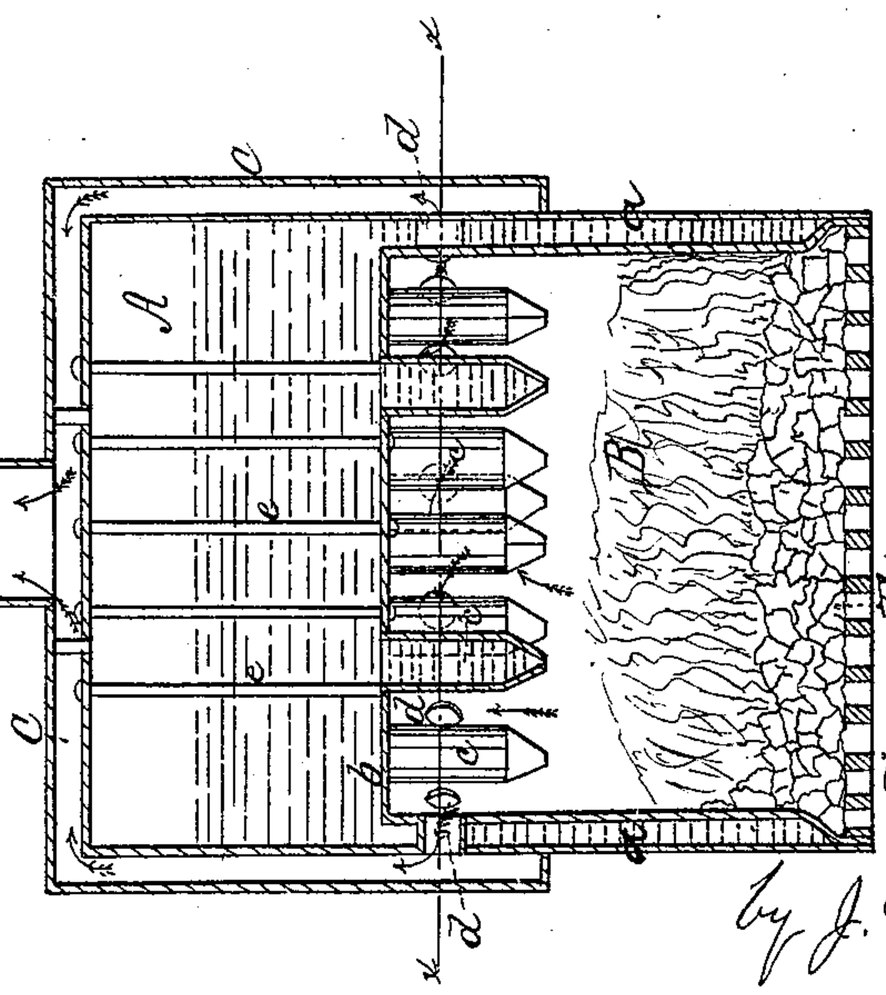


Fig. 3.

Fig. 1.



Witnesses:

Jay Hyatt

J. A. Davis

Inventor:

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by J. Fraser & Co. attys.

UNITED STATES PATENT OFFICE.

BIRDSILL HOLLY, OF LOCKPORT, NEW YORK.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **53,617**, dated April 3, 1866.

To all whom it may concern:

Be it known that I, BIRDSILL HOLLY, of Lockport, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a central vertical section; Fig. 2, a horizontal section thereof in the plane of line *x x*; Fig. 3, a diagram of the end of one of the tubes, looking from beneath, showing the manner of welding the same.

Like letters of reference indicate corresponding parts in all the figures.

My invention consists in the combination and arrangement of pendent water-tubes with horizontal flues near the top of the fire-chamber, arranged radially around said tubes, and communicating with a hot-air space inclosing the water-chamber of the boiler.

In the drawings, A represents the water-space of the boiler, which is preferably of cylindrical form, and placed upright over the fire-space B, and having an annular portion extending downward around the fire-chamber, forming the water-jacket *a*.

The bottom plate, *b*, of the water-space of the boiler is provided with pendent tubes *c c*, secured to the same, which descend into the fire-chamber B, and which open into the water-space A.

d d are horizontal flues passing from the upper portion of the fire-chamber, through the water-jacket *a*, into a hot-air chamber, C, which is also of cylindrical form, to correspond with that of the water-space, which it incloses at the top and sides, extending downward a short distance (which may be more or less) below the openings of the flues. At the top and center of this hot-air chamber is the outlet or smoke-pipe D, for the escape of the products of combustion.

The top and bottom of the water-space are secured against expansion from the pressure of steam within by the ordinary stay-rods or struts *e e*.

The operation of my improved boiler thus constructed is as follows: The chamber A being supplied with the proper amount of water, fire is kindled beneath on the grate E, when the heat rising to the top of the fire-chamber, its direction is turned horizontally outward, when it must circulate around and between the tubes before escaping through the flues *d d* into the surrounding air-chamber, whence the heated products of combustion, after passing up the sides of the water-space, converge over the top to the center thereof, where they escape through the pipe D.

My improved boiler possesses the advantage of a large amount of heating-surface in a most compact form, the usual amount of surface being greatly increased by the tubes, flues, and the surface inclosed by the hot-air chamber C, which is ordinarily exposed to the radiation instead of the absorption of heat.

In the use of my improvement the products of the fire rising directly against the bottom of the water-space, and surrounding and circulating among the tubes, heat the water in a rapid manner; and this is still more perfectly accomplished by the arrangement of the flues, whereby the heated currents in their passage through them impart their heat to the water in the jacket *a*.

The hot-air chamber, incasing as it does the main portion of the boiler or space A, and by being constantly filled with the products of combustion, prevents all contact of the external cold with the surface of the steam and water space and the resultant condensation of steam and consequent foaming of the water, which are the deleterious effects that ensue when no such surrounding air-chamber is employed.

What I claim as my invention, and desire to secure by Letters Patent, is—

The combination and arrangement of the vertically-pendent tubes *c c* with the furnace B, flues *d d*, and water-jacket *a*, substantially in the manner and for the purposes described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

BIRDSILL HOLLY.

Witnesses:

CHAS. G. HILDRETH,

J. K. MCDONALD.