(No Model.)

N. T. PITKIN.

STEAM GENERATOR.

No. 452,388. Patented May 19, 1891.

Fig. 1

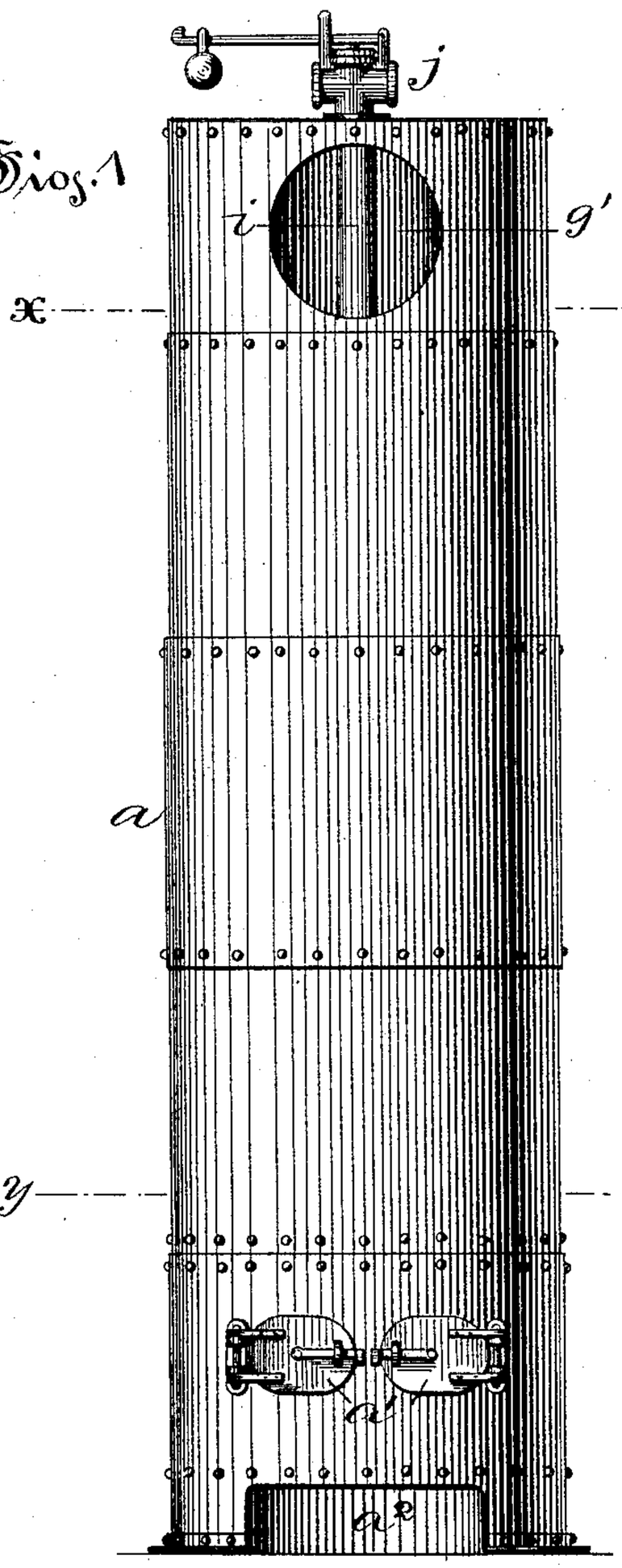


Fig. 2

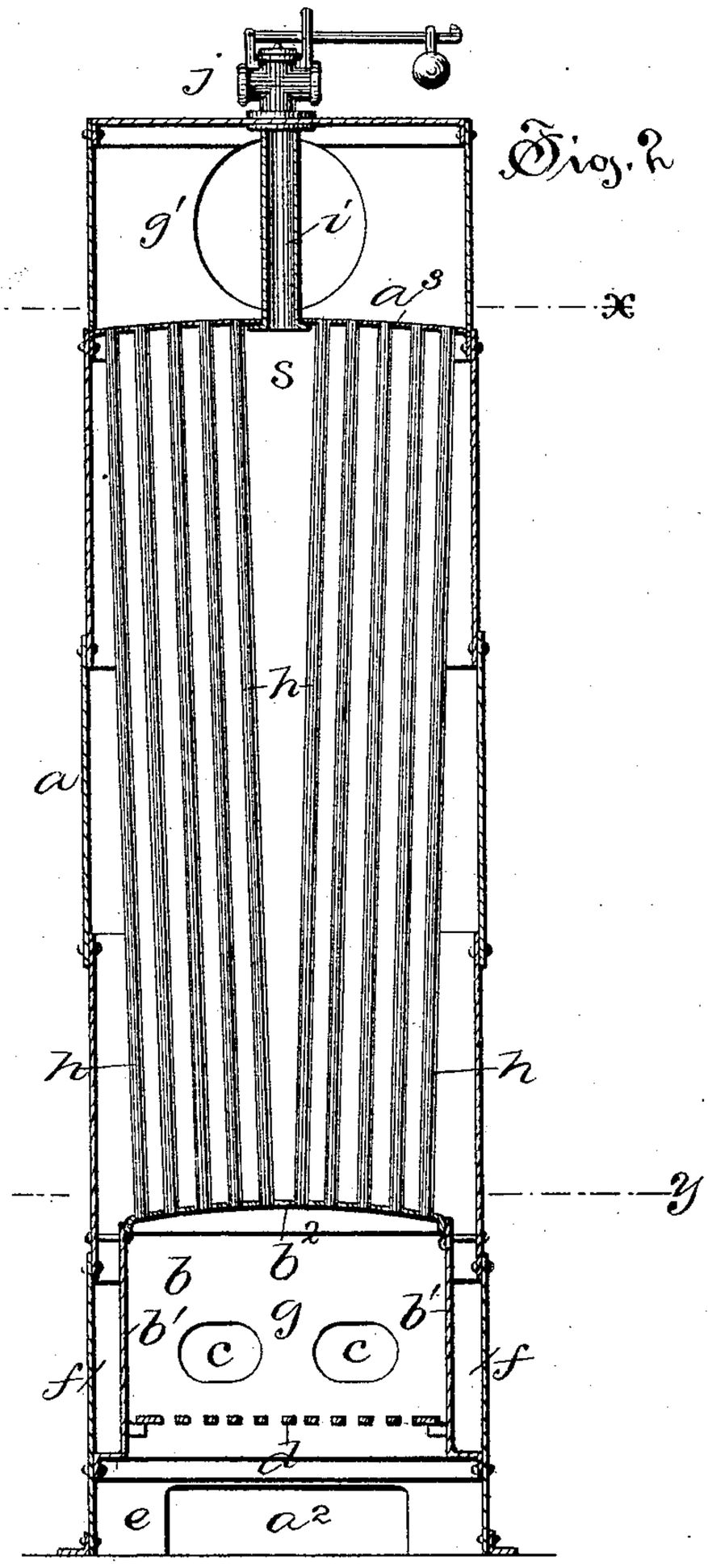


Fig. 3

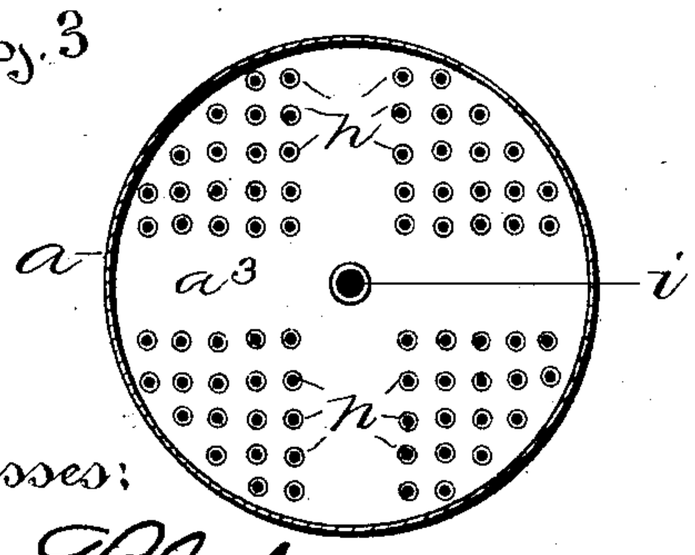
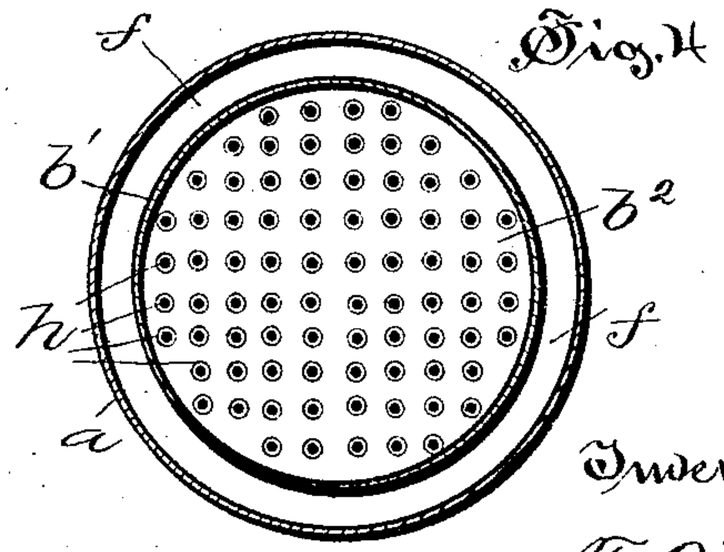


Fig. 4



Witnesses:
Arthur B. Jenkins,
John T. Healy

Inventor,
Norman T. Pitkin,
by Harry P. Williams
atty.

UNITED STATES PATENT OFFICE.

NORMAN T. PITKIN, OF HARTFORD, CONNECTICUT.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 452,388, dated May 19, 1891.

Application filed February 4, 1891. Serial No. 380,157. (No model.)

To all whom it may concern:

Be it known that I, NORMAN T. PITKIN, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Steam-Generators, of which the following is a full, clear, and exact specification.

The invention relates to vertical tubular fire-box steam-boilers, and the object is to increase the efficiency and strength of such boilers without adding to their size or cost.

To this end the invention consists in such a boiler having a novel arrangement of flues, whereby an increased circulation is insured, a direct easy vertical liberation of steam from around the heated flues into an enlarged central steam-space is permitted, and a large central outlet from the steam-chamber is provided; also in the arrangement and shape of the crown-sheets of the fire-box and steam-chamber, which adds to the strength of the construction and reduces the liability of leakage around the ends of the peculiarly-arranged flues which pass from the combustion-chamber to the smoke-box above.

Referring to the accompanying drawings, Figure 1 is an elevation of the boiler. Fig. 2 is a central section of the same. Fig. 3 is a cross-section on plane denoted by the line *x x*, and Fig. 4 is a cross-section on plane denoted by line *y y*.

In the views, the letter *a* indicates the shell or jacket of a vertical tubular boiler, which is made of the usual metal in the customary manner. Inside of the shell, near the bottom, by suitable stays, is supported the fire-box *b*, having openings *c* opposite the stoke-doors *a'* and any desirable form of grate *d* above an ash-pit *e*, to which an opening a^2 through the shell is made. The side walls *b'* of the fire-box *b*, which is somewhat smaller in diameter than the shell *a*, are preferably parallel with the sides of the shell, leaving the desired water-legs *f* around the fire-box, while the top or crown-sheet b^2 above the combustion-chamber *g* is slightly convexed or domed. The top or crown-sheet a^3 of the shell or water-jacket *a* above the steam-chamber *s* is also slightly convexed or domed, preferably being curved upon the arc of a circle that is concentric with the circle upon which the crown-sheet b^2 of the fire-box is formed. The flues *h*, which are grouped together and pass through the crown-sheet b^2 above the combustion-chamber at even distances apart, filling this crown-sheet practically full, diverge from the axis of the boiler as they rise, leaving a large space between the center flues at the point where they reach the crown-sheet a^3 above the water and steam-chambers, through which, however, they pass at the same distances apart from each other at which they left the bottom crown-sheet b^2—that is, those flues which are upon the same radii are parallel and all incline from the center or axis of the boiler, leaving a larger space at the top between the center flues than anywhere else for the collection of the steam.

Above the top crown-sheet a^3 is located the usual smoke-box *g'*, from which any ordinary outlet is made for the escape of the products of combustion to a chimney. From the center of the crown-sheet a^3 at the top of the steam-chamber above the open space left at the center by the diverging flues a pressure-pipe *i* for live steam leads through the smoke-box to any form of safety-valve *j*, having an outlet for connection with an engine and a discharge for the relief of any excess pressure generated. An inlet-pipe passes through the shell or head at any suitable point to any desired position in the interior of the boiler, and any common form of water and steam gages may be attached, as desired, at suitable points. By this arrangement and location of the diverging flues for the passage of the products of combustion and heated gases through the water-chamber an enlarged space for the formation of the steam and necessary ebullition of the water is provided at the center of the chamber, which insures a rapid formation of vapor and an increased circulation down the cooler sides of the shell and up at the center into the enlarged space. The flames and heated gases in passing through the inclined flues come in contact with and more directly impinge upon their upper surfaces and heat them to a higher temperature than when passing through vertical flues without a tendency to impinge more on one side than the other, and the steam generated can rise vertically direct from the upper heated surface of the inclined flues into the central

steam-space easier than from around vertical flues. The crown-sheet over the fire-box is filled with flues, all of which extend through the upper crown-sheet, however, leaving the center of the latter clear for a large live-steam outlet. These crown-sheets at the top and bottom are preferably formed upon concentric circles, and the flues lie on radii of these circles, so that the flues pass through the crown-sheets at approximately right angles to the heads, so that the joints may be tightly fitted and cannot leak, while the convexing of the crowns gives them additional strength to resist the pressure of the steam or a vacuum, should one be formed when the steam is allowed to condense. Sediment is unlikely to settle upon the lower rounded crown-sheet, but is washed off into the water-legs around the fire-box, from which it can be removed.

I claim as my invention—

A vertical steam-boiler consisting of a tubular shell having domed ends, with a fire-box beneath the lower dome and a smoke-box above the upper dome, a plural number of flues extending from the fire-box to the smoke-box above the water and steam chamber, each flue diverging from the axis of the boiler and passing through the domed ends approximately at right angles to the surface of the ends adjacent to the flues, and a steam-outlet opening through the center of the upper domed end and rising through the smoke-box, substantially as specified.

NORMAN T. PITKIN.

Witnesses:
HARRY R. WILLIAMS,
ARTHUR B. JENKINS.