

(No Model.)

3 Sheets—Sheet 1.

R. JOY.
STEAM BOILER.

No. 573,001.

Patented Dec. 15, 1896.

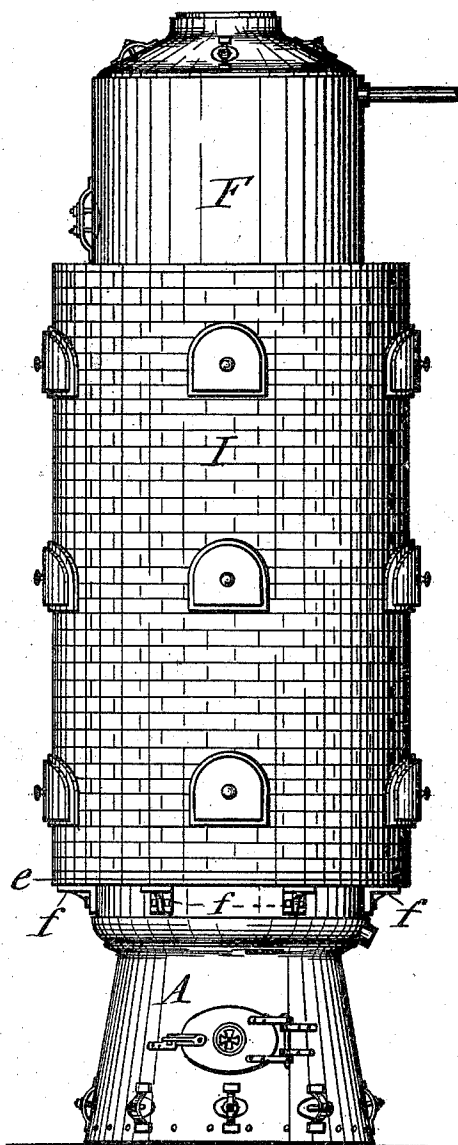


Fig. 1

WITNESSES:

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M. A. Leyden

INVENTOR:

Robert Joy
By E. Laess
his ATTORNEY

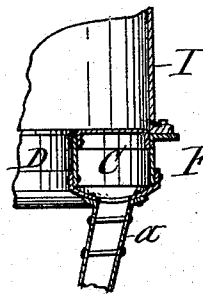
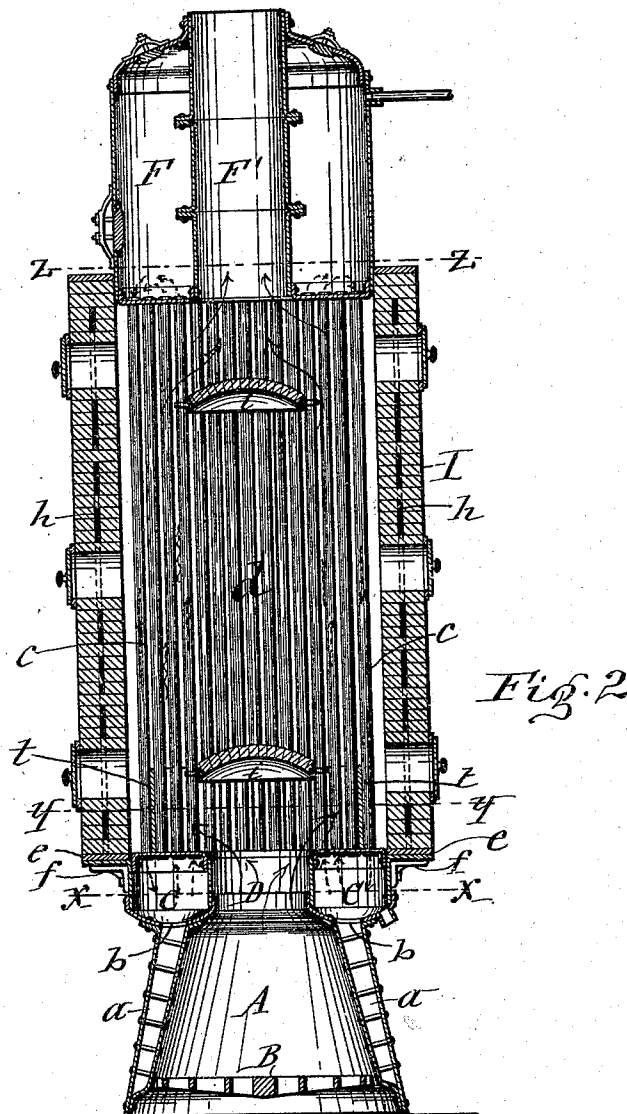
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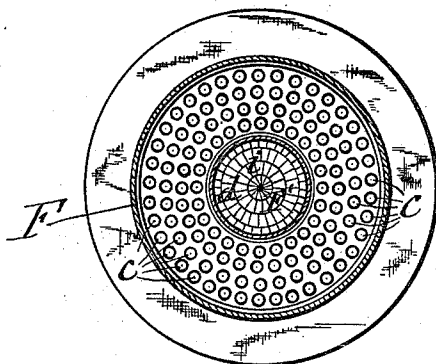


Fig. 5

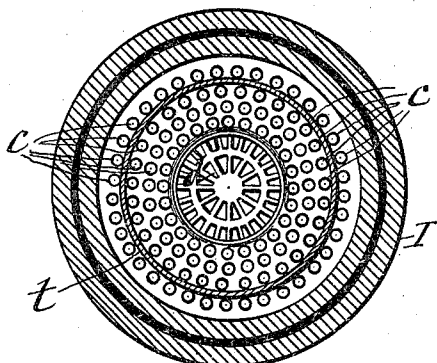


Fig. 4

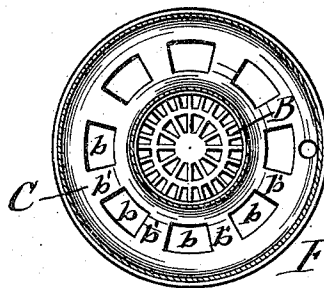


Fig. 3

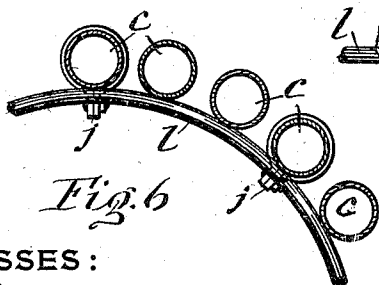


Fig. 6

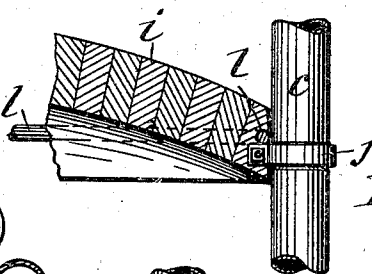


Fig. 8

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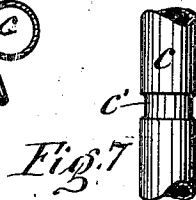


Fig. 7

INVENTOR

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UNITED STATES PATENT OFFICE.

ROBERT JOY, OF OSWEGO, NEW YORK, ASSIGNOR TO THOMSON KINGSFORD,
OF SAME PLACE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 573,001, dated December 15, 1896.

Application filed March 9, 1896. Serial No. 582,335. (No model.)

To all whom it may concern:

Be it known that I, ROBERT JOY, of Oswego, in the county of Oswego, in the State of New York, have invented new and useful Improvements in Steam-Boilers, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to the class of steam-boilers designated "upright water-tube" boilers; and the object of the invention is to provide a boiler which shall be very compact and simple in construction, with great capacity and superior efficiency; and to that end the invention consists in the novel construction and combination of the component parts of the boiler, as hereinafter described, and set forth in the claims.

The invention is fully illustrated in the annexed drawings, in which—

Figure 1 is a front elevation of a boiler embodying my invention. Fig. 2 is a vertical transverse section of the same. Figs. 3, 4, and 5 are horizontal transverse sections, respectively, on lines X X, Y Y, and Z Z in Fig. 2. Fig. 6 is an enlarged horizontal sectional view of a portion of the support of one of the central diaphragms in the combustion-chamber. Fig. 7 is a side view of that portion of one of the water-tubes to which the support of the said diaphragm is to be connected. Fig. 8 shows said portion of the water-tube with the diaphragm-support connected thereto, and Fig. 9 is a sectional view illustrating a modification of the construction of the wall of the combustion-chamber.

Similar letters of reference indicate corresponding parts.

A represents the fire-box, which is conical-shaped and formed with water-legs *a a*, completely surrounding the fire-box.

B denotes the fire-grate, which may be of any suitable and well-known type. Upon the outwardly-flanged top of said water-legs is supported and riveted the annular water-chamber C, upon which is supported the superposed portion of the boiler hereinafter described. To enable said water-chamber to communicate with the interior of the water-leg *a* and support the aforesaid portion of the boiler without liability of causing said

chamber to be spread by the superincumbent weight, the bottom of the water-chamber C is provided with ports *b b* to afford the aforesaid communications, and with intermediate integral portions *b' b'*, as shown in Fig. 3 of the drawings, which integral portions serve as ties to resist the lateral strain exerted on the chamber by the aforesaid weight.

The superimposed portions of the boiler consist of the annularly-arranged series of vertical water-tubes *c c*, surrounding the central space *d*, which is directly over the central opening or fire-passage D, formed by the annular water-chamber C, directly over the fire-box A, as clearly shown in Fig. 2 of the drawings. Said water-tubes are attached to and communicate with the interior of said water-chamber. The upper ends of said tubes communicate with the interior of the combined water and steam chamber F, which is mounted directly on said tubes and is thereby supported in its position. The chamber F is also of annular shape in cross-section to form the central passage F' for the products of combustion. Said passage F' and lower passage D are axially in line with the central space *d*. The series of water-tubes *c c* are inclosed in the cylindrical combustion-chamber I, which is vertically elongated sufficiently to embrace the top portion of the lower water-chamber C and bottom portion of the upper chamber F, which latter is movable vertically in the combustion-chamber to allow the water-tubes *c c* to freely expand and contract without danger of straining and buckling the flue-sheets. The wall of the combustion-chamber is supported on and rises from annular plates *e e*, seated on brackets *f f*, secured to the exterior of the water-chamber C. Said wall may be formed either of brick, preferably of two thicknesses, with an air-space *h* between them, or of iron or steel, as represented in Fig. 9 of the drawings.

In order to compel the products of combustion to thoroughly circulate between the water-tubes *c c* and thus effectually heat the same, the central space *d* is provided with deflectors or diaphragms *i i*, which span said space. I preferably form said diaphragms of arches built of fire-brick and upon suitable

supports secured to a plurality of the tubes of the inner annular row. These arch-supports I prefer to form of clamps *j*, embracing circumferentially compressed portions *c'* of the tubes, so as to prevent said clamps from slipping down on the tubes, and upon these clamps I support a hoop *l*, upon which the arch is built. Said arch-supports are more clearly shown in Figs. 6, 7, and 8 of the drawings.

The base of the arch is to cover the hoop and subjacent portions of the clamps to protect said parts from the impingement of the fire.

In order to insure proper circulation of the water in the boiler, I interpose between two of the outer annular rows of tubes *cc*, at the base thereof, suitable baffle-plates *tt*, which serve to deflect the fire thereat, so as to heat more thoroughly the inner rows of tubes and keep the outer row of tubes comparatively cool. This causes the water to rise from the water-chamber *C*, through the inner rows of tubes *cc*, to the upper chamber *F*, and thence descend through the outer row of tubes back to the lower chamber *C*, as indicated by dotted arrows in Fig. 2 of the drawings, the unbroken arrows indicating the circulation of the products of combustion.

What I claim is—

1. The combination of a vertically-prolonged combustion-chamber, an annular water-chamber at the base of said combustion-chamber, the fire-box formed with water-legs supporting upon their upper ends the said water-chamber, said chamber having ports in its bottom to communicate with the interior of the water-legs, and the portions of the chamber between the ports forming ties to prevent the spreading of the chamber, a combined water and steam chamber on the upper end of the combustion-chamber and provided with a central vertical smoke-flue, an annu-

larly-arranged series of water-tubes connecting the two water-chambers and diaphragms across the space surrounded by the series of water-tubes as set forth.

2. The combination of an upright conical fire-box formed with water-legs, an annular water-chamber seated upon the upper ends of said water-legs and provided with ports communicating with the interior of the water-legs, an upright cylindrical combustion-chamber rising from the outer periphery of said water-chamber, a water-chamber seated in the upper end of the combustion-chamber and provided with a vertical smoke-flue over the center of the combustion-chamber, an annularly-disposed series of vertical water-tubes connecting the two water-chambers and supporting the upper of said chambers, and diaphragms across the space surrounded by the series of water-tubes, said upper water-chamber being movable vertically in the combustion-chamber to allow the water-tubes to freely expand and contract as set forth.

3. In combination with the fire-box two water-chambers arranged one above the other and above the fire-box and provided with vertical flues through their centers for the passage of the products of combustion, an annularly-disposed series of water-tubes connecting said water-chambers, and a combustion-chamber inclosing said series of tubes, clamps secured to a plurality of the inner tubes, and diaphragms supported on said clamps as set forth.

In testimony whereof I have hereunto signed my name this 3d day of February, 1896.

ROBERT JOY. [L. s.]

Witnesses:

J. J. LAASS,
M. A. LEYDEN.