(No Model.) 2 Sheets—Sheet 1.

H. W. FRACKMANN.

WATER TUBE SAFETY BOILER.

No. 503,130. Patented Aug. 15, 1893.

Fig. 1.

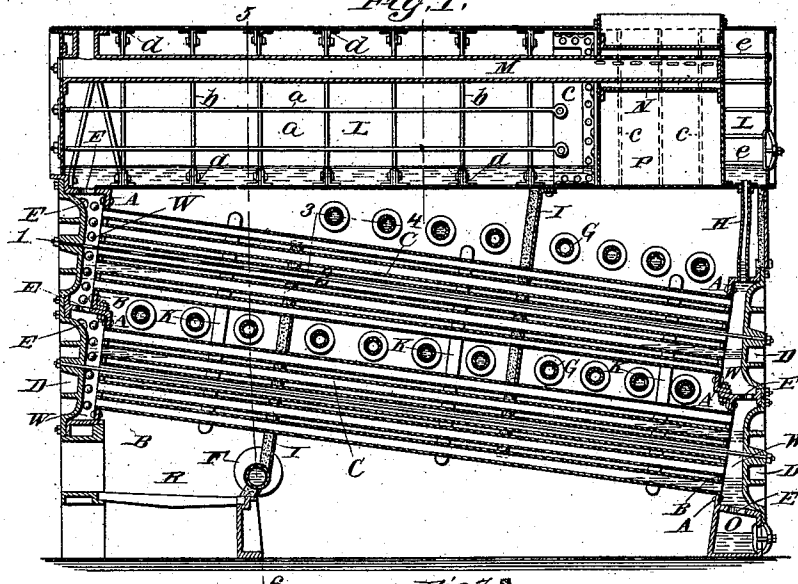


Fig. 2.

Section 5.6.

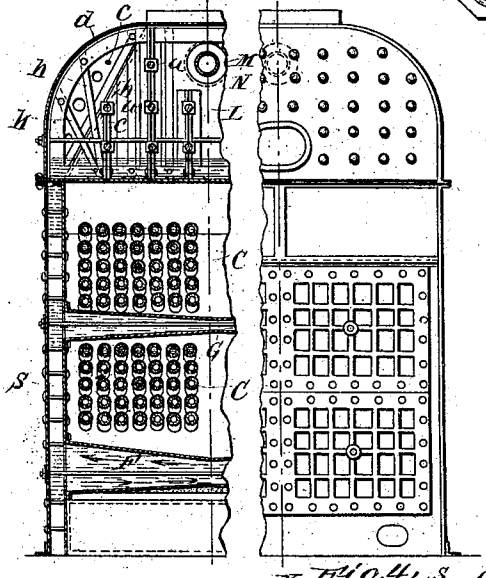


Fig. 3.

Fig. 7.

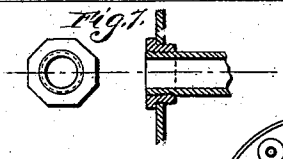


Fig. 6.

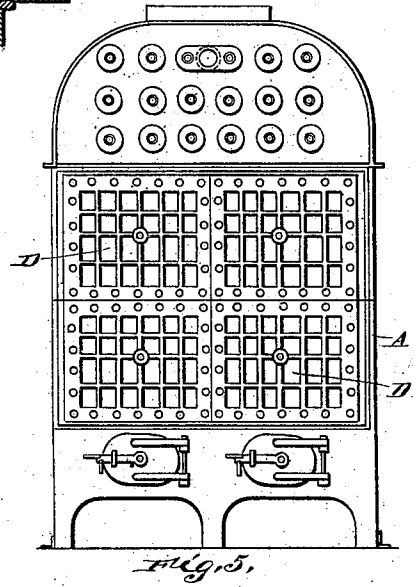


Fig. 4.

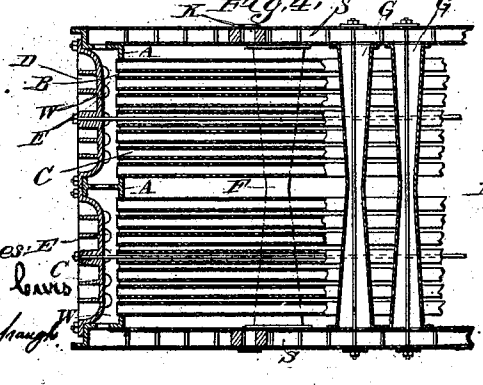
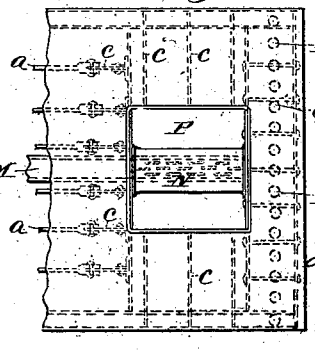


Fig. 5.



Witnesses:
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(No Model.) 2 Sheets—Sheet 2.

H. W. FRACKMANN.

WATER TUBE SAFETY BOILER.

No. 503,130. Patented Aug. 15, 1893.

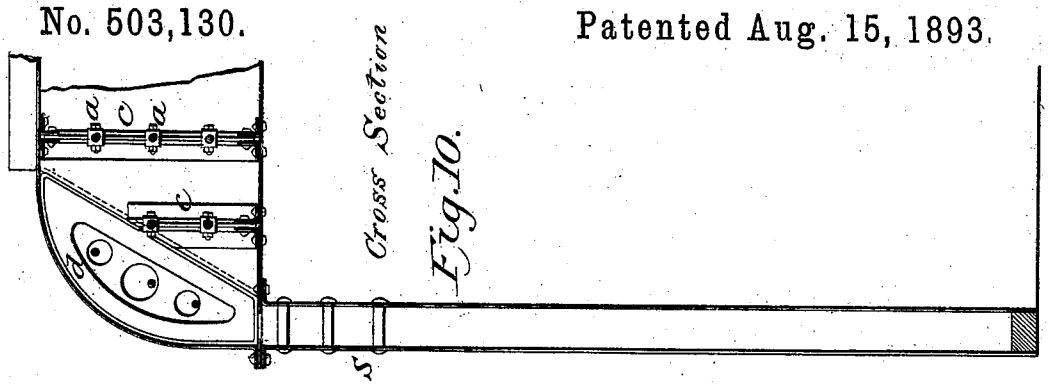

Fig. 10. Cross Section

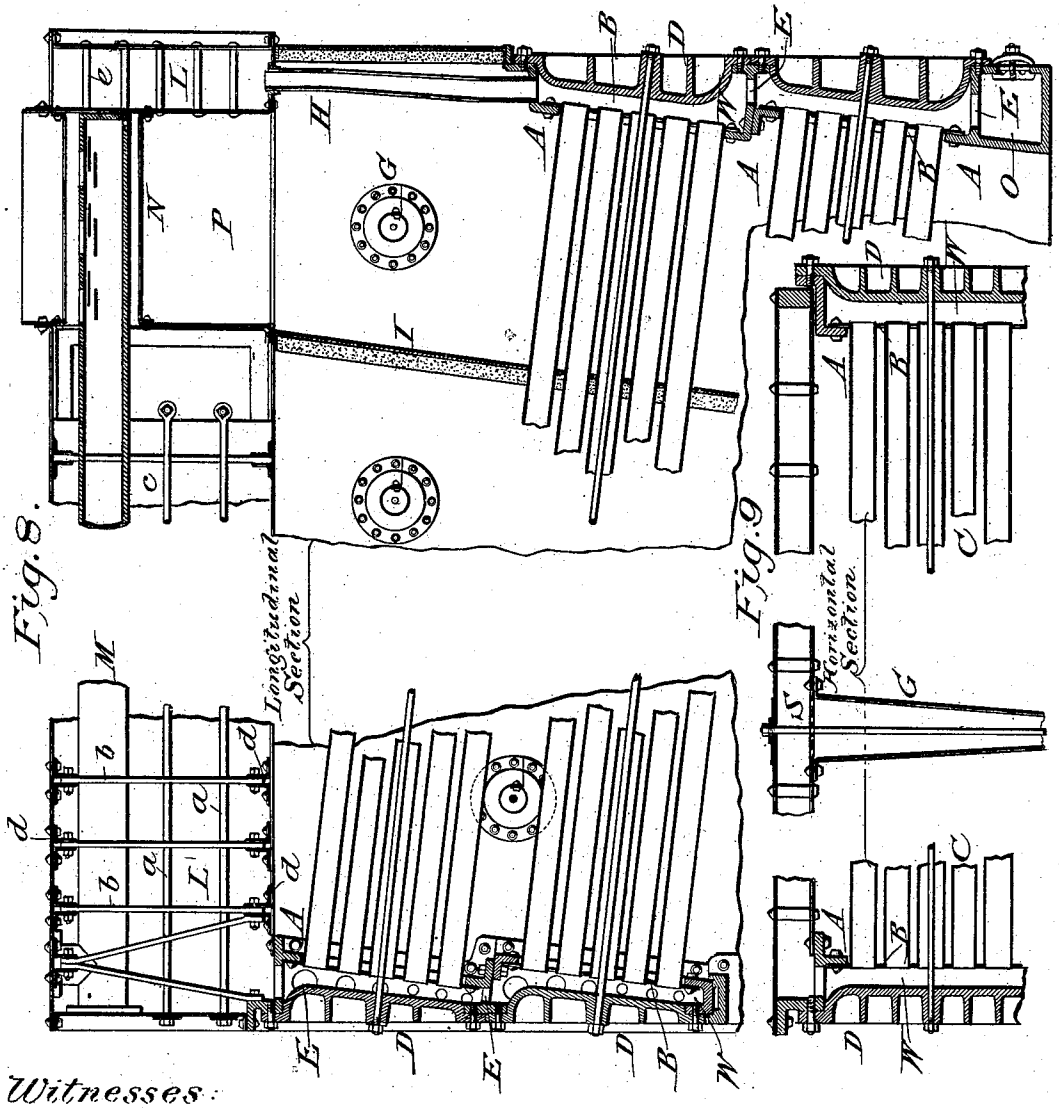

Fig. 8. Longitudinal Section

Fig. 9. Horizontal Section.

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UNITED STATES PATENT OFFICE.

HENRY W. FRACKMANN, OF SCRANTON, PENNSYLVANIA.

WATER-TUBE SAFETY-BOILER.

SPECIFICATION forming part of Letters Patent No. 503,130, dated August 15, 1893.

Application filed June 23, 1891. Serial No. 397,190. (No model.)

To all whom it may concern:

Be it known that I, HENRY W. FRACKMANN, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented a new Water-Tube Safety-Boiler, of which the following is a specification.

My invention relates to improvements in water tube boilers, to obtain a large heating surface with small grate-bar surface, continuously circulating water and large safety steam room with dry superheated steam. I attain these objects by illustrations in the accompanying drawings in which—

Figure 1, is a vertical longitudinal section; Fig. 2, half vertical transverse section; Fig. 3, half back view; Fig. 4, plan of horizontal section through 1, 2, 3, 4; Fig. 5, top view of rear end of boiler, showing smoke-box with superheating pipe; Fig. 6, a front elevation. Fig. 7, shows the mode of securing tubes in tube sheet, when used as braces. Figs. 8, 9 and 10 are detail views on an enlarged scale.

Similar letters refer to similar parts throughout the several views.

In Fig. 1, A A. are tube sheet frames; B B. the tube sheets; C C. inclined tubes, water circulating through the inside of the same; D D. are frame covers which form with frames A A. and tube sheets B B. the front and back water boxes W W. Each of these water boxes form an irregular prism, having to its ends like figures, but not parallel; the tube carrying side and its opposite cover. Two opposite sides, top and bottom of the four remaining sides, are equal parallelograms, the two remaining sides form equal trapezoids.

E E. are holes in the sides, tops and bottoms of tube sheet frames to allow the circulation of water and steam with the sides and top of the boiler.

F, is a conical shaped water back and forms the back side of furnace R.

G G. are double shaped water cones.

H H. are communicating pipes between back water boxes W W. and steam room L.

I I. are brick partitions to regulate the course of fire from furnace to smoke-box.

K K. are openings inside of boiler for cleaning; L, safety steam room, in which *a a.* are longitudinal braces, *b b.* braces between crown-sheet and outer shell, *c c.* gusset pieces to act as braces and brackets for smoke-box P.; M. dry pipe with oblong holes in top of after end and where it is incased by the superheating pipe N. and located in the fire-box P; O. mud-drum connected to after lower water-box to collect the sediments of the water.

The front and back water-boxes W W. connected with the inclined water tubes C C., the steam room L and the two sides S S., which are double for a water space between them, form the boiler with the furnace R at the forward end and the mud-drum O at the lowest after end. The generated steam in the inclined tubes and back and front water boxes passes through the holes E E. in the tube sheet frames to the steam room L; the water also circulates through these inclined tubes and through the hole E E. with the sides S S. and the steam room L, the bottom of the latter steam room is also covered with water, the under side having an effective fire surface. The conical form of water back F, and other water cones G G. allow the water and steam freely to circulate in the same and to rise through the sides S S. to the steam room L, as indicated by arrows. Through communicating pipes H H. circulation of water and rising of steam is perfected at the after end of boiler between water boxes W and steam room L. The safety steam room is formed by bracing the outsides with gusset pieces C C. and double "L" angle or tee ("T") iron *d d.* and these are then held together longitudinally by braces *a a.* and transversely and between crown sheet and outer sheet by braces *b b.* and also with screw-stays *e e.* The front water boxes W W. are only secured to the two water spaced sides so that the expansion of tubes and back water boxes can be free. It will be readily seen, that, as the fire from the furnace goes between and around the inclined water tubes C C. and through the aid of partitions I I. several times, that the fire also surrounds the water back F, water cones G G., parts of the front and back water boxes W W.; the communicating pipes H H., the two insides of the two sides S S. and the crown sheet, it has a very large and effective fire surface; and therefore steam can be quickly generated and having a large safety steam room, can keep the steam up too. Superheated steam I receive by bringing a dry pipe M. in the upper part of safety steam

room L from front to back, the after end has oblong holes in the upper part of the same, through which the steam enters. The after end of this dry pipe and there where the oblong holes are in the top, is surrounded by the superheating pipe N, having a larger diameter than the dry pipe so that the steam can surround the dry pipe. The superheating pipe N is secured to the smoke box P and is heated from the furnace fire. The dry and superheated steam can be utilized from either at the front, back, sides or top of the boiler.

Fig. 7, shows the mode of using the tubes as braces. The ends of the tubes are thickened and threaded a little taper, the hole in the tube sheet is bored larger than the tube and also taper thread cut thereon with the same pitch as the thread on the tube; the space between the tube and tube sheet is filled with a conical shaped nut, threaded inside and outside and the same kind of thread as tube and tube sheet, and thus can be screwed, wedge shape like, in the space between tube and tube sheet and doing this on both ends the tube forms a good brace between the two tube sheets.

Prior to my invention water tube boilers have been built, but

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

1. The combination of two irregular prismoidal water boxes, the ends of which form trapeziums with the connecting inclined water tubes, each prismoidal water box having one separate cover opposite the tube carrying side, with openings in the other four sides, two of which form trapeziums, by which water and steam communication is formed with the water spaced sides, the ends of said front and back irregular water boxes forming trapeziums being in communication with the water spaced sides, all as described.

2. The combination of back irregular water-box and cover, with the tubes connecting back irregular water-box and safety steam room, a front water-box, with inclined tubes connecting back and front water-boxes, these connecting tubes forming communication between front and back irregular water boxes and the safety steam room, all as specified.

3. The combination of double cone shaped water chambers with a furnace of a boiler, the double cone shaped water chamber forming a water back at the after end of furnace, and connected to the inner side of the water spaced sides, so that water and steam communicate between double cone shaped water back and water spaced sides, all as described.

4. The combination of double cone shaped water chambers with the water spaced sides, through which there are water and steam communications with the water spaced sides and safety steam room, all as specified.

5. The combination of the safety steam room, connected with the front and back irregular prismoidal water boxes and the water spaced sides, with the smoke-box passing through it, with a super-heating pipe inside of smoke-box, with a steam dry pipe in the steam room and in the super-heating pipe, with holes in after and upper side of dry pipe, all substantially as described.

6. The combination of front and back irregular prismoidal water boxes, connected with inclined tubes, with water spaced sides, with a furnace under and after the front water box, with a double cone shaped water-back, with double cone shaped water chamber, connecting the water spaced sides with a safety steam room and its smoke-box passing through it, with a super-heating pipe in smoke-box, with a steam dry pipe and its holes in the upper side of after end, with tubes connecting safety steam room and back water boxes, with a mud-drum, all substantially as described.

HENRY W. FRACKMANN.

Witnesses:
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