

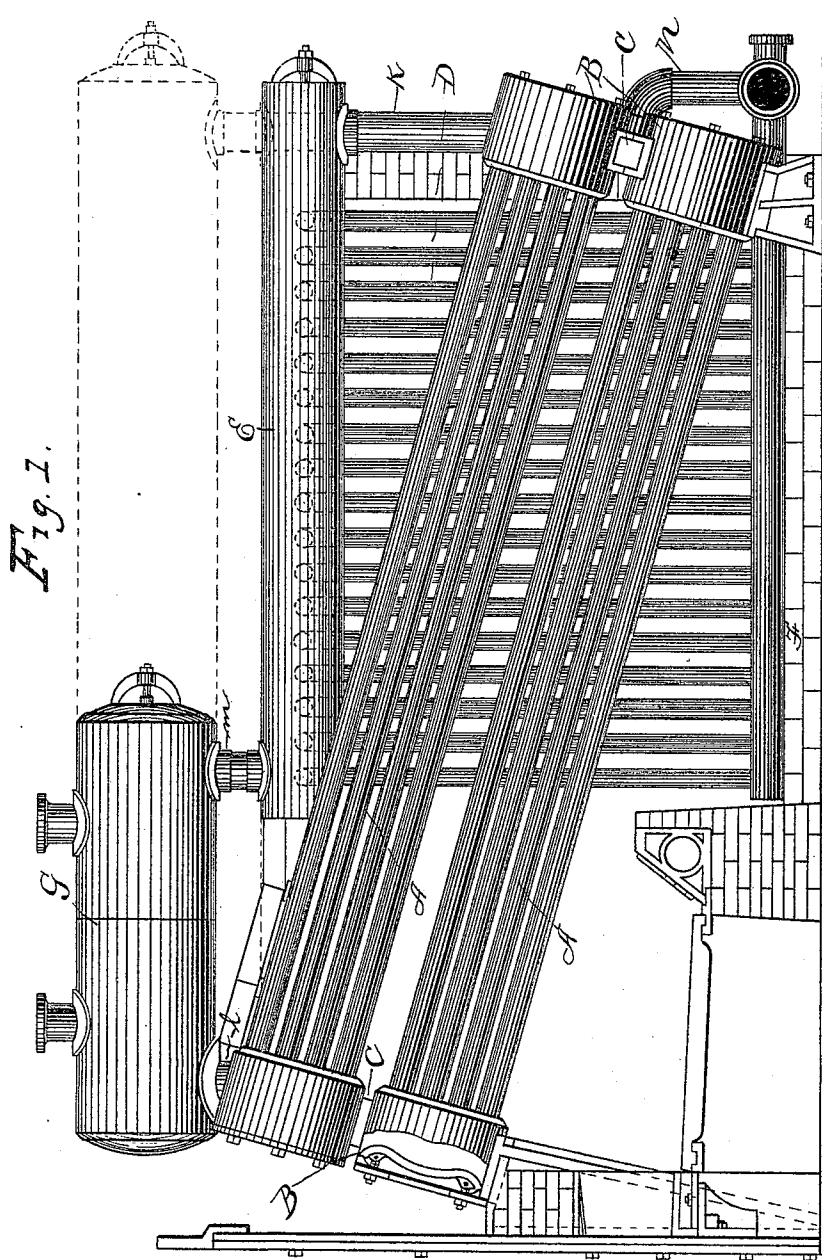
(No Model.)

3 Sheets—Sheet 1.

A. E. DAIN.
TUBULAR BOILER.

No. 438,090.

Patented Oct. 7, 1890.



WITNESSES:

W D Lewis
J J Painter

INVENTOR

Albert E. Dain

BY John H. Roney
his

ATTORNEY

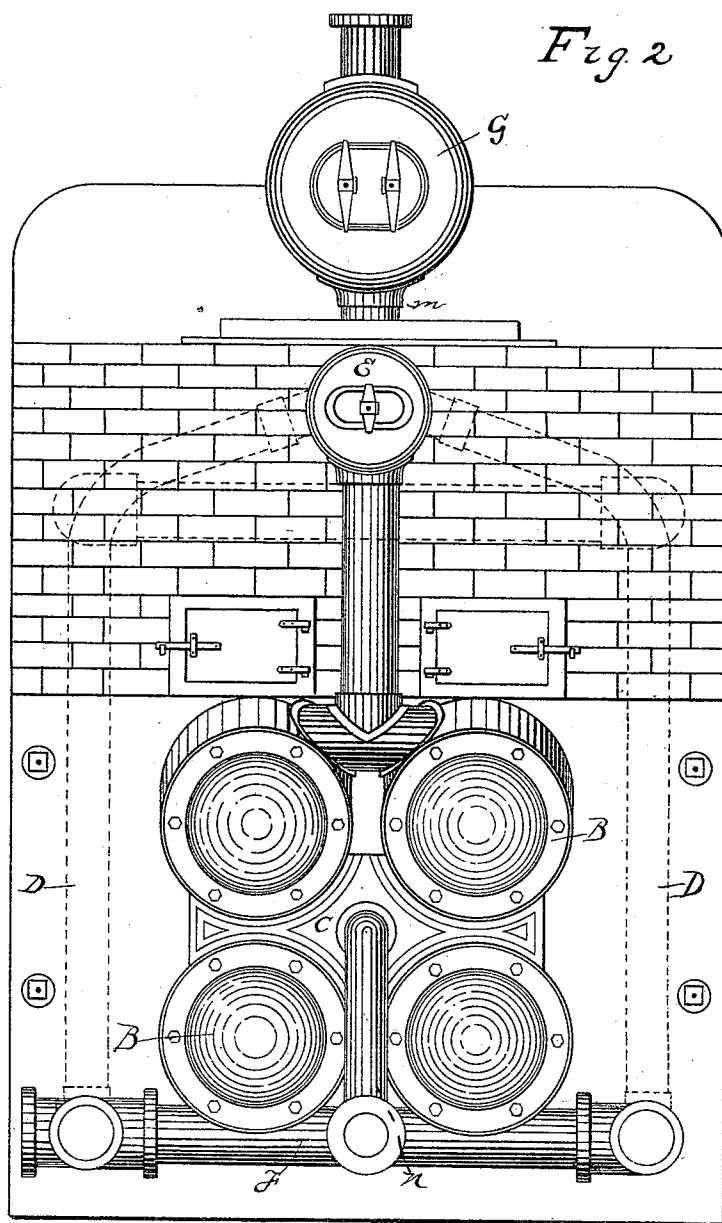
(No Model.)

3 Sheets—Sheet 2.

A. E. DAIN.
TUBULAR BOILER.

No. 438,090.

Patented Oct. 7, 1890.



WITNESSES:

O D Lewis
J J Painter

INVENTOR

Albert E Dain

BY

John H. Conely
his

ATTORNEY

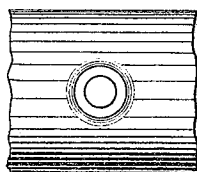
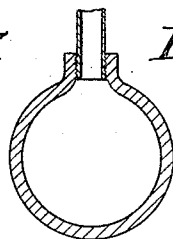
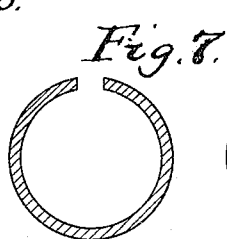
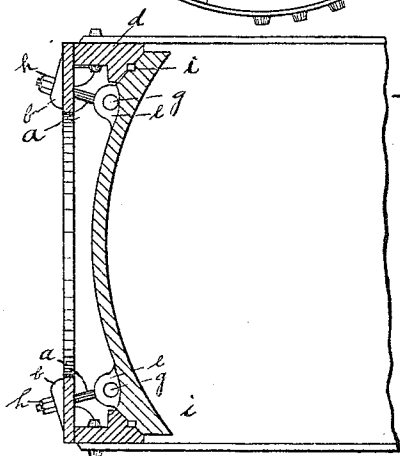
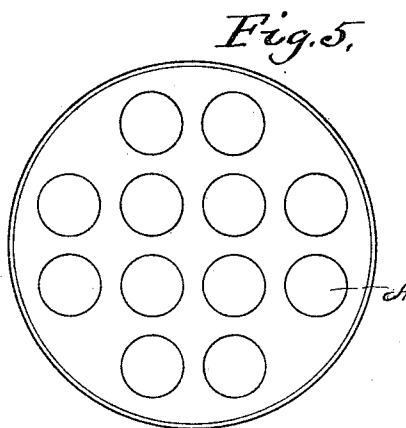
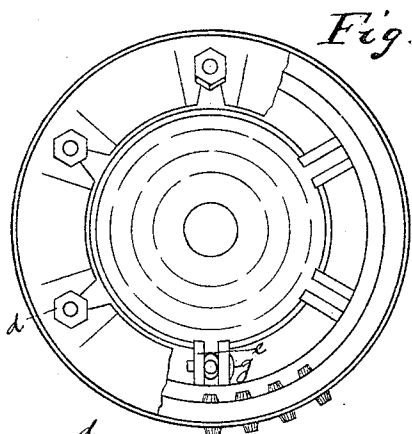
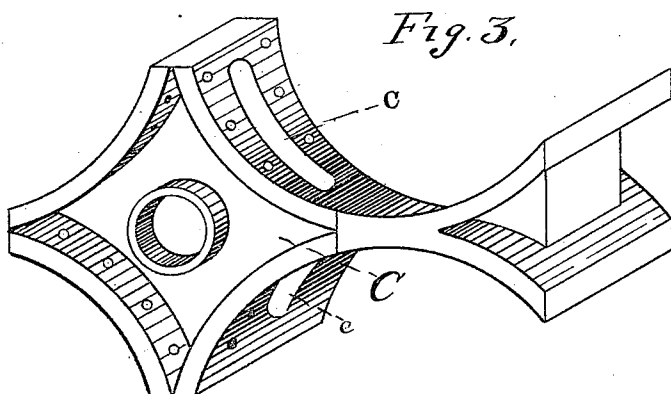
(No Model.)

3 Sheets—Sheet 3.

A. E. DAIN.
TUBULAR BOILER.

No. 438,090.

Patented Oct. 7, 1890.



WITNESSES:

O D Lewis
J J Painter

INVENTOR

Albert E Dain

BY John H Roney
his

ATTORNEY

UNITED STATES PATENT OFFICE.

ALBERT E. DAIN, OF PITTSBURG, PENNSYLVANIA.

TUBULAR BOILER.

SPECIFICATION forming part of Letters Patent No. 438,090, dated October 7, 1890.

Application filed August 1, 1890. Serial No. 360,710. (No model.)

To all whom it may concern:

Be it known that I, ALBERT E. DAIN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in 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 the same, reference being had to the accompanying drawings, which form a part of this specification, in which—

Figure 1 indicates a side elevation of my improved tubular boiler. Fig. 2 is a rear elevation of the same. Fig. 3 is an enlarged perspective of the combined water-chamber and water-head connector. Figs. 4 and 5 are respectively plans of front and rear walls of water-heads. Fig. 6 is a vertical section of front wall of water-head. Fig. 7 is a section of supply-pipe or mud-drum and horizontal water-tube, taken through one of the orifices therein. Fig. 8 is same, said orifice being drawn out and section of one of the vertical tubes secured therein. Fig. 9 is a plan of upper surface of section of supply-pipe, showing orifice and vertical tube therein.

My invention relates to tubular boilers; and it consists in the novel construction and arrangement of parts hereinafter specifically described, reference being had to the accompanying drawings, forming part hereof, in which like letters indicate like parts wherever they occur.

In said drawings, A A are series of inclined water-tubes arranged in series of twelve (12) or more and nested in water-heads B B B B by expanding or otherwise suitably securing the ends of said tubes in the rear walls of said water-heads, as shown in Fig. 1. Said water-heads are connected by the water-chambers C C, two at either end, to secure a group of four water-heads. The upper and lower surfaces of lateral extensions of said water-chambers are concave and convex, respectively, and are bolted or otherwise suitably secured to the upper and lower water-heads, respectively. Said water-chambers are provided with oblong orifices c c, four in number, opposite, when said chambers are secured to said water-heads, to similar openings therein,

whereby water, when received in said water-chambers, is permitted to pass therefrom into said water-heads and thence into the tubes. Said water-heads are suitably supported in the front and rear walls, respectively, of the furnace. The front walls of said water-heads are secured therein by swivel-bolts a a a, which pass through the lugs b b upon the annular rings d d, (said lugs being provided with orifices for that purpose,) and the inner ends of said bolts are secured between the lugs e e e upon outer surface of said front walls, said lugs being provided with orifices for the reception of the bolt g g, whereby when said swivel-bolts are tightened by screwing the nuts h h at their outer ends the beveled portions of said front walls are drawn tightly against the correspondingly-beveled inner face of said annular rings, thoroughly securing said water-head wall therein.

A lead gasket i i may, if desirable, be inserted in the recess formed by the notches on the beveled faces of the annular rings and front walls, respectively, for the purpose of making said water-heads more thoroughly water-tight.

D D are vertical water-tubes arranged in or near the side walls of the furnace, the upper ends of said tubes terminating in elbows, being connected with the horizontal water-tube E, and the lower ends being connected with the mud-drum F on the upper side of the same, as shown by the dotted lines of Fig. 2. Said horizontal water-tube and mud-drum are respectively provided with orifices corresponding in number with said vertical tubes, said orifices being drawn out or provided with an upwardly-projecting flange provided with a thread, as shown in Fig. 8, for the purpose of securing the ends of said vertical tubes therein. Said horizontal water-tube is also connected with the upper rear water-heads by the vertical pipe K for the purpose of re-establishing intercommunication between all said water-tubes.

G is a steam-dome connected at the front and rear ends, respectively, by the short vertical pipes l and m with the upper front water-heads and said horizontal water-tubes, as shown in Fig. 1. Said steam-dome may, if desirable, be enlarged, as shown by dotted lines, same figure, and connected, as shown,

with the rear end of said horizontal water-tube.

5 N is a pipe, the upper end of which is connected by an elbow with the water-chamber, the lower end being connected with said mud-drum for the purpose of supplying water to said chamber, and from thence, as heretofore stated, to the water-tubes.

10 One of the many advantages obtained by my construction and arrangement of the tubes in their respective water-heads is that by bolting a plate over the orifices in the water-chamber, which communicates with its respective water-head by means of similar openings therein, the removal of said water-heads and tubes nesting therein does not interfere with the operation of the balance.

20 Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a tubular steam-boiler, the combination of a series of inclined water-tubes nested in water-heads and a water-chamber provided with convexo-concave lateral extensions adapted to partially surround the lower periphery of the upper water-heads and the

upper periphery of the lower water-heads, respectively, said water-chambers being also provided with orifices opposite similar openings in said water-heads, whereby intercommunication is had between said chambers and said heads, substantially as and for the purpose herein described. 30

2. In a tubular steam-boiler, the combination of a series of inclined water-tubes nested in water-heads, said water-heads being connected by a water-chamber provided with convexo-concave extensions and openings communicating with said water-heads, a series of vertical water-tubes at either side of said inclined tubes and connecting a horizontal water-tube and the mud-drum, and a steam-dome, substantially as and for the purpose herein set forth. 40

In testimony that I claim the foregoing I hereunto affix my signature this 24th day of July, A. D. 1890. 45

ALBERT E. DAIN. [L. S.]

In presence of—

R. J. STONEY, Jr.,
GEO. F. STONEY.