

(No Model.)

2 Sheets—Sheet 1.

J. HAYTHORN.

WATER TUBE BOILER AND TUBE FASTENING.

No. 558,685.

Patented Apr. 21, 1896.

FIG. 2.

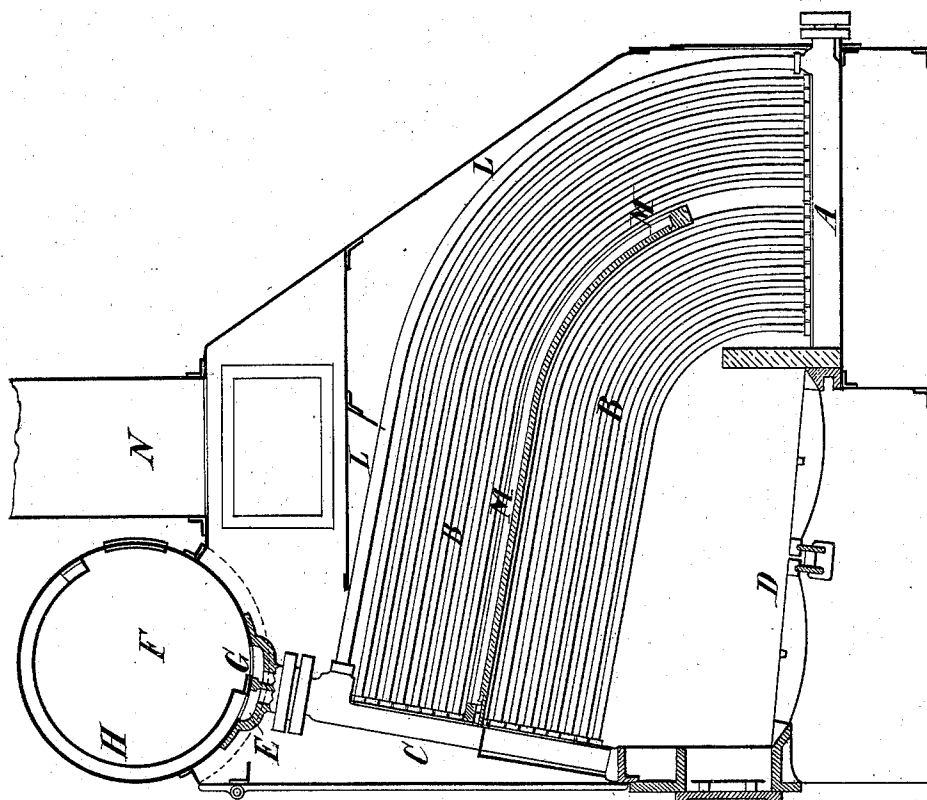
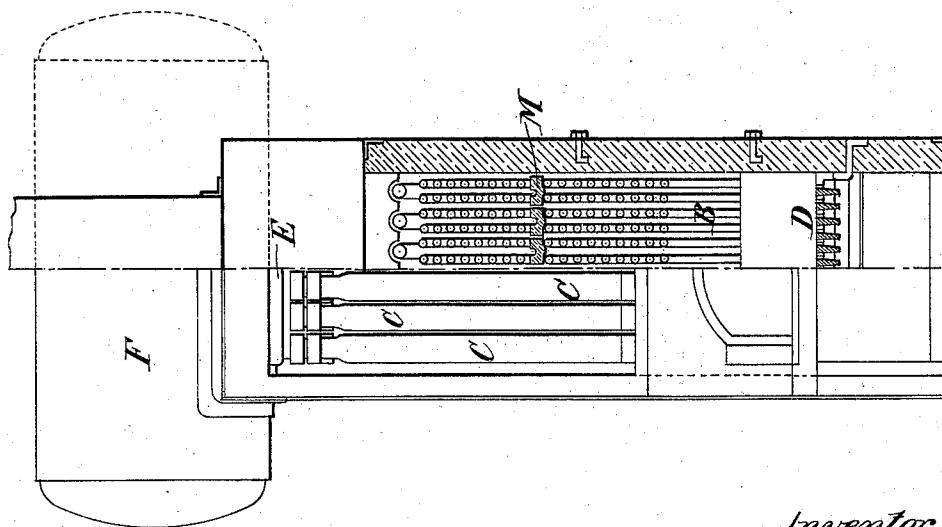


FIG. 1.



Witnesses
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By his Attorneys
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(No Model.)

2 Sheets—Sheet 2.

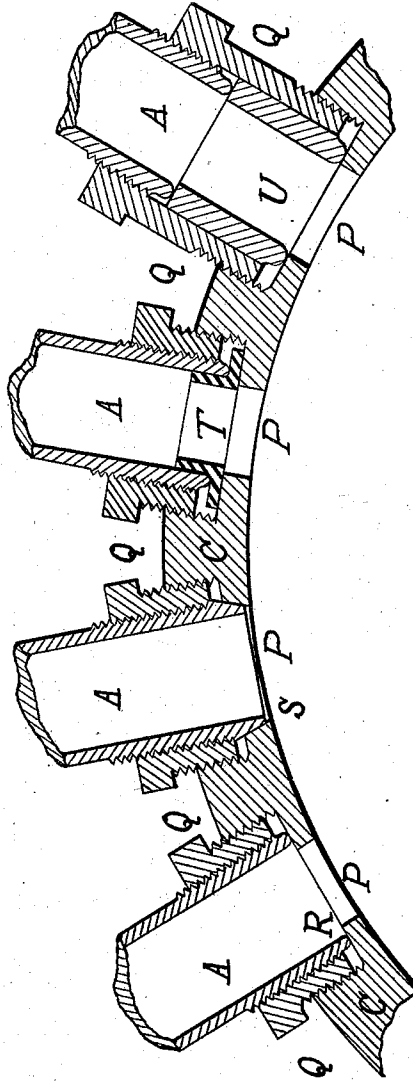
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FIG. 3.



WITNESSES:

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UNITED STATES PATENT OFFICE.

JOHN HAYTHORN, OF GLASGOW, SCOTLAND.

WATER-TUBE BOILER AND TUBE-FASTENING.

SPECIFICATION forming part of Letters Patent No. 558,685, dated April 21, 1896.

Application filed June 22, 1895. Serial No. 553,694. (No model.)

To all whom it may concern:

Be it known that I, JOHN HAYTHORN, a subject of the Queen of Great Britain and Ireland, and a resident of Glasgow, Scotland, have invented certain Improvements in Water-Tube Boilers and Tube-Fastenings for such Boilers, of which the following is a specification.

My said invention has for its object to improve the construction of water-tube boilers.

10 A boiler as made with my improvements consists of a number of elements or sections combined with one or more steam-drums or upper cylinders. Each element consists of a lower narrow horizontal or nearly horizontal box or casing connected by a number of water-tubes to an upper vertical or nearly vertical box or casing. The elements are placed side by side and their vertical boxes are connected to a drum or cylinder above them.

20 The set of lower boxes are connected by large pipes to the drum or cylinder for the descent of the water to the lower ends of the water-tubes, or some of the water-tubes may be made larger for the purpose. Each element

25 may have one or more rows of water-tubes connecting its upper and lower boxes. When required for examination or repair, any one element can be disconnected and taken away without disturbing the neighboring elements.

30 The water-tubes are secured to the boxes or casings by improved externally-applied fastenings.

I hereunto append two sheets of explanatory drawings, to be hereinafter referred to, and showing my improvements.

Figure 1 on Sheet 1 of the drawings is an end elevation of one modification of my improved boiler, one half being shown with the smoke-box door removed and the other half being in section. Fig. 2 is a vertical section of the same as taken at right angles to Fig. 1. Fig. 3 on Sheet 2 is a section showing modifications of the improved water-tube fastening.

45 In the drawings the same reference-letters are used to mark the same or like parts wherever they are repeated.

Each element of the boiler shown in Figs. 1 and 2 consists of a lower narrow horizontal or nearly horizontal box or casing A, connected by a number of water-tubes B to an upper vertical or nearly vertical box or casing

C. The tubes B, starting vertically from the lower box A, curve over and extend nearly horizontally to the upper box C, the fireplace D being under the higher nearly horizontal parts of the tubes. The elements are placed side by side and the upper ends of their upper vertical boxes C are connected by flanged and bolted joints, or it might be by screw-couplings, to a box or casing E, extending across the set of elements and connected to a steam drum or cylinder F, which is at right angles to the elements. The box or casing E is divided by a partition G, and the water and steam pass up on the outer side of the partition into a narrow space formed by the shell of the drum F and an inner shell H before entering the interior of the drum, or the upper ends of the vertical boxes C may be connected directly to a steam drum or cylinder. The set of lower boxes A may be connected to a box or casing (not shown) lying across their ends and connected by one or more large pipes to the steam drum or cylinder, these connections being for the descent of the water to the lower ends of the water-tubes; or, as shown in Figs. 1 and 2, the descent or return downward is provided for wholly or partly through curved tubes L, each connected to the upper and lower boxes C and A. These tubes L are larger than the water-tubes B, and the descending water enters their upper ends from the space on the inner side of the partition G in the casing E.

The fire-gases acting directly on the nearly horizontal parts of the lower portion of the water-tubes B are, by a partition which may be formed by arranging tubes close together or by inserting firebrick-slabs M, made to extend along the water-tubes from their upper ends toward their lower ends, whence they return among the upper portion of the tubes and above the partition M to an uptake N.

Each element may have one or more vertical rows of water-tubes B connecting its upper and lower boxes C A. When required for examination or repair, any one element can be disconnected and taken away without disturbing the neighboring elements.

I am enabled to make the upper and lower boxes C A, to which the water-tubes B are fixed, smaller than would otherwise be necessary and without plugged or covered open-

ings opposite to the tubes in consequence of employing an improved fastening which is secured from the outside. In the box or casing A, Fig. 3, into which a tube B is to be fixed, a socket is formed with a contracted opening P through its inner end equal to the bore of the tube or a little less. The socket is internally screwed to receive an externally-screwed nut Q, and this nut is screwed internally to fit a screw-thread formed on the end of the tube B. The screw-thread on the tube is made of finer pitch than that of the internal screw-thread of the socket. When the nut Q, having been screwed a certain distance upon the tube end, is screwed into the socket, it draws the tube in and forces its end tightly against the contracted inner end of the socket. The end of the tube may bear on a flat surface R or a conical surface S at the inner end of the socket, or a washer T of copper or other suitable material may be interposed to form a tight joint; or, again, a short tubular piece U may be interposed so that the tube end need not enter the socket, the nut Q being in such case made long and strong enough to sufficiently support the tube.

I claim as my invention—

1. The improved water-tube boiler consisting of combined vertical sections, each comprising a lower approximately horizontal water box, casing, or pipe, connected by curved water-tubes to an approximately vertical casing, box or pipe communicating with a steam drum or cylinder, the connections being made by externally applied differential screw-nuts or short tubes, and in combination therewith a furnace under nearly horizontal parts of the water-tubes and a fire-

brick partition dividing the water-tubes into lower and upper portions and causing the fire-gases to pass among the lower portion of water-tubes toward their lower ends and thence among the upper portion of the water-tubes, substantially as herein set forth.

2. The improved water-tube boiler, consisting of combined vertical sections, each comprising a lower approximately horizontal water box, casing or pipe, connected by curved water-tubes to an approximately vertical casing, box or pipe communicating with a steam drum or cylinder, and in combination therewith a furnace under nearly horizontal parts of the water-tubes and a fire-brick partition dividing the water-tubes into lower and upper portions and causing the fire-gases to pass among the lower portion of water-tubes toward their lower ends and thence among the upper portion of the water-tubes, substantially as herein set forth.

3. The improved fastenings for securing tubes of water-tube boilers to cylinders, pipes, or other parts, and each consisting essentially of a nut having two screw-threads of different pitches, one of which threads screws upon the tube end and the other in a socket of the cylinder, pipe or other part, the tube end being forced into contact with said socket or piece therein, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN HAYTHORN.

Witnesses:

EDMOND HUNT,
DAVID FERGUSON.