

I. C. SMITH.  
STEAM BOILER.

No. 468,367.

Patented Feb. 9, 1892.

Fig. 1.

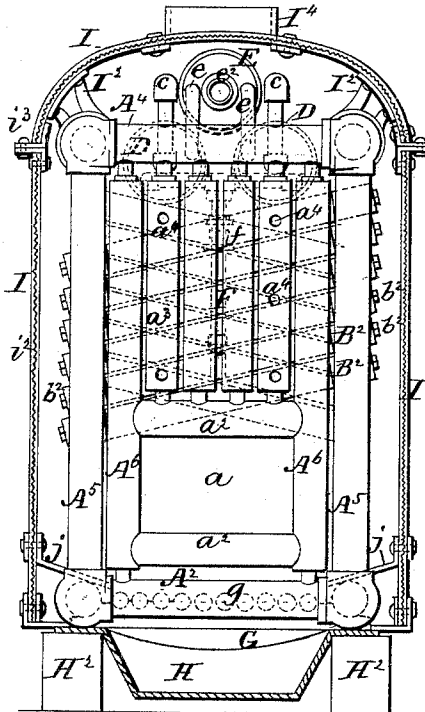


Fig. 2.

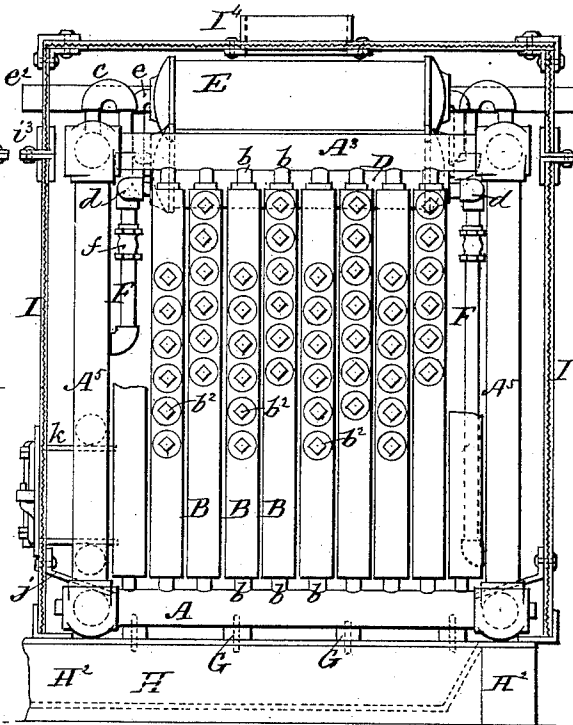


Fig. 3.

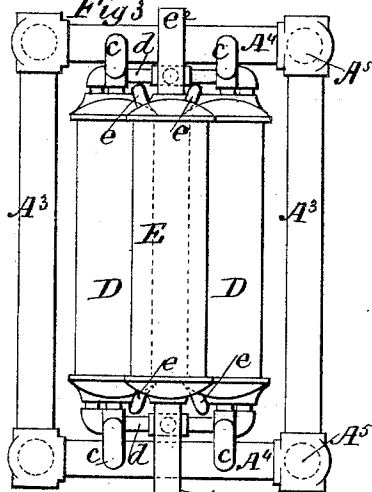


Fig. 4.

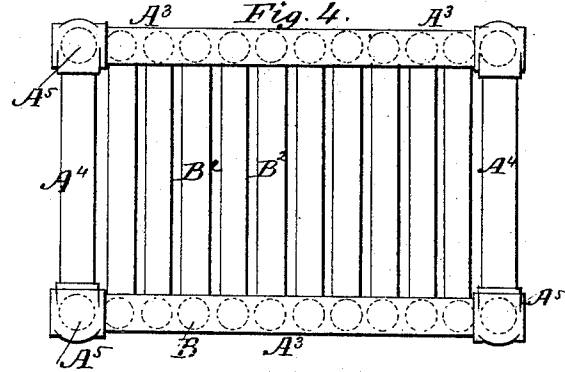
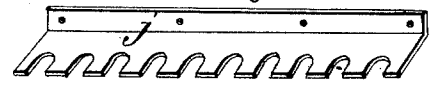


Fig. 5.



Witnesses

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W. R. Edelen.

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Fig. 5.

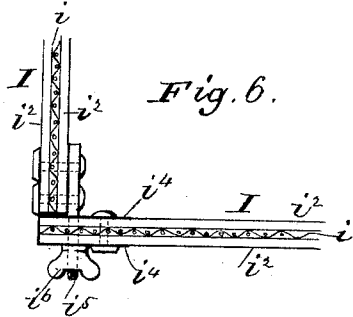
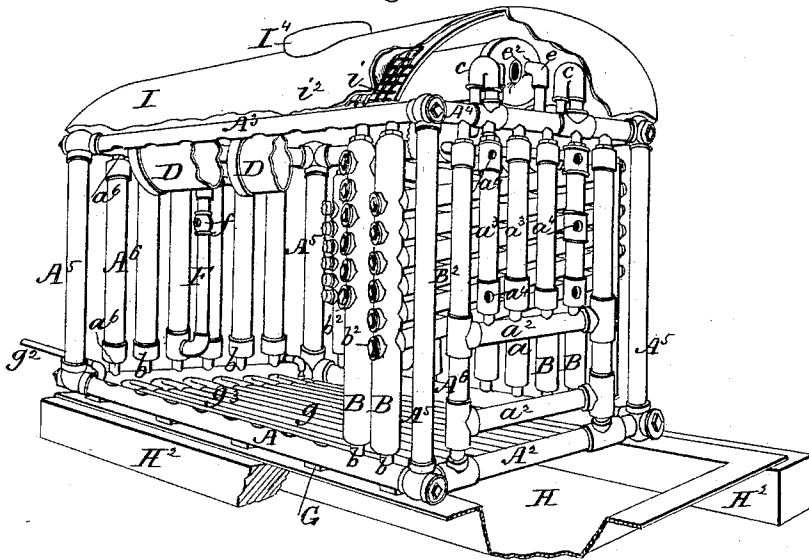


Fig. 6.

Fig. 7.

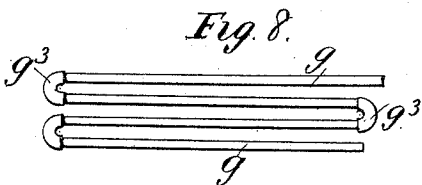
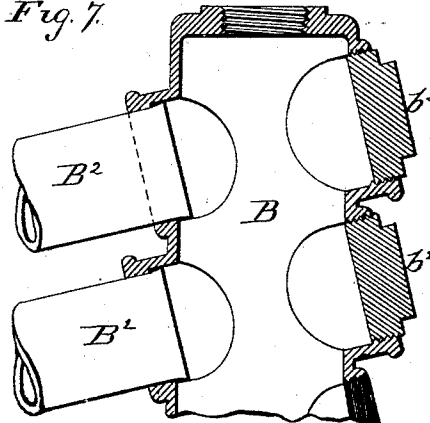


Fig. 8.

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# UNITED STATES PATENT OFFICE.

IRVING C. SMITH, OF NEW YORK, N Y.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 468,367, dated February 9, 1892.

Application filed July 23, 1891. Serial No. 400,425. (No model.)

*To all whom it may concern:*

Be it known that I, IRVING C. SMITH, a citizen of the United States, residing at New York city, in the county of New York, State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to sectional water-tube boilers having vertical tubes inclosing the fire-box and inclined boiler-tubes uniting said vertical tubes.

My improvement relates to details of construction to reduce the weight and increase the strength and steam-producing capacity of the boiler without increasing its cost, as hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of the boiler constructed in accordance with my invention, the front of the jacket being removed to show the boiler therein. Fig. 2 is a side elevation of the same with the side of the jacket removed. Fig. 3 is a top view of the pipe-frame of the boiler with the steam-receivers and their connections with said frame. Fig. 4 is a top view of the pipe-frame and manifolds of the boiler with the steam-receivers removed. Fig. 5 is a perspective view of the boiler with a portion of the jacket and of the manifolds removed and two of the steam-receivers partly broken away to show the interior. Fig. 6 is a top view of one of the side connections of the jacket. Fig. 7 is a vertical section through one end of the barrel of one of the manifolds. Fig. 8 is a top view of a portion of the tubular grate. Fig. 9 is a perspective view of one of the ash-deflecting plates.

The rectangular frame of the boiler consists of two side-sill pipes A and two end-sill pipes A<sup>2</sup>, and at a suitable distance above them two pipes A<sup>3</sup>, that I call "side-plate" pipes, and two end-plate pipes A<sup>4</sup>, the sill-pipes being united to the plate-pipes by pipe corner-posts securely joined thereto by right and left hand threads, flange connections, or other well-known means. The sill-pipes A and plate-pipes A<sup>3</sup> have their ends closed with screw-plugs b<sup>2</sup> and are furthermore connected together by a series of vertical and inclined

boiler-tubes united together, which, for convenience, I have termed "manifolds" and which consist of two vertical cast-steel or malleable iron tubular barrels B, having their bores contracted at the ends b, each barrel having openings on two opposite sides in the upper half thereof. The inner side openings of one barrel are connected to the inner side openings of the opposite barrel by means of boiler-tubes B<sup>2</sup>, having an inclination of about two and a half inches to the foot, and the ends of said tubes B<sup>2</sup> are expanded within the vertical barrels B to properly secure them thereto. The outer side openings of the barrels have screw-plugs b<sup>2</sup>, which can be removed to clean the tubes B<sup>2</sup>, said tubes being preferably introduced in the barrels B through the openings closed by the plugs b<sup>2</sup> when constructing the manifolds. Every alternate manifold is turned around in the construction of the boiler, so that the tubes B<sup>2</sup> will be inclined in the opposite direction from that in the adjacent manifolds.

The contracted upper ends b of the barrels B are connected with the horizontal pipes A<sup>3</sup> of the frame and the contracted lower ends b with the side-sill pipes A.

The lower half of the vertical barrels B of the manifolds under the inclined tubes B<sup>2</sup> constitute the side walls of the fire-chamber. The rear end wall of said chamber consists of a series of vertical pipes A<sup>6</sup>, Fig. 5, having nipples a<sup>6</sup> of reduced diameter at the upper end with lock-nut thereon to connect them with the plate-pipe A<sup>4</sup>, and right and left threaded nipples to connect them with the end-sill pipe A<sup>2</sup>. The front end wall of the fire-chamber has two vertical pipes A<sup>6</sup>, that are connected together by two horizontal pipes a<sup>2</sup>, between which is left a fire-door opening a. The upper horizontal pipe a<sup>2</sup> is connected with the upper horizontal pipe A<sup>4</sup> of the frame by means of a series of vertical pipes a<sup>3</sup>, which complete the front end wall of the boiler, and some of the pipes a<sup>3</sup> have perforations a<sup>4</sup> to receive the connections of the water-gage and gage-cocks.

The steam produced in the manifolds and in the pipe-frame of the boiler is first conducted from the top side of the two end-plate pipes A<sup>4</sup> through the inverted-U-shaped pipes or "return-bends" c into the two lower cylin-

drical receivers D, that are suspended from said pipes c, but may also rest upon the manifolds. From the two ends of the receivers D the steam passes into the two ends of a cylindrical superheating steam-receiver E through vertical pipes e, that also support said receiver. Steam is taken from either end or from both ends of the latter through pipes e<sup>2</sup> and conducted to any desired point.

To return into the vertical pipes A<sup>6</sup> or body of the boiler any priming-water that may have accumulated in the steam-receivers D, the ends of the latter are connected together about their lower portion by horizontal pipes d, and about the middle of the length of the latter there is a T-joint, from the vertical branch of which there extends downward a vertical pipe F, the lower end of which is connected with one of the vertical pipes A<sup>6</sup> of the rear end of the boiler-frame and with one of the vertical pipes a<sup>3</sup> of the front end of said frame. Each vertical pipe F has in its upper portion an upright check-valve f, closing upward to prevent any sudden draft of steam from flooding the steam-receivers with water from the contents of the boiler below them.

The grate-bars consist of small wrought-iron pipes g, placed lengthwise of the boiler and having their ends connected together by U-shaped return-bends g<sup>3</sup>, and the last one of said pipes on one side is connected with the sill-pipe A alongside thereof to have a circulation of the feed-water admitted therein through the pipe g<sup>2</sup>. These tubular grate-bars are supported by bearing-bars G, having their ends resting either upon iron beams or upon the outwardly-flanged upper edge of the ash-pan H, said flanged upper edge resting upon the foundation or sills H<sup>2</sup> directly under the sill-pipes A.

The sides, ends, and top of the boiler (which I regard as very suitable for a marine boiler) are inclosed in a jacket I, which consists of an inner and outer sheet of asbestos i<sup>2</sup>, between which sheets is placed a coarse-woven wire-cloth i of open mesh, and they are riveted together at intervals of about four inches and stiffened and bound at the edges by iron straps and light angle-iron. The top or bonnet of the jacket has an arched roof and vertical ends, and is supported upon brackets I<sup>2</sup>, resting on and secured to the side pipes A<sup>3</sup> of the frame. The sides of the jacket are secured to and suspended from the lower edges of the bonnet with small bolts passing through the angle-iron binding i<sup>3</sup>. The front and back sheets of the jacket have their vertical edges bound with strips of brass or of sheet-iron i<sup>4</sup>, having holes therein to receive the screw-threaded ends of studs i<sup>5</sup>, secured to the side sheets of the jacket, and upon said screw-threaded ends thumb-nuts i<sup>6</sup> are placed to securely unite the parts together, but permits the boiler to be easily uncovered for cleaning and repairing purposes. The lower half of the jacket opposite the fire-box may have several thicknesses of asbestos added to the

inside sheet, not only to insure the standing of great heat, but to partly fill up the space between it and the manifolds. Near the bottom edge of the sides and ends of the jacket is attached thereto horizontally an angularly-bent strip of sheet-iron or deflector j, having its lower edge cut in the form of comb-teeth or tongues that are made to pass between the nipples b of the barrels of the manifolds and rest upon the sill-pipes A to cause all dust and ashes falling thereon to pass into the ash-pan and also to prevent any draft of air from entering the fire-box from underneath the lower edge of the jacket. In the arched top of the jacket there is an angle-iron ring I<sup>4</sup>, conforming to the hole cut through the asbestos sheets and wire-cloth, the horizontal flange of the ring being securely riveted to the jacket and the vertical portion of the ring being adapted to be received in the lower end of the smoke-stack. Through each vertical end of the arched top or bonnet a hole is cut for the passage of the steam-pipes e<sup>2</sup>, and through the front end of the jacket holes are cut for the passage of the gage-cocks and water-glass fittings. The holes in the jacket at these points are hemmed or bound inside and out by means of iron or brass washers riveted thereto. The opening in the jacket for the furnace-door is placed opposite the opening in the vertical end pipes, and the door-frame surrounding the opening has a nozzle k, extending in through and flush with the inner face of the vertical end pipes.

Having now fully described my invention, I claim—

1. In a boiler, the combination of the manifolds, as described, consisting of vertical tubular barrels contracted at the ends and connected together by a series of inclined boiler-tubes, with a rectangular frame consisting of two tubular side sills A and two upper pipes A<sup>3</sup>, perforated to receive the nipples in the contracted ends of the tubular barrels, two end sills A<sup>2</sup> and two upper end pipes A<sup>4</sup>, with four pipe corner-posts having their ends securely united to the sills and upper pipes of the frame, substantially as shown and described.

2. In a boiler, the combination of a rectangular frame consisting of two tubular side sills A and two upper pipes A<sup>3</sup>, connected to the sills A, as shown and described, with the manifolds consisting of vertical tubular barrels contracted at the ends, each barrel having a series of openings on opposite sides thereof, the openings on one side receiving the ends of inclined boiler-tubes and the openings on the opposite side being closed with screw-plugs, substantially as and for the purpose described.

3. In a boiler, the combination of a rectangular frame having the tubular side sills A and sills A<sup>2</sup> and corresponding upper pipes A<sup>3</sup> A<sup>4</sup>, connected together by pipe corner-posts, and the manifolds, as shown and de-

scribed, with the vertical end pipes  $A^6$ , connected to the horizontal end pipes  $A^2$  and  $A^4$  of the frame, substantially as shown and described.

5 4. The combination of the rectangular tubular frame having the upper horizontal pipes  $A^4$  and the series of manifolds, as described, with two horizontal steam-receivers  $D$ , connected to the pipes  $A^4$  of the frame and suspended therefrom by inverted-**U**-shaped pipes  $c$ , substantially as shown and described.

15 5. The combination of the rectangular tubular frame having the two horizontal upper pipes  $A^4$  and the series of manifolds, as described, with two horizontal steam-receivers  $D$ , connected to the pipes  $A^4$  of the frame by inverted-**U**-shaped pipes  $c$ , and the steam-receiver  $E$ , connected with the two ends of each receiver  $D$  by pipes  $e$ , supporting it, substantially as shown and described.

20 6. The combination of the rectangular tubular frame having the vertical end pipes  $A^6$ , the upper horizontal pipes  $A^4$ , and the series of manifolds, as described, with two horizontal steam-receivers  $D$ , connected to the pipes  $A^4$  of the frame, as described, the horizontal pipes  $d$ , connecting the ends of the receivers  $D$ , and the vertical pipes  $F$ , connecting the pipes  $d$  with the vertical end pipes, substantially as described.

7. The combination of the rectangular tubular frame having the side sills  $A$  and grate-bearing bars  $G$ , having their ends under said side sills, with grate-bars consisting of pipes  $g$ , having their ends connected together by **U**-shaped return-bends  $g^3$ , substantially as shown and described.

8. In a boiler, the combination of a rectangular frame having the tubular side sills  $A$  and sills  $A^2$  and corresponding upper pipes  $A^3$   $A^4$ , connected together by pipe corner-posts, the manifolds, as shown and described, the vertical end pipes  $A^6$ , and the horizontal steam-receivers, with the inclosing jacket, substantially as shown and described.

9. The combination of the rectangular frame of a boiler having the tubular sills  $A$  and the inclosing jacket  $I$ , consisting of sheets of asbestos and interposed wire-cloth united together, as described, with the deflector  $j$ , secured to the jacket and having one edge provided with tongues resting upon the tubular sills of the frame, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

IRVING C. SMITH.

Witnesses:

E. E. MASSON,  
C. C. SCHILLER.