(No Model.)

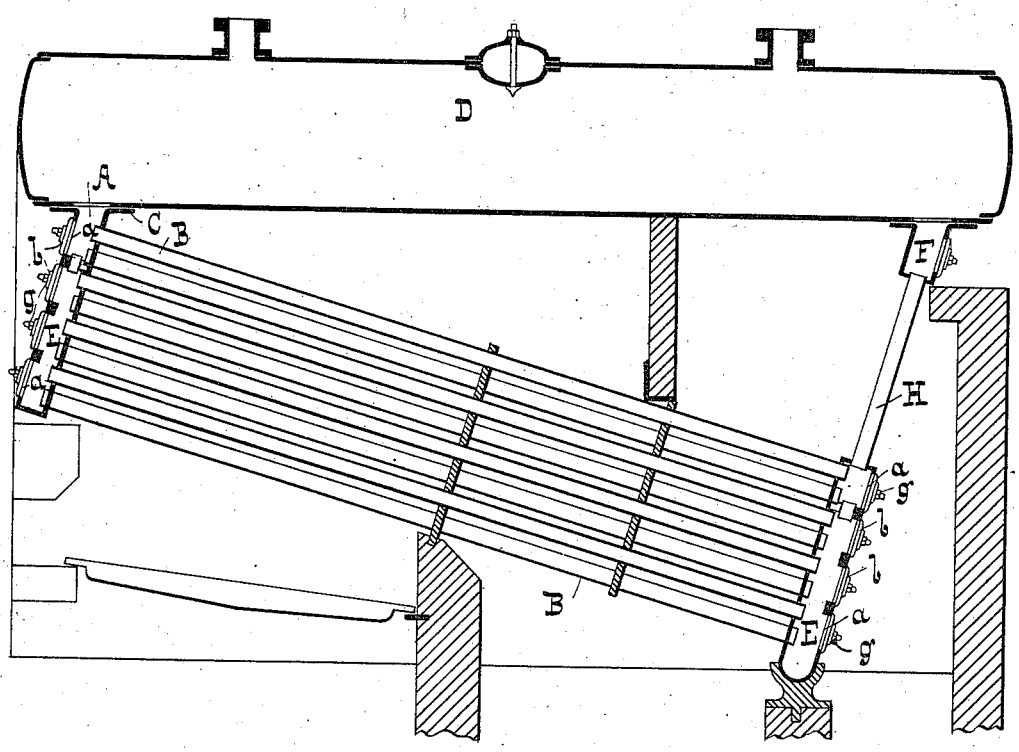
2 Sheets—Sheet 1.

E. J. MOORE.

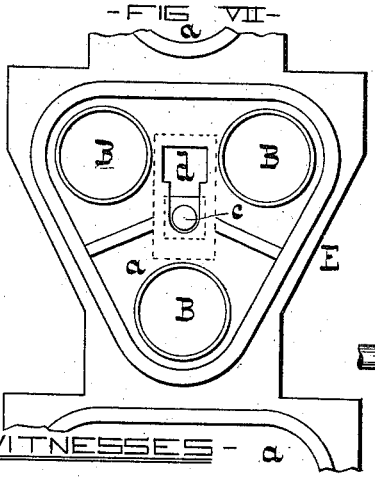
WATER TUBE BOILER.

No. 305,401. Patented Sept. 16, 1884.

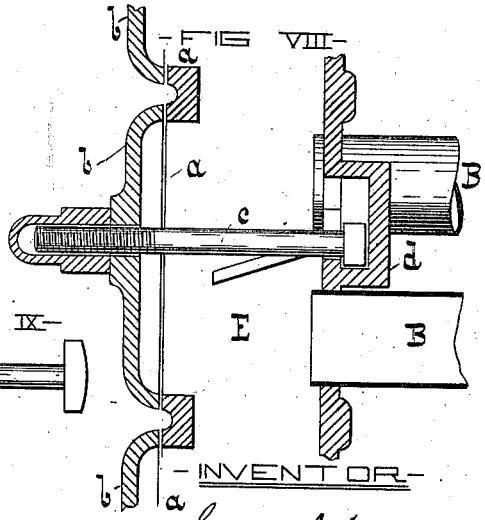
-FIG I-



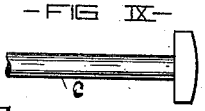
-FIG VII-



-FIG VIII-



-FIG IX-



-WITNESSES-

Dan'l Fisher

Chas. B. Cassady

-INVENTOR-

Edward J. Moore,

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Atty.

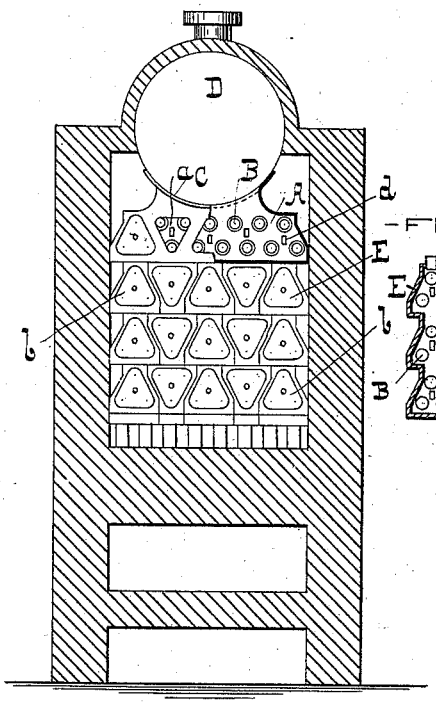
(No Model.) 2 Sheets—Sheet 2.

E. J. MOORE.

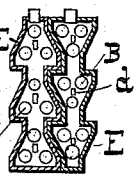
WATER TUBE BOILER.

No. 305,401. Patented Sept. 16, 1884.

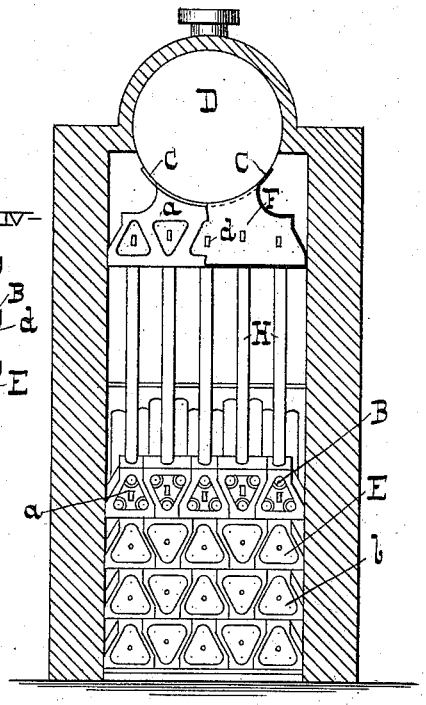
-FIG II-



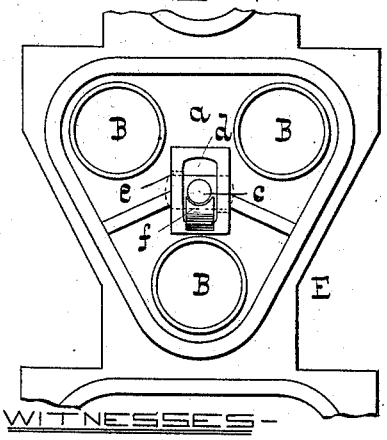
-FIG IV-



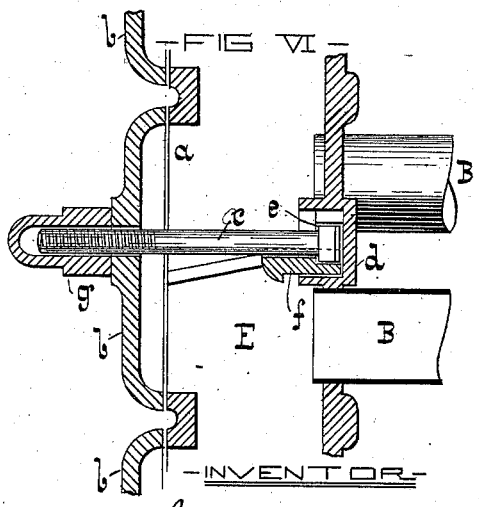
-FIG III-



-FIG V-



-FIG VI-



-WITNESSES-

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Atty.

UNITED STATES PATENT OFFICE.

EDWARD J. MOORE, OF BALTIMORE, MARYLAND.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 305,401, dated September 16, 1884.

Application filed January 22, 1884. (No model.)

To all whom it may concern:

Be it known that I, EDWARD J. MOORE, of the city of Baltimore and State of Maryland, have invented certain Improvements in Water-Tube Boilers, of which the following is a specification.

This invention consists, first, in connecting the front ends of the two upper rows of tubes, which are staggered—that is to say, arranged to be at equal distances apart and not in vertical lines—by a box extending laterally of the system of tubes, having an opening communicating with the drum, and a flange to admit of its being bolted or riveted thereto.

The said invention consists, secondly, in connecting the front ends of the tubes below the two upper rows by vertical boxes, which separate them into vertical double rows, the tubes being staggered, as before described. The said vertical boxes are constructed to represent a series of practically triangular boxes, each containing a group of three tubes connected by thimbles, and differing only from that design, in that instead of the thimbles or nipples the connections are a part of the boxes.

The said invention consists, thirdly, in connecting the rear end of the system of tubes, without reference to the construction of the leg or header, to the rear end of the steam-drum by a box corresponding in all essential particulars with the lateral box at the front end of the tubes before referred to, and a series of circulating pipes or tubes.

The said invention consists, fourthly, in providing the said boxes with pockets for the heads of the bolts holding the covers in place, which are situated partially or wholly in the rear of the rear wall of the said boxes, whereby more space is obtained in the boxes, and the circulation of water therein not interfered with or restricted by the water meeting with projections, as would be the case if the said heads and the metal which surrounds them projected inward, as in similar boxes heretofore used.

The said invention consists, fifthly, in means to prevent the turning of the heads of the bolts which are employed to hold the triangular covering-plates in position.

The said invention consists, sixthly, in connecting the rear lateral box to the drum forward of the interior flange of the rear drum-head, in order that the said flange may not impede the flow of water with its sediment from the front to the rear end of the drum and to the circulating-tubes leading to the back leg.

In the accompanying drawings, Figure I is a longitudinal section of my improved boiler. Fig. II is a partly sectional front view of the same. Fig. III is a partly sectional rear view of the boiler. Fig. IV is a sectional front view of two of the vertical boxes. Figs. V and VI are respectively a front and a sectional side view, on an enlarged scale, of a part of one of the vertical boxes, together with the attached tubes. Figs. VII and VIII are similar views of the box, illustrating a modified construction of the rear pocket. Fig. IX is a top view of a bolt for holding the front plate in position.

A is the lateral box, in which the front end of the two upper rows of tubes B are fastened, and it has a flanged nozzle, C, for connection to the drum D. This box and the front head of the drum may be cast together, if desired; but I prefer the design shown in the drawings. As before stated, the tubes are arranged in the box A so that the top tubes are directly over the spaces between the bottom ones, and the tubes composing the two rows are at equal distances apart. The said box has a triangular aperture, *a*, opposite each group of three tubes, and the said aperture is closed by means of a plate, *b*, of a corresponding shape. The triangular plates are secured in place by central bolts, *c*, the heads of which are seated in pockets *d*. These pockets are recessed in the rear plate of the box, the metal forming the back of the pocket projecting beyond the said rear plate. By this construction more clear space is allowed in the boxes for the free circulation of water.

E E are the vertical boxes, which consist of a series of practically triangular boxes, united as shown in the drawings, and particularly in Fig. IV. The arrangement of the tubes in these boxes is precisely the same as in the one, A, before described. The continuous vertical boxes are more easily erected and are cheaper than the triangular boxes united by nipples, as heretofore. The bolts *c* have T-heads with a curved back, as shown in Fig. IX, and in Figs. V and VI the metal forming the sides of

the pockets has slots *e* therein, in which the ends of the T bolt-heads are turned after being seated.

Referring again to Figs. V and VI, it will be seen that a key, *f*, is used to prevent the bolt *c* turning in screwing or unscrewing the nuts *g*. In Figs. VII and VIII the key *f* is not used; but the pocket is recessed, as before described. It will be seen that the bolt *c*, applied as shown, braces the leg.

F is a horizontal box similar to the one A, secured to the rear end of the drum D, and connected to rear vertical boxes, E, which correspond in all essential particulars with the ones, E, at the front end of the boiler, by circulating-pipes H.

I claim as my invention—

1. In a water-tube boiler, a front lateral box for the upper rows of tubes, having a flanged nozzle for attachment to the drum, a practically triangular opening in the front wall opposite each group of three tubes, a practically triangular covering-plate for the said opening, and a bolt and nut to hold the said plate in position and form a joint, all combined substantially as specified.

2. In a water-tube boiler, the legs or headers constructed wholly or in part of a series of vertical boxes which consist of practically triangular boxes cast together with communicating apertures, each with three entering tubes, substantially as specified.

3. In a water-tube boiler, a rear lateral box flanged for attachment to the drum, and having a series of practically triangular openings with covering-plates in the rear side of the same, combined with a series of circulating-tubes arranged opposite the said openings, which connect with the rear leg or header, substantially as specified.

4. In a water-tube boiler, the legs or headers having pockets for the cap-holding bolts, recessed beyond the rear plate of the said leg or header, and in communication with their interior, substantially as and for the purpose specified.

5. In a water-tube boiler having legs or headers with opening and covering plates in front, holding-bolts for the said plates, with their heads resting in pockets, and keys to prevent the turning of the said bolts, substantially as specified.

EDWARD J. MOORE.

Witnesses:
WM. T. HOWARD,
CHAS. B. CASSADY.