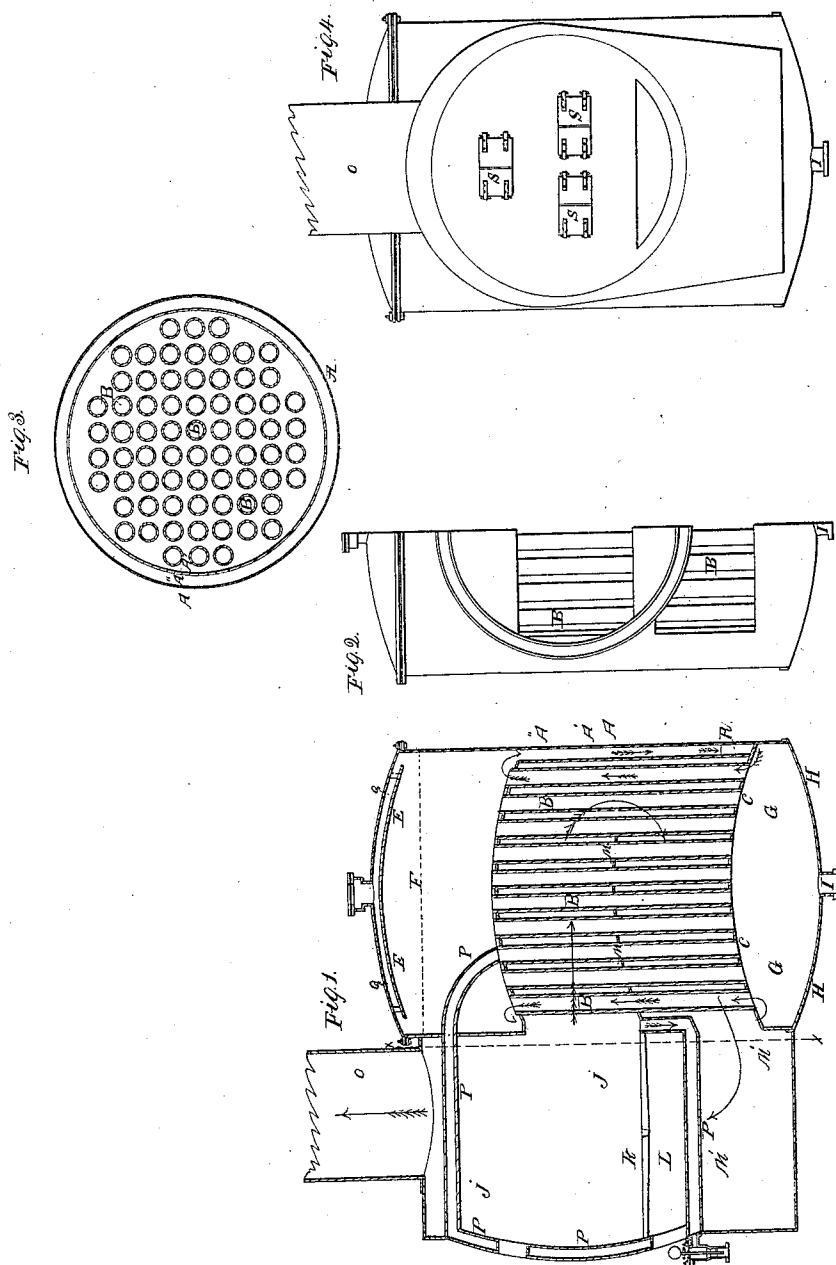


*J. Montgomery,  
Steam-Boiler Water-Tube.*

*N<sup>o</sup> 4,331.*

*Patented Dec. 26, 1845.*



# UNITED STATES PATENT OFFICE.

JAMES MONTGOMERY, OF MEMPHIS, TENNESSEE.

## IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. 4,331, dated December 26, 1845.

*To all whom it may concern:*

Be it known that I, JAMES MONTGOMERY, of Memphis, in the county of Shelby and State of Tennessee, have made certain new and useful Improvements in the Manner of Constructing a Vertical Tubular Steam-Boiler; and I do hereby declare that the following is a full and exact description thereof.

The improvements which I have made have in view an economical mode of using the fuel, the establishing of a perfect circulation of the water through the tubes, the depositing of sedimentary matter in a receptacle below the fire, and the preventing of the passing of water from foaming or other causes into the steam-pipe and cylinder.

In the accompanying drawings, Figure 1 is a vertical section through the center of the boiler and through the furnace attached thereto. Fig. 2 is a view of a part of the boiler, supposing the furnace part to be removed and a vertical section to be made of the sectional part in the line *xx* of Fig. 1 and at right angles thereto. Fig. 3 is a top view of the termination of the boiler-tubes and of the shell or case by which they are surrounded. Fig. 4 is a front view of the furnace and boiler.

In each of the figures where the same parts occur they are designated by the same letters of reference.

The boiler in that part which surrounds the tubes is formed of two concentric vertical cylinders, excepting where the heat and flame from the furnace are introduced and where the gaseous products of combustion escape to be conducted off by the flue.

A is the outer and A' the inner shell of the boiler, with a water-space A<sup>2</sup> between them.

B B are the tubes which pass through and are made fast to two heads C C and D D, that are convex upward.

E E is the steam-space, and F the water-line.

G G is that part of the boiler which is below the lower tube-head C C, and H H the bottom of the boiler. This bottom is convex outward and may be either spherical or conical, and as the direct heat from the fire is never applied to this bottom the water contained between it and the lower tube-head C C is in a state of comparative quiescence, in consequence of which the sedimentary matter which forms incrustations on the bottom and other parts of boilers as ordinarily con-

structed will settle down in this part in a loose unaggregated state. At I in the center of this bottom I place a blow-off valve, which I denominate a "mud-valve," and which may be opened when requisite for the purpose of blowing off the accumulated sediment, which it will do effectually without occasioning any considerable waste of water.

J J is the fire-chamber of the furnace; K, the grate-bars, and L the ash-pit. The furnace I prefer to place, as represented in the drawings, in such manner as that the direct heat from it shall enter among the tubes B B at their upper section above a diaphragm or partition M M, over which the draft will pass, as indicated by the arrows, and then into the lower flue-space M' M' and around the furnace to the chimney O.

The furnace I surround with a water-space P P, which communicates with the water in the boiler. This furnace may be placed lower down, if desired, and the heat be made to impinge directly on the lower part of the tubes; but I am well assured that the arrangement as represented will be found to be the best.

Below the upper head of the boiler I place a metallic shield Q Q, leaving an annular steam-space of a few inches around it, which will in a great degree repress the foaming of the water when the pressure is taken off by the admittance of steam into the cylinder, and will thereby prevent the injurious and frequently destructive result of the entrance of water with the steam. Under my arrangement of the shield the steam is drawn equally from all parts of the circumference of the boiler.

The production of a free and perfect circulation of the water in a boiler has frequently been aimed at, but has not, as I verily believe, been heretofore attained; but by my plan of arranging the parts of the boiler in such way as that its bottom shall not be subjected to the direct action of the heat and of introducing it laterally among the vertical tubes I not only allow of the depositing of the sediment, as stated, but cause a decided and rapid circulation, preventing all incrustation on the interior of the tubes and augmenting the generation of steam. To clear out any ashes that may accumulate around the lower ends of the tubes, an opening closed in the manner of a man-hole must be pre-

pared, as at R, or in any other convenient situation.

S S S, Fig. 4, are the ordinary openings into the fire-chamber.

Having thus fully described the nature of my improvement in the steam-engine boiler and shown the operation of the same, what I claim as new therein, and desire to secure by Letters Patent, is—

1. Arranging the fire-chamber or furnace of a tubular boiler at the side, so that the heat shall act on the upper half of the tubes, in combination with a diaphragm or partition and flue to carry off the flame, heated air, &c., to act on the lower half of the tubes after acting on the upper half, as herein described.

2. The making of the bottom of the boiler of a conical or dished form, with a mud or blow-off valve in the lowest part of the concavity, in combination with the vertical tubes communicating with the bottom in the manner herein described to permit the deposit of the sediment, there being a water-space surrounding them to induce circulation of the water up the tubes and down the surrounding water-space to wash the sediment toward the mud or blow-off valve, as herein described.

JAS. MONTGOMERY.

Witnesses:

GUY C. HUMPHRIES,  
EDWIN L. BRUNDAGE.