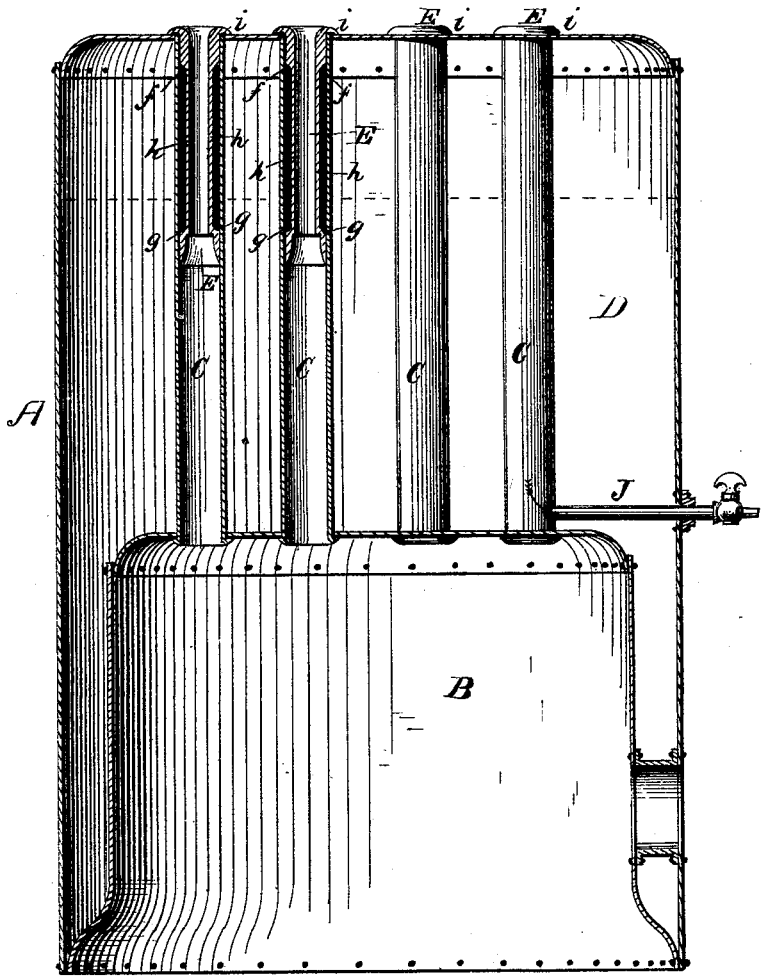
C. M. MILLER.

Thimble for Vertical-Flue Boilers.

No. 218,393. Patented Aug 12, 1879.




Attest,
W. H. H. Knight.
W. Blackstock.

Inventor,
Cassius M. Miller
By C. A. Ellsworth.
His attorney.

# UNITED STATES PATENT OFFICE.

CASSIUS M. MILLER, OF CANTON, OHIO, ASSIGNOR OF ONE-HALF HIS RIGHT TO C. AULTMAN & CO., OF SAME PLACE.

## IMPROVEMENT IN THIMBLES FOR VERTICAL-FLUE BOILERS.

Specification forming part of Letters Patent No. **218,393**, dated August 12, 1879; application filed January 18, 1879.

*To all whom it may concern:*

Be it known that I, CASSIUS M. MILLER, of Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Thimbles for Vertical-Flue Boilers; and I do hereby declare the following to be a full, clear, and exact description of the same, which will enable others skilled in the art to which my invention relates to make and use it, reference being had to the accompanying drawing, forming part of this specification, in which the figure is a vertical section of a boiler, showing the application of my improvements.

My invention relates to that class of stationary and portable steam-generators known as "vertical-flue boilers;" and it has for its object to improve the flues and protect them within the steam-space of the boiler.

To this end, the invention consists in the construction of the flue-thimbles and in their combination with the flues, as I will now proceed to describe.

In the accompanying drawings, A represents a vertical-flue boiler of the usual or any preferred pattern, having the fire-box B, vertical flues C, and the water and steam space D. The flues are of the usual size, but are made smaller at their upper ends by the insertion of cast-iron or other metal or fire-brick thimbles E within them. These thimbles are each about fourteen inches in length, more or less, according to the length of the flues and the height of the steam-space above the low-water line of the boiler, and their diameter between the shoulders *f g* is considerably reduced, so as to form long annular spaces *h* between the tubes and thimbles, as shown, which spaces extend below the low-water line, and therefore protect the flues or that portion of them formed by the thimbles from the action of the steam in the steam-space.

All that portion of the tubes below the thimbles is sufficiently protected by the water in the boiler, while that portion above the water-line is equally protected by the spaces *h*, and, therefore, all liability of their being unduly heated or heated unequally to an injurious extent is avoided.

The thimbles are held within the tubes by the exterior flanges, *i*, bearing against the flue-sheet and the parts forming the shoulders bearing against the interior of the flues above and below the annular spaces *h*.

The opening through the thimbles is considerably smaller in diameter than the flues, and therefore permits the passage of a lesser flame than would pass through the larger portion of the tube. The latter, therefore, radiates a greater amount of heat, while the thimbles contract the flame and allow it to pass more slowly, so that the combustion shall be more complete within the tubes below the thimbles. This increases the heat of the tubes and decreases the amount of fuel which would otherwise be required in boilers having tubes of uniform diameter.

The thimbles are further made with the central passage larger at the top than at the bottom, and as the flame and other products of combustion pass through the lower narrow portion they spread out and move along the diverging walls, and therefore draw through the flues with sufficient force to carry them off and maintain the requisite combustion in the fire-box without the danger of wasting fuel. I prefer to make the relative diameters of the passage through the thimbles about three-quarters of an inch at the upper end, and about eleven-sixteenths of an inch at the lower end; but these proportions may be varied according to the size of the flues.

Having thus described my invention, what I claim is—

1. The flue-thimbles made with long central openings, diverging from the lower end upward, and with a reduced exterior diameter between the bearing ends, substantially as described, for the purpose specified.

2. The flue-thimbles made with reduced external diameters between the bearing ends, combined with the flues to form spaces *h* therein extending below the low-water line of the boiler, substantially as described, for the purpose specified.

CASSIUS M. MILLER.

Witnesses:
E. A. ELLSWORTH,
EDGAR J. GROSS.