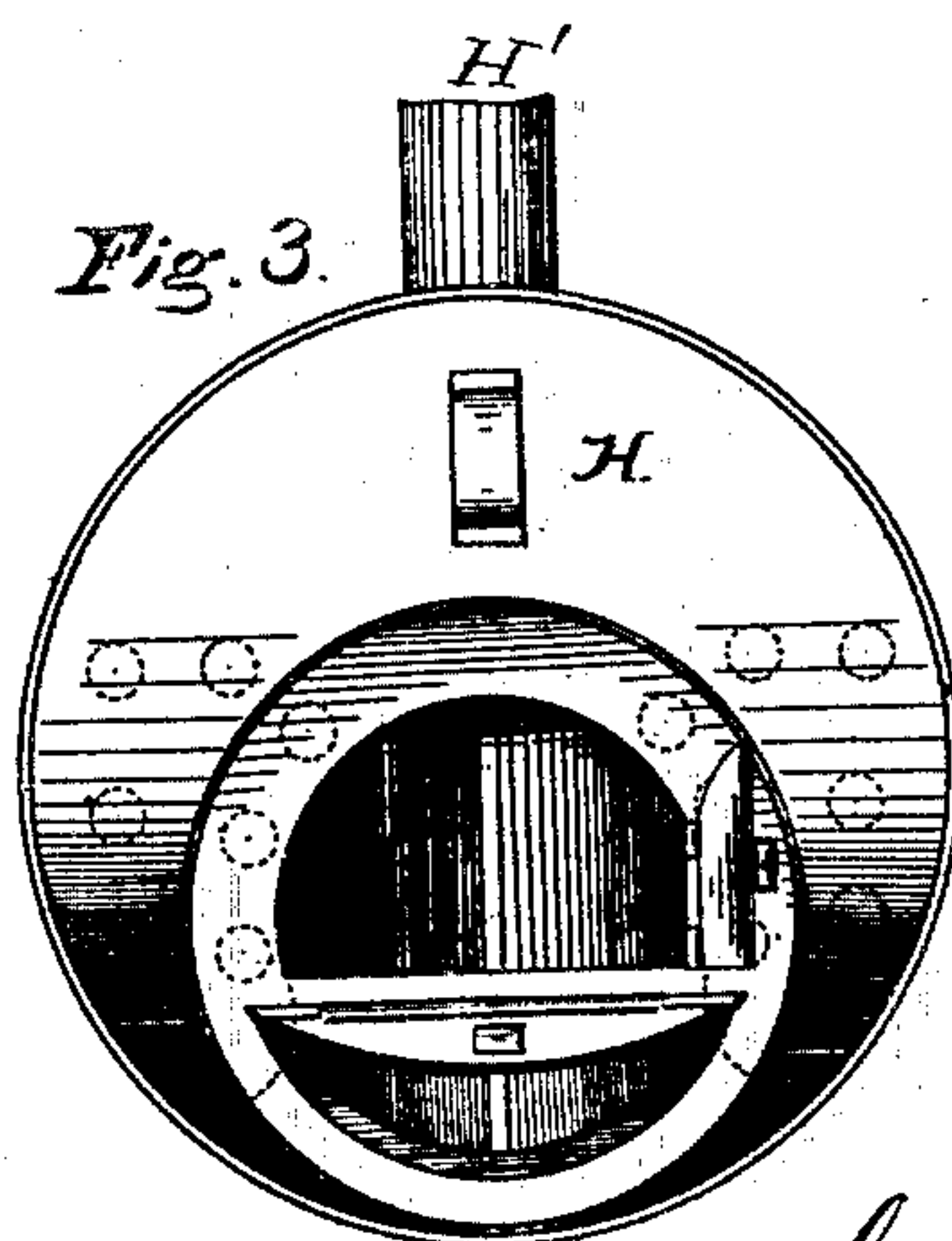
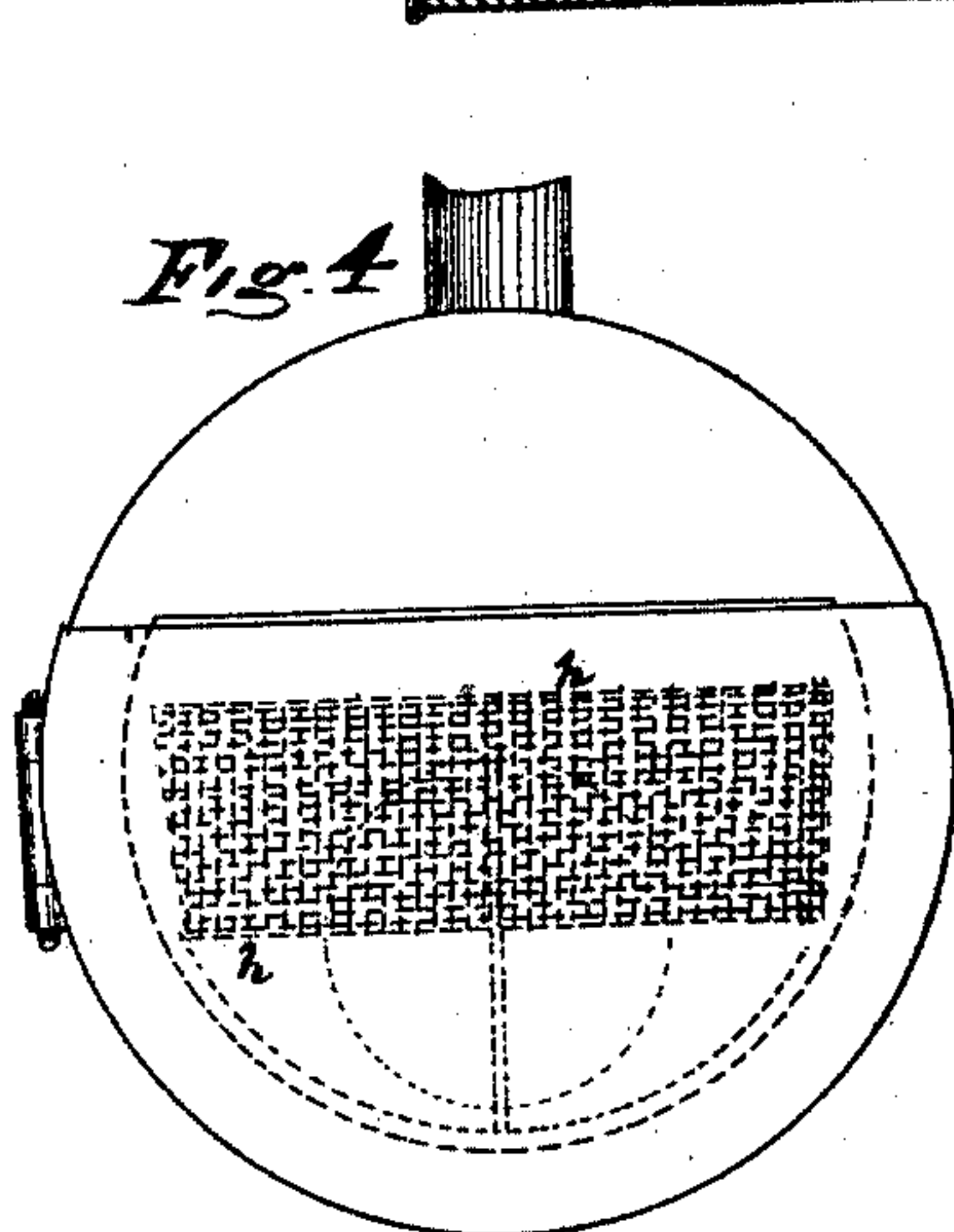
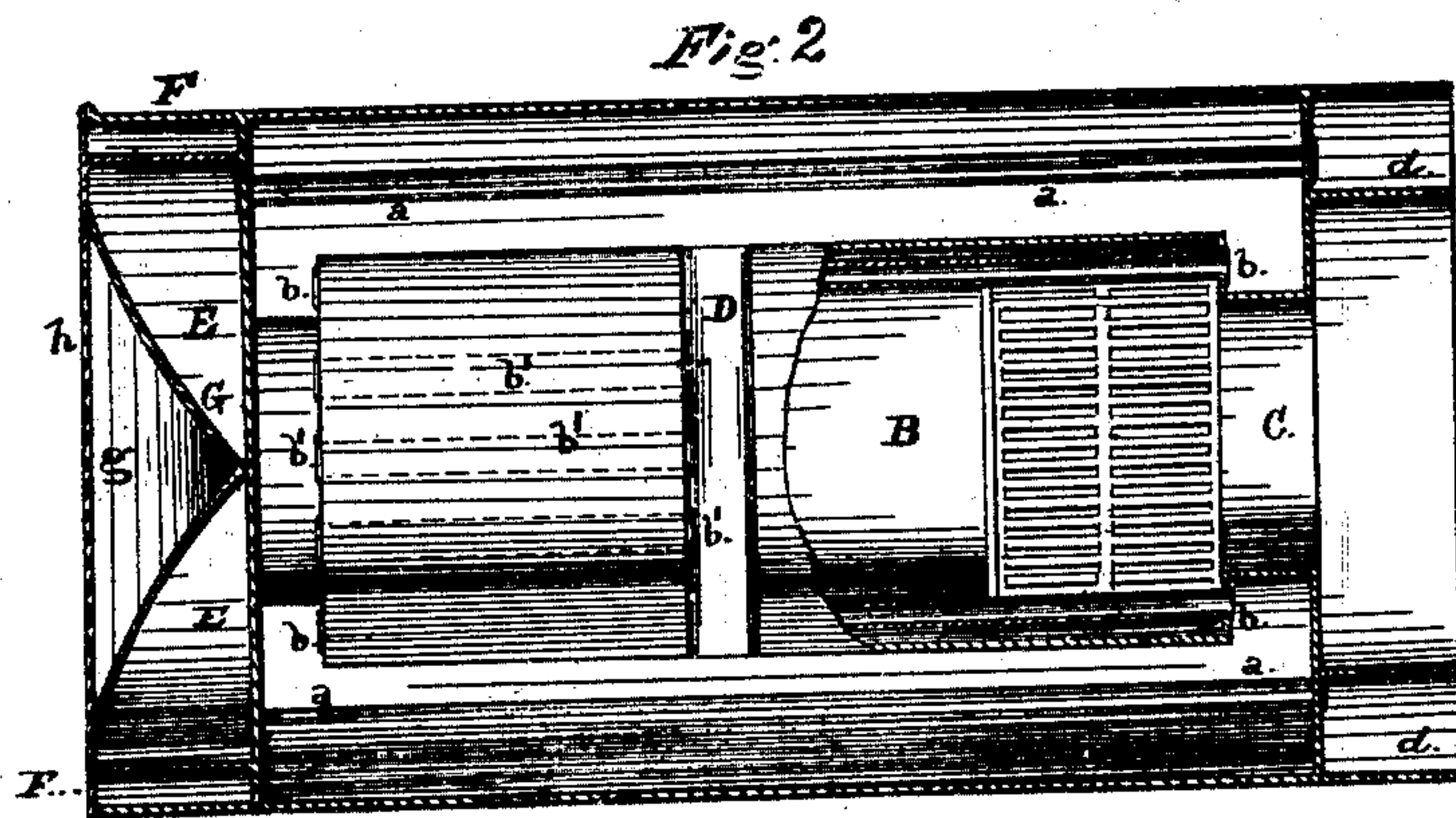
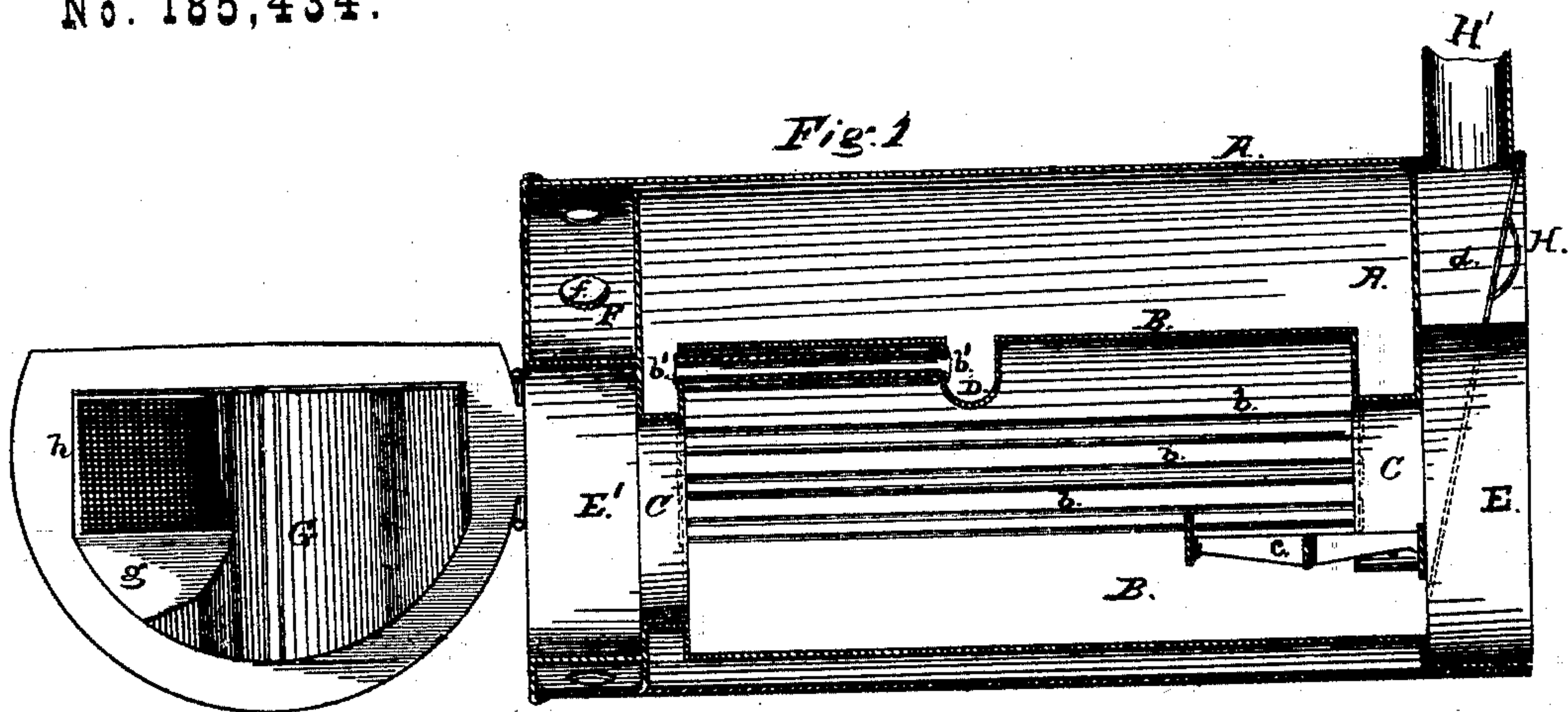


R. EHMAN.
RETURN TUBULAR BOILERS.

No. 185,434.

Patented Dec. 19, 1876.



Witnesses:
E. Patterson
Wm. E. Paige

Inventor: *Robert Ehman*
By *W. M. Smith*
Atty.

UNITED STATES PATENT OFFICE.

ROBERT EHMAN, OF VALLEJO, CALIFORNIA.

IMPROVEMENT IN RETURN TUBULAR BOILERS.

Specification forming part of Letters Patent No. **185,434**, dated December 19, 1876; application filed August 24, 1876.

To all whom it may concern:

Be it known that I, ROBERT EHMAN, of Vallejo, in the county of Solano and State of California, have invented certain new and useful Improvements in Return Tubular Boilers for Steam-Engines; and I do hereby declare that the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which my invention most nearly appertains to construct and use the same without further invention or experiment.

My invention relates, mainly, to that class of steam-boilers employed in field or portable engines; and it consists, principally, of means for regulating and increasing the draft, and directing and conducting the heat to the return-flues, whereby combustion of the fuel is much more rapid and the product of combustion more fully utilized.

My invention also relates to the construction and arrangement of the water-tubes and water spaces and jackets, whereby steam is more rapidly generated with a less quantity of fuel than in the ordinary boiler now employed; and, also, to means for ventilating the outer shell and rear head or end of the boiler, all of which will hereinafter more fully appear.

Referring to the drawings, and to the letters of reference marked thereon, Figure 1 is a longitudinal vertical section, with rear-end door thrown back. Fig. 2 is a horizontal view in section, with outer shell and a portion of fire box or chamber; Fig. 3, front-end view, with outer door removed, and showing the deflecting-collar in position; Fig. 4, rear-end view, with door closed.

A represents the outer shell of the boiler, and B the inner shell, which surrounds the fire-chamber grate-bars *c c* and tubes *b b* and short tubes *b' b'*. C C are the water-spaces, which connect with the tubes *b b*. D is a water-space, connecting with the main water-space of the boiler, and extending downward across the upper arch or crown of the heating or fire chamber, so that the flame and heat, as it ascends, will come in contact with this projecting water-heater before passing onward to the rear end of the boiler.

The water-tubes *b' b'* connect at one end

with this water-space, their opposite ends extending into the main water-space A. These tubes are only about one-half the length of the tubes *b b*, and are also located along the upper arc of the fire or furnace box, while the long tubes are located at both sides of the furnace-box, and extend from end to end of it, and enter the water-jackets C C, constructed at both ends of the boiler.

Thus it will be seen that the fire and heat have full play upon the long and short water-tubes, the water-jackets C C, shell B, and water-space D, whereby the heat from the furnace is utilized in the best manner possible.

The rear end of the boiler is provided with a cold-air chamber, F, which is perforated at the top with holes *f*, which serve mainly as a ventilator of that portion or end of the boiler which prevents the lining of the back connections from becoming heated and burning out. Beneath this air-chamber is a hot-air space, E'.

A hinged door is attached to the rear end of the boiler, which is provided with a deflecting-plate, G, which is constructed independent of the door-plate by bending a sheet of metal or joining two sheets, so as to form a sharp vertical angle, inclining outward to the inner edges of the door-plate, and so as to form a cold-air ventilating-chamber, *g*, between it and the door-plate, the door-plate being cut away to receive a wire-gauze frame, *h*, through which to admit cold air to keep the plates cool.

The products of combustion from the furnace are carried from the furnace through the main flue into the chamber E', where they are deflected at the right and left, and into and through the heating-flues *a a*, back to the front end of the boiler, which is provided with a smoke box or chamber, *d*. This chamber is provided with an inclined movable damper or deflector, H, which directs the smoke up and out through the smoke-stack H'.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a steam-boiler, the combination of the water-spaces D, depending from the crown-sheet, and extending across the upper part of the combustion-chamber, and the water-tubes

b and *b'* in the said combustion-chamber, constructed and arranged substantially as described and shown.

2. In a steam-boiler, the combination of the hot-air chamber *E'* at the rear of the boiler, and the air-chamber *F*, encircling the said hot-air chamber, and provided with air-holes *f*, constructed and arranged substantially as described and shown.

3. In a steam-boiler, the combination of the combustion-chamber with the hot-air cham-

ber *E'*, fire-tubes *a*, circular chamber *d*, and movable inclined deflector *H*, all constructed and arranged substantially as described and shown.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 26th day of July, 1876.

ROBERT EHMAN. [L. S.]

Witnesses:

C. W. M. SMITH,
PHILIP MAHLER.