(No Model.)

W. O. WEBBER.

VERTICAL BOILER.

No. 556,293. Patented Mar. 10, 1896.

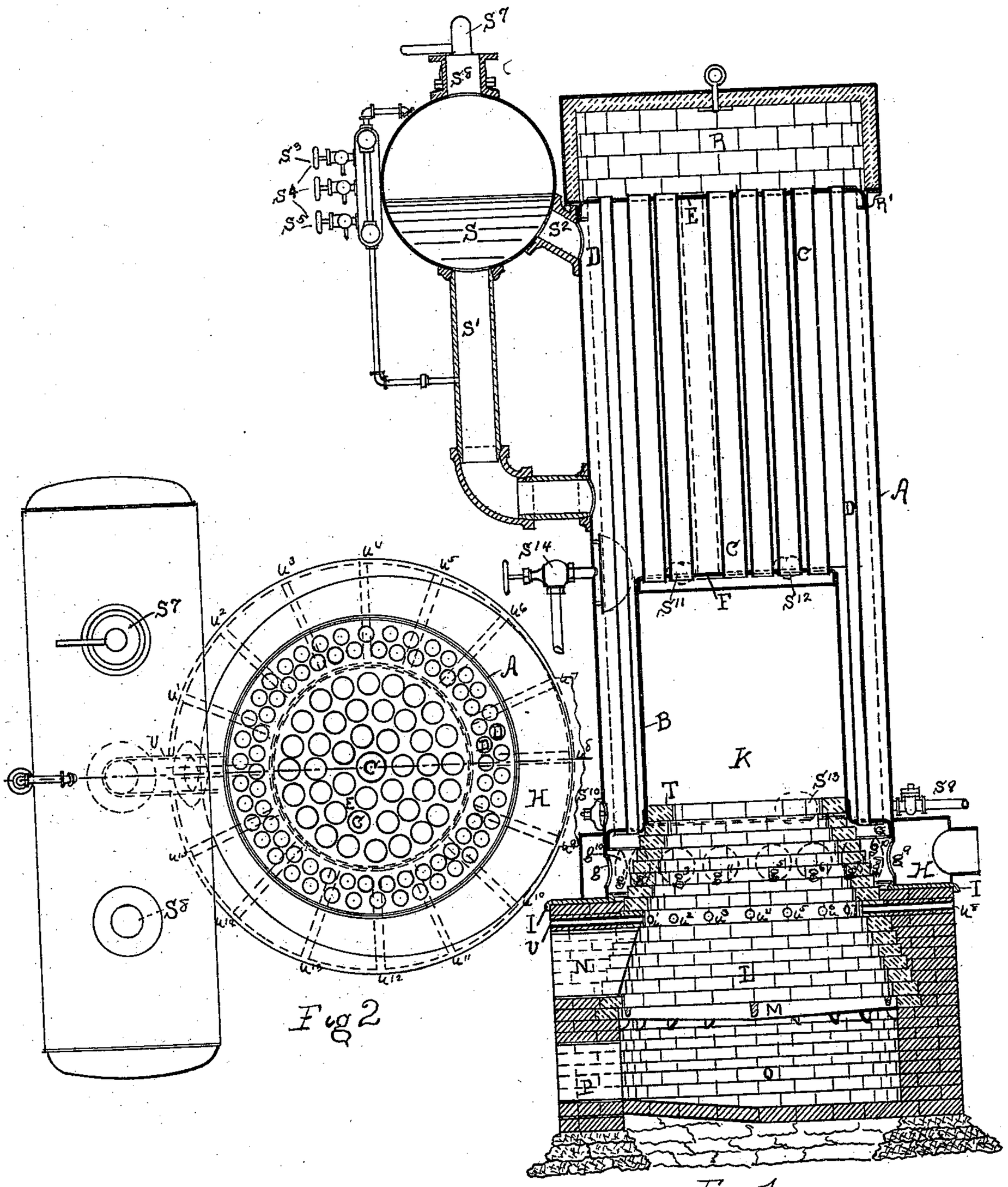

Fig 2

Fig 1

WITNESSES:

G. A. Cain

M. F. Dunham

INVENTOR

William O. Webber.

UNITED STATES PATENT OFFICE.

WILLIAM O. WEBBER, OF BOSTON, MASSACHUSETTS.

VERTICAL BOILER.

SPECIFICATION forming part of Letters Patent No. 556,293, dated March 10, 1896.

Application filed August 3, 1895. Serial No. 558,160. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM O. WEBBER, of Boston, in the county of Suffolk and State of Massachusetts, have invented sundry new and useful Improvements in Vertical Boilers, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to vertical boilers of the return-flue tubular type.

The objects of my improvement are in making the flues into which the heated gases and products of combustion first pass after leaving the furnace large enough in diameter and short enough in length so as not to wholly extinguish these gases and prevent further combustion, then allowing these gases to escape into a mixing and additional combustion-chamber and returning these heated gases downwardly through smaller-diameter flues, but of considerably greater length, so as to compel these gases to part with nearly all of their available heat before escaping at the bottom of these smaller tubes.

It is preferable in the construction of my boiler that the large-diameter short-length tubes be near the center and that the smaller-diameter and longer-length tubes be adjacent to the outside shell of the boiler; but I do not desire to be limited to the exact form of construction as shown and described, the general object being to produce a very efficient boiler occupying a small amount of floor-space and of the simplest form of construction, which will admit of its being constructed by machinery and consequent cheapness of cost.

Referring to the drawings herewith, Figure 1 is a vertical section of boiler set or mounted upon a brick furnace. Fig. 2 is a plan of the boiler proper, showing a lay-out of the tubes.

In Fig. 1 A is the outer shell of the boiler.

B is the inner shell, which forms the sides of the combustion-chamber K.

C are the inner flues of large diameter and short lengths, and D are the outer downward-draft flues of small diameter and longer length.

E is the upper tube-sheet.

F is the crown of inner tube-sheet, and G is the lowest outer tube-sheet.

The outer sheet, A, of the boiler is prolonged below the bottom of the lowest outer tube-sheet, G, sufficiently to admit of the holes g g' g^2 g^3 g^4 g^5 g^6 g^7 g^8, the total number of these holes to have an area large enough to carry off all of the gases and products of combustion which can pass through either of the series of tubes into the smoke-box H, which surrounds the bottom of the boiler and is preferably located on top of the walls of the furnace for support. This prolongation of the outer shell-sheet, A, also serves as a support to hold up the boiler by resting on the plate I, which covers the brick walls of the furnace.

The crown or inner tube-sheet, F, is located sufficiently above the bottom of the boiler to provide a large combustion space or chamber K.

The boiler is shown mounted upon the furnace L, which is provided with a grate M, fire-door N, ash-pit O, ash-pit door P, and is covered with a cast-iron plate I, on which the boiler-sheet A and smoke-box H are supported. Immediately below this plate I are inserted in the walls of the furnace a number air ducts or pipes u u' u^2 u^3 u^4 u^5 u^6 u^7 u^8 u^9 u^{10} for the purpose of admitting air into the furnace above the top of the fire. The sides of the furnace next to the fire are built of fire-brick, laid in circular courses with a batter, or of diminishing diameter as they approach the top, so that the area at the top of this construction is considerably less than the area at the bottom. This construction is carried up far enough to cover the lower ends of the inner shell-sheet, B, and projecting into the combustion-chamber K, forming, together with the extension of the shell-sheet A the smoke-passage g^{10}.

On top of the boiler is placed a combined mixing-chamber and deflector R, which may be lined with fire-brick or other non-combustible material. This deflector is preferably supported upon brackets R', which may be fastened to the top of shell-sheet A.

At or near the top of the boiler is located the steam dome or drum S, which is preferably located so that the bulk of its mass is located above the top of the upper tube-sheet, E, and this drum is connected with the boiler proper by one or more connections s' and s^2. On this drum or dome are preferably located the gage-cocks s^3 s^4 s^5, the steam-gage s^6,

safety-valve s^7 and service-outlet of the boiler s^8. The boiler is also provided with blow-off s^9, cleaning-holes s^{10}, s^{11}, s^{12}, and s^{13}, and water-supply inlet s^{14}.

The action of this boiler is as follows: The coal or other fuel burning on the grate M liberates excessive amounts of hydrocarbons or other combustible gases, which, being retarded by the contracting and battering rings of the fire-brick lining of the furnace T, are held until they are met by the air entering through the air-ducts u u' u^2 u^3 u^4 u^5 u^6 u^7 u^8 u^9 u^{10}. This combination of air and gas is then still further retarded by the contracting rings above the air-inlets until these gases are thoroughly combined, when they are ignited by the high temperature of the walls T and burst into flame in the combustion-chamber K. The top of this chamber K, formed by the inner tube-sheet, F, is high enough above the grate M to insure room for nearly perfect combustion. The products of combustion then enter the large tubes C, passing upwardly into the mixing-chamber and deflector R, where they may be still further burned and are then deflected back against the tube-sheet E and into the smaller downward-draft tubes D, down which they pass into the space g^{10}, and then through the openings g g' g^2 g^3 g^4 g^5 g^6 g^7 g^8 into the smoke-box, and from thence into the chimney or stack, parting with nearly all of their remaining heat on the last downward passage.

What I claim as new and useful, as well as tending to greater efficiency and cheapness of construction, is—

1. In a vertical boiler the prolongation of the outer shell-sheet below the line of the lower flue-sheet so as to form a support for the boiler, and provided with passages in this prolongation for the escaping gases from combustion, substantially as described.

2. In a vertical boiler the combination of the short flues, C, the longer flues, D, the combustion-chamber, K, and the prolonged shell-sheet, A, provided with gas-escape passages, g, g', g^2, g^3, g^4, g^5, g^6, g^7, g^8, substantially as described.

3. In a vertical boiler the furnace, L, of conical battering courses, smaller in diameter at the top than at the bottom, and projecting into the combustion-chamber, K, substantially as and for the purpose described.

4. In a vertical boiler the combination of the outer boiler-shell, A, the inner boiler-shell, B, the lower tube-sheet, G, and the conically-shaped furnace-wall, T, projecting into the boiler so as to form a smoke-passage, g^{10}, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 31st day of July, A. D. 1895.

WILLIAM O. WEBBER.

Witnesses:
J. HENRY TAYLOR,
C. F. CUSHING.