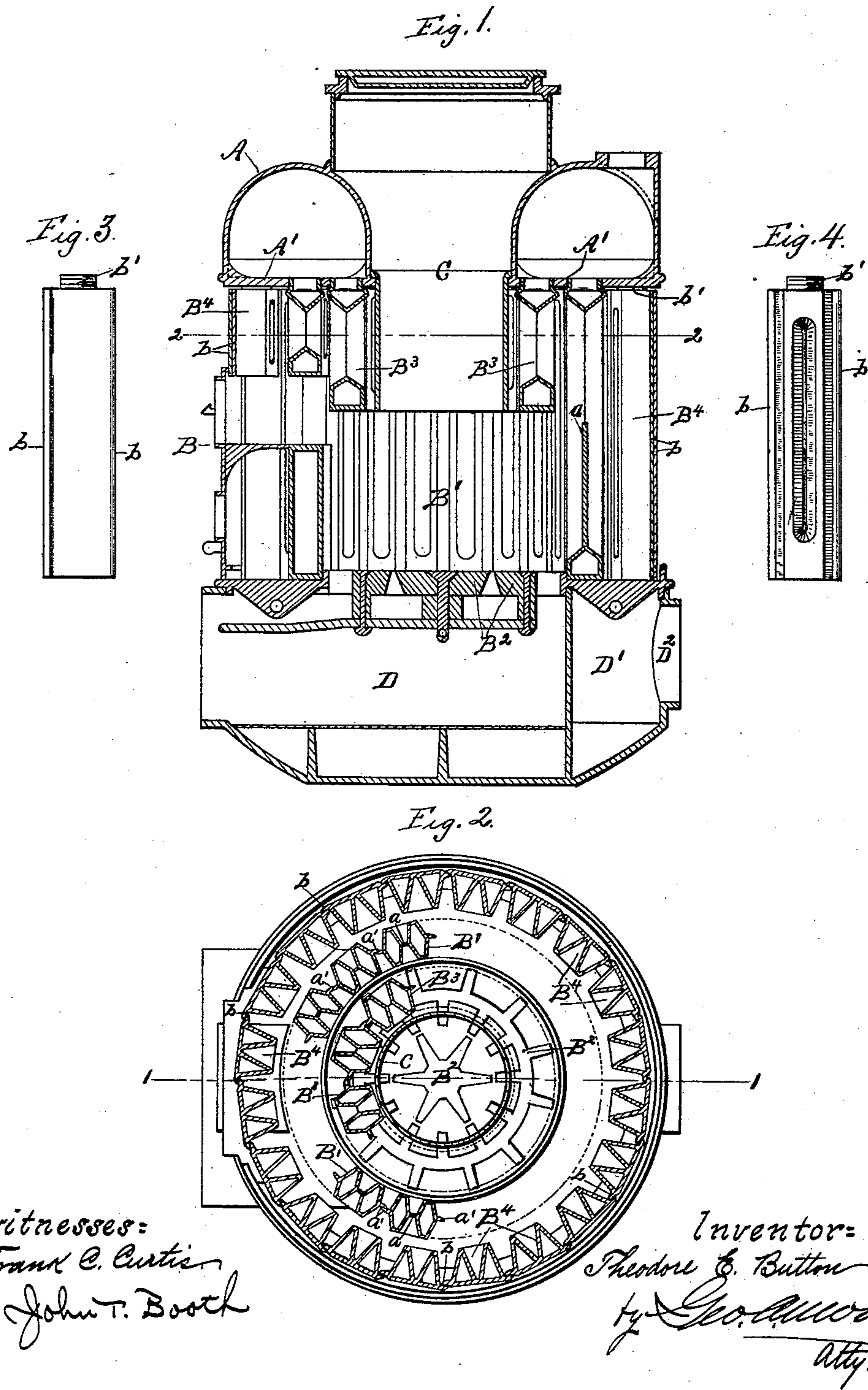


(No Model.)

T. E. BUTTON.
BOILER.

No. 459,561.

Patented Sept. 15, 1891.



UNITED STATES PATENT OFFICE.

THEODORE E. BUTTON, OF WATERFORD, NEW YORK, ASSIGNOR OF ONE-HALF TO CHARLES R. BUTTON, OF SAME PLACE.

BOILER.

SPECIFICATION forming part of Letters Patent No. 459,561, dated September 15, 1891.

Application filed December 10, 1890. Serial No. 374,180. (No model.)

To all whom it may concern:

Be it known that I, THEODORE E. BUTTON, a citizen of the United States, residing at Waterford, county of Saratoga, and State of New York, have invented certain new and useful Improvements in Boilers, of which the following is a specification.

My invention relates to such improvements; and it consists of the novel construction and combination of parts hereinafter described and subsequently claimed.

Reference may be had to the accompanying drawings and the letters of reference marked thereon, which form a part of this specification.

Similar letters refer to similar parts in the several figures therein.

My present application relates to an improvement in the boiler shown and described in United States Patent No. 387,393, issued to me August 7, 1888, to which reference may be had. The construction of such boiler comprises two rows of water tubes or loops depending from the crown-sheet of the boiler, one row inclosing the other, the loops of the outer row being longer than those of the inner row and extending downward to the fire-grate. The loops of the outer row were provided with connecting-webs and lapping longitudinal flanges, thereby forming a continuous wall inclosing the fire-box. The rows of loops were inclosed by a depending portion of the boiler formed of two concentric shells, the inner shell depending from the periphery of the crown-sheet. The space between such shells communicated with the water and steam chamber or dome of the boiler and when in use comprised a water-leg surrounding the furnace. The exposed surface of the inner shell, being in contact with the heated gases from the furnace, was a heat-absorbing or fire surface, while the exposed surface of the outer shell, being in contact with the atmosphere, formed a radiating-surface. As the inner shell was inclosed within the outer, the radiating-surface was greater than the fire-surface, both being plain. The efficiency of the boiler can be largely increased by corrugating the inner shell of the water-leg having the fire-surface and leaving the outer shell having the radiating-surface plain. Such form of

construction I have shown in the accompanying drawings, in which—

Figure 1 is a central vertical section of my improved boiler, taken on the broken line 1 1 in Fig. 2. Fig. 2 is a horizontal cross-section of the same, taken on the broken line 2 2 in Fig. 1. Figs. 3 and 4 are respectively outer and inner views of one of my improved water tubes or loops.

Referring to the drawings, A is the dome, which may be a water-chamber or a water and steam chamber, and B is the furnace. The furnace is provided with a fire-box composed of a circular row of water tubes or loops B', depending from the crown-sheet or diaphragm A', and the fire-grate B², surrounded by the lower portions of such loops. The loops B' form the vertical walls of the fire-box and each are provided with a web *a*, which fills the space between the branches of the loop to the height desired for the fire-box. The loops are also each provided with longitudinal flanges *a'*, corresponding in height with the web *a*, diametrically opposed to each other and adapted to engage similar flanges on the contiguous loops, thereby forming a continuous wall inclosing the fire-box. A row of similar depending loops B³ surrounds the lower portion of a fuel-supply cylinder C, which extends from the top of the boiler down through the dome and upper portion of the furnace into the fire-box.

In Fig. 2 I have shown only portions of the rows of loops B' and B³, the position of the remaining loops in each row being indicated by dotted lines.

The furnace is inclosed by a wall or water-leg composed of a series or row of water tubes or loops B⁴, extending around the same. The tubes or loops B⁴ depend from the crown-sheet and communicate with the interior of the dome. The branches of the individual loops in the furnace-inclosing water-leg are triangular in horizontal section and so arranged relatively to each other that one side of each branch is in line with one side of its supplementing branch and the two sides are united throughout their length to form an unbroken outer wall of the loop. Each loop or tube is provided with longitudinal flanges *b*, extend-

ing along the vertical edges of its outer wall, adapted to lap similar flanges on the contiguous loops, the lapping flanges and the outer walls of the loops forming, when joined together in series, as shown in Fig. 2, the outer shell of the water-leg of the boiler. The inner walls of the several loops or tubes form the inner shell of such water-leg, the spaces between the several branches giving such shell a corrugated surface. The inner shell of the boiler, which also forms the inner wall of the water-leg, being corrugated, presents an extensive surface to the heated gases from the furnace, while the outer shell, being approximately plain, presents a comparatively small area of radiating-surface to the atmosphere.

The base of the furnace comprises the ash-pit D, the horizontal flue D', and the escape-flue D².

It will be readily seen that by my improved form of construction I have greatly increased the area of fire-surface over that shown in my said patent, No. 387,393, without materially increasing the area of the radiating-surface of the same, thereby greatly increasing the efficiency of the boiler. The upper ends *b'* of the loops are contracted and screw-threaded to fit similarly-threaded apertures in the crown-sheet.

In constructing a water-leg of my improved loops or tubes the alternate loops or tubes are screwed into the crown-sheet until within a quarter-turn of their seats. The intervening loops are then screwed fully to their seats,

after which the first-mentioned loops are given their last quarter-turn, thereby seating them and making the flanges of each loop lap the flanges of the contiguous loops. The loops or tubes thus have their corrugated inner walls entirely within the furnace, exposing to the atmosphere only the plain surfaces of their outer walls.

My improved boiler is especially adapted for the use of steam or hot water for heating purposes.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a boiler comprising a dome and a subjacent heating-furnace, an outer water-leg consisting of a series of water-loops communicating at their upper ends with the interior of the dome and joined exteriorly along the vertical edges of their outer walls by lapping flanges, the outer walls of the individual tubes being plain and approximately in line with the lapping flanges, and the inner walls being corrugated, substantially as described.

2. A water-circulating tube or loop having an indented inner wall and a plain outer wall and provided with a longitudinal flange along each vertical edge of the outer wall, substantially as described.

In testimony whereof I have hereunto set my hand this 6th day of December, 1890.

THEO. E. BUTTON.

Witnesses:

GEO. E. HOLROYD,
CHAS. R. BUTTON.