

(No Model.)

2 Sheets—Sheet 1.

T. E. BUTTON.
BOILER.

No. 567,940.

Patented Sept. 15, 1896.

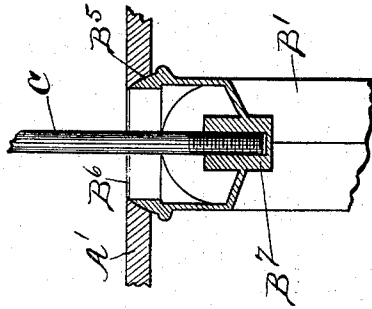
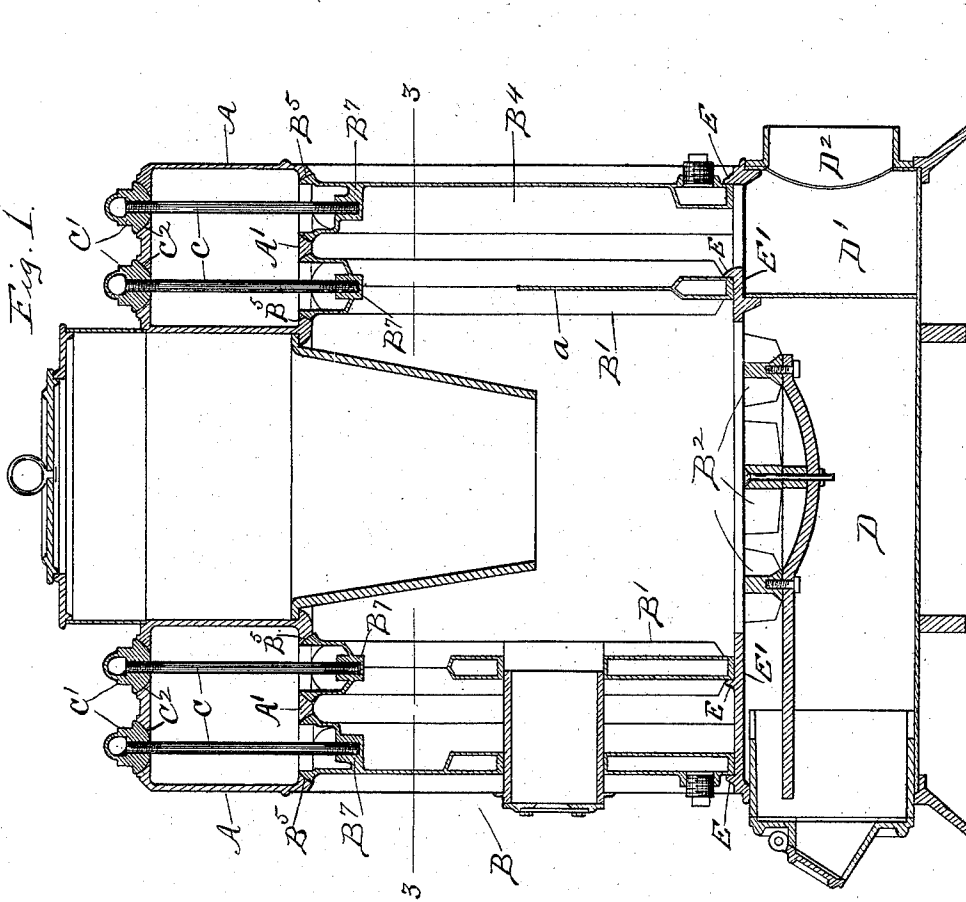


Fig. 2.



Witnesses:
H. E. Delaney
Geo. H. Gibson

Inventor:
Theodore E. Button
by Mosher & Curtis
attys

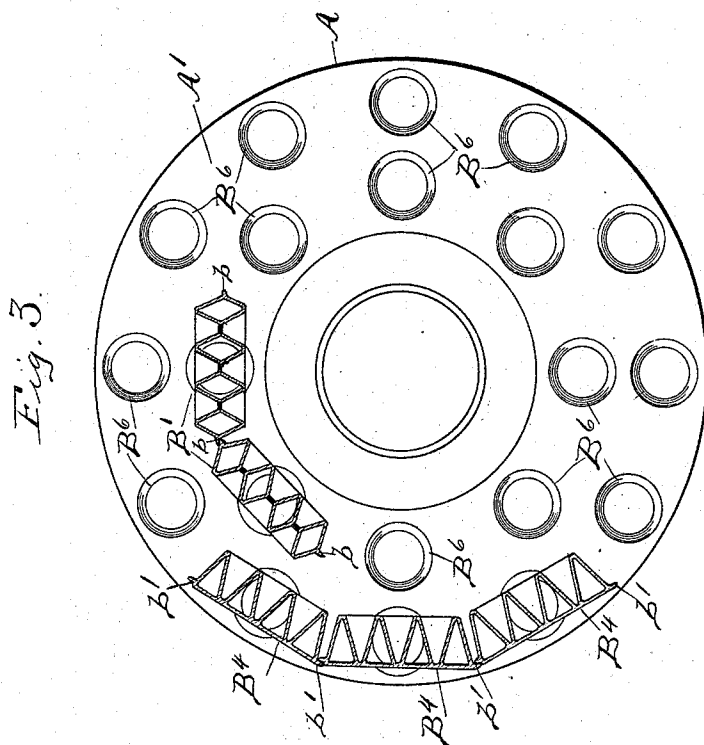
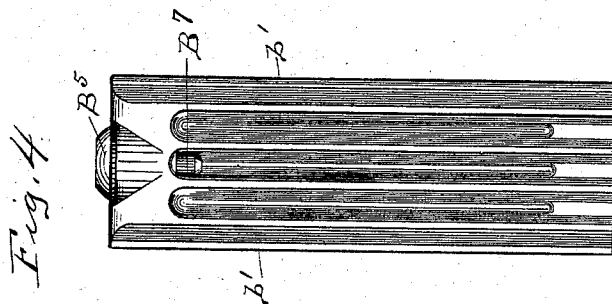
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2 Sheets—Sheet 2.

T. E. BUTTON.
BOILER.

No. 567,940.

Patented Sept. 15, 1896.



Witnesses:
A. S. Delaney
Geo. H. Gibson

Inventor:
Theodore E. Button
by Mosher Curtis
attys.

UNITED STATES PATENT OFFICE.

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

BOILER.

SPECIFICATION forming part of Letters Patent No. 567,940, dated September 15, 1896.

Application filed December 13, 1893. Serial No. 493,537. (No model.)

To all whom it may concern:

Be it known that I, THEODORE E. BUTTON, a citizen of the United States, residing at Schenectady, county of Schenectady, 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 improvements in the construction shown and described in United States Patent No. 459,561, issued to T. E. Button and C. R. Button September 15, 1891, to which patent reference may be had. In the patented construction a water-leg surrounding the furnace or combustion-chamber was formed by connecting a series of water-loops at their upper ends with the crown-sheet, so that the loops communicated with the interior of the dome, the lower closed ends of the individual loops being supported laterally by an inclosing flange projecting upward from the base-casting in the same way that the staves of a barrel are supported by the hoops. The connection between the individual loops and the crown-sheet was made by inserting their contracted screw-threaded ends in similarly-threaded apertures in the crown-sheet. I have ascertained that in practice it is a difficult and expensive operation to thus connect the loops with the crown-sheet. A slight variation in the direction of the axial lines of the screw-threaded parts would make a considerable variation in the position of their lower ends, which latter variation could be overcome only by springing the lower ends of the depending loops into position to engage each other and be supported by the base-flange before mentioned. Imperfections in the castings, such as thickening of a particular part, would also necessitate springing a loop to get it in position to be sup-

ported by the base-flange. If the imperfection should be considerable, such springing strain would be sufficient to break the loop or cause it to fracture when subjected to heat in use.

In my improved construction I connect the upper end of each loop-section with the crown-sheet by a ball-and-socket joint, which enables me to swing the lower end of the loop to the desired position to engage the supporting base-flange without any lateral strain upon the loop, whereby I am able not only to quickly assemble the parts in perfect adjustment, but to do so without subjecting any of them to dangerous strains.

As a further improvement I find that by employing a bolt connection between the loops and crown-sheet, instead of the screw-threaded connection shown in the patented construction, I am able to provide a plurality of water-loops in a single casting, thereby largely reducing the number of parts and joints. Such a casting I term a "loop-section." When two rows of loops are employed, as shown in the patented construction, it would be impracticable to have more than one loop in a section which required to be rotated on its longitudinal axis to screw it into the crown-sheet, because, with neighboring loops on three sides within the arc described by its rotary movement, they could not all be so placed as to afford the necessary rotary movement. To separate the sections sufficiently to permit such rotary movement would require too much room and render the device impracticable for the purposes intended; but when the loop-sections are connected with the dome by a joint, which can be made tight by drawing the parts together with bolts and without rotating the sections, there is no limit to the cross-sectional form of the sections or relative arrangement and combination of individual loops in a section.

Referring to the drawings, Figure 1 is a central vertical section of my improved boiler. Fig. 2 is an enlarged sectional view of the ball-and-socket connection between the loop-section and the crown-sheet. Fig. 3 is a horizontal section of the boiler, taken on the broken line 3 3 in Fig. 1, viewed in the direction of the arrow, a portion only of the loop-

sections being inserted. Fig. 4 is an enlarged view in elevation of the inner side of one of the loop-sections forming the outer shell or wall of the device.

5 A is the dome, and B the subjacent furnace. The base of the furnace comprises the ash-pit D, the horizontal flue D', and the escape-flue D². The furnace is provided with a fire-box composed of a circular row of loop-sections B', depending from the crown-sheet or diaphragm A', and the grate B³, surrounded by the lower portions of such sections. The loop-sections B' communicate at their upper ends with the interior of the dome and are provided with the web *a*, which fills the space between the branches of each loop-section to the height of the fire-box. The several loop-sections B' also have lapping flanges *b* on their neighboring sides extending to the height of the fire-box, thereby forming a continuous fire-box wall.

The loop-sections forming the fire-box wall are inclosed by a wall or water-leg composed of a series or row of water-loop sections B⁴, extending around the same. These loop-sections also depend from the crown-sheet and communicate at their upper ends with the interior of the dome. The branches of these loop-sections are triangular in cross-section and arranged with one side of each branch continuous with one side of each of its supplementing branches in the section. The outer wall of each loop-section B⁴ is thus unbroken and plain, while its inner wall is indented, due to the triangular form of the branches. These loop-sections are also provided with lapping edge flanges *b'*, extending throughout the length of their neighboring sides. The upper end of each loop-section is provided with a spherical seating-surface B⁵, surrounding the opening in the end of the section and adapted to be inserted in and fit a socket B⁶ in the under side of the crown-sheet. The walls of the socket or seat B⁶ surround an aperture in the crown-sheet through which the interior of the loop-section communicates with the interior of the dome, and such walls are given the same degree of curvature as the spherical seating-surface on the end of the loop-section, whereby the engaging curved seating-surfaces form a ball-and-socket joint between the loop-section and crown-sheet. The joined parts are securely held in engagement with each other by means of the coupling link or bolt C, screw-threaded at its ends and having its lower end screwed into a threaded socket B⁷, located centrally in the upper open end or mouth of the loop-section. The upper end of the bolt passes through an aperture in the top wall of the dome, and is provided with a nut C', which bears upon the outer side of such wall. The nut has a spherical seating-surface C² on its under side, and the nut-engaging surface on the dome-wall is curved to conform thereto, whereby a ball-and-socket joint is formed between the nut and dome.

By employing a ball-and-socket connection I am able to maintain a steam-tight joint between the parts while permitting a limited adjustment of the body of the loop-section, and as I do not depend upon the screw-threaded parts to form steam-tight joints the threads on such parts can be made with less care and accuracy and the threaded portions can fit together loosely.

The threaded portions being all of small diameter, the threads can be formed thereon with sufficient accuracy much more easily than upon the outer side of the contracted end of the loop-section, as in my former patented construction.

The loop-sections are secured to the crown-sheet, each section being properly placed and adjusted with its lower end in engagement with and supported laterally by a flange E on the base-casting E' of the furnace and in a position such that its edge flanges will lap and engage the edge flanges on the neighboring loop-sections. When so adjusted, the loop-sections are rigidly secured to the crown-sheet by means of the screw-bolt and nut, the ball-and-socket joints forming steam-tight connections between the parts in any position they may assume relatively to each other, due to the adjustment of the lower end of the loop-section.

I have shown each loop-section made up of two loops or four branches, but the size and number of loops are limited only by the facilities for casting the same and the size and form of the furnace.

I have shown the fire-box and furnace-walls, formed of the loop-sections, of a circular form; but the sections may be arranged to make such walls rectangular or of other desired form.

By my improved construction the number of joints can be reduced to the minimum, thereby reducing the cost of construction and increasing the efficiency and durability of the boiler. The loops are closed at their lower ends, and four or more branches in a single casting or section are connected by a single joint, common to each branch, with one-eighth as many joints to leak, or liable to leak, as there would be if each branch had a joint at each end. When such joints are made by passing a rod-bolt through each branch open at both ends, some of the numerous and necessarily ill-fitting joints are sure to leak at once or soon after use. The long rod-bolts within the branches also considerably diminish the water-space and impede the water circulation. By closing the lower ends of the four or more branches of my improved water-circulating loop-section, and having their upper ends open to a common single-joint connection, I am able to successfully connect the section by a single short bolt, seated in the upper open end of the loop-section, with the crown-sheet of the boiler, as hereinbefore described. The bolt

connection being confined to one end only of each loop-section and the other end not being rigidly fixed, the joint is not affected by the expansion and contraction of the loop portion of the section, and the lower end of the section being free to move within certain limits any known form of joint-seats may be employed to make a joint that will withstand low pressures, but for high pressures I prefer the ball-and-socket joint hereinbefore described.

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

1. In a boiler comprising a dome and adjacent heating-furnace, the combination with the crown-sheet of the dome, of an inner and an outer water-leg composed of water-loop sections having a plurality of water-loops in each section severally closed at one end and open to a single joint connection at the other end, and bolt connections between the open ends of the several water-loop sections and the crown-sheet, substantially as described.

2. A water-circulating loop-section having a plurality of water-loops in a single integral casting severally closed at one end and open to a single joint connection at the other end, and provided at its open end with a bolt-seat,

whereby the section is adapted to be connected with the steam-chamber and supported by a bolt connection at one end only, substantially as described.

3. In a boiler comprising a dome and adjacent heating-furnace, the combination with the crown-sheet of the dome, of a series of depending water-loops, a lateral support for the lower ends of the loops, and ball-and-socket connections between the crown-sheet and loops, substantially as described.

4. In a boiler, the combination with the crown-sheet and dome-wall, of a water-circulating loop depending from the crown-sheet and provided with a bolt-socket, of a bolt secured in the loop-socket and projecting through the dome-wall, a nut screwed upon the projecting end of the bolt, and ball-and-socket connections between the loop and crown-sheet, and the nut and dome-wall, substantially as described.

In testimony whereof I have hereunto set my hand this 4th day of December, 1893.

THEODORE E. BUTTON.

Witnesses:

GEO. A. MOSHER,

WM. H. HOLLISTER, Jr.