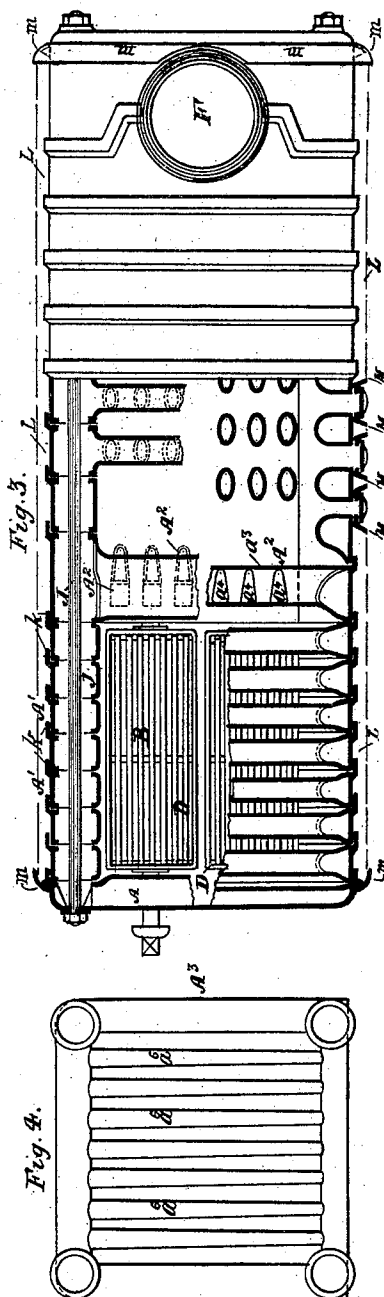
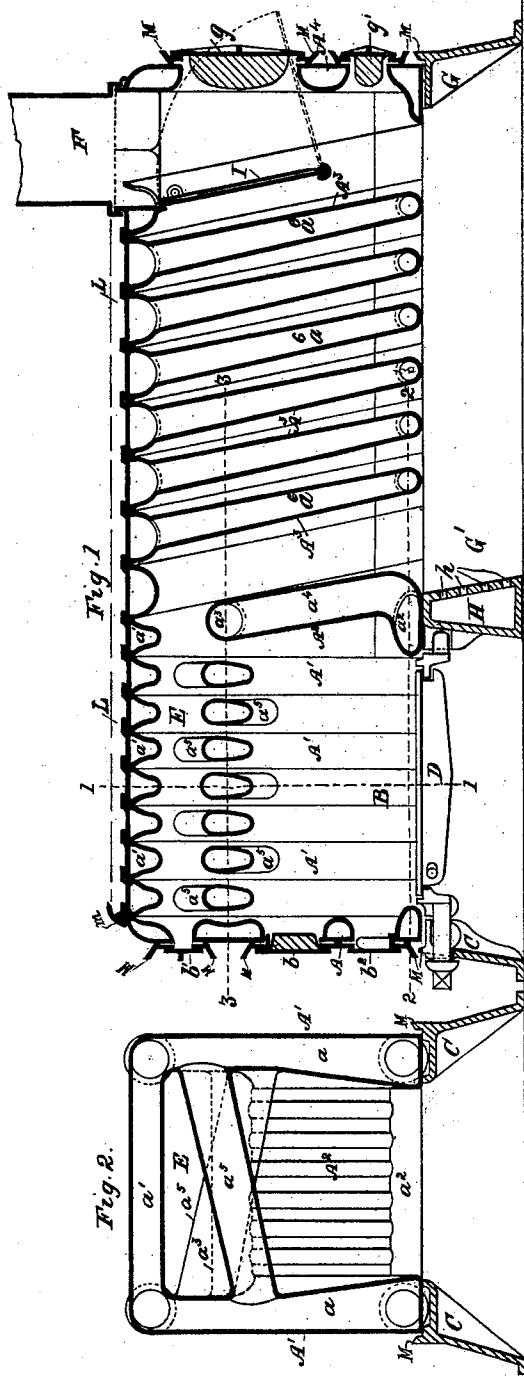


(No Model.)

J. KEITH.
SECTIONAL WATER BOILER.

No. 409,043.

Patented Aug. 13, 1889.



Attest
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UNITED STATES PATENT OFFICE.

JAMES KEITH, OF LONDON, ENGLAND.

SECTIONAL WATER-BOILER.

SPECIFICATION forming part of Letters Patent No. 409,043, dated August 13, 1889.

Application filed December 13, 1888. Serial No. 293,524. (No model.) Patented in England February 26, 1887, No. 3,013.

To all whom it may concern:

Be it known that I, JAMES KEITH, a citizen of the United Kingdom of Great Britain and Ireland, residing at 57 Holborn Viaduct, in the city of London, England, have invented
5 new and useful Improvements in Sectional Water-Boilers, (which have not been patented in any country except Great Britain by Letters Patent dated the 26th day of February,
10 1887, No. 3,013;) and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art or manufacture to which it relates to make and use the same.

15 My invention relates to sectional hot-water boilers; and under the present improvements the boiler is composed of a number of sections which are set vertically or at a slight inclination on end, and so connected face to face
20 that the boiler occupies little space in height and width, and may be lengthened indefinitely to give increased heating-power by adding to the number of sections either in the fire-box or in the rear thereof.

25 In the accompanying drawings, which illustrate my invention, Figure 1 is a longitudinal vertical section of a modification of my improved sectional water-boiler. Fig. 2 is a
30 transverse vertical section taken at the line 1 1 in Fig. 1. Fig. 3 is a sectional plan, the section being taken partly at the line 2 2 and partly at the line 3 3 in Fig. 1; and Fig. 4 is an elevation of one of the rear end sections of the boiler.

35 One of the end sections, which constitutes the boiler-front, is composed of a casing or water-slab A, of rectangular or other contour, having formed in it openings b , b' , and b'' , for firing and cleaning and for giving access to
40 the furnace B, which is inclosed by a number of the sections A' adjoining the front, said sections consisting, as shown at Fig. 2, each of two upright side tubes a , connected at the top by a horizontal tube a' and resting at the
45 bottom upon a hollow sole plate or frame C, serving to carry a dumping fire grate or grates D D, which grate or grates is or are formed, preferably, of separate single bars set and held loosely in strong frames, in the manner

shown in the drawings, though of course any
50 other suitable form of grate can be applied, and the interior of which forms, in conjunction with the floor, a receptacle for the ashes from the fire.

The section A², forming the rear end of the
55 furnace, is, by preference, of greater cross-sectional area at the base than at the top, its rear face being tapered, and the base is composed of a tubular water-way a^2 , connected to the side tubes, while horizontal tubes a' and
60 a^3 extend across from side to side at and near the top, the tube a^3 being connected to the base by tubular bars a^4 , which, together with the cross-tube a^3 itself, constitutes a water-
65 bridge, over and through between the tubular bars of which the fire-gases pass out of the furnace.

At about the level of the top of the bridge
cross-tubes a^5 are also formed in the sections
A', inclosing the furnace or fire, the tubes
70 being inclined and slightly tapered to promote circulation, and being at such a distance from the top that a clear way is left at E for the passage of the fire-gases between
75 them and the inclosed top tubes a' of the boiler.

Behind the bridge-section A² are fitted a series of sections A³ of a contour corresponding to the sections inclosing the fire, a water-
80 way being formed at the top, sides, and bottom, as shown by Fig. 4, and the top and bottom being connected by cross or vertical tubes a^6 , which present a large heating-surface, upon which the fire-gases impinge in passing
85 through between them to the chimney-opening F at the rear. The sections last referred to rest upon an open frame G, which may be lined on the inside with fire-bricks, and which is or may be a prolongation rearward of the
90 sole or framing C, constituting the ash-box, and the water-ways at the base are preferably of smaller cross-sectional area than those at the top, the connecting cross or vertical tubes a^6 being correspondingly tapered, in order to
95 promote circulation of the water through them and to facilitate the operation of removing soot, which, when brushed or blown off the tubes, drops down without depositing

afresh thereon into an open flue-space G' , formed between the sections and the floor within the supporting-sole or framing G .

Immediately behind the fire-bridge section A^2 one or more sections similar to the sections A^3 may be placed, these sections having no upright or vertical inside tubes, as a^6 , nor lower cross-tube a^2 , the outlet or upright side tubes being similar to those shown in Fig. 2, the space between them being open at the bottom to the flue-space G' . Between the ash-box C and the flue-space G' a hollow air-bridge II is formed under the water-bridge A^2 , and has in its rear face a number of slits or perforations h , through which air, after being heated in its course through the bridge, is discharged, and, mixing with the fire-gases passing through between the tubes a^4 of the water-bridge, insures complete combustion of said gases before they pass through between the cross or vertical tubes a^6 toward the chimney-opening F , which is formed in the top of one or more of the rear sections A^3 , a baffle plate or plates I , which may be swung out to the position indicated in Fig. 1, being fitted under the outlet to direct the fire-gases downward on the lower parts of the sections before escaping. The rear end section A^4 , like the front, is composed of a water box or slab, in which are doors g g' to give access for cleaning between the tubes, and the front and rear sections are connected together by long bolts J , passing through longitudinal water-ways j , formed from end to end of the sections, suitably-faced flange-joints k being made between the several sections around the connecting water-ways j .

In addition to the soot or cleaning doors in the outside, rear, and front water-slab sections already described, there are long upright narrow soot or cleaning doors provided on each side of the boiler between all the rear or A^3 sections, and a deep tapered rim M , looking outward, is formed on each of the frames of these and of all the other soot or cleaning and firing doors, as well as on the sole-plate or lower frame C and G , on which the whole boiler rests, so that the boiler can be wholly coated or plastered over outside with non-conducting composition up to the outside edge of these tapered rims.

When the outside of the boiler is covered over in this way and the two extreme end sections A and A^4 are left uncovered, circled projecting narrow plates m are preferably arranged on these end sections round the two sides and the top in the manner shown on Figs. 1 and 3, the non-conducting composition or covering being then put on between these two sets of plates, as shown by dotted lines L in Figs. 1 and 3. At one end of each of the upright tubes a^4 and a^6 and each of the cross-tubes a^2 and a^5 screwed sunk plugs are provided for the examination of the interior of these tubes after being formed when the boilers are to be used for ordinary hot-

water-heating work. When, however, the boilers are intended for heating water for washing or bathing or commercial purposes where the water is regularly drawn off after being heated, suitably-faced cleaning-doors are arranged at the corners of each section and opposite every upright and cross tube, for the purpose of enabling all the internal water-ways to be thoroughly cleared of sediment deposit at any time without requiring that the boilers should be taken apart.

In addition to the doors in the ash-pan C , in front, under the firing and clinker doors, doors are formed in the other end of the sole-plate or frame G , immediately under the soot-doors g and g' and in the sides of said frame G , where necessary, to give access for the removal of dust, soot, or ashes, which may be formed or may fall in the lower open flue-space G' between the sections and the floor. Air-doors are also provided in the sides of the frame G for the supply of air to each end of the hollow air-bridge II , for the purpose of assisting combustion, as already mentioned.

Flow and return connections can be formed on any suitable part of the boiler at top and bottom, respectively; but the flow connection or connections is or are preferably taken off the upper corners of the second or fire-box section from the front, while the return connection or connections is or are preferably attached to the lower corners of the rear end section.

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

1. In a sectional boiler, the combination, with the fire-box, of the bridge-wall section A^2 , having the upper and lower cross-tubes a^3 a^2 , respectively, and said tubes being connected together by a series of inclined tubes a^4 , substantially as set forth.

2. In a sectional boiler, the combination, with the fire-box, of a number of water-sections A^3 , arranged on edge in a horizontal series and communicating with each other, and the tapering tubes a^6 , connecting the upper and lower sides of each section together, substantially as set forth.

3. In a sectional boiler, the combination, with the fire-box, of a number of water-sections A^3 , arranged on edge in a horizontal series and communicating with each other, and the hollow base G , serving as a support for said sections and as a soot and dust collector, substantially as set forth.

4. In a sectional boiler, the combination, with the fire-box, of a number of water-sections A^3 , communicating with each other and arranged diagonally in a horizontal series, and the downwardly-tapering inclined tubes a^6 , connecting the sides of each section together, substantially as set forth.

5. In a sectional boiler, the combination, with the fire-box, of a series of water-sections A^3 , each having an upper horizontal tube

and a lower horizontal tube of smaller diameter than said upper tube, and a number of downwardly-tapering cross-tubes connecting said upper and lower tubes together, substantially as set forth.

5 6. In a sectional boiler, the combination, with the sections A', forming the fire-box, of the tubes a^5 , extending across said sections and inclined alternately in opposite directions, the bridge-wall section, and the water-
10 sections A³, arranged beyond said bridge-wall and having communication with each other

and with said other sections, substantially as set forth.

In witness whereof I have hereunto set my hand this 22d day of October 1888.

JAMES KEITH.

Witnesses:

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