

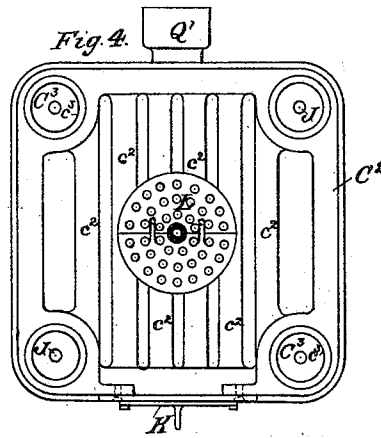
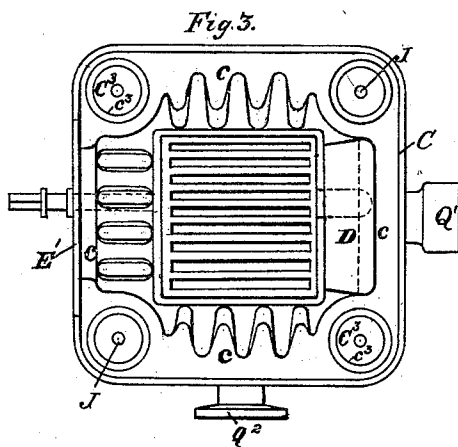
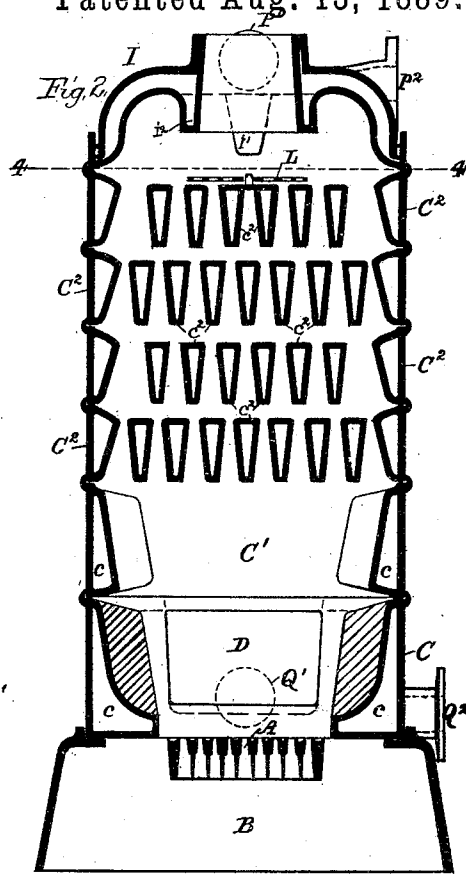
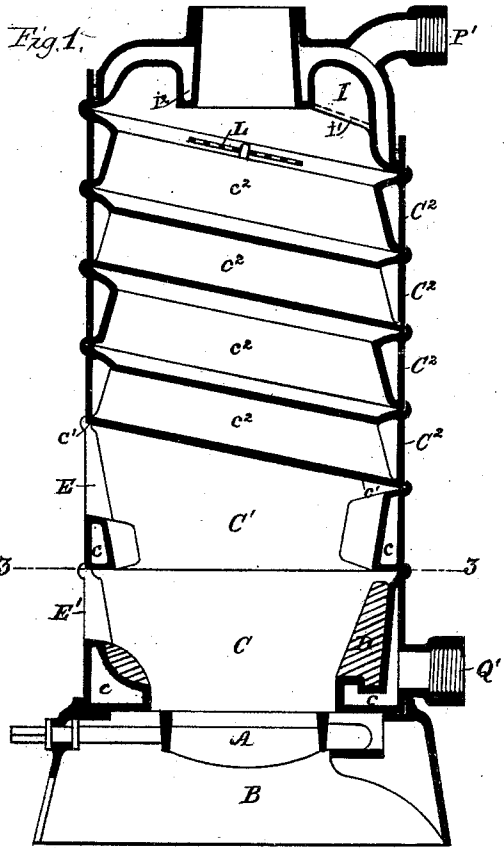
(No Model.)

3 Sheets—Sheet 1.

J. KEITH.
SECTIONAL WATER BOILER.

No. 409,042.

Patented Aug. 13, 1889.



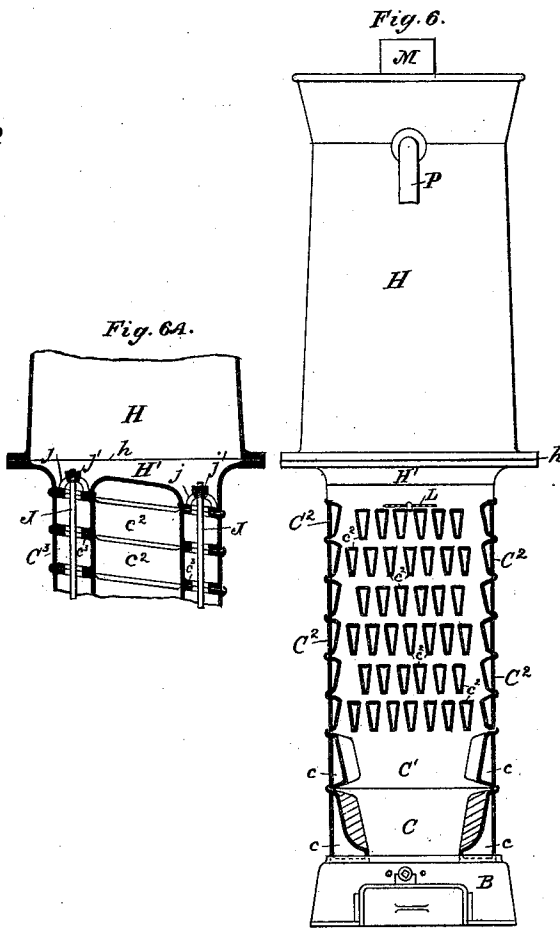
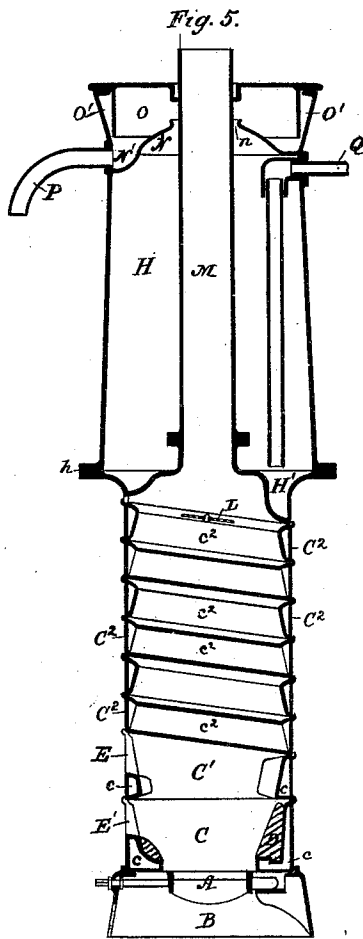
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Inventor:
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 By Knight Bros
 Atty.

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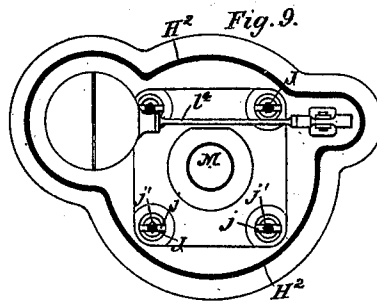
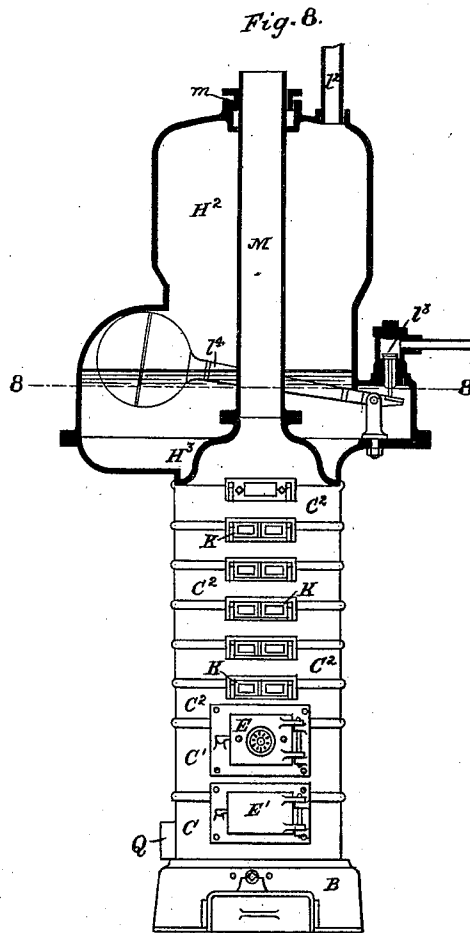
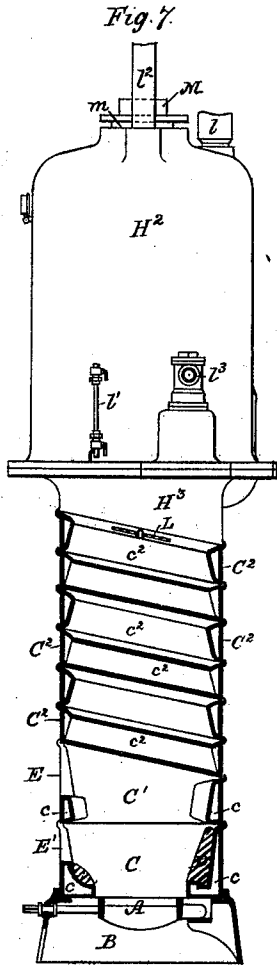
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UNITED STATES PATENT OFFICE.

JAMES KEITH, OF LONDON, ENGLAND.

SECTIONAL WATER-BOILER.

SPECIFICATION forming part of Letters Patent No. 409,042, dated August 13, 1889.

Application filed December 13, 1888. Serial No. 293,523. (No model.) Patented in England May 9, 1885, No. 5,744.

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 new and useful Improvements in Sectional Hot-Water Boilers, which have not been patented in any country except Great Britain by Letters Patent dated the 9th day of May, 1885, No. 5,744; 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.

My invention relates to sectional hot-water boilers of the type illustrated in the specification filed with my application, Serial No. 293,522, for patent of even date herewith; and it consists in features of novelty herein after fully described in connection with the accompanying drawings, and particularly pointed out in the claims.

In the said drawings, Figures 1 and 2 are vertical sections at right angles to each other of my improved hot-water boiler; and Figs. 3 and 4, separate plans of parts of the boiler under the lines 3 3 and 4 4, respectively. Figs. 5 and 6 are vertical sections at right angles to each other of the improved boiler combined with a water heating and circulating tank, the tank in Fig. 6 being in elevation. Figs. 7 and 8 are vertical sections, and Fig. 9 is a horizontal section on the line 8 8 of the boiler combined with a modified form of tank.

The boiler is composed of a series of superposed sections C^2 , communicating one with another through orifices formed at the corners where the sections are bolted together, each section circulating directly and independently into the said orifices, forming upright water-columns communicating with the upper part of the boiler, the whole resting on a metal base B, in which is loosely fitted a dumping fire-grate A; and the fire-chamber, which is entirely surrounded by a water-jacket c , is formed by the two lowest sections C and C' of the boiler. These sections are formed with rows of vertical corrugations surrounding the fire, excepting at part of the

back, where a fire-brick D is inserted in a water-jacketed recess provided for it, and at the front, where the firing-door E and clinker-door E' are fitted. The fire-box is made deeper, when desired, by the introduction of a section similar to C' , but without door-openings, and with both top and lower edges perfectly horizontal between the lowest section C and the section C' .

The upper edges or bearing-surfaces c' of the water-jacketed fire-chamber are inclined from back to front, the extent of inclination being preferably about equal to the depth of one of the water-sections C^2 above. These water-sections are in like manner inclined from back to front, their joints or meeting surfaces being also so inclined, excepting at front and back, where they are horizontal, and they are formed with cross-tubes c^2 , connecting the front and back, which, instead of being horizontal, are inclined.

The sections C^2 communicate with each other only at the four corners, (or at other like points, according to the configuration of the sections in plan,) where vertical flanged tube-like orifices C^3 are formed, the flanges c^3 being on the inside among the water and being faced up. A layer of asbestos, mill-board, or similar packing may be fitted at the joints when the sections are laid over each other in erecting the boiler.

When the heating apparatus is made, as shown in Figs. 1 and 2, in the form of a boiler without a separate water or steam vessel, there is placed over the uppermost section C^2 an inclosed water-dome I, inclined at its lower face from back to front to fit the angle of the sections and the upper surface of the fire-chamber or lower sections, while the top of the dome-section I is perfectly level. The top or cover of the dome is screw-pin and rust jointed to the lower part, a circulation being kept up through the depressed portion of dome I^2 by the narrow cross-channel I' .

The inclined tubular sections C^2 , the dome-piece I, and the fire-chamber or lower corrugated ring-sections C and C' are secured together by long bolts J, passing down at the four corners through the orifices or water-

columns connecting the sections, as shown particularly in Figs. 3 and 4. These orifices or upright water-columns C^2 , communicating with the dome or upper part and with each section separately, produce, in combination with the highly-inclined sections, an active and constant internal circulation when the boilers are heated, which equalizes the temperature of the water more readily in all parts of the boiler and prevents the formation of steam in the cross-tubes and damage from undue expansion and contraction, besides making the whole more powerful and economical as a water-heater. Cleaning or soot-doors K are fitted between the several sections C^2 , so that all parts of the heating-surfaces can be thoroughly and rapidly cleaned of dust or soot. The form of these soot-doors is shown more particularly in Figs. 4 and 8. Over the uppermost tube-section C^2 is loosely fitted a perforated distributing-plate L , preferably in two halves hinged together, to prevent direct outflow of the hot products of combustion of the fuel.

In lieu of a simple dome, I in some cases fit over the sections C^2 , as shown in Figs. 5 and 6, a long vertical or slightly-tapered chamber H , through the center of which passes the chimney M , carrying off the products of combustion. This cylinder is, for convenience of access to the binding-bolts J , divided into two parts H and H' , connected by a horizontal flanged joint h , which is faced and kept perfectly level, the lower portion H' being inclined and formed to fit the upper inclined section C^2 immediately below it, and having tubular orifices in it communicating with the water-sections below and fitted with seats for bridges j , which form the bearings for the nuts j' of the binding-bolts J , as shown in Figs. 6^A and 9.

Near the top and inside of the cylinder II a dome-like diaphragm N is fitted, extending from the shell of the cylinder to within a short distance of the chimney-tube M , and leaving merely a narrow annular passage n for the upward and outward flow of the water round the tube M , in order that all the water may be forced to flow over the diaphragm at this point, and that all the available heat of the chimney may be absorbed by the water. A steam-space O is also formed round the top part of the cylinder with an annular air-space O' all round it. The outlet-pipe P for the water is connected to the water-cylinder II on the upper side of the diaphragm N , in which a pocket N' is formed for draining into said pipes, and it opens directly to the atmosphere, while the inlet-pipe Q for cold water is led in preferably at the back immediately below the diaphragm N , and is carried down through the water to the bottom of the cylinder II , or into the water-columns of the section at the back to promote circulation and to partially heat the inflowing water, and thus lessen the risk of injuring the sections of the

boiler which are directly exposed to the fire. When the improved apparatus is employed for circulating hot water through water-coils and the like, the inlet-pipe Q' may be connected to the lower section C' and the outlet-pipe P' to the water-dome I , as shown in Fig. 1; or more inlet and outlet pipes can be attached either by screwed or flanged joints to the parts mentioned, in the manner shown by openings and attachments at Q^2 and P^2 on Figs. 2 and 3.

When the apparatus is used for generating steam at low pressure for cooking or heating purposes, a steam-cylinder $II^2 II^3$, with domed top, as shown in Figs. 7, 8, and 9, takes the place of the water-cylinder II , the chimney-flue M going through a stuffing-box m in the top of the steam-vessel. The steam dome or cylinder II^2 is fitted with a safety-valve l , water-gage l' , steam-pipe l^2 , and feed-water-supply pipe and valve l^3 , the last being operated by a ball-lever l^4 , by means of which the normal water-level is uniformly maintained. Either water or steam cylinder may be jacketed or formed with a double casing inclosing air. Ordinarily each of the tubed sections is provided with a sunk screwed plug opposite the end of every tube at the back of the boiler, so that the inside of the tubes can be examined after the sections are formed. Where, however, the boilers are used for heating water or for raising steam for washing or bathing or other purposes, and where the water is thus necessarily regularly drawn off or evaporated from the boilers, suitably-faced cleaning-doors are arranged at the corners of each section at each side of the dome and opposite the ends of every tube, back and front, for the purpose of enabling all the internal water-ways to be thoroughly and periodically cleaned of any sediment deposit formed from bad water.

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

1. In a sectional boiler, the combination of the lower section C , having a fire-brick lining and a surrounding water-jacket, the superposed section C' , having inclined upper edges, and a number of superposed sections C^2 , having inclined upper and lower edges, mounted on the section C' , and all of said sections having communicating openings, substantially as set forth.

2. In a sectional boiler, the combination, with the fire-chamber, of the superposed section C' , having a water-space and inclined upper edges, the superposed sections C^2 , having vertical outer sides and inclined upper and lower edges mounted upon the section C' , and having communication therewith and with each other, and inclined tubes c^2 , extending across each of said sections C^2 , substantially as and for the purposes set forth.

3. In a sectional boiler, the combination, with the fire-box, of the superposed section C' ,

having the water-jacket *c* and inclined upper
flanged edges, the superposed sections C^2 ,
having inclined upper and lower edges and
the upper edges having flanges to receive the
5 section immediately above, inclined tubes c^2 ,
extending across the sections C^2 , and a dome
having inclined lower edges surmounting said
sections C^2 , and all of said sections and dome
having communicating openings, substan-
10 tially as and for the purposes set forth.

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

JAMES KEITH.

Witnesses:

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