

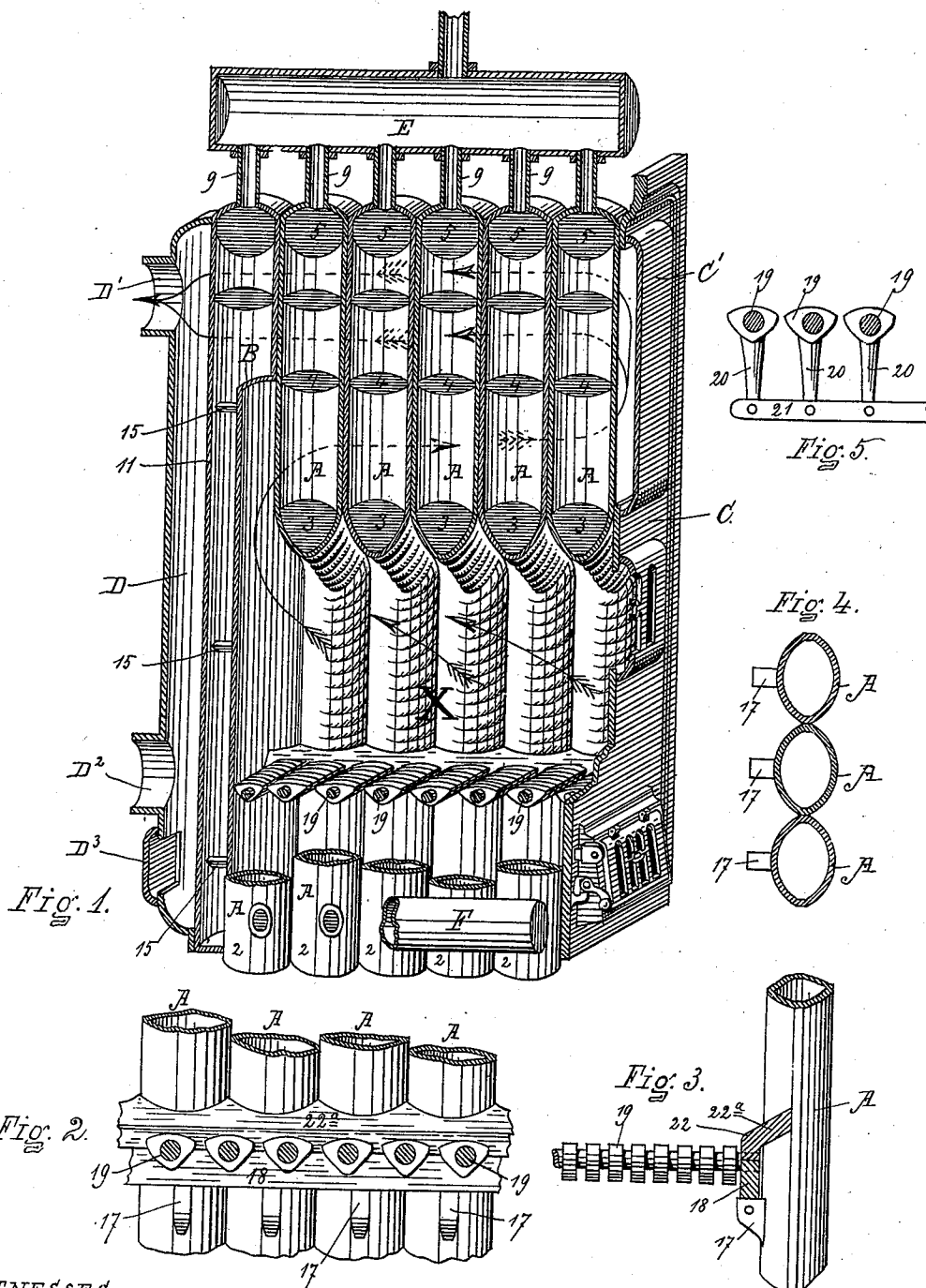
(No Model.)

2 Sheets—Sheet 1.

W. CAMPBELL.  
HEATER.

No. 539,166.

Patented May 14, 1895.

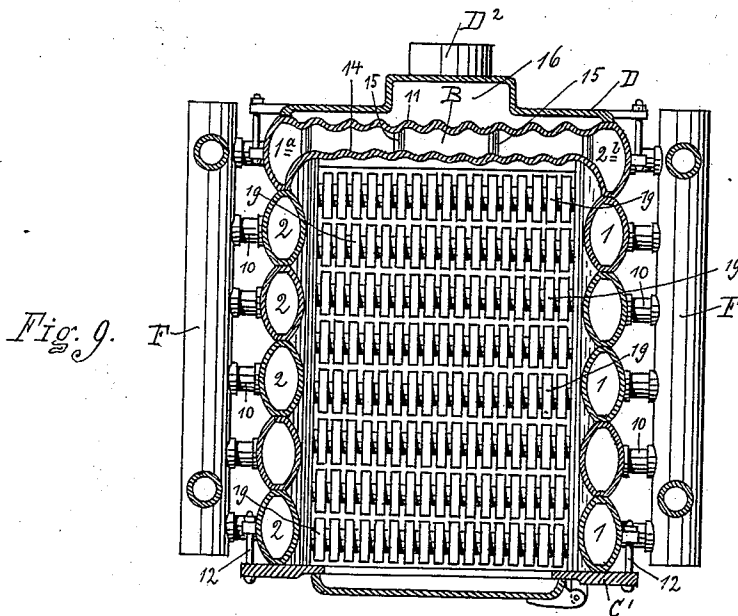
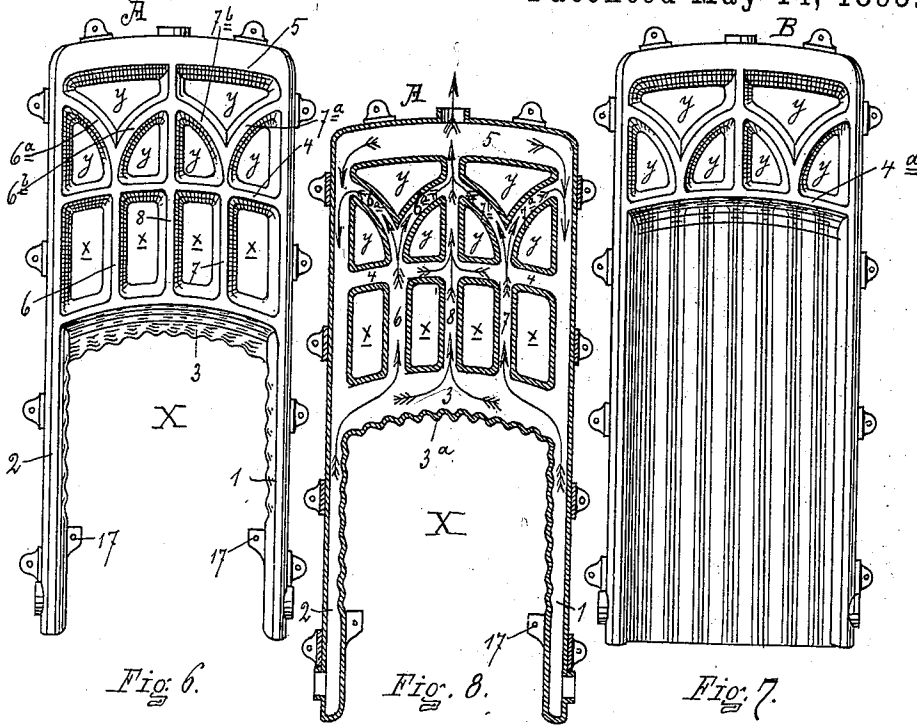


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Rich. A. George.  
M. A. Keller.

INVENTOR  
WILLIAM CAMPBELL  
BY *Risley, Robinson & Love*  
ATTORNEYS.

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# UNITED STATES PATENT OFFICE.

WILLIAM CAMPBELL, OF UTICA, NEW YORK, ASSIGNOR TO THE CARTON FURNACE COMPANY, OF SAME PLACE.

## HEATER.

SPECIFICATION forming part of Letters Patent No. 539,166, dated May 14, 1895.

Application filed November 30, 1894. Serial No. 530,438. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM CAMPBELL, of Utica, in the county of Oneida and State of New York, have invented certain new and useful Improvements in Heaters; 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 to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form part of this specification.

My invention relates to an improvement in hot water heaters. These heaters are also adapted to use as steam heaters.

In the drawings which accompany and form a part of this specification, and in which similar letters and figures of reference refer to corresponding parts in the several views, Figure 1 shows a vertical section of the boiler, partially in perspective and broken out to show various details of the construction. Fig. 2 shows details relating to the manner in which the grate is supported. Fig. 3 shows the same details shown in Fig. 2 at right angles from the position in which they are shown in Fig. 2. Fig. 4 shows a horizontal section of the legs of three sections, showing also the lugs on which the grate is supported. Fig. 5 shows details of the construction of the grate. Fig. 6 shows a side or face elevation of one of the main or body sections of which the heater is constructed. Fig. 7 shows the back or rear section. Fig. 8 shows a vertical section of the section shown in Fig. 6. Fig. 9 shows a horizontal section above the grate of the construction of heater shown in Fig. 1.

The heater as shown consists of five main or body sections A, A, &c., arranged side by side, and a rear section B also abutting on the last of the other sections. In connection with these sections is provided a front C and a back D.

Each of the sections A consists of a pair of vertical legs or water tubes 1 and 2 between which are provided the arched water tubes 3, 4 and 5. Communicating with these and intermediate of the legs 1 and 2 are the vertical tubes 6, 7 and 8. The tubes 7 and 8 diverge into two curved branches at their up-

per ends, one branch curving out and communicating with the leg 1 as shown at 7<sup>a</sup>. The other branch 7<sup>b</sup> communicates with the vertical tube 8 which extends to the upper arched tube 5. The arrangement of the curved branches 6<sup>a</sup> and 6<sup>b</sup> is the same as that of 7<sup>a</sup> and 7<sup>b</sup>. The arrangement of arched and vertical tubes described divides the upper portion of the section A into a lower set of return flues *x*, four in number, and an upper set of return flues *y*, *y*, being six in number. The several arched tubes 3 form the crown sheet over the fire chamber and are substantially V-shaped in cross section as clearly appears from Fig. 1. This arrangement forms a corrugated top to the fire chamber, the corrugations running transversely to the length of the chamber and forming intervals between the V-shaped tubes 3, as also clearly appears from Fig. 1. The arched shaped tubes 3 on their lower projecting edges are also provided with comparatively small corrugations as shown at 3<sup>a</sup>, which run in a direction substantially lengthwise with the fire chamber. These corrugations afford a more extended surface exposed to the fire as well as obviating the tendency to crack the section and a tendency to separate the lower end of the legs of the section when the same are heated by the fire. Extending from front to rear over the top of the section is provided a drum or header E. Each section is connected at its middle point at the upper end by a short section of tube or pipe 9 with this drum. At the bottom at either side of the heater are provided smaller headers or drums F, F, which are connected with the lower ends of the legs of the section by short pieces of pipe or nipples 10. The outflowing pipe is connected with the drum E and the return pipe with one or the other or both of the drums F, and any number of systems which the heater is able to support may be so connected. Connections for one are shown with the drum E in Fig. 1, and two on each of the drums F in Fig. 9.

The sections A are held in position and in contact with each other, as clearly appears from Fig. 9 by the nipples 10, 10 on either side at the base and the nipple 9 at the head.

In connection with the heater built up of sections as shown, is provided a front C which

is secured to the front section A by bolts 12 passing through the front and the perforated ears 13 provided on the outside of each of the sections A.

5 A sufficient number of sections A are provided to form a heater of the desired capacity, and on the rear of this is provided a back section B. The section B consists of two vertical legs 1<sup>a</sup> and 2<sup>a</sup>. Between these legs are provided two corrugated walls 11 and 14 between which is afforded a water space, and the walls 11 and 14 are provided with suitable stays 15 spanning the water space. The section B is connected by short tubes or nipples with the main header or drum E and the side headers or return drums F in the same manner as the other sections. The arrangement and construction of the rear section B are such that the corrugated walls 11 and 14 terminate at their upper ends at 4<sup>a</sup> on a line with the arched tube 4 of the other sections and the thickness of the section B and position of the wall 14 thereof are such that a flue is provided from the fire chamber X around the arched tube 3 of the rear section A and communicating with the return flues  $x$ ,  $x$  in the lower part of the upper half of the sections A. The upper part of the rear section B is provided with the upper set of return flues  $y$ , coinciding with those of the section A. On the rear of the section B is provided a back D extending from top to bottom of the rear section. The rear plate or back D is so constructed as to afford a vertical smoke flue 16 which is in communication with the upper set of return flues  $y$ , and is provided with means for the attachment of a direct or indirect draft flue, as shown at D' and D<sup>2</sup> respectively. In the lower end of the flue 16 may also be provided a cleaning-out door D<sup>3</sup>. The inner sides of the legs 1 and 2 of the sections A are provided with lugs 17 which support the grate bearing bars 18. The grate, as shown, consists of a series of transverse rocking bars 19 having bearing in the bar 18 at either end and each provided with an arm 20 connecting with a rod or bar 21 by which they may be rocked to shake the grate. The particular form of construction of grate, however, is not material. The grate bars are held in place in the bearing bar 18 by an upper bearing 22. This bearing is provided with inclined extension lips or portions 22<sup>a</sup> projecting into the intervals between the oval-shaped legs of the sections A and closing the same against passage of fuel or ashes. In order to afford a passage between the lower set of return flues  $x$  and the upper set  $y$  at the front of the heater, I provide a swell front door C' which allows the products of combustion and gases to pass from the flues  $x$  to those  $y$ , as indicated by the circulation arrows in Fig. 1.

The circulation of the water of the sections A is shown by the arrows in Fig. 8. It will be noted that the interior construction is such that provision is made for bringing the water in its circulation in the section directly over

the hottest part of the fire and passing that portion of the water which is hottest directly to the top which connects with the drum E, while that portion of the water which is not so fully heated is allowed to circulate back to the hottest part of the section to be fully heated before being delivered to the drum E. The arrangement is also such that the circulation will keep the tubes of the section clean and free of sediment, affording the sediment an opportunity to all accumulate in the vertical legs 1 and 2 of the sections where it may be drawn off at intervals by partially drawing the water from the heater and its connecting system of heating pipes.

The heater as shown is preferably covered with a plaster or mastic of asbestos or some similar non-combustible material which will prevent radiation.

It will be understood that the products of combustion pass from the fire on the grate to the rear of the heater, up the wall 14 past the crown flues 3, thence through the four lower set of return flues  $x$  to the front of the heater where they rise to the upper set  $y$  of the return flues and pass to the rear of the heater into the smoke flue 16, and thence out through a direct or indirect flue attached at D' or D<sup>2</sup> as the case may be.

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

1. The combination in a heater of a series of sections bestride the fire chamber, each section having an arched water tube over the fire chamber, which tube is substantially V-shaped in cross section with the point depending into the fire chamber and the shell of the tube being corrugated in its entire body on its exposed bottom and sides, substantially as set forth.

2. A section for a heater having two vertical water legs, a series of arched water tubes between the upper portions of the legs, a discharge opening located centrally in the top arched tube, vertical water tubes 6, 7 and 8 connecting the arched tubes, the tubes 6 and 7 diverging at their upper ends toward the outside in branches 6<sup>a</sup> and 7<sup>a</sup> respectively, and toward the center of the section in branches 6<sup>b</sup> and 7<sup>b</sup> respectively, whereby provision is made for the free circulation in the section and the delivery of the hottest water at the discharge outlet, substantially as set forth.

3. The combination in a heater of a series of sections having arched tubes dividing the upper portion of the section into an upper and lower set of openings forming an upper and lower re-direct draft flue and a fire chamber in the lower portion of the sections, a rear section having double walls affording a water space, the wall 14 thereof being let back into the front face of the section affording a passage from the rear of the fire chamber into the lower set of flues and terminating at its upper end in contact with the arched flue of the regular sections which divides the upper

and lower set of draft flues, substantially as set forth.

4. In a heater, a series of sections bestride the fire chamber, each section having a downwardly extending leg and inwardly projecting lug 17 on the leg, a grate bearing bar 15 resting on the lugs of each section, and an upper grate retaining bar 22 having inclined projections 22<sup>a</sup> extending into the intervals

between the sections, substantially as set forth.

In witness whereof I have affixed my signature in presence of two witnesses.

WILLIAM CAMPBELL.

Witnesses:

M. A. KELLER,  
GEORGE C. CARTER.