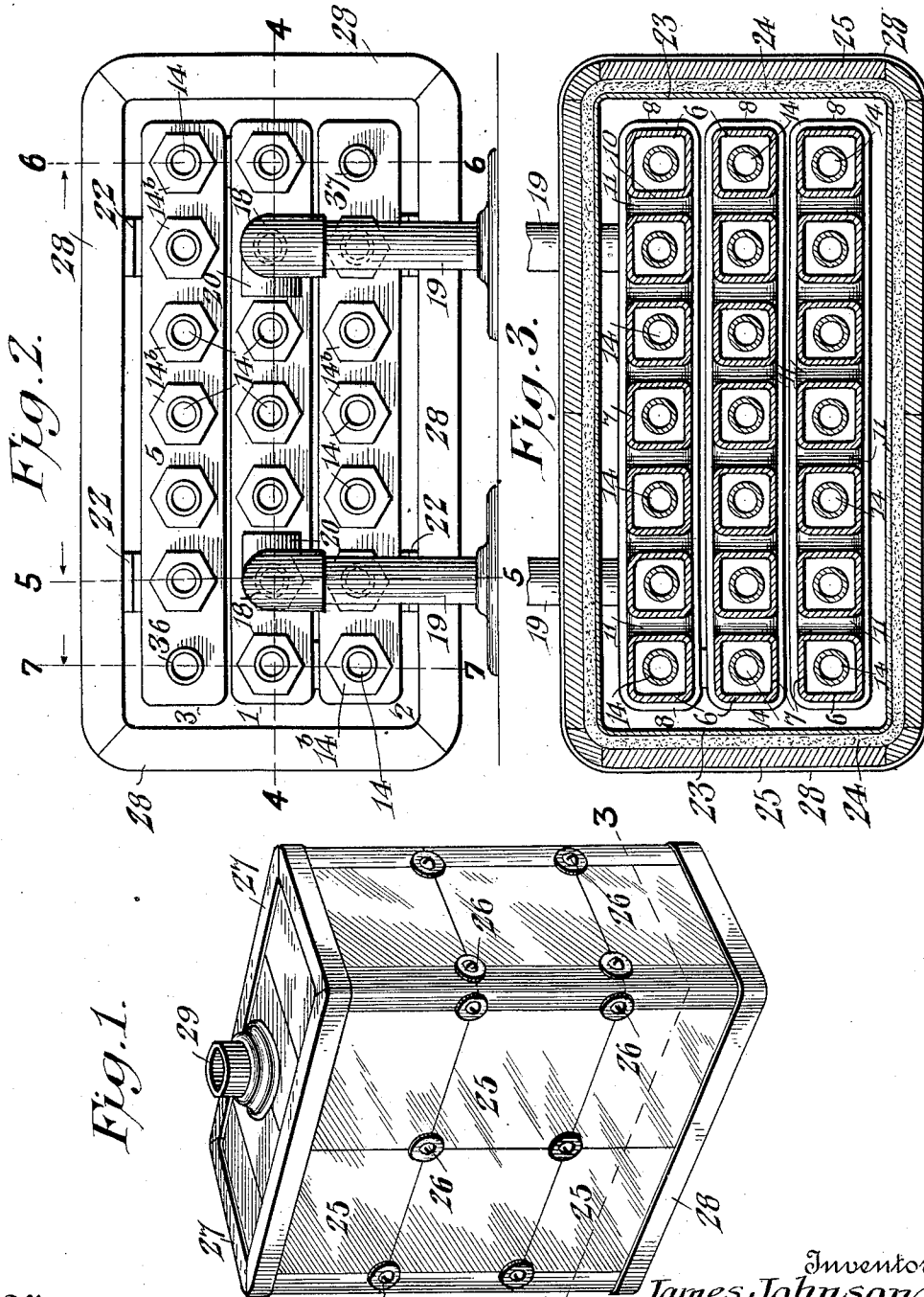


1,050,543.

J. JOHNSON.
WATER HEATER.
APPLICATION FILED DEC. 4, 1911.

Patented Jan. 14, 1913.

3 SHEETS-SHEET 1.



Witnesses
Jas. F. McEachern
F. J. Chapman.

Inventor
James Johnson
C. G. Siggers
Attorney

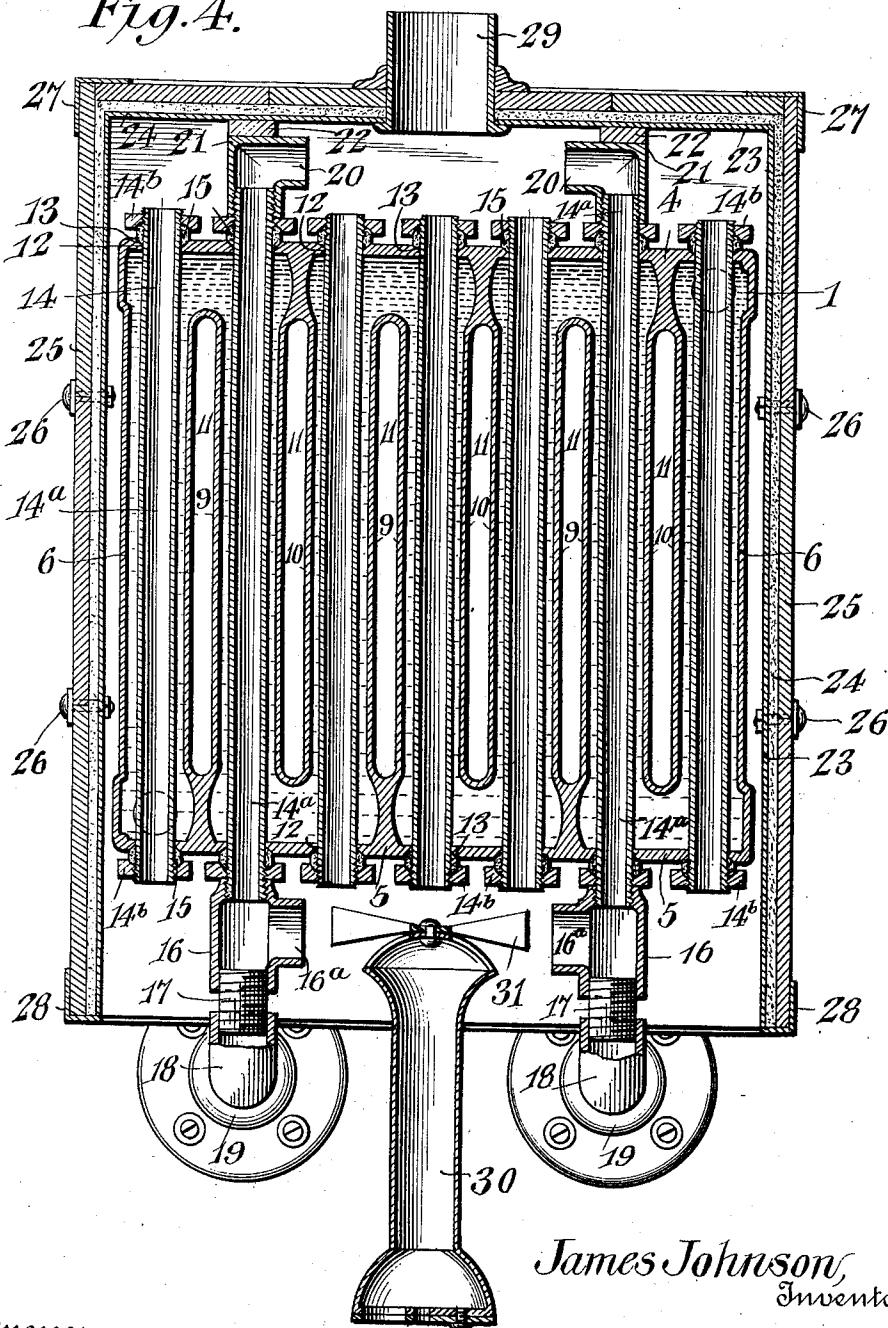
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3 SHEETS-SHEET 2.

Fig. 4.



Witnesses
Jas. H. McLaughlin
F. J. Chapman.

James Johnson,
Inventor

By

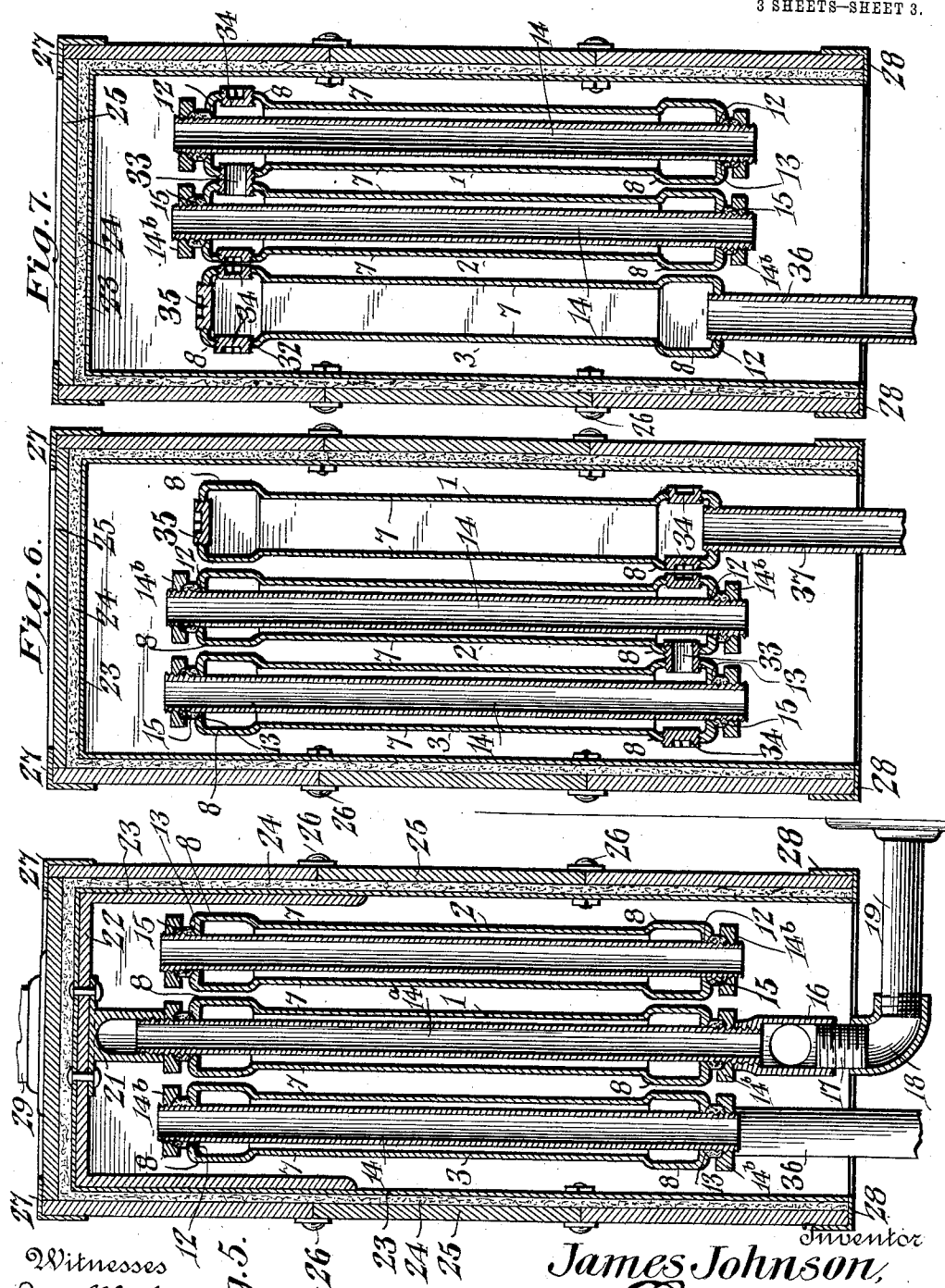
E. J. Siggers
Attorney

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3 SHEETS—SHEET 3.



Witnesses
Jas E. McArthur
F. J. Chapman.

James Johnson,
By *E. G. Siggers*
Attorney

UNITED STATES PATENT OFFICE.

JAMES JOHNSON, OF CHESTER, PENNSYLVANIA.

WATER-HEATER.

1,050,543.

Specification of Letters Patent.

Patented Jan. 14, 1913.

Application filed December 4, 1911. Serial No. 663,885.

To all whom it may concern:

Be it known that I, JAMES JOHNSON, a citizen of the United States, residing at Chester, in the county of Delaware and State of Pennsylvania, have invented a new and useful Water-Heater, of which the following is a specification.

This invention has reference to improvements in water heaters and is designed more particularly to provide a means whereby hot water may be supplied on demand, the heating agent being gas or any other convenient heating material.

In accordance with the present invention there is provided a heating unit which may be readily multiplied into a series of connected units where greater heating capacity is desired than is furnished by one unit. The units are each in the form of a single casting with a tortuous channel therethrough produced by a series of oppositely directed alternately arranged webs, which latter are in part made hollow so that the products of combustion may pass therethrough, and in the spaces between the webs, which latter are appropriately separated for the purpose, heat flues are introduced so that the products of combustion have other paths than the hollow webs through the body of water contained within the unit when in operation. The last named heat flues may be in the form of pipes locked in water tight relation to the walls of the unit and open at the ends outside the heating unit so that a heating agent will readily traverse the pipes and may be directed through the hollow webs or baffles within the heating unit in a direction substantially perpendicular to the direction of travel of the products of combustion through the pipes, whereby there is provided a broad expanse of heating surface in operative relation to thin bodies of water traveling in a tortuous path through the heating unit, and the water is quickly heated and may even be superheated since it is caused to travel toward the source of heat at different points in its passage through the heating unit.

To conserve the heat, the heating unit or series of heating units where more than one is employed, is inclosed in a suitable casing which may be made to a large extent thermoinsulating and may, furthermore, be made of ornamental appearance by the employment of a tiling or like external lining.

The invention will be best understood from a consideration of the following detailed description, taken in connection with the accompanying drawings forming a part of this specification, with the understanding that while the showing of the drawings is confined to one practical form of the invention it is susceptible of being embodied in other practical forms retaining the same principle of operation and, therefore, the invention is not confined to any exact conformity to the embodiment illustrated in the drawings but may be variously changed and modified so long as the salient features of the invention are retained and the end sought is obtained.

In the drawings:—Figure 1 is a perspective view of a water heater constructed in accordance with the present invention. Fig. 2 is a bottom plan view thereof. Fig. 3 is a section on the line 3—3 of Fig. 1. Fig. 4 is a section on the line 4—4 of Fig. 2. Fig. 5 is a section on the line 5—5 of Fig. 2. Fig. 6 is a section on the line 6—6 of Fig. 2. Fig. 7 is a section on the line 7—7 of Fig. 2.

Referring to the drawings there are shown heating units 1, 2, 3, respectively, each of which may be substantially identical with the others and, therefore, a description of one will apply with equal force to the other two, but it will be understood that while in the drawings the heater is shown as made up of three units, a heater of less capacity may be made up of one or two units, and if greater capacity be desired more than three units may be employed.

Each unit comprises a substantially rectangular casting having top and bottom walls 4, 5, respectively, end walls 6 and side walls 7, the latter being comparatively close together so that the unit is much thinner as regards the distance between the walls 7 than it is long or high, it being customary in practice to arrange the units so that the walls 7 are practically upright. Adjacent the ends 4 and 5 the side walls 7 are separated one from the other to a greater extent than elsewhere, as indicated at 8. Inside the walls of each unit there are spaced webs 9, 10, respectively, the webs 9 rising from the bottom wall 5 and the webs 10 depending from the top wall 4 and each stopping short of the opposite top or bottom wall, as the case may be. The webs 9 and 10 alternate and extend from one side wall 7 to

the other so that there is produced throughout the interior of the unit a tortuous passage, the end of each web 9 and 10 remote from the wall carrying said web terminating at about the point where the expanded portions 8 of the walls 7 begin. The webs 9 and 10 throughout the greater portion of their length have elongated passages 11 therethrough opening through the side walls 7, but having no communication with the interior of the casing constituting the walls of the heating unit.

Through the top and bottom walls 4 and 5 intermediate of the webs 9 and 10 there are provided alined passages 12, each of which may be countersunk at the outer end as indicated at 13. Through these passages there are passed pipes 14 open at the ends and the end portions of the pipes are threaded for the reception of nuts 14^b, which latter may also be countersunk to match the countersunk portions 13 of the passages 12, so as to confine packing rings or gaskets 15 against the corresponding faces of the top and bottom 4 and 5, the nuts 14^b and packing 15 serving to hold the pipes in place and at the same time rendering the joints water tight. The webs 9 and 10 are in substantially parallel relation one to the other and the pipes 14 are substantially parallel with the webs 9 and 10 where passing between them, and in practice the pipes 14 are in quite close relation to the corresponding walls of the webs 9 and 10, it being customary to make the space between these parts about one-eighth of an inch. The channels defined by the webs 9 and 10 may be substantially rectangular in cross section while the pipes 14 may be round, both forms being shown in Fig. 3. The pipes 14 are in practice arranged upright, while the passages 11 through the webs 9 and 10 are in practice substantially horizontal, wherefore the passages 11 are so far as their direction through the heating unit is concerned substantially perpendicular to the passages defined by the pipes 14.

To support the heating unit, certain of the pipes 14 are elongated and in Figs. 4 and 5 these elongated pipes are indicated at 14^a. At one end each pipe 14^a receives a T 16 having the angle portion 16^a of one T directed toward the corresponding angle portion of the other and the straight portion of the T is connected at the end remote from the pipe 14^a by a nipple 17 to an elbow 18 carried by a bracket 19 which in turn may be connected to a wall or any other suitable support. That end of each pipe 14^a remote from the T 16 is connected to an elbow 20 directed toward the elbow of the other pipe and each elbow is secured to a block 21 in turn riveted or otherwise secured to a U-shaped angle frame 22 designed to support a suitable casing. In the

present instance the casing comprises an inner lining 23 which may be of metal, an intermediate lining 24 which may be of asbestos, and an outer lining 25 shown in the present instance as made up of tile blocks held together by bolts 26 traversing the tiles, asbestos lining and inner metal lining 23. Angle frames 27, 28 embrace the upper and lower margins of the casing, respectively, and serve to hold the corresponding portions of the tiles in place and also provide an ornamental finish. The top of the casing is pierced by a hollow nipple 29 serving as an escape flue for gases of combustion as will presently appear, and this nipple or thimble 29 serves as a means for the attachment of a suitable smoke flue if such be desired.

Heat is supplied by means of a burner 30 or in any other suitable manner, the burner 30 being taken as typical of any suitable means of supplying heat, and in the particular instance shown in the drawings the burner 30 is provided with a distributing fan 31 which tends to direct the hot products of combustion toward the sides of the casing, as will presently appear.

Considering the heater as made up of three units as illustrated in the drawings, each unit at the opposite upper and lower corners is provided with threaded passages 32 certain of which are connected together by screw nipples 33, the threads of which may be right and left at the two ends of each nipple as is customary in connecting structures of this character. In order that the units may be interchangeable and may be connected up in any desired grouping they are provided with matching passages 32, and those not in use for the reception of nipples 33 are closed by screw plugs 34. In order to provide for the entrance and escape of water from its units whether there be one or more than one in a heater, certain of the pipes 14 are omitted and the openings 12 through the upper end 4 are closed by plugs 35 while corresponding openings 12 through the wall 5 receive pipes 36, 37, respectively, which may constitute the inlet and outlet pipes for the water to be heated, the arrangement being such that water entering, say, through the pipe 36 will pass in a tortuous path alternately up and down through the unit into which the water enters, say the unit 3, thence through the unit 1 by a like tortuous path, and finally through the unit 2 also through a similar tortuous path passing out through the pipe 37. Assuming the burner 30 to be active the flame is directed over the bottom of the several units finding its way through the flues or pipes 14 and also through the necks 16^a into the T's 16 and through the pipes 14^a out through the elbows 20, so that the hot products of combustion pass through

the several units by way of the pipes 14 and 14^a from the bottom of the bank of units to the top thereof and ultimately find escape through the thimble 29. Other portions of the products of combustion are directed against the inner walls of the casing and about the water containing units which are spaced a short distance from the inner walls of the exterior casing, and other portions of the products of combustion find their way through the space between the units which are separated one from the other by short distances. There is thereby established a circulation of hot gases about and between the units and also through the hollow webs or baffles 9 and 10, wherefore the water within the heating units is presented in a thin broad stream to extensive heating walls, whereby the water is quickly raised to a high temperature being progressively heated from its entrance into the heating units to its escape therefrom and being directed many times into close relation to the intense portion of the heating flame since the path of the water through each heating unit is up and down.

The burner 30 while efficient for the purpose of supplying the necessary amount of heat and distributing the same underneath the heating units may be replaced by other types of heat producing devices adapted to burn various fuels, the particular means for supplying heat not forming a part of the present invention.

In the construction shown and described the castings may be cheaply made, while the flues formed by the pipes 14 are readily introduced and secured in place in a fluid tight manner without liability of working loose, and such flues are readily replaced at any time at small cost. For certain purposes it may be advantageous to construct the device in a manner different from that illustrated, but such different constructions do not mean any material departure from those features of the present invention which distinguish it from other water heaters. For instance, the flues may be connected to the water container by being upset at the ends, or brazed, and other mechanical expedients may be employed in the construction as is customary in devices of this character.

The supporting means for the water heaters shown in the drawings utilizes certain of the flues but the heating capacity of the device is not diminished by such utilization of certain of the flues as supports, since these flues are placed in communication with the source of heat by direction changing means, such as T's and elbows.

What is claimed is:—

1. In a water heater, a heating unit provided with a water chamber having elongated heat conducting flues extending there-

through in directions substantially perpendicular one to the other, the elongation of all the flues being in the same direction.

2. In a water heater, a heating unit provided with a water chamber having hollow upright webs therein forming a tortuous up and down passage for water through said chamber, the hollow interiors of the webs opening exterior to the water chamber.

3. In a water heater, a heating unit provided with a water chamber having elongated spaced webs therein in staggered relation to provide a tortuous water course through the water chamber, and flues extending through the water chamber between the webs in the direction of the length of the latter.

4. In a water heater, a heating unit provided with a water chamber having a series of upright staggered webs therein defining a tortuous up and down channel for water from one end of the chamber to the other, opposite walls of the water chamber and the webs being related to define a water channel through the water chamber of substantially square cross section, and flues extending through the channel in substantially centralized relation to the branches thereof.

5. In a water heater, a heating unit provided with a water chamber having a series of upright staggered webs therein defining a tortuous up and down channel for water from one end of the chamber to the other, opposite walls of the water chamber and the webs being related to define a water channel through the water chamber of substantially square cross section, and flues extending through the channel in substantially centralized relation to the branches thereof, the flues being hollow and opening through the upright walls of the water chamber.

6. In a water heater, a heating unit comprising a casting having webs extending between and united to the side walls in staggered relation one to the other and defining a tortuous channel through the interior of the casting and having passages through them opening through said side walls, and pipes open at the ends and there extending through the corresponding walls of the casting, the pipes traversing the water chamber within the casting in substantially centralized relation to the branches of the water channel through the water chamber.

7. In a water heater, a heating unit comprising a casting having interior upright webs in staggered relation one to the other defining a tortuous up and down water passage through the casting, the webs being hollow and opening through the corresponding walls of the casting, and upright flues extending through the water chamber of the casting.

8. In a water heater, a heating unit comprising a casting having interior upright

webs in staggered relation one to the other defining a tortuous up and down water passage through the casting, the webs being hollow and opening through the corresponding side walls of the casting, and upright flues extending through the water chamber of the casting, the flues and the hollow webs defining passages substantially perpendicular one to the other for products of combustion.

9. In a water heater, a water chamber having flues in the form of pipes traversing it, said flues extending beyond the outer walls of the water chamber and there threaded, nuts adapted to the threaded ends of the flues and located wholly exterior to the outer walls of the water chamber, and packing interposed between the nuts and the corresponding walls of the water chamber.

10. In a water heater, a heating unit having a water chamber with heat flues extending therethrough, said heat flues having at the ends exterior to the water chamber direction changing fittings, the fittings at one end of the flues being provided with supporting means for the heating unit.

11. In a water heater, a heating unit having a water chamber with heat flues extending therethrough, said heat flues having at the ends exterior to the water chamber direction changing fittings, the fittings at one end of the flues being provided with supporting means for the heating unit, a casing for the heating unit, and supporting means for the casing carried by the fittings at the other end of the heat flues.

12. A water heater comprising a heating unit having a water chamber with its walls in the form of a casting enlarged at the ends

constituting the top and bottom of the unit when in operative position, said water chamber having therewithin hollow webs integral with the body of the casting, said webs being in staggered relation one to the other and extending from a respective top or bottom wall to the enlarged portion at the other end of the chamber, the webs having passages therethrough elongated in the direction of the length of the webs and opening through the corresponding side walls of the casting.

13. A water heater comprising a heating unit having a water chamber with its walls in the form of a casting enlarged at the ends constituting the top and the bottom of the unit when in operative position, said water chamber having therewithin hollow webs integral with the body of the casting, said webs being in staggered relation one to the other and extending from a respective top or bottom wall to the enlarged portion at the other end of the chamber, the webs having passages therethrough elongated in the direction of the length of the webs and opening through the corresponding side walls of the casting, said casting being also provided with alined passages through the respective top and bottom walls intermediate of the webs, and flues extending through the water chamber between the webs and also through the alined passages at the top and bottom of the casting.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JAMES JOHNSON.

Witnesses:

GEORGE W. CURRY,
MAJOR H. JOHNSTON.