S. TACHE.

INSTANTANEOUS WATER HEATER.

APPLICATION FILED OCT. 4, 1909.

958,563.

Patented May 17, 1910.

Fig. 1.

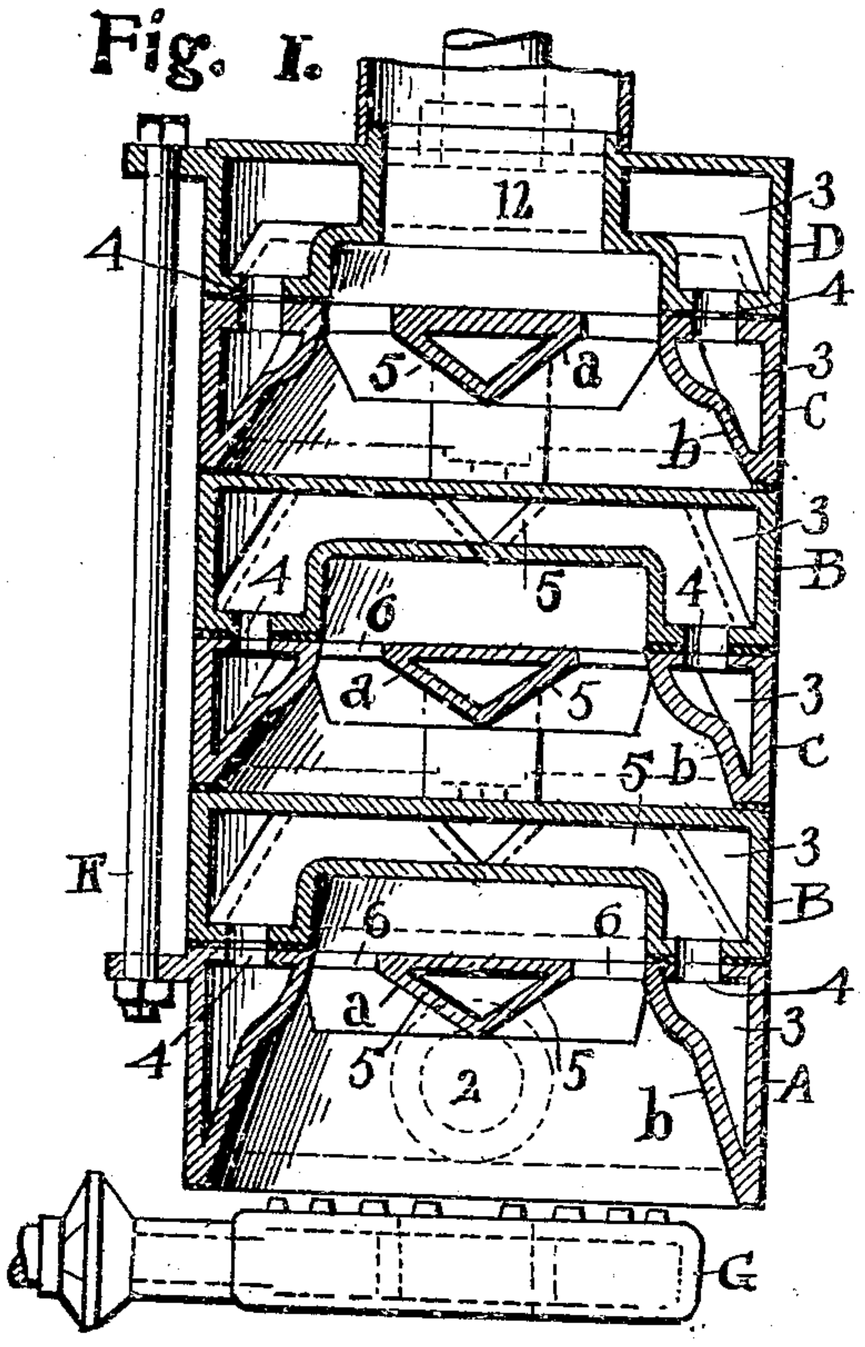


Fig. 2.

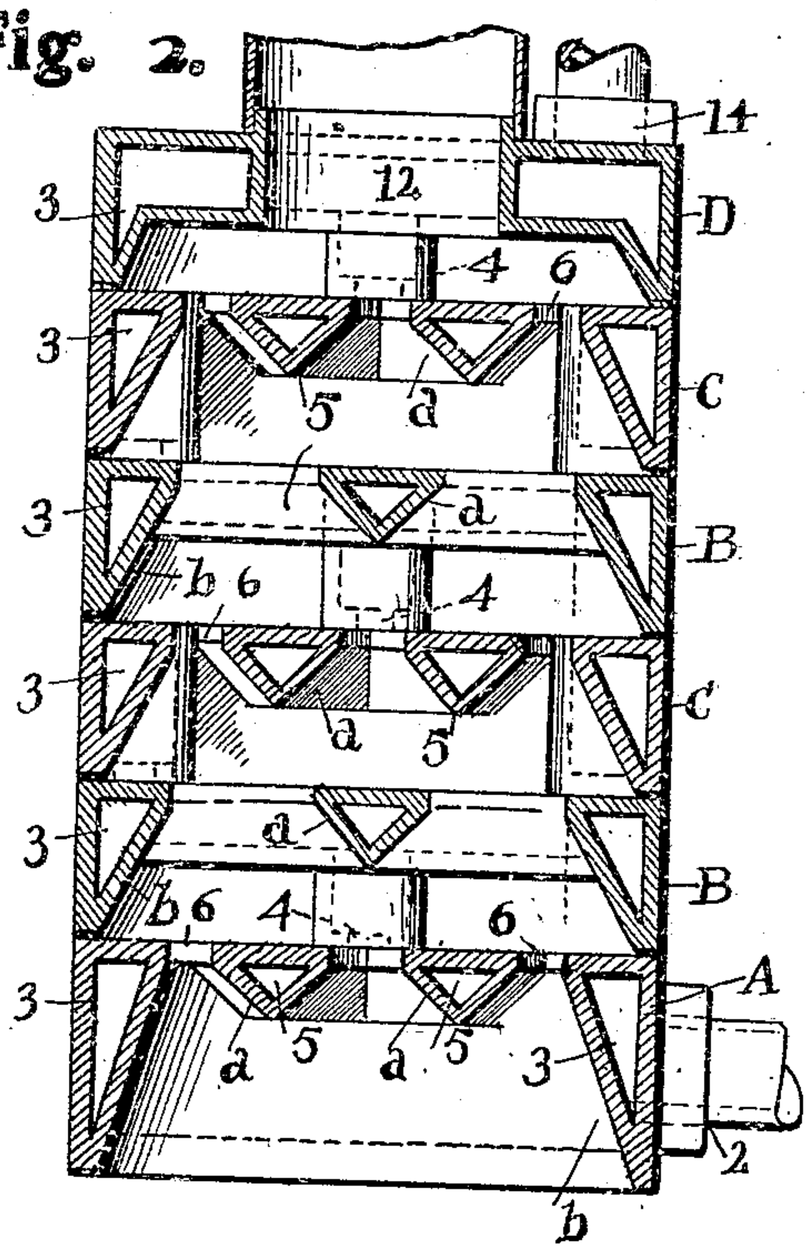


Fig. 4.

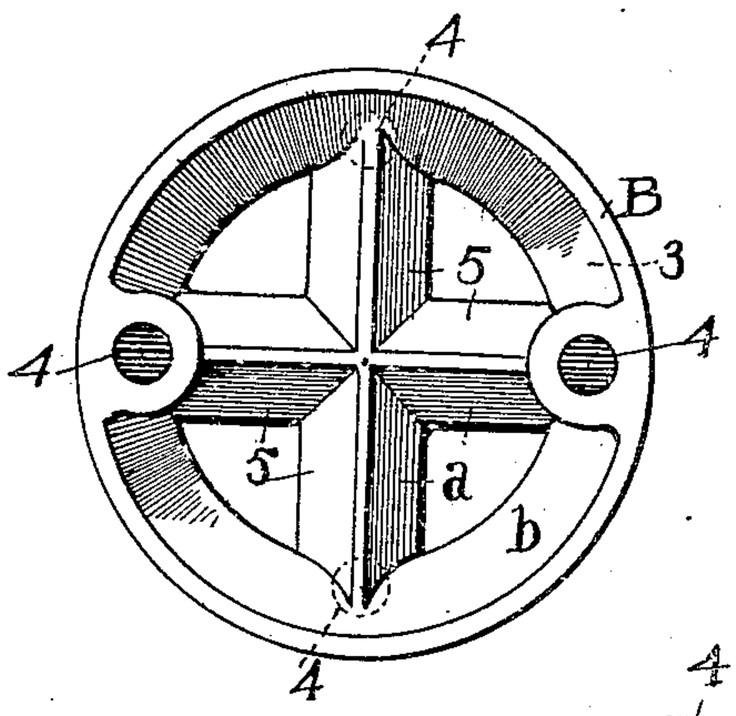


Fig. 3.

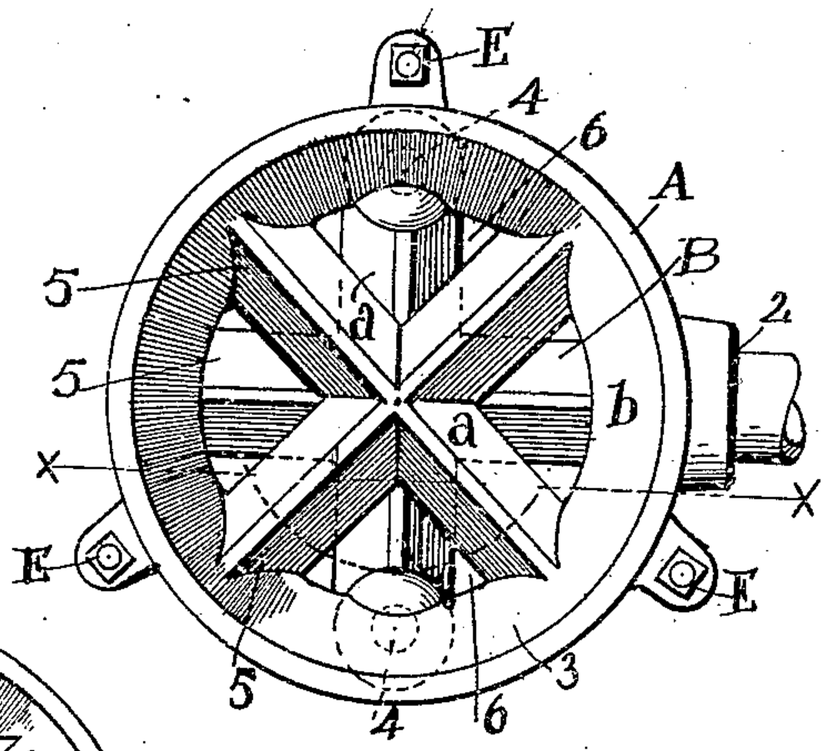
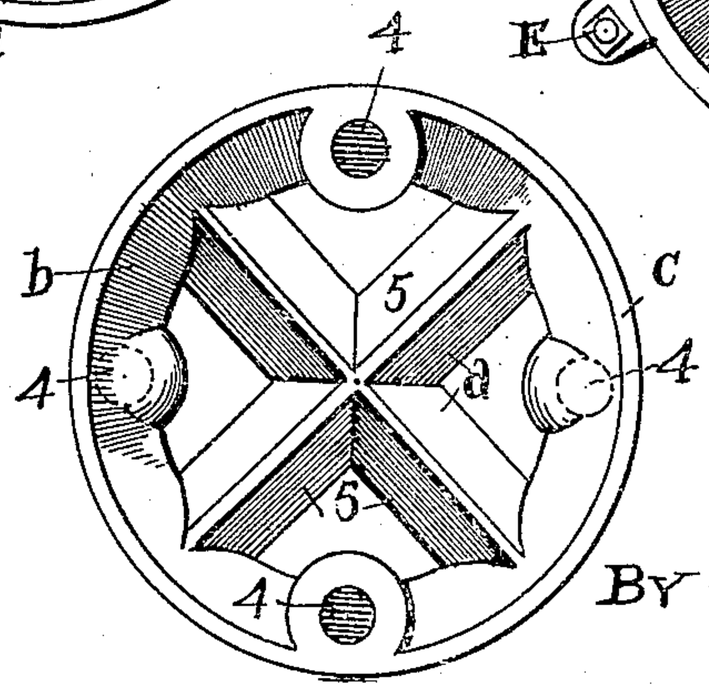


Fig. 5.



ATTEST

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SIMON TACHE, OF CLEVELAND, OHIO.

INSTANTANEOUS WATER-HEATER.

958,563. Specification of Letters Patent. **Patented May 17, 1910.**

Application filed October 4, 1909. Serial No. 520,981.

To all whom it may concern:

Be it known that I, SIMON TACHE, citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Instantaneous Water-Heaters, of which the following is a specification.

My invention relates to instantaneous water heaters, and the invention consists in a heater with a pile or series of sections arranged one above the other and constructed to conduct the water through the pile from bottom to top with the products of combustion playing about the same, substantially as shown and described and particularly pointed out in the claim.

In the accompanying drawings, Figure 1 is a vertical sectional elevation of the heater, and Fig. 2 also is a vertical sectional elevation of the heater but substantially at right angles to Fig. 1, or, more definitely, on a line corresponding to *x*—*x*, Fig. 3. Fig. 3 is a bottom view more particularly of the lower section of the heater, and Fig. 4 is a bottom view of the next succeeding section above the lower one or the second in the pile, and Fig. 5 is a bottom view of the third section in the pile, or of one of the sections alternate to that shown in Fig. 4.

Ordinarily the heater is built up with a series of six sections one upon the other, and the alternate sections intermediate of the top and bottom sections are alike. Of course a greater number of sections may be used, but the presumption is that six sections under fire with fresh water flowing through them will absorb practically all the heat developed by the burner. Of course it is advantageous to the heater to do this in the smallest possible compass, and the heater is built and arranged to work with six or more sections which have a full working size of about six inches across. The number of sections however does not in itself convey a full conception of the heating capacity of the device because in addition to this there is the peculiar construction of the water channels or passages whereby the water is exposed to the heat over the largest possible surface and the heat is carried through indirect ways and the travel is greatly prolonged and the flow is advantageously checked, all as will hereinafter fully appear.

Referring now to the drawings, the sections of the heater are indicated by A, B, C, and D respectively, noted in their order from bottom to top. These sections are united by tie rods E, or their equivalent, connecting the top and bottom sections through ears or lugs thereon or in any equivalent way, and the said sections are constructed and related in such manner as to unite and make a unitary structure. To this end the said sections are provided with both water and combustion passages respectively, communicating from section to section from bottom to top of the entire heater for the flow of both water and the combustion products through the same and with their entrance at the bottom and exit at the top of the heater, the difference being that the water has internal passages and the products of combustion are external to the sections. The invention lies in the construction of said sections with these features and with the advantage of a maximum heat absorption for surface exposed. Beginning with the lower section of the series the said section A is shown as having a fluid or water inlet at 2 into its annular space or passage 3 from which there are two vertical outlets 4 into section B next above. Two cross passages or ducts 5 open to each other at their intersection and to the annular passage 3 at their ends and enter said passage 3 between the said ducts or openings 4 relatively as seen in Fig. 3. The said cross passages are substantially V shaped as between their inclined sides *a* and the outer annular portion of the section has an inclined inner side *b* which makes an inner passage 3 narrow at the bottom and widening toward the top, and said passages or ducts are fully exposed to the products of combustion from burner G, beneath, which pass thence upward through the intermediate openings 6 into the space about the bottom and sides of section B next above. The said section B is provided with an annular water belt or passage 3 corresponding to the passage in section A and cross passages or ducts 5 at right angles to each other corresponding to the ducts in A below, and provided with beveled sides *a* and *b* also corresponding to those in section A but having fluid communication from beneath at the ends of one of said cross passages and fluid communication above at the ends of the other cross passage, and the said cross passages 5 are arranged to come over the open space for the draft from the section next beneath. This begins a zigzag

relation between said cross passages extending from bottom to top of the heater and directly exposes said cross passages to the heat from below. The immediate relation between sections A and B is shown in Fig. 3 where the said cross portions of both sections are shown in full lines, and a similar relation is sustained between the other sections, as illustrated in Figs. 1 and 2. Both the sections B are alike as also are the intermediate sections C, as will now appear. Thus, the section C has an annular fluid channel or belt 3 like A and B, and cross ribs 5 with beveled sides *a* and the outer beveled side *b* like said sections, but the water communicating openings or holes through which circulation is maintained are intermediate the said cross passages 5, the outlet openings from above being a quarter way around in each case from one of the said inlets, thus materially extending the length of travel for the water to the exit and getting the greatest possible exposure to the heat. Section D at the top has the outer annular water belt 3 substantially the same as the lower sections but instead of cross passages it has an exhaust opening 12 in its center and top for the products of combustion and a discharge opening 14 for the heated water, and communicates with the section C beneath by the passages 4 as in the other sections. For convenience the reference characters 3, 4 and 5 indicate the water spaces or channels while 6 indicates the draft channel which plays about the cross ribs or passages of the respective sections.

Any suitable packing may be interposed between the sections and about the fluid openings 4 from one to the other, and to safeguard any possible losses of heat by radiation, the heater sections may be provided with an outer asbestos lining. In this connection it will be noted that I have dispensed with the usual separate outer casing about the sections and in which constructions the heat products passed up between the outside of the heater sections and the said casing. On the contrary, each section of my heater has a belt like outer portion filled with water and which makes or builds up a hollow outer water wall which absorbs the heat instead of radiating through a casing as before. In former constructions much loss of heat was caused by radiation through the outer casing, but my chambered outer walls absorb all the heat units circulating next to said wall and there is practically no loss by radiation to the outer atmosphere. In fact there is practically no loss of heat from the burner possible with my construction because all heat units are directly absorbed by the water flowing through the sections and none is radiated uselessly. This works great economy in the consumption of fuel and hastens the heating of the water. This is clearly seen by referring to Fig. 1 which shows that the products of combustion from the burner travel wholly within the water belts as well as around water cross passages, and that the heat must first pass through the water within the walls before loss by radiation can possibly occur. In other words, the water is heated before radiation can take place, and being heated it is instantly drawn off for use.

What I claim is:

A water heater, embodying a series of circular sections having peripheral water chambers triangular in cross area and forming a closed exterior wall, said sections also having intersecting triangular cross passages, said passages in one section being staggered relatively to the passages of its adjacent sections, and oppositely disposed ports communicating between said sections and out of alinement with respect to the ports of the adjacent sections, whereby tortuous passages within the confines of the said peripheral water chambers for both the water and the products of combustion are afforded through the heater.

In testimony whereof I affix my signature in presence of two witnesses.

SIMON TACHE.

Witnesses:
E. M. FISHER,
F. C. MUSSEN.