No. 756,909. PATENTED APR. 12, 1904.

S. TACHE.

HOT WATER FURNACE.

APPLICATION FILED SEPT. 19, 1903.

NO MODEL.

FIG. 1.

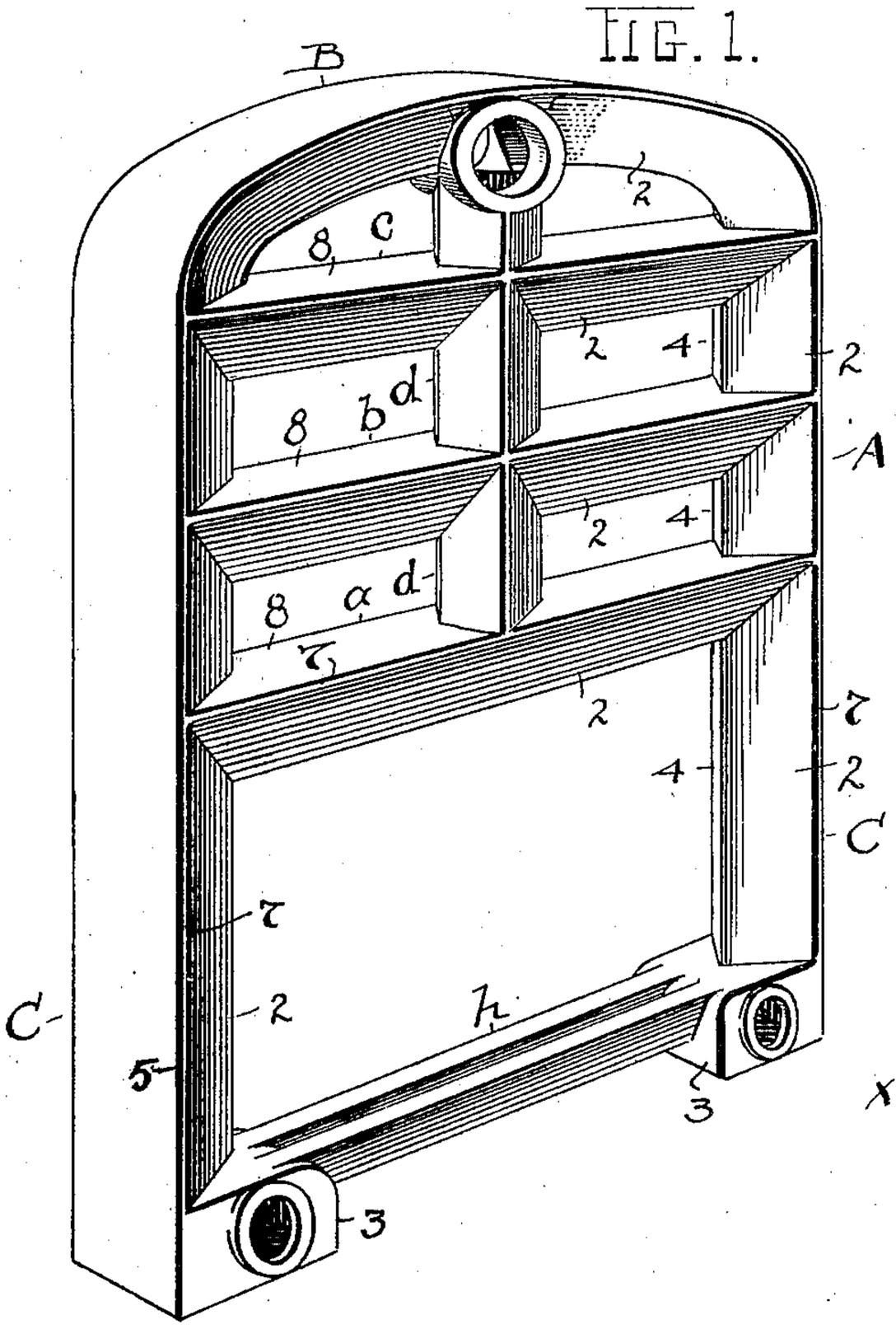


FIG. 2.

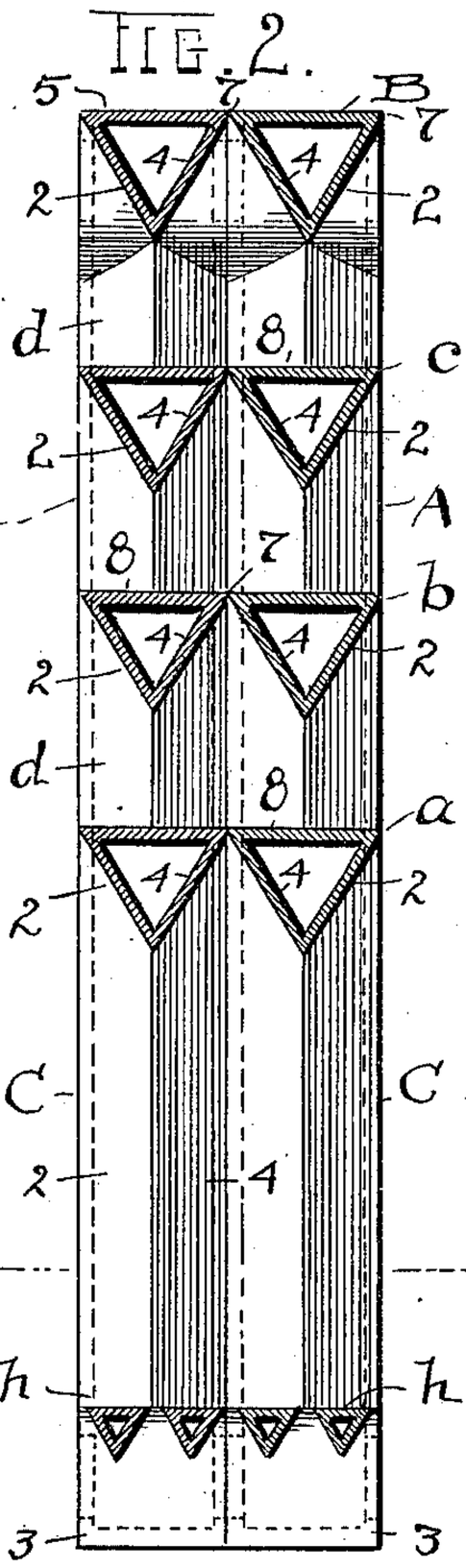


FIG. 3.

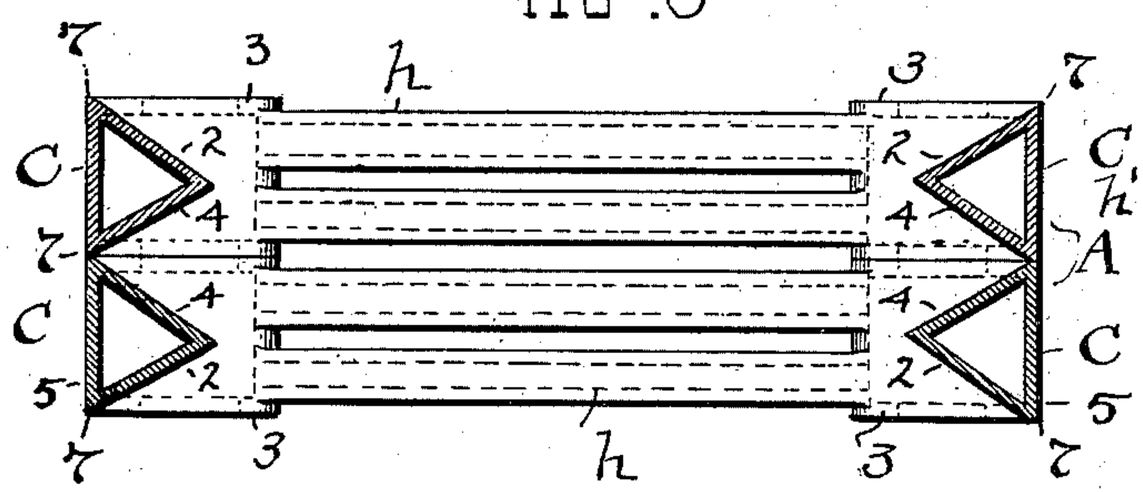
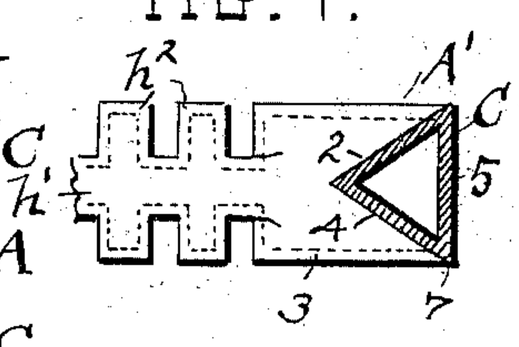


FIG. 4.



ATTEST

T. B. Moser

A. M. Moser.

INVENTOR.

Simon Tache

BY H. J. Fisher ATTY

No. 756,909. Patented April 12, 1904.

UNITED STATES PATENT OFFICE.

SIMON TACHE, OF CLEVELAND, OHIO.

HOT-WATER FURNACE.

SPECIFICATION forming part of Letters Patent No. 756,909, dated April 12, 1904.

Application filed September 19, 1903. Serial No. 173,759. (No model.)

To all whom it may concern:

Be it known that I, SIMON TACHE, a 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 Hot-Water Furnaces; and I do 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.

My invention relates to improvements in hot-water furnaces; and the invention consists, primarily, in a single section of a furnace as a new article of manufacture and sale, the said section being one of several in the same furnace which are exactly alike in all particulars and which are used in such numbers in any given case as the service a furnace is expected to perform may require—say from four or five sections as a minimum for the smaller sizes of furnace up to ten or more sections in places where large areas are to be heated.

In the accompanying drawings, Figure 1 is a perspective view of a section of my improved furnace, and Fig. 2 is a vertical cross-section of two sections of the furnace brought together in working relation and shown as they appear in the furnace complete. Any number of sections brought together would simply be an extension of this view. Fig. 3 is a plan view of a pair of sections on a line corresponding to *x x*, Fig. 2. Fig. 4 is a similar view to Fig. 3, but showing a modification of the grate-bar.

In the views of the invention as thus shown, A represents one of my new and improved furnace sections or members. In this section, which also illustrates the principle upon which the entire furnace is developed, except the front and rear thereof, which are not material to this application, I have had in mind the utmost possible economy of fuel with the greatest possible percentage of heat units absorbed by the water, and this has led to the peculiar and novel construction of furnace or the sectional members thereof as will now be described. Obviously to attain these results the furnace must have the maximum of heating surface or area exposed to the products of combustion with the most advantageous exposure possible of the water therein to such surface or surfaces, and where both these conditions meet and are developed as herein the effect will be manifest both in a very prompt heating of the water and in the heating of a large volume as well. Now referring definitely to the construction of the furnace whereby these results are secured, it will be seen that all the water ducts or passages in the section are alike of substantially uniform or triangular shape in cross-section, with a slight inward curvature, if desired, of the two opposite converging sides 2 and 4, respectively, as shown. This latter feature reduces the volume or body of water and narrows the same between the sides 2 and 4 in such measure that the heating of the water in the passages of the furnaces is facilitated and circulation of hot water throughout the system established more promptly than where the body of water present in the furnace is materially larger.

Considered as an article, section A is formed with an outer frame portion of the form or style of a bow B, rounded over its top and running down and terminating in straight side portions or legs C. In addition to this, said section is provided with three several straight cross portions *a*, *b*, and *c* and a central vertical four-sided portion *d*, extending from the lower cross portion or passage *a* up to the upper portion B and open to all said portions from end to end, so that it forms a water conveying and heating portion in common with the remainder of the section. Respecting the outer or frame portion of the section, it will be noticed that it also is three-sided in cross-section and that the opposite converging sides 2 and 4 run back to the straight outer surface 5, which bounds the entire exterior of the section all around and forms an outer wall to the section at right angles to its face. By this construction I avoid absolutely all dead and waste portions or spaces in the construction of my furnace, because every inch of surface which incloses water is directly exposed to the products of combustion and the inwardly-converging sides 2 and 4 run back to the edges of the outer surface 5. This is illustrated in Fig. 3, where two sections A are brought together

as they are when the furnace is erected and in use. It will be seen that the said sections impinge only at their edges 7, where sides 2 and 4 terminate, and the entire depth or width of sides 4 and 2 is exposed to the heat and no portion is overlapped and killed by the opposite section on either side. This insures the greatest possible exposure of surface to the heat that can be given to water-channels in a formation of furnace-section which necessarily has its exterior 5 outside the furnace, and the application of the heat upon the two converging sides with only a comparatively light body of water between them is obviously advantageous and desirable; but the cross portions *a*, *b*, and *c* of the section are wholly exposed to the heat over all their three surfaces from end to end, and the said portions are so arranged as to bring their flat top surfaces 8 flush together at their edges and form a perfectly even floor in the flues or draft-passages of the furnace. It is to be especially noticed that the said cross portions lie one against the other, forming a close flat even floor to the flues and in this particular are the same as if the entire floor were in one plate or piece. This construction has the very material additional advantage of being self-cleansing, or rather by reason of being flat and even the draft or suction through the furnace will carry off all loose particles arising from combustion and keep the top of said flues perfectly clean. Hence the said surfaces 8 also make their proportionate contribution to the heating of the water, and being even throughout there is no place for foreign substance to deposit, as there would be if the surface were uneven and soot and ashes accumulated.

An additional and original feature in this furnace is the hollow grate or grate-bars *h*, which are cast directly in or upon each section A, as seen in the several figures, and constitute an integral inseparable part thereof. Hitherto, so far as I know and believe, the grate-bars or grates of a furnace have been a wholly separate portion or part, and hence whatever heat has come upon such grates or grate-bars has been practically lost and at any rate did not directly reach the water to be heated. That the amount of heat at this point usually is very great is well known, and hence I have planned to utilize the same to the best possible advantage by constructing my furnance with hollow grate-bars constructed to serve both their ordinary function and as a medium for heating the water, as shown. To these ends the two grate-bars *h* on each section are cast integrally with the legs C and are hollow throughout and in open communication at each end with the interior of said legs, thereby affording a free circulation of water through said bars and economizing the otherwise wasted heat at this point. It will be noticed also that this brings the coolest water down to the point of the greatest heat, so that the ascending heat meets only heated water on the higher levels, and by reason of the perfect exposure of the water to the heat its entire length of travel in the furnace the water gets all possible benefit from the heat as it flows and the heat is applied in such way as to be absorbed by the water. It will be noticed also that by this construction each furnace-section is complete with its own portion of grate and the grate-bars communicate at both ends with the sides of the section. The water may therefore flow either direction through said bars and serves also to protect said bars from warping or melting out under excessive firing of the furnace, as frequently occurs in cold weather. With integral hollow grate-bars connecting the feet of each section a positive circulation of the water through the complete section at all points is assured, even though the incoming water is only supplied to one leg or side of the section or, as sometimes occurs, if the fire is only alive at one side of the section.

Fig. 4 shows a modified form of grate-bar *h'*, wherein spurs or projections h^2 are formed at right angles to the bar at either side thereof.

What I claim is—

As a new article of manufacture, a section for a water-heating furnace having a hollow three-sided outer frame extending from the bottom of said section upward on both sides and over the top thereof, the said frame being triangular in cross-section with the outer side 5 at right angles to the plane of the section and the sides 4 thereof converging to a substantially **V** shape, thereby forming sharp abutting edges at the junction of said sides 4 and 5, and said section having a series of three several triangular cross portions, *a*, *b* and *c*, one above the other and communicating with said outer frame at their ends and having converging sides 2 in substantially **V** shape below, thus providing sharp abutting edges on the plane 8 at their top, and a central vertical substantially diamond-shape fluid connection *d* uniting said cross portions with the top of said outer frame, thereby providing a maximum of exposed surfaces to the heat in a given size of furnace, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

SIMON TACHE.

Witnesses:
R. B. MOSER,
A. SELL.