No. 664,866. Patented Jan. 1, 1901.

D. E. HOWATT.

SECTIONAL WATER HEATER.

(Application filed May 31, 1898. Renewed July 27, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

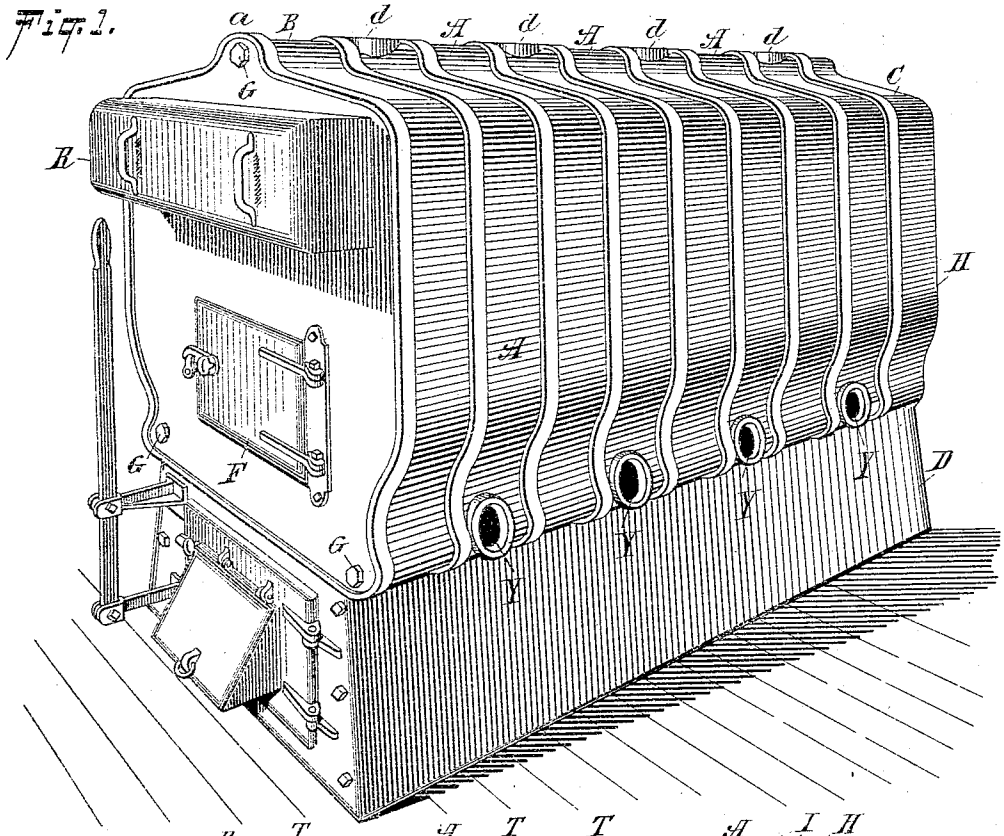
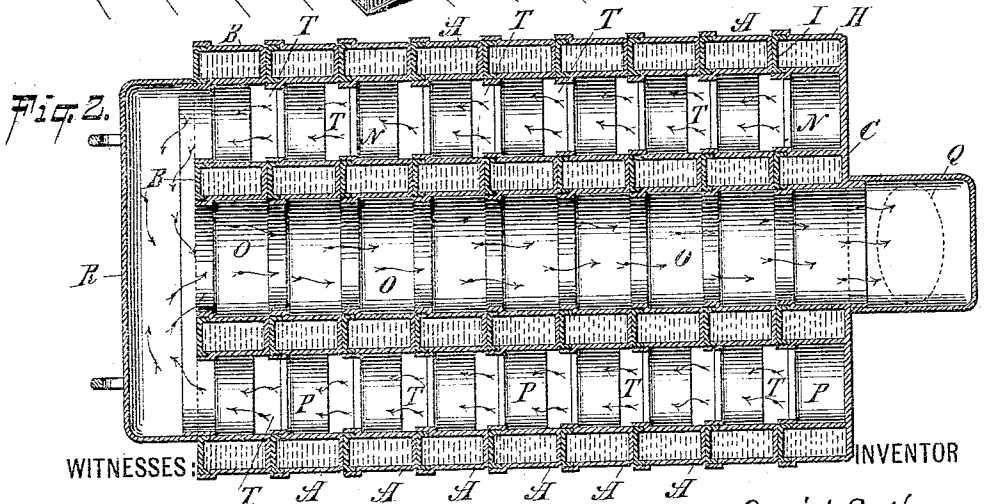


Fig. 2.



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Fig. 3.

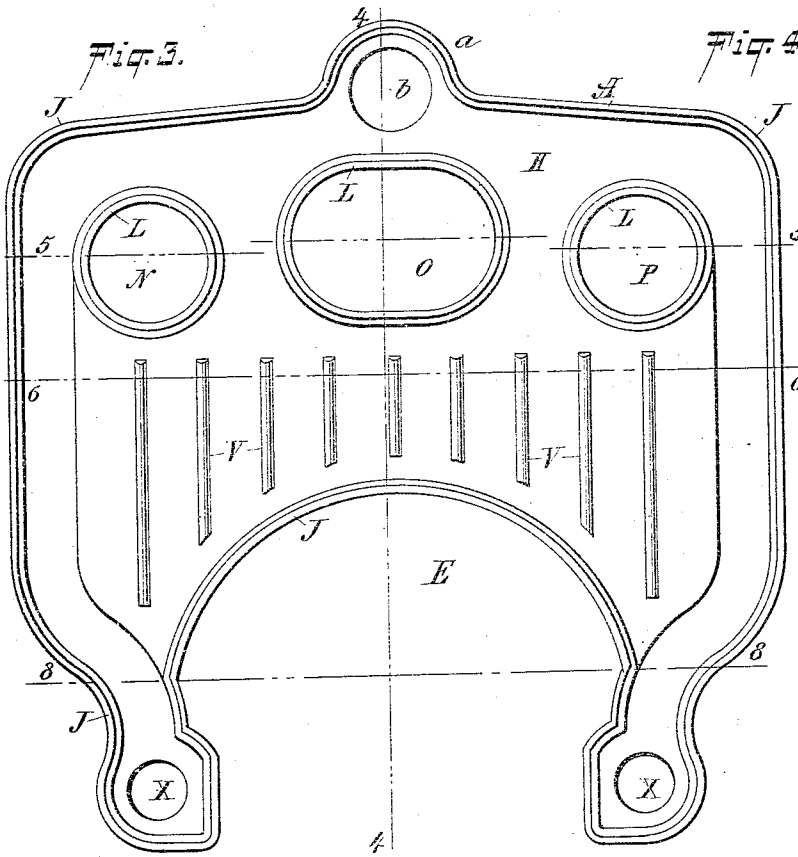


Fig. 4.

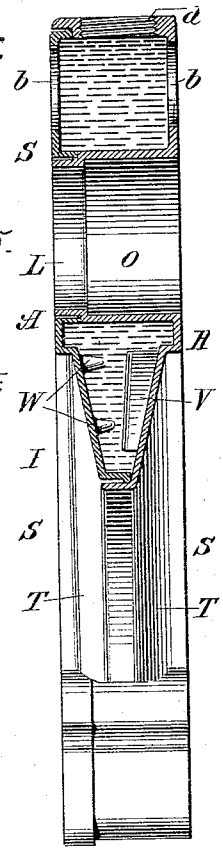


Fig. 5.

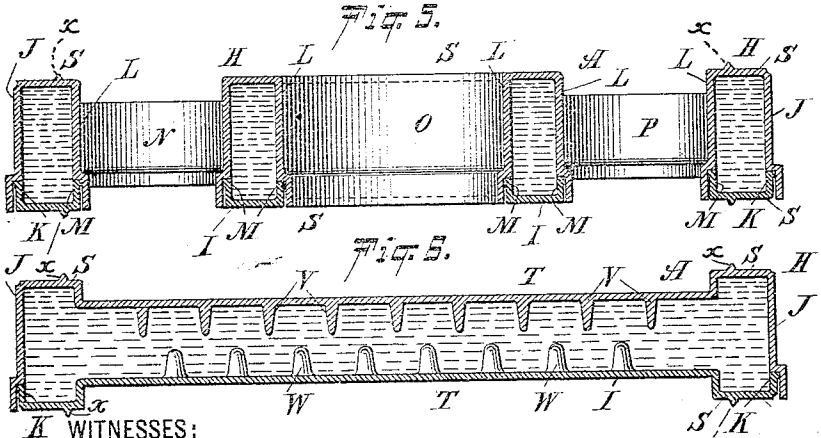


Fig. 5.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 7.

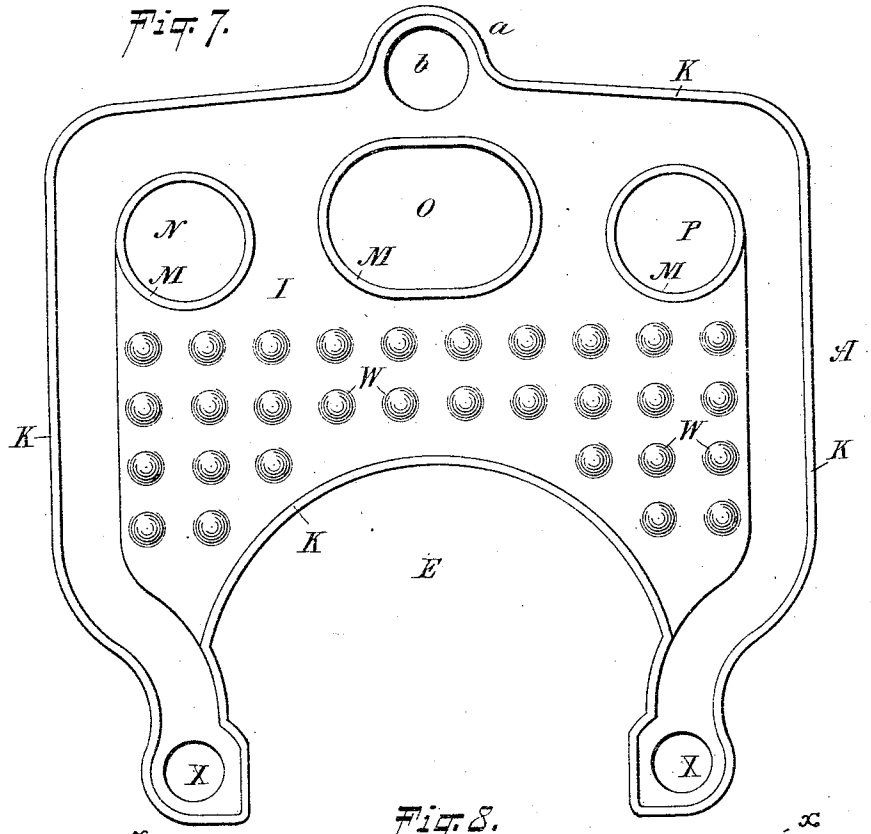


Fig. 8.

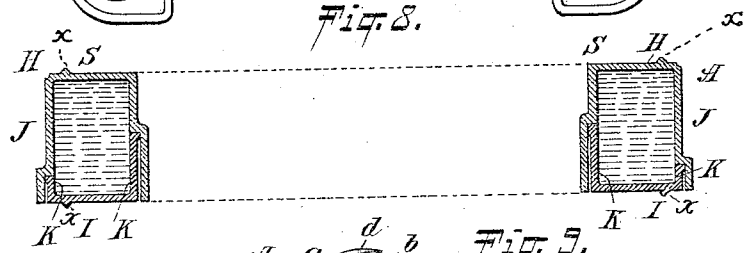
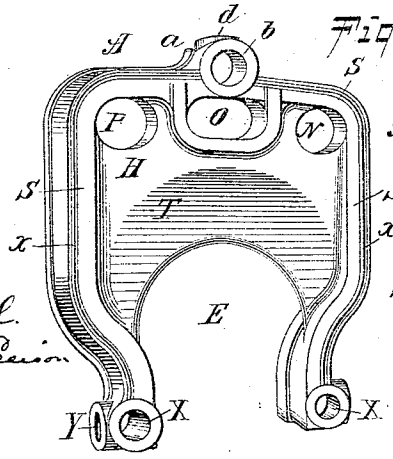


Fig. 9.



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UNITED STATES PATENT OFFICE.

DAVID E. HOWATT, OF ROSLYN, NEW YORK.

SECTIONAL WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 664,866, dated January 1, 1901.

Application filed May 31, 1898. Renewed July 27, 1900. Serial No. 25,049. (No model.)

To all whom it may concern:

Be it known that I, DAVID E. HOWATT, a citizen of the United States, and a resident of Roslyn, in the county of Nassau and State of New York, have invented certain new and useful Improvements in Sectional Water-Heaters, of which the following is a specification.

The invention relates to improvements in sectional water-heaters; and it consists in the novel features and combinations hereinafter described, and particularly pointed out in the claims.

The invention pertains more especially to the character of heaters described and claimed in the Letters Patent of the United States heretofore granted to me and numbered, respectively, 431,355, of July 1, 1890, and 459,096, of September 8, 1891; and its object is to produce a heater which shall be more efficient and economical in operation than the earlier heaters of the class to which it relates and which also shall be of superior mechanical construction and less expensive of production.

I have embodied the invention, as hereinafter fully explained, in a heater composed of individual vertical hollow communicating sections substantially corresponding with one another and arranged side by side to form a heater of the desired length, each section being complete in itself and the bank of sections being bound together between two end sections by bolts and superimposed over a suitable ash-pit. Between the lower portions or legs of the several sections is formed the main combustion-chamber, and through the upper portions of said sections are formed three longitudinal conduits or flues, all being side by side and affording a passage to the exit-pipe for the smoke, gases, and other products of combustion ascending from the furnace or main combustion-chamber. The upper central portions of the said sections are somewhat raised and are formed with longitudinal openings through their side faces in order that the interior water-chambers of the several sections may be brought into direct communication with one another, and this raised portion of the upper part of the sections receives the outlet-pipes for the water from the heater, the inlet or return pipes for the water being led to the lower ends or legs of said sections. Aside from other important features hereinafter explained, each of said sections is made up of two parts or sections which are brought together to form the complete section, and each of these parts may have on its inner face ribs, flanges, lugs, or equivalent features extending into the water chambers or cells and serving to conduct the heat inward to the water and compel a more efficient circulation of the water.

The invention will be thoroughly understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of a complete sectional water-heater constructed in accordance with and embodying my invention. Fig. 2 is a horizontal longitudinal section of same, taken centrally through the three smoke-flues. Fig. 3 is an inner face view of one part of one of the hollow sections. Fig. 4 is a vertical section of a complete hollow section on the line 4 4 of Fig. 3. Fig. 5 is a transverse section of same on the dotted line 5 5 of Fig. 3. Fig. 6 is a like section of same on the line 6 6 of Fig. 3. Fig. 7 is an inner face view of the other part of one of the hollow sections. Fig. 8 is a transverse section of one of the hollow sections on the dotted line 8 8 of Fig. 3, and Fig. 9 is a perspective view of one of the hollow sections.

In the drawings, A designates the individual hollow sections intermediate the end sections, which are indicated by the letters B C, respectively, and said sections, as shown in Figs. 1 and 2, are arranged side by side over a suitable ash-pit D to form the complete water-heater, the body of which above the ash-pit being composed of a bank of said sections extending transversely over the ash-pit and forming between their lower outer portions or legs the sides of the fire-box or combustion-chamber E, access to which may be had at one or both ends of the heater by means of a suitable door or doors F. The bank of sections (denoted by the letters A B C) are firmly secured together by the bolts G, as hereinafter explained.

The construction of the sections A may be fully understood on reference to Figs. 3 to 9, inclusive, in which it will be seen that each

section is formed of the two auxiliary sections or parts H I, which when brought together form a hollow section adapted to hold and permit the circulation of the water to be heated. The part H of the sections A is of receptacle shape, being formed of the face and longitudinal flanges J, and the part I of said sections is in the nature of a face-plate having narrow longitudinal flanges K and fitting within the flanges J of the part H, a rust or other suitable and convenient joint being formed between the contacting portions of the said parts H I. The flanges J K of the parts H I of the individual hollow sections extend along the entire edges outlining said parts H I, and said parts H I are also formed with the longitudinal flanges L M, which engage one another, as do the flanges J K, and form sections of the three flues N O P, extending longitudinally through the upper portion of the heater and leading to the final exit or smoke pipe Q. The flues N O P are on the same horizontal plane, and the side flues N P are closed at one end and at the other end are brought into communication with the central flue O by means of the bonnet R at a point farthest removed from the smoke-pipe Q. The outer portions of the hollow water-sections have the faces S at their front and rear sides, and these faces S when the said sections are brought together contact with one another, and said sections along their middle portions over the fire-box and below the central flue O are depressed or set inward at their front and rear sides, and preferably on downwardly-converging lines, to form vertical transverse heat-flues T between said hollow sections, said flues T at their upper portions communicating with the side longitudinal flues N P and being prevented from having communication with the central longitudinal flue O by reason of the face-to-face contact of said sections entirely around said central flue O, the said sections being so formed as to permit and insure this result. It will thus be apparent that the gases and other products ascending from the fire-box or combustion-chamber will pass into the heat-flues T and after spreading over the front and rear surfaces of the hollow sections A will enter the side longitudinal flues N P and pass through the same to the central flue O, through which they will pass to the exit or smoke pipe Q. The heat from the fire-box is thus compelled to do its maximum duty before reaching the smoke-pipe Q, and greater efficiency is thus secured in the heater, since the ascending heat is compelled, with its maximum effect, to pass laterally over the front and rear faces of the water cells or chambers to reach the flues N P instead of being permitted to act upon its natural tendency to ascend at once and pass directly into the central flue O, leading to the exit-pipe Q. The inner faces of the parts H I of the hollow sections are provided with ribs V (or equivalent means, such as studs W) to conduct the heat inward into the water-cells, the more quickly and economically to heat the water and compel its proper circulation. At the lower side portions or legs of the hollow sections are formed the corresponding longitudinal alined apertures X, which are in the face-to-face contacting portions of said sections and afford means for the water to pass from one to another of said sections at points adjacent to the inlet-nozzles Y, formed in some of said sections, for receiving the pipes (not shown) by which the water is fed or returned to said sections at opposite sides of their lower portions. The end sections B C at their outer faces have small apertures in line with the aforesaid apertures X, and through those small apertures and the said apertures X pass the lower bolts G, securing said sections together, the diameter of the apertures X being greater than that of the bolts G, so as not to permit the bolts G to interfere with the circulation of the water from one to another of said sections.

Above the central flue O the sections A B C are raised or dome-shaped, as denoted at *a*, and through the contacting faces of this portion of these sections are formed the longitudinal alined apertures *b*, which form means for the passage of the water from one section to another adjacent to the points where some of the sections are provided with the nozzles *d* for the coupling thereto of the outlet-pipes (not shown) for the hot water from the heater. Through the apertures *b* and the smaller apertures in the front and rear faces of the heater passes the upper securing-bolt G, whose diameter is less than the diameter of the said apertures *b*, so as not to close the same. In view of the fact that the apertures *b* permit water communication from one section A to another along the dome or head portion *a* it is unnecessary to provide each of said sections with the outlet-nozzles *d*, and, likewise, since the apertures X establish water communication between the lower portions of the hollow sections it is unnecessary to provide all the sections with the inlet-nozzles Y.

The exterior outline of the sections A B C is of importance in that the vertical outer portions of said sections above their lower ends turn outward and then upward, as shown, both within and without the heater, and thereby increased water capacity is created in the sections, and the fire-box is given greater breadth or lateral extent with increased efficiency.

The operation of the heater hereinbefore described will probably be understood from the explanations above given, and hence but brief further description of the same is required. The sections A B C being in position and secured by the bolts G, the fire will be started in the fire-box E and the water permitted to enter the lower portions of said sections through the nozzles Y and apertures X and to escape from the upper portions of said sections through the apertures *b* and nozzles *d*. The gases, heat, and other products as-

ceeding from the fire-box are compelled to spread over the front and rear surfaces of the several hollow sections and pass upward and laterally to the longitudinal side flues N P, whence they travel to the bonnet R and then through the central flue O to the smoke-pipe Q, whereby the water within the said several sections becomes heated and a due circulation of the water is established.

The outer portions of the hollow water-sections have been described as having faces S which come into contact with one another; but it must not be understood that these faces necessarily come into physical touch with one another, since a layer of asbestos may be placed between them, and it may be preferred to provide the said faces with ribs *x*, which when coming together will leave small spaces between the hollow sections to receive the asbestos.

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

1. In a sectional water-heater of the character described, the combination of the several hollow sections arranged side by side and having at their upper portion the side and middle flues, said sections being each composed of the parts H, I, flanged and brought together and forming the complete hollow section; substantially as set forth.

2. In a sectional water-heater of the character described, the combination of the several hollow sections arranged side by side and having at their upper portion a longitudinal flue leading to the smoke-pipe, said sections forming heat-flues between them and being formed of the parts H, I, flanged and brought together and having on their inner surface the inwardly-extending heat-conducting portions; substantially as set forth.

3. In a sectional water-heater of the character described, the combination of the several hollow water-sections bound together and forming between them the heat-flues which extend upward to a longitudinal exit-flue, said sections being composed of the vertical transverse parts H, I, brought together and whose flanges form said longitudinal exit-flue; substantially as set forth.

4. In a sectional water-heater of the character described, the combination of the several hollow water-sections arranged side by side and depressed over their middle portions to form the heat-flues and forming in their upper portions the longitudinal side and middle exit-flues, said sections having contacting faces which prevent the escape of the gases and like products except by first passing into said side flues, said sections being composed of the parts H, I, flanged and brought together to form the hollow sections; substantially as set forth.

5. In a sectional water-heater of the character described, the combination of the several sections forming between them the heat-flues and longitudinal exit-flue, said sections being composed of the parts H, I, flanged and brought together, one of the said parts having the deep flange and the other the shallow flange; substantially as set forth.

6. In a sectional water-heater the several individual water sections or cells banked together to form the complete heater, each of said sections being composed of the separately-formed parts flanged and brought together and forming the complete section, substantially as set forth.

7. In a sectional water-heater, the several individual water sections or cells banked together to form the complete heater, each of said sections being composed of the separately-formed parts brought together to form the complete section, and said parts being formed on their inner faces with inwardly-projecting heat-conducting portions; substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 25th day of May, A. D. 1898.

DAVID E. HOWATT.

Witnesses:
CHARLES C. GILL,
WILLIAM B. ELLISON.