No. 622,575. Patented Apr. 4, 1899.

W. J. WALSH.

HOT WATER HEATER.

(Application filed Dec. 2, 1898.)

(No Model.) 2 Sheets—Sheet 1.

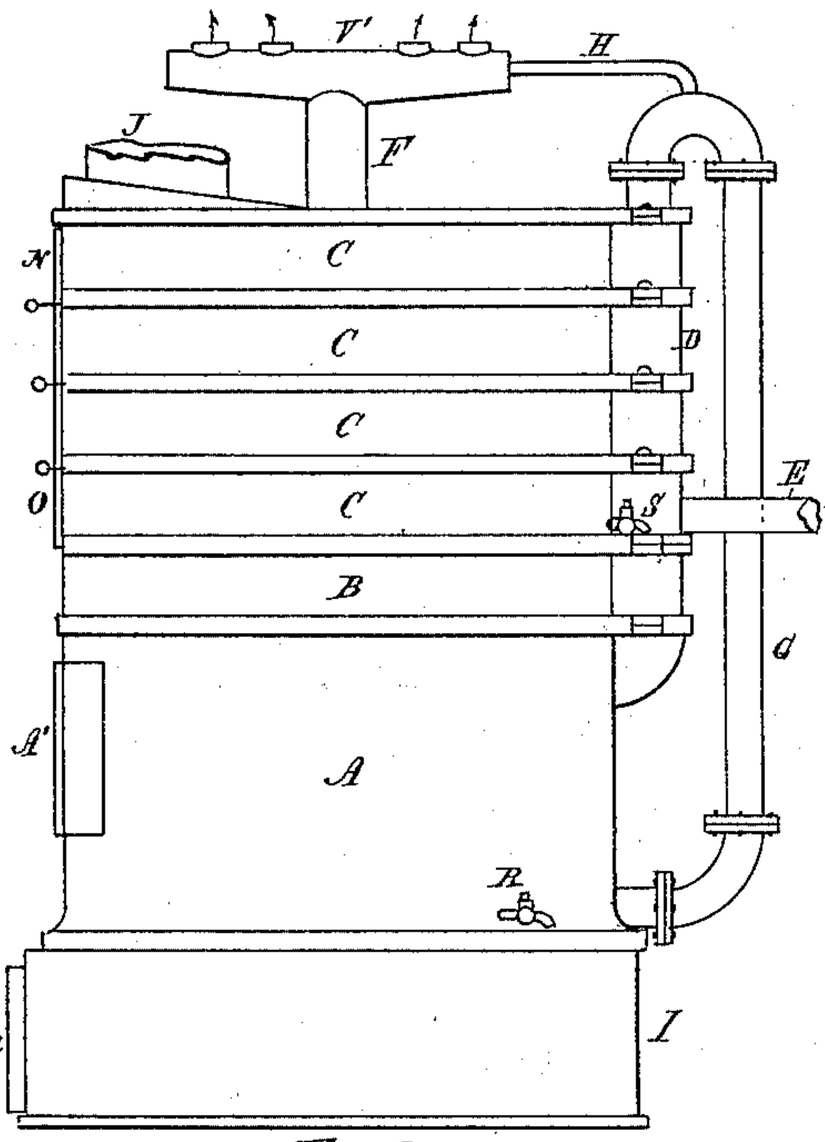

Fig. 1

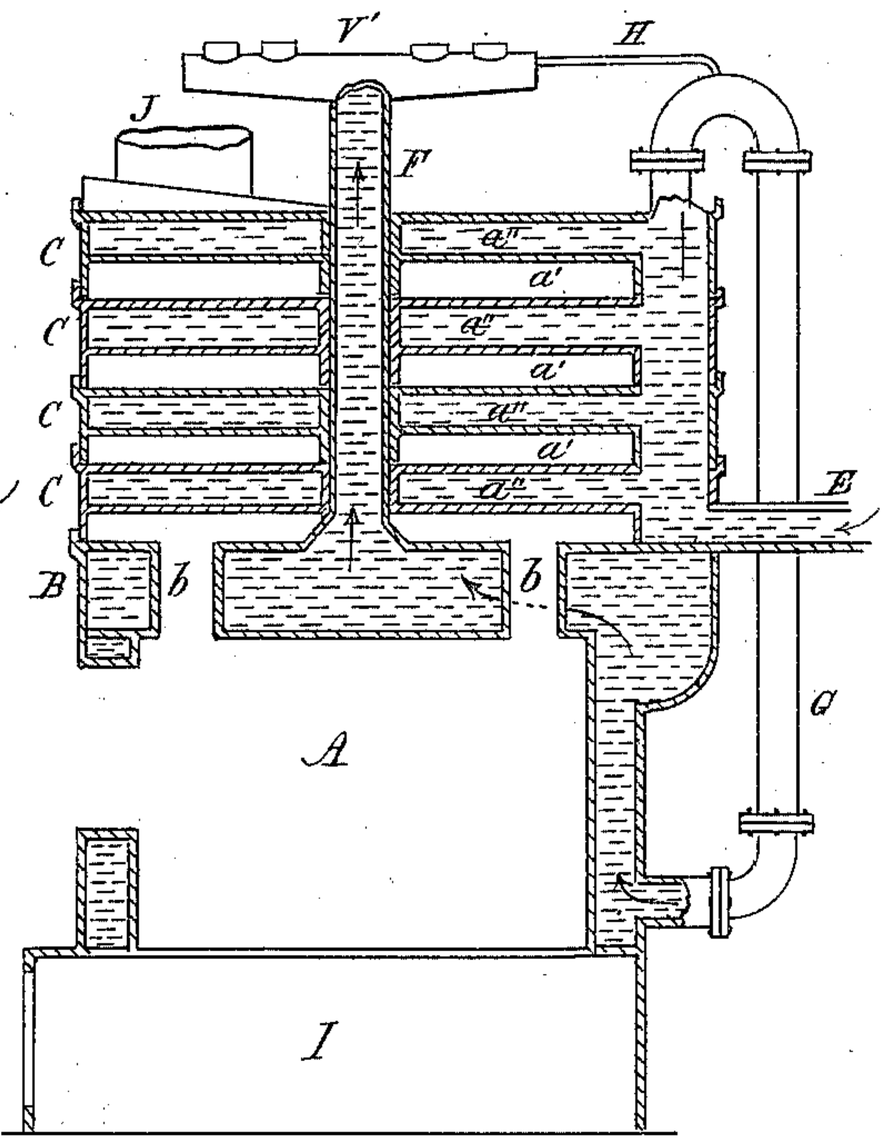

Fig. 3.

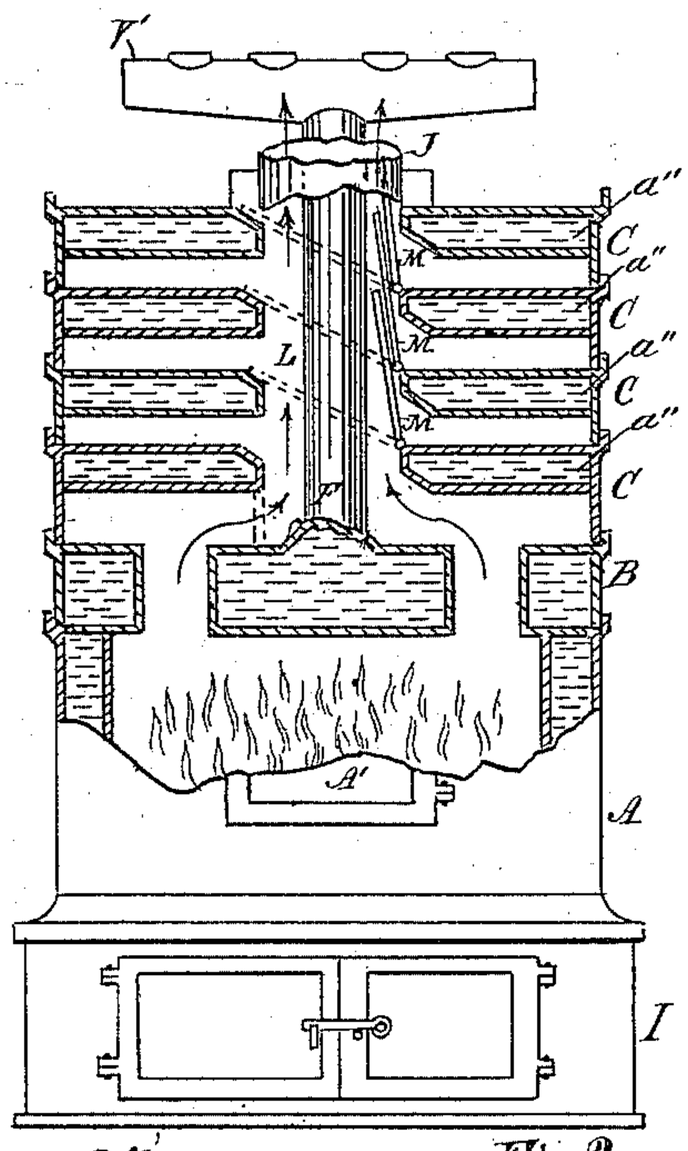

Fig. 2.

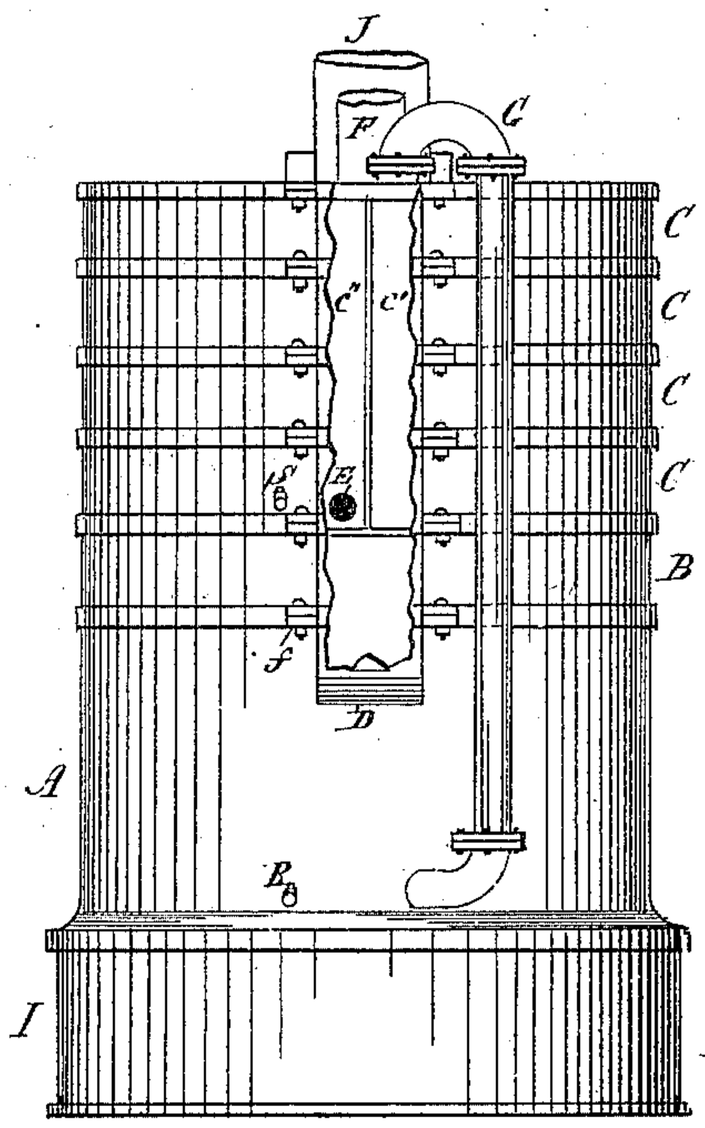

Fig. 4.

Witnesses

F. McBay.

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No. 622,575. Patented Apr. 4, 1899.

W. J. WALSH.

HOT WATER HEATER.

(Application filed Dec. 2, 1898.)

(No Model.) 2 Sheets—Sheet 2.

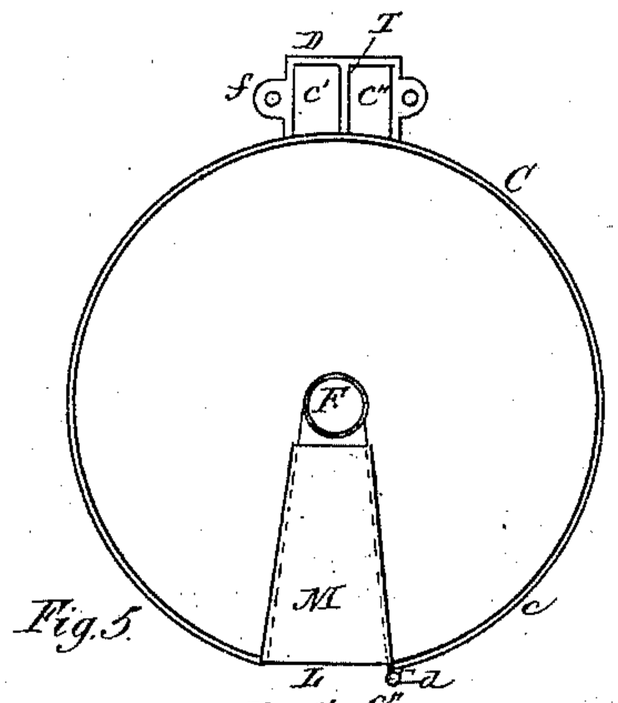

Fig. 5.

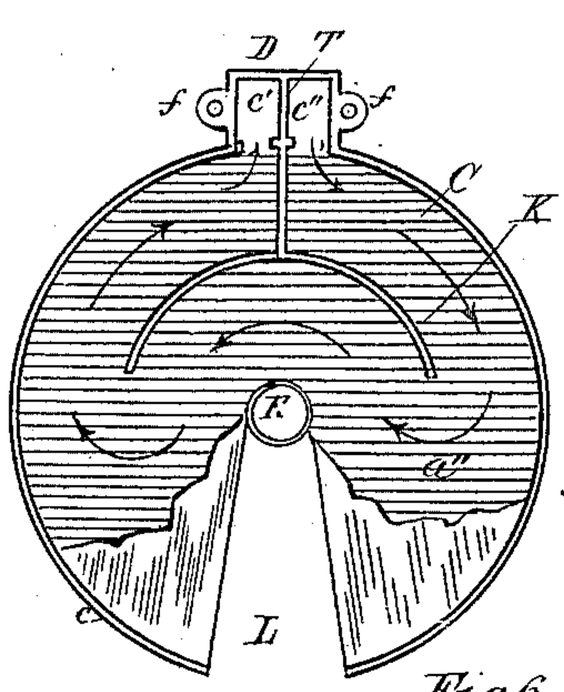

Fig. 6.

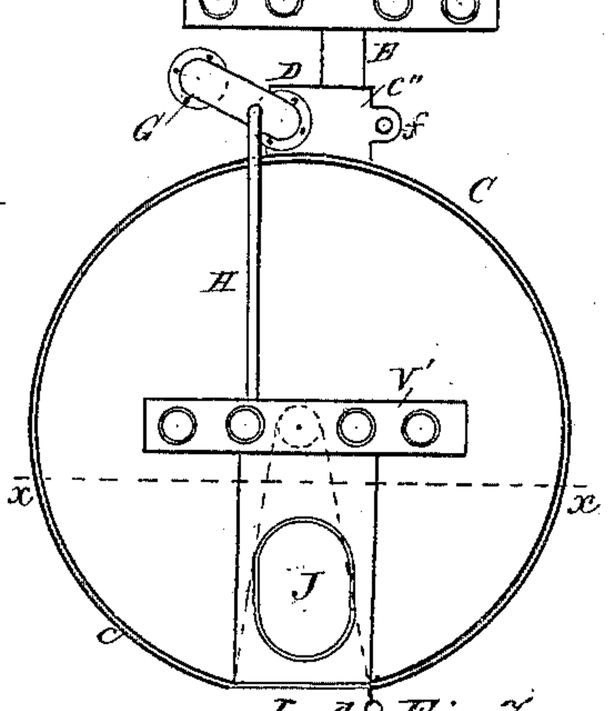

Fig. 7.

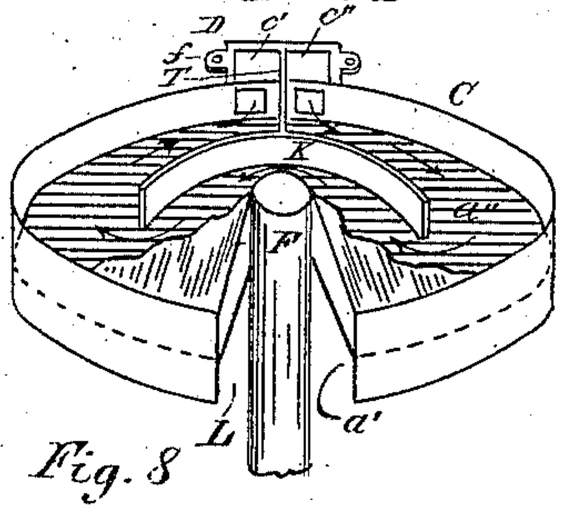

Fig. 8

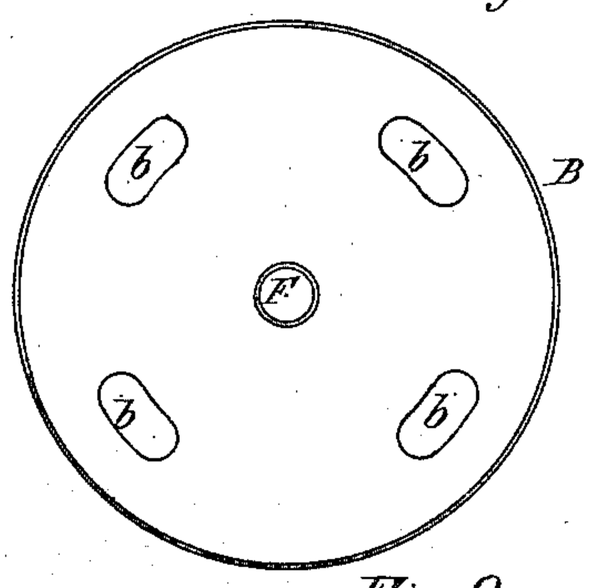

Fig. 9.

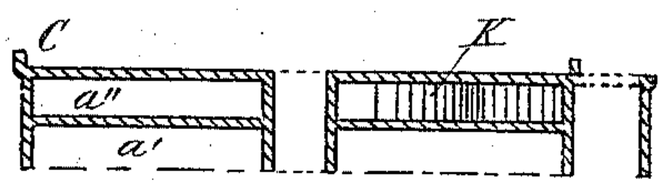

Fig. 10

Witnesses

F. McBay.

E. Baylis.

Inventor.

Wm. J. Walsh

By W. Bruce atty

UNITED STATES PATENT OFFICE.

WILLIAM JAMES WALSH, OF HAMILTON, CANADA, ASSIGNOR OF TWO-THIRDS TO GEORGE M. RYCKMAN AND MICHAEL HOLLAND LE HANE, OF SAME PLACE.

HOT-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 622,575, dated April 4, 1899.

Application filed December 2, 1898. Serial No. 698,042. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM JAMES WALSH, a citizen of the Dominion of Canada, residing at the city of Hamilton, in the county of Wentworth, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Circular Sectional Hot-Water Heaters; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same.

The invention relates to improvements in the class of hot-water heaters specified by which the following advantages are obtained—viz., the hottest water is taken direct from the hottest part of the heater to the radiators by a central pipe and when the fire in the heater is forced and steam generated the steam is allowed to escape without disturbing the circulation of water in the system.

The heater is constructed with a direct unimpeded flue, so that in lighting or building up the fire complete combustion is obtained immediately by throwing open the dampers in the direct flue, which causes the radiators throughout the system to become heated from twenty to thirty minutes sooner than can be done with other horizontal sectional water-heaters.

Great economy in fuel is obtained in this heater by the improved construction of fire-travel flues, which is upward and around and under each section without being broken like they are in heaters of other construction. The return water from radiators at a low temperature is brought in contact with the hot gases above the fire-chamber where there is the greatest heat, thus heating the water quickly with great economy of fuel. The return water after circulating around and up through all sections of heater excepting the first section above the fire-pot is carried down through a circulating-pipe entering the water-space at the bottom of the fire-pot section, thus heating the water before it enters the first hot-water section over the fire.

The invention consists in an annular fire-pot, a series of sections over the fire-pot, the same being divided into smoke and water spaces, the first section over the fire-pot being an entire water-section having smoke-flues passing through the same connecting the fire-space with the smoke-spaces above. There are five sections altogether, but as many can be used as desired. Each water section or space is provided with a diaphragm to divide and spread the water over the entire section of heating-surface. Each section is connected to a vertical waterway, which is divided into two parts, the water entering one and going out at the other. There is a central water-pipe made to pass from the first water-section and through all the other sections, coming out at the top and made to connect with the radiators independent of the other sections for the purpose of taking the heated water from the section over the fire-pot and send it direct to the radiators independent of the other sections.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side view of the heater. Fig. 2 is a front elevation, the upper part shown in section on the line $x\,x$. Fig. 3 is a side elevation in section. Fig. 4 is a rear elevation with outside of vertical waterway broken off. Fig. 5 is a top view of one of the upper sections. Fig. 6 is a similar view with top partially broken away to show the interior diaphragm of the upper water-space. Fig. 7 is a plan view of the top of the heater. Fig. 8 is a perspective view of one of the sections, showing water-space on the upper half and smoke-space on the lower half. Fig. 9 is a plan view of the top of the entire water-section over the fire-pot. Fig. 10 is a cross-section of one of the upper smoke and water sections.

In the drawings, A represents a corrugated circular fire-pot section which is provided with a fuel-opening and a door A′ for the entrance of fuel of whatever kind employed, and the ash-pit section I underneath the fire-section being provided with a double door a for convenience in removing ashes.

B is the first water-section, placed directly over the fire and will be entirely occupied with water with the exception of the four oval-shaped smoke pipes or flues b, which are made to pass through it, connecting the fire-

section with the next section above the said entire water-section B.

C C C C represent a series of circular sections placed one upon the other over the entire water-section B and which are each divided horizontally in the center, the bottom space *a'* being for smoke and the upper one *a''* for water.

D is a vertical waterway to receive the water from the return-pipe, divided into two upright compartments *c' c''*.

F is a central hot-water flow-pipe connected to the first water-section B and to the radiator, branches of which may be connected to different radiators. (Not necessary to show in the drawings.)

E is the return water-pipe, connecting the radiators with the vertical waterway D at the rear of the heater to complete the water-circuit.

G is a water-circulating pipe connecting the top section to the water-space around the fire-pot section A over the ash-pit section I to heat the return water, and H is a small air-pipe connecting the said pipe G to the flow-pipe F to prevent binding and allow free circulation of the water.

J is the smoke-pipe leading to the chimney or exit.

K is a half-circular diaphragm, with a straight portion connecting it to the back of the rear waterway D, which spreads the water around the entire water-space of each section.

Each section C is formed with a U-shaped space L in front from eight to twelve inches wide at that portion and extending from the outside of each section to the center of the same to act as a smoke-space and also to afford a convenient way to extract a section if broken and to insert a new one. The said space L in each section when the sections are placed one on top of the other forms a flue communicating with the smoke-exit flue J for a quick direct draft on first lighting the fire or for brightening up a low fire; but this flue may be converted into an indirect draft by means of three dampers M M M, formed to fit the opening and hinged to one side of the space L of the three upper sections C and provided with handles *d*, projecting to the outside, by which each damper is made to stand upright for a direct upward passage of smoke from the combustion-chamber to the exit-flue and when made to fall over diagonally on the next section above to direct the smoke and products of combustion horizontally around the smoke-passage *a'* in the under part of each section C for an indirect draft, thereby giving a longer distance for the smoke to travel, increasing greatly the heating-surface.

The space L in the front of the heater is covered by two doors N O, hinged to the outside of the sections and can be conveniently opened for cleaning the interior.

R is a draw-off tap inserted in the bottom of the fire-pot section A. S is another draw-off tap inserted in the section C above the water-section B.

T is the vertical partition in the vertical waterway, dividing it into two water-chambers.

V is a damper in the left of the first section C to close an opening in the same for convenience in cleaning it.

It will be observed that the usual spreaders, as seen at V', Fig. 2, will be used on the water-pipes, both flow and return, but upon which I claim nothing, and the pipe G may be an attached pipe, as shown at Fig. 1, or a flue-column cast on the sections to connect the top section with the fire-section.

The practical operation of the device may be described as follows: The boiler and system being first filled with water in the usual manner, the fire is started in the fire-pot section. Immediately the gases and products of combustion strike the under side of the first complete water-section B over the fire the water in it is instantly heated and rises through the central flow-pipe F and ascends directly to the radiators, heating the same quickly, then returns through the return-main E, which enters the left compartment *c''* of the waterway D, and into water-section *a''* of the water and smoke section C, thence around the curved diaphragm K and out at the compartment *c'* of the said waterway D, thence into the next section above, circulating through all the sections to the top one, then down through the water-circulating pipe G to the fire-chamber A, thence into the first entire water-section B, completing the circulation. The smoke and products of combustion pass from the combustion-chamber A, thence upward through the series of smoke-flues *b*, which are placed through the water-section B. Thence, if a direct draft is desired, it rises up through the open space L formed in the four top sections C to the exit smoke-pipe J, (the dampers M M M being placed vertical.) If an indirect draft is wished, the said dampers M are thrown over diagonally onto the edge of the next higher section C, as shown at dotted line, Fig. 2, which closes the direct upward draft, and the smoke and products of combustion are diverted thereby around and through the smoke-space *a'* of the sections C, being conducted from the lower to the next one above over the dampers M M M in a diagonal position until it reaches the exit smoke-pipe J, which conducts the smoke to the chimney.

Each of the smoke and water sections C will be cast separately, with a diaphragm partly curved and partly straight, as K, Figs. 6 and 8, cast in the upper or water chamber *a''* and a vertically-divided waterway D formed in the rear communicating with the water-chamber *a''*, as shown at Figs. 3, 6, and 8, a circular projection *c* being formed on the top of each section to receive the section above, and lugs *f* being cast on the waterway to be bolted together.

In the present state of the art all hot-water-heating boilers to my knowledge are con-

structed in such a manner that the water contained in boiler circulates from the water-space around and above fire-pot, where the water receives the greatest amount of heat, up through the water-space of the different sections until it reaches the highest point on boiler, when it is then distributed to the mains leading to the hot-water radiators. It will be noticed that the smoke or gases from combustion travel in the same direction, always coming in contact with the surface contained in upper portion of boiler, while boiler-surface contains hot water at a much higher temperature than the smoke or unconsumed gases. At times there must be several degrees difference in temperature between the hot water contained in the boiler at the highest point and the non-consumed gases from combustion as they pass the heating-surface of the upper portion of boiler on their way to chimney, while a boiler constructed with a downdraft may keep the non-consumed gases at a lower temperature from coming in contact with that part of the boiler containing heated water of a higher temperature than the gases. However, a downdraft heater has its drawbacks in many respects, inasmuch as it is difficult to clean and is not a success when attached to an ordinary chimney such as is found in the average dwelling. To render the matter more clear to persons not thoroughly acquainted with hot-water heaters or boilers, it may be observed that my device receives the coldest water in the system, which is the return water from hot-water radiators, in that part of the boiler-surface receiving the heat that is contained in the non-consumed gases from combustion after they have left the fire-chamber proper and which are at a much lower temperature than when they were in the fire-chamber, for these gases will not raise the temperature of water contained in boiler-surface of a higher temperature than the gases themselves. On the contrary, they will rob this hotter surface of a great deal of heat on their way to the chimney, which is the case with all horizontal boilers or heaters that I am acquainted with constructed with vertical and horizontal smoke-flues. After the return water at the lowest possible temperature has passed through that portion of the boiler-surface acted upon by the non-consumed gases and taken up all the possible heat out of the gases, which is considerable when it is calculated the lower temperature of the return water that is brought in contact with the gases, it circulates down into the bottom of the water-space in the fire-chamber at a much higher temperature previous to receiving a greater heat in fire-chamber. In other words, the cold return water from radiators is heated before entering the boiler proper, or when it would enter on boilers of other makes by being brought in contact with heated surface acted upon by unconsumed gases, which would otherwise carry much heat into chimney if allowed to come in contact with boiler-surface of a higher temperature than these gases, which is the case with hot-water-heating boilers such as are now used on the market.

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

1. In combination with a hot-water heater and radiators a central water-pipe connecting the radiators directly with the water-section nearest the fire and passing through the other water-sections without communicating therewith, substantially as set forth.

2. A water-heater provided with cylindrical sections built one upon another, each section being recessed from the front to the center, forming a continuous smoke-flue which extends throughout the series, each section being further provided with a water-passage and a passage for smoke and the products of combustion, and with valves controlling the communication between the said flue and the latter passages, in order that the draft may be kept direct or turned through any or all of the said smoke-passages at will, substantially as set forth.

3. In a hot-water heater, the combination of a series of superposed water-sections C with a fire-pot and water-section inclosing the same, a circulating water-pipe connecting the top section with the fire-pot section, a water-section B above the fire-pot, a water-pipe supplying the radiators directly from this latter section, means of communication between the lowest section C and the radiators and means of communication between the water-passages of section C whereby the water is allowed to flow through the entire series of such sections, substantially as set forth.

4. In a hot-water heater the combination of a series of superposed communicating water-sections, and an independent water-section arranged below them with a fire-box acting first on the latter section, the radiators, a flow-pipe directly connecting the latter section and the radiators, a return-pipe connecting the latter section of the series with the said independent water-section, and a small pipe H connecting the flow-pipe with the return-pipe, substantially as set forth.

5. In a hot-water heater, and radiators, a direct water-pipe attached to the first water-section over the fire-chamber, and made to pass up through all the upper sections and make a direct connection with radiators, and the return water-pipe made to enter the first smoke and water section above the fire-section, and a water-circulating pipe adapted to connect the top section with the bottom of the fire-section, all constructed substantially as and for the purpose specified.

6. In a hot-water heater, a direct hot-water flow-pipe F, connected to the first water-section B, over the fire-section A, and connected to radiators, and the return water-pipe E, from the radiators made to enter the left compartment of the waterway D, contiguous to and communicating with the first smoke and

water section C, immediately over the hot-water section B, above the fire, substantially as and for the purpose specified.

7. In a hot-water heater, a series of water and smoke sections C, constructed each with an opening L, (from front to center or otherwise) adapted when the sections are placed one on top of the other to leave a direct draft for the smoke and products of combustion direct from the fire to the smoke-exit pipe J, substantially as specified.

8. In a hot-water heater, the combination of the central direct flow-pipe F, from the first water-section B, to the radiators, the return water-pipe E, from the radiators to the first water and smoke section C, above the fire-section A, the circulating water-pipe G, connecting the top section C with the bottom of the fire-section A, the direct smoke-flue L, in the sections C, and the dampers M, made to close said flue L, for conducting the smoke and products of combustion around the sections C, for an indirect draft, all constructed substantially as and for the purpose specified.

Hamilton, Ontario, Canada, October 20, 1898.

WILLIAM JAMES WALSH.

In presence of—

H. D. GODARD,

W. BRUCE.