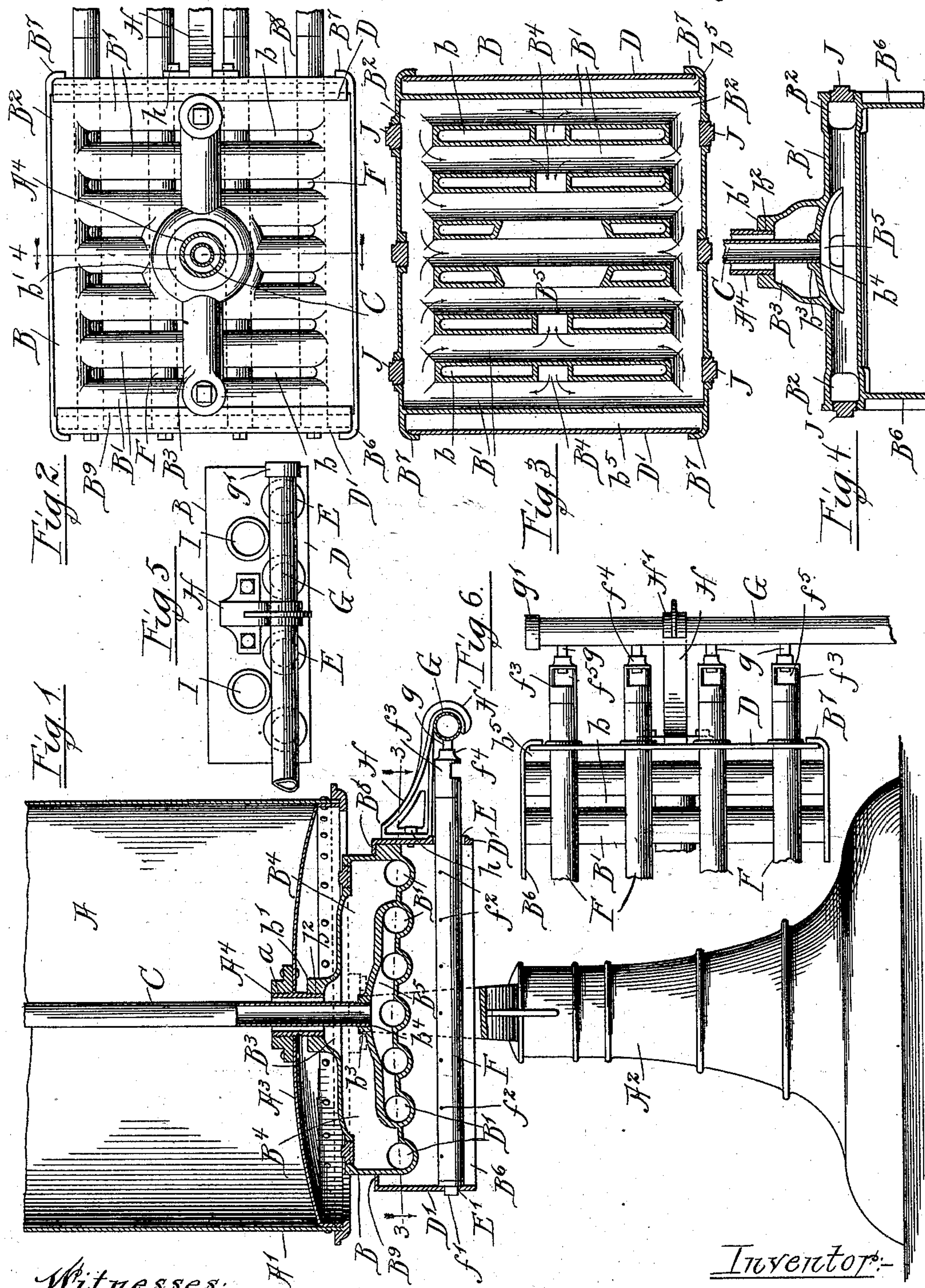


(No Model.)

W. J. EDWARDS.
WATER HEATER.

No. 560,848.

Patented May 26, 1896.



Witnesses:-
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UNITED STATES PATENT OFFICE.

WILLIAM J. EDWARDS, OF CHICAGO, ILLINOIS.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 560,848, dated May 26, 1896.

Application filed September 12, 1895. Serial No. 562,236. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. EDWARDS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Water-Heaters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in gas water-heaters more especially intended for use in heating the contents of upright kitchen-range tanks and the like.

One principal object of the invention is to provide a construction in tubular water-heaters calculated to give the water to be heated a more than ordinarily advantageous circulation with respect to the parts to which external heat is applied.

Another principal object is to make such construction in the form of an integral casting containing only screw-joints, whereby absolute exemption from leakage may be assured.

Still another object is to provide for the more complete utilization of the heat of the gas-burner, the parts being so constructed and arranged that after the jet-flames have acted upon the tubes of the water-heater they and the products of combustion may pass on and act effectively upon the bottom of the tank with which the heater is connected.

Simplicity of construction and consequent reduction of cost in making, assembly, and repair is also aimed at, as will appear more fully from the detailed description.

The invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and it will be readily understood from the following description of the accompanying drawings, which represent the best embodiment of my invention now known to me.

In the drawings, Figure 1 is a view of the lower portion of an ordinary kitchen-tank with my invention, the tank and heater being shown in central vertical section. Fig. 2 is a top plan view of the heater, the inlet and outlet pipes being shown in horizontal section and portions of one end being broken away to reduce the size of the figure. Fig. 3 is a horizontal sectional view taken in the line 3 3

of Fig. 1 and looking in the direction of the arrows. Fig. 4 is a transverse vertical section taken in the line 4 4 of Fig. 2. Fig. 5 is a front end elevation of the heater. Fig. 6 is a bottom plan view of the front end portion of the heater.

Referring to said drawings, A designates as a whole a kitchen-range tank of conventional form, comprising an upright hollow cylinder A', supported by an open-topped standard A². At the center of the bottom A³ of the tank is formed an aperture within which is threaded one end of a nipple or short tube A⁴, the protruding end of which is exteriorly screw-threaded, as seen at a.

B designates the water-heater as a whole, which is shown as when made entirely of cast metal and in a single jointless piece. Said heater comprises as its principal features a plurality of parallel water-tubes B' B', arranged in a horizontal plane with intervening spaces b, header tubes or chambers B² B², extending across the heater at the ends of the tubes B' and communicating with all of said tubes B', an upper chamber B³, arranged above the tubes B' and having communication with the outer ones of said tubes B' by means of laterally-extending passages B⁴ B⁴, and a centrally-located chamber B⁵, arranged immediately subjacent to the chamber B³ and communicating with the central portions of all of the parallel tubes B' excepting the outer ones, which communicate with the upper chamber B³.

At the center of the upper chamber B³ is formed a boss or hub b', which is centrally tapped at b² to receive the nipple A⁴, said nipple at once serving to support the heater from the tank and to give communication between the lower part of the tank interior and the chamber B³ of the heater. A somewhat similar boss b³ is provided at the center of the lower wall of the lower chamber B⁵, and through this is tapped an aperture b⁴, smaller than that of the upper chamber and in axial alinement with the latter. The aperture b⁴, which forms the outlet of the heater, has screw-threaded therein the lower end of a pipe C, which rises vertically through the nipple A⁴ and is in open communication with the interior of the tank at a point desirably near its upper end.

The circulation of the water from the boiler to the heater, through the latter, and back to the boiler is as follows: The colder, and therefore heavier, water at the bottom of the boiler passes down through the nipple to the central upper chamber B^3 and thence later-
 5 ally outward at opposite sides of the chamber through the passages B^4 to the outer ones of the parallel tubes B^1 . Here the water
 10 again divides, going in opposite directions through said outer tubes to the end headers B^2 , from which latter it flows through all of the inner ones of the parallel tubes to the lower central chamber B^5 , as indicated clearly
 15 by the arrows in sectional Fig. 3. From the lower chamber the water rises through the pipe C to the upper part of the tank or boiler.

B^6 B^6 designate depending flanges, preferably and as herein shown formed integrally
 20 with the outer sides of the headers B^2 and extending some distance below the lower surface of the parallel tubes, the purpose of said flanges being to form the side walls of a housing surrounding the burner. Said flanges
 25 are extended a short distance beyond the ends of the main body of the heater at each end thereof and their extreme vertical end margins turned at right angles inwardly to form retaining-flanges B^7 B^7 , between which
 30 and the body of the heater removable end plates D D' are placed by sliding them vertically down with their end margins engaged with the ways b^5 b^5 , formed between said
 35 flanges B^7 B^7 and the body of the heater. The upper edges of the end plates are provided with inturned flanges B^8 B^9 , which limit their downward movement when the proper
 40 position is reached, the lower margins of said end plates being arranged to extend down coincident with the bottom margin of the side flanges B^6 B^6 when the flanges B^8 B^9 rest in contact with the upper surface of the heater, thus forming, with the side flanges
 45 B^6 B^6 , a valance extending entirely around the heater.

E E and E' E' designate a plurality (in this instance four) apertures arranged in a series extending across the lower side of each end plate D D', the several apertures of one plate
 50 being arranged opposite those of the other. The apertures E E of the plate D are preferably round and of proper size to receive loosely therein tubular burners F, while the apertures E' of the plate D' are smaller and of rectangular
 55 form to receive the correspondingly-shaped ends of bosses f^1 , formed on the end caps or closures F of the said burners, thus serving both to support the ends of the burner-tubes and to prevent said tubes from turning
 60 in their supports. The burner-tubes are thus supported immediately beneath the water-spaces of the heater and are of such length as to extend the full length of the heater and protrude some distance at the front or that
 65 end provided with the round supporting-apertures E. The upper sides of the portions of the tubes within the heater are provided with

a plurality of evenly-distributed jet-openings f^2 f^2 . The outer end of each burner-tube is provided with a reducing-cap f^3 , having a
 70 central aperture f^4 of less diameter than the interior diameter of the tube, said apertures f^4 being severally adapted to receive the ends of short branch gas or vapor supply pipes or
 75 nipples g , connected with a main supply-pipe G, which extends transversely across the end of the burner. The main supply-pipe G is suitably capped or closed at one end g' , while its other end is adapted for connection with
 80 any suitable source of fuel supply. Each of the burner-tubes F is transversely slotted or provided with an aperture f^5 , located approximately opposite the end of the inlet-nipple g , and preferably upon the under side of the burner, through which slot air is entrained
 85 by the jet of gas issuing from the inlet-pipe g . The interior of the burner-tube thus performs the function of a mixing-chamber. In order to hold the burner-tubes in position within their bearings in the end plates and
 90 at the same time support the supply-pipe G against the ends of said burner with the nipples thereof projecting within the latter, a bracket H, provided with a hooked end H', which engages the supply-pipe G, is secured
 95 to the outer face of the end plate D by means of one or more suitable screw-bolts h . It will be obvious from the foregoing that by simply loosening and removing the bracket H the supply-pipes may be removed, the burners
 100 withdrawn, and the end plates removed, thus separating the heater and its several individual parts.

J J designate screw-plugs employed to close the core-holes necessary for casting the hol-
 105 low parts of the heater integral and affording access to the interior to remove sediment.

I I designate igniting-apertures in the end plate D, through which the several burners may be conveniently lighted after the gas or
 110 vapor has been turned on.

The water circulation of the burner having been described need not be here repeated. It will be obvious, however, that a very large
 115 amount of heating-surface is provided, and also that the water in its circulation from the point at which it enters the heater constantly approaches a hotter and hotter part of the heater in its tortuous passage through the latter until it finally reaches the exit-pipe at
 120 the center and hottest part of the heater. This arrangement greatly facilitates and augments the circulation of the water, and the latter is therefore rapidly raised in temperature. Furthermore, all the products of com-
 125 bustion, after having acted on the heater, pass upward through the spaces between the water-tubes and act upon the concave bottom of the tank, thus further aiding in heating the water.

The construction set forth, in which the
 130 entire heating-coil is cast integral and contains only screw-joints, is a feature of importance, inasmuch as it is comparatively easy to make screw-joints fit and remain per-

fectly tight in use, while in the case of rectilinear joints and seams it is very difficult to do so, and leaks are of common occurrence.

I claim as my invention—

5 1. A tubular water-heater provided with a centrally-located top inlet above a series of connecting-tubes, passages leading radially outward from said inlet to the outer tubes, and a centrally-located exit-opening communicating with the inner tubes, substantially as described.

2. A water-heater provided with a centrally-located top inlet, a passage leading radially and horizontally outward from said inlet and communicating with a return-passage, said return-passage being arranged in a horizontal plane below and parallel with that of the outward passage, and a centrally-located exit-opening communicating with said return-passage, substantially as described.

3. A tubular water-heater provided with a centrally-located top inlet, passages leading radially and horizontally outward from said inlet, a plurality of tubes or return-passages communicating with said outward passage, and a centrally-located exit-opening with which said return-passages communicate, substantially as described.

4. A tubular water-heater provided with a centrally-located top inlet, a passage leading radially outward from said inlet, and a plurality of tortuous return-passages communicating with said outward passage, and a centrally-located exit-opening with which each of said return-passages communicates, substantially as described.

5. A water-heater provided with a centrally-located inlet, a passage leading radially outward from said inlet, and a plurality of return-passages communicating with said outward passage, openings extending through the heater between said return-passages, and a centrally-located exit-opening through which each of said return-passages communicates, substantially as described.

6. A water-heater provided with a centrally-located top inlet, passages leading radially outward from said inlet, a plurality of water-tubes arranged parallel with each other, transversely of said radial passages, header-chambers at each end of said parallel water-tubes, with which the latter communicate, passages connecting said radial passages with said heaters, and a central exit-opening with which said parallel water-tubes communicate, substantially as described.

7. A water-heater provided with a centrally-located top inlet, passages leading radially outward from said inlet, a plurality of water-tubes arranged parallel with each other transversely of said radial passages, intervening spaces between said parallel water-tubes, header-chambers at each end of said parallel tubes with which the latter communicate, passages connecting said radial passages with

said headers, and a central opening with which said parallel water-tubes communicate, substantially as described.

8. A water-heater provided with a centrally-located upper inlet-chamber, passages leading radially and horizontally outward from said inlet-chamber and communicating with a plurality of return-passages arranged in a lower horizontal plane, a centrally-located lower chamber with which each of said return-passages communicates, and an exit-pipe leading from said lower chamber upwardly, said heater being formed of a single integral casting, substantially as described.

9. The combination, with a tank having an exteriorly-concave bottom, of a water-heater arranged beneath and adjacent to said concave bottom and provided with a centrally-located upper inlet-chamber communicating with the lower part of said tank, passages leading radially and horizontally outward from said inlet-chamber, a plurality of return-passages arranged in a lower plane parallel with and communicating with said outward passages, a centrally-located lower chamber with which each of said return-passages communicates, and an exit-pipe connected with said lower chamber, passing upwardly through said upper chamber and the inlet-opening thereof and communicating with the upper part of the tank, said exit-pipe being of less exterior diameter than the diameter of said inlet-opening, substantially as described.

10. A water-heater comprising a heating-coil arranged in a horizontal plane, intervening spaces between the parts of said coil, a depending flange surrounding said heating-coil, and a burner arranged beneath the coil, substantially as described.

11. The combination with a tank having a concave bottom, of a water-heater arranged beneath and adjacent to said concave bottom and provided with an inlet-opening, a heating-coil arranged in a horizontal plane, communicating with said inlet-opening, intervening spaces between the parts of said coil, a depending flange surrounding said heating-coil, and a burner arranged beneath the coil, substantially as described.

12. A tubular water-heater for use beneath a kitchen-tank or the like, comprising a heating-coil arranged in a horizontal plane and provided with openings or air-spaces extending between the parts of said coil, said heater being made from a single integral casting, substantially as set forth.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 7th day of September, A. D. 1895.

WILLIAM J. EDWARDS.

Witnesses:

ALBERT H. GRAVES,
WILLIAM L. HALL.