

No. 608,972.

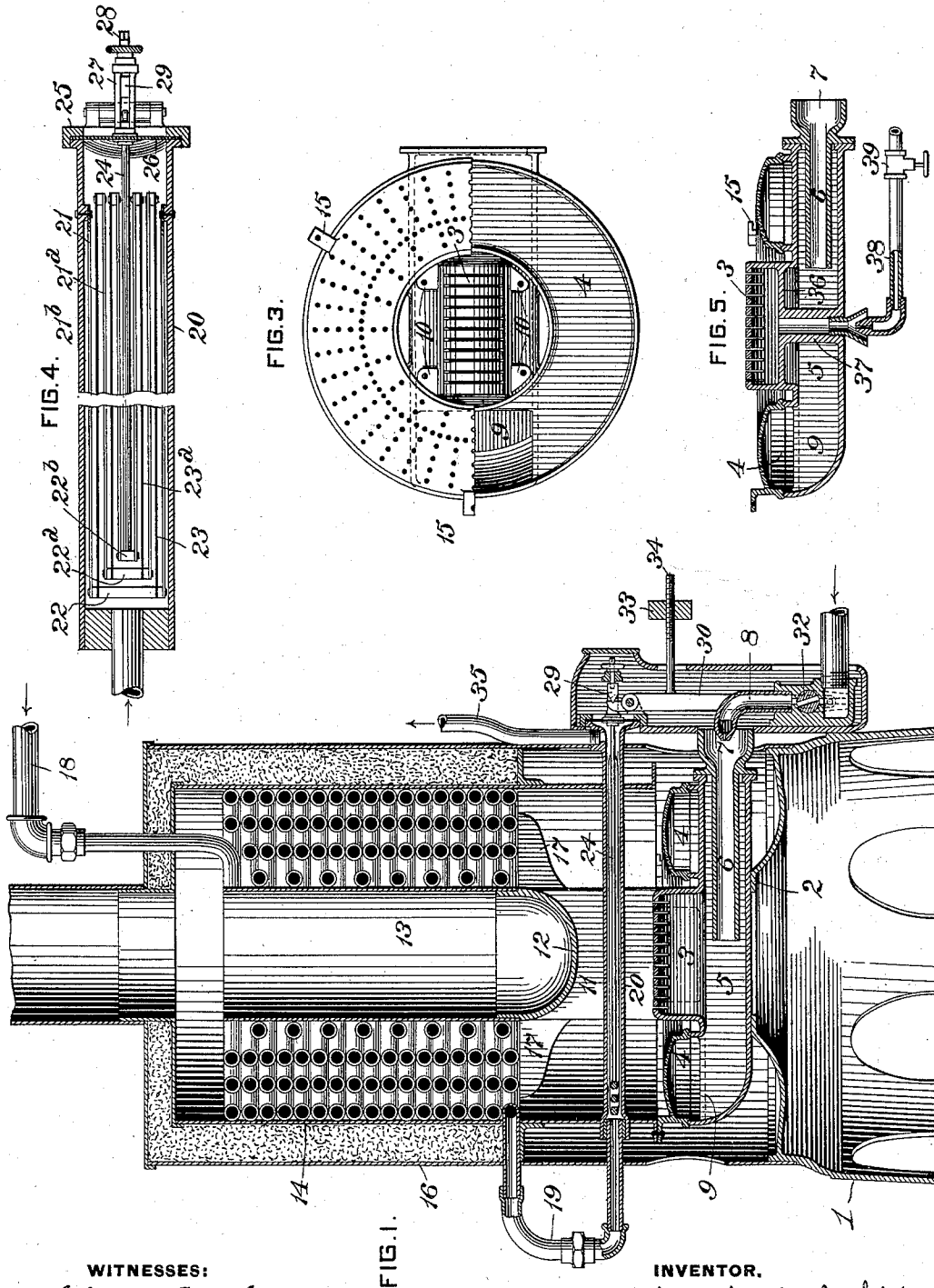
Patented Aug. 9, 1898.

J. C. BECKFIELD.
WATER HEATER.

(Application filed Feb. 18, 1897.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:

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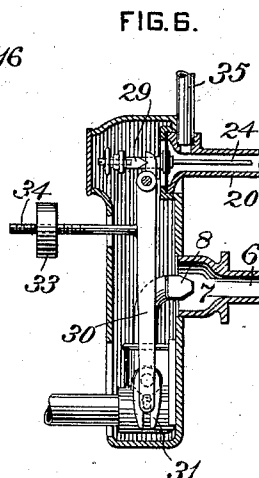
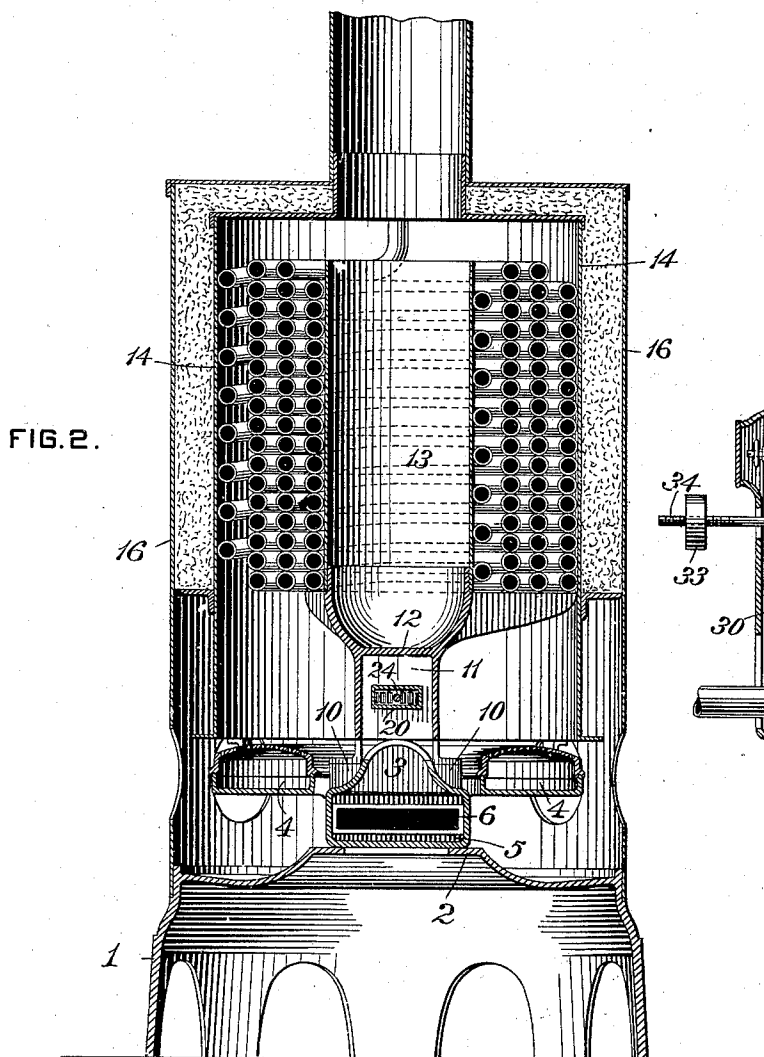
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3 Sheets—Sheet 2.



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FIG. 7.

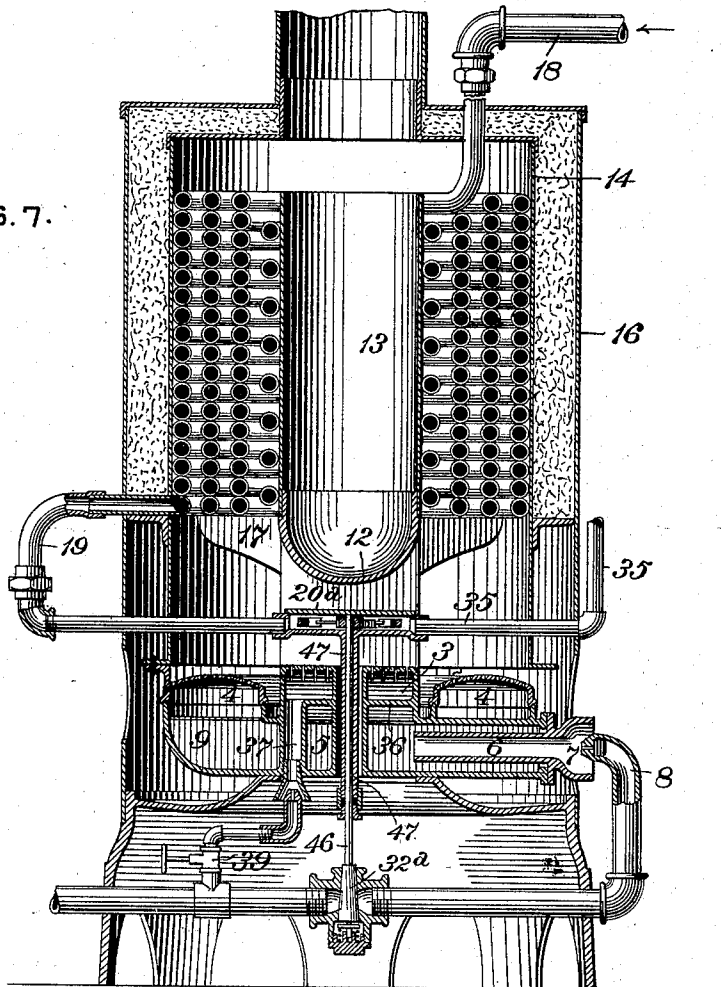
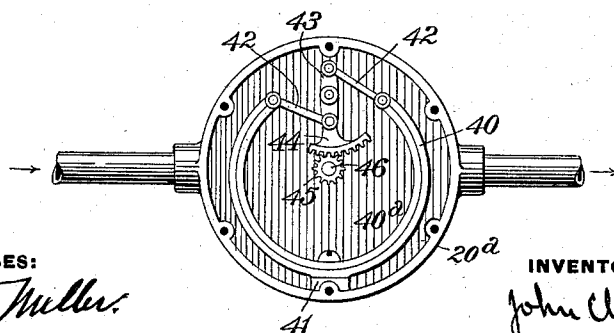


FIG. 8.



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UNITED STATES PATENT OFFICE.

JOHN CHARLES BECKFIELD, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO
THE MONARCH WATER HEATER COMPANY, OF SAME PLACE.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 608,972, dated August 9, 1898.

Application filed February 18, 1897. Serial No. 823,991. (No model.)

To all whom it may concern:

Be it known that I, JOHN CHARLES BECKFIELD, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Water-Heaters, of which improvements the following is a specification.

The invention described herein relates to certain improvements in automatic water-heaters, the improvement relating more especially to that class or kind of heaters known as "domestic" heaters.

The invention has for its object a construction of valve mechanism and valve-operating mechanism arranged in such relation to each other and to a subsidiary or pilot light that the water in the coil or other receptacle is maintained at all times at an approximately uniform temperature and when the water is drawn the gas-supply to the burner will be increased to such a quantity of gas as will heat the water flowing through the coils to the desired temperature and maintain it at such temperature while the water is flowing.

In general terms the invention consists in the construction and combination substantially as hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figures 1 and 2 are sectional elevations of my improved heater, the planes of sections of said views being at right angles to each other. Fig. 3 is a view in top plan of the burner, one-half of the cap-plate being removed for the purposes of illustration. Fig. 4 is a sectional plan view of the thermostat employed for operating the valve controlling the flow of gas to the burner. Fig. 5 is a sectional elevation of a modified form of burner. Fig. 6 is a sectional elevation showing the valve mechanism and the connections from such mechanism to the operating-thermostat. Fig. 7 is a sectional elevation illustrating a modified construction of burner and thermostat, and Fig. 8 is a sectional plan view of the construction shown in Fig. 7.

In the practice of my invention I provide a suitable base 1, preferably formed of cast-iron and provided in its top with a seat 2 for

supporting the burner. This burner consists of a central portion 3 and an annular portion 4, surrounding the central burner. In the lower portion of the burner is formed a diametrical passage 5, into which projects a pipe 6, provided at its outer end with a mixing-chamber 7. Into this chamber projects the gas-nozzle 8, connected with the valve mechanism. The passage 5 communicates freely with the auxiliary or central burner 3, and at the end diametrically opposite that at which the pipe 6 is inserted with the annular burner 4. The pipe 6 is made of such a length that its inner end extends nearly to the center of the central or auxiliary burner. It follows from this construction that when the flow of gas through the pipe 6 is reduced to or below the volume necessary to supply the perforations in the central burner no gas will flow into the main or annular burner 4; but when the flow of gas is increased beyond the capacity of the perforations in the auxiliary burner such surplus will flow into the main burner through the port 9, connecting the main burner with the passage 5.

It is characteristic of the above construction that both the main and auxiliary burners can be employed for heating purposes when the valve controlling the gas-supply is fully opened.

As shown in Figs. 2 and 3, lugs 10 are cast on the central or auxiliary burner, and on these lugs are supported the walls of the combustion-chamber 11. As will be seen by reference to Figs. 1 and 2, this chamber is open at its ends, so as to permit of the escape of products of combustion. The upper wall or top of the combustion-chamber is preferably formed by a concavo-convex plate 12, adapted to support the tube 13, forming the inner wall of the main combustion-chamber, the outer wall of such chamber being formed by the shell 14, which is supported by lugs 15 on the annular burner. The shell 14 is so supported by its lugs as to form an air-passage between its lower end and the burner of sufficient dimensions to afford the necessary supply of air for supporting combustion of the several burners. It is preferred to surround the shell 14 with a jacket 16 of sufficiently large diameter to form a space between the shell and

jacket for the reception of a suitable non-conducting material.

Within the annular combustion-chamber formed by the tube 13 and the shell 14 I arrange a water-receptacle, preferably in the form of a coil of pipe constructed as described in application, Serial No. 605,856, filed by me the 15th day of September, 1897, so as to form a series of annular flues for the passage of the products of combustion. As described in said application, the walls of these annular flues are formed by a series of super-jacent coils of pipe, the coils of each wall being preferably in or approximately in contact with each other, so as to prevent any lateral flow of the products of combustion from one flue to the next adjacent flue or flues. This coil is supported in the annular combustion-chamber by a series of radial wings 17 on the walls of the combustion-chamber 11.

The upper end of the coil is connected by a pipe 18 to a suitable water-supply, while the lower end of the coil is connected by a pipe 19 to a tube 20, passing through the main combustion-chamber and the central combustion-chamber 11. Within this tube 20 I arrange a thermostatic device consisting of a series of alternately-arranged bars having a considerable difference in their coefficients of expansion—as, for example, the outer rods 21 are formed of brass or copper and are secured at one end to the wall of the tube 20 and at their opposite ends to a transverse bar 22, to which is also connected one end of iron bars 23. The opposite ends of these iron bars are connected to the ends of copper bars 21^a, whose opposite ends are connected to transverse bars 22^a, to which is also connected one end of the iron bars 23^a. The opposite ends of these bars 23^a are connected to copper or brass rods 21^b, having their opposite ends connected to a transverse bar 22^b. To this bar 22^b is connected a rod 24, preferably formed of iron or steel, and is secured to one side of the diaphragm 26, closing the end of the tube 20. This diaphragm, which is held in place by a cap 25, is provided with a yoke 27, and through the outer end of the yoke is passed the threaded rod 28, provided at its inner end with a bearing-piece 29, adapted to bear against the short arm of the lever 30, which is pivotally mounted on suitable bearings preferably attached to the annular cap 25 on the end of the tube 20. As shown in Fig. 6, the lower end of the lever 30 is provided with a pin projecting into the slot in the arm 31, secured to the valve 32, controlling the flow of gas to the burners. As will be readily understood, the thermostatic device will shift the lever, and with it the valve, in one direction, and in order to move the valve in the opposite direction a weight 33 is attached to an arm 34, projecting at right angles from the lever 30.

The tube 20, as before stated, is connected to the lower end of the heating-coil, while its

opposite end is connected by a pipe 35 to the hot-water system of a house. This tube 20 is made of sufficient size to have a capacity equal to that of the pipes forming the heating-coil regardless of the space occupied by the thermostatic device. The thermostatic device is so constructed, arranged, and connected to the valve controlling the gas-supply that when the temperature of the water in the tube 20 is raised above that required the expansion of the rods composing the thermostatic device will shift the lever 30 so as to close the gas-valve, the opening movement of the valve being effected by the weight 33. The coil and tube having been filled with water, that in the tube is raised by the admission of gas into the central burner 3 to the desired temperature, and the bearing-block 29 is adjusted so as to shift the valve 32 to such position that it will admit such a quantity of gas that its combustion in the central burner 3 will maintain the water in the tube 20 at the desired temperature. As soon as a faucet is opened in the house system water will flow from the coil through the tube 20, and as this water is at a lower temperature the bars composing the thermostatic device will contract, allowing the valve 32 to be shifted, admitting a larger volume of gas. As the volume thus admitted is greater than that necessary to supply the central or auxiliary burner, the surplus gas will flow by the port 9 to the annular burner 4, which, as before stated, is located at the lower end of the annular combustion-chamber. The burning of the gas in this chamber will heat up the coils to the desired temperature, or if the temperature rises above that to which the thermostatic device is set the latter will operate to partially close the valve 32.

As shown in Fig. 5, the central or auxiliary burner 3 may be constructed so as to have an independent gas-supply. To this end a diaphragm 36 is formed across the lower end of the burner, and a passage 37 is formed through the passage 5 and provided at its lower end with a suitable mixer connection to a supply-pipe 38, which is provided with a valve 39 for regulating the flow of gas to the central or auxiliary burner.

In Figs. 7 and 8 is shown a modification in the construction of the thermostatic device and its connection to the gas-regulating valve. In this construction two bars 40 40^a of different coefficients of expansion are soldered together and connected midway of their length to a suitable fixed abutment 41 in the water-chamber 20^a, forming a part of the connection from the heating-coil to the house system. The free ends of these bars are connected by links 42 to a lever 43 on opposite sides of its pivotal point, so that as the free ends change their position on changes of temperature the lever will be correspondingly shifted. The inner end of the lever is provided with a curved rack 44, adapted to intermesh with the pinion 45 on the upper end

of the stem 46 of the valve 32^a. This stem is surrounded by a sleeve 47, formed integral with the chamber 20^a and extending down through an opening formed through the burner. This thermostatic device and the valve controlled thereby operate in the same manner as hereinbefore stated in reference to the construction shown in Figs. 1, 2, and 3.

I claim herein as my invention—

1. In a water-heater, the combination of a burner, a heating-coil arranged in the combustion-chamber of said burner, an auxiliary or pilot burner having a constant supply of gas and a thermostatic device for operating the valve controlling the flow of gas to said main burner and arranged in the path of flow of water from the heating-coil, and so located as to be constantly subjected to the heat of the auxiliary or pilot burner, substantially as set forth.

2. In a water-heater, the combination of an annular burner arranged in a correspondingly-shaped combustion-chamber, a heating-coil arranged in said chamber, an auxiliary or pilot burner arranged within the main burner and having a constant supply of gas, a thermostatic device for operating the valve controlling the flow of gas to the main burner, said thermostat being located in a chamber forming a part of the outlet from the heating-coil, said chamber being so arranged as to be subjected to the heat from the main and auxiliary burners, substantially as set forth.

3. In a water-heater, the combination of an annular burner arranged in a correspondingly-shaped combustion-chamber, a heating-

coil arranged in said chamber, an auxiliary or pilot burner arranged within the annular burner and within a combustion-chamber communicating at its ends with the main combustion-chamber, a thermostat arranged within a chamber located in part at least in the auxiliary combustion-chamber and forming a part of the outlet from the heating-coil, said thermostat being adapted to operate the valve controlling the flow of gas to the main burner, substantially as set forth.

4. The combination of a main burner, an auxiliary burner, constantly-open ports connecting the said burners to a common supply-chamber, a tube having gas and air inlets and having its discharge end located in the common supply-chamber in such proximity to the port leading to the auxiliary burner that the gas and air will flow primarily to the auxiliary burner, substantially as set forth.

5. The combination of an annular burner, an auxiliary burner arranged within the annular burner, constantly-open ports connecting said burners to a common supply-chamber, a tube having gas and air inlets and having its discharge end located in such proximity to the port leading to the auxiliary burner that the gas and air will flow primarily to the auxiliary burner, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOHN CHARLES BECKFIELD.

Witnesses:

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F. E. GAITHER.