N. G. GOREAU.

WATER HEATER.

APPLICATION FILED JULY 3, 1917.

1,346,952. **Patented July 20, 1920.**

FIG. 1.

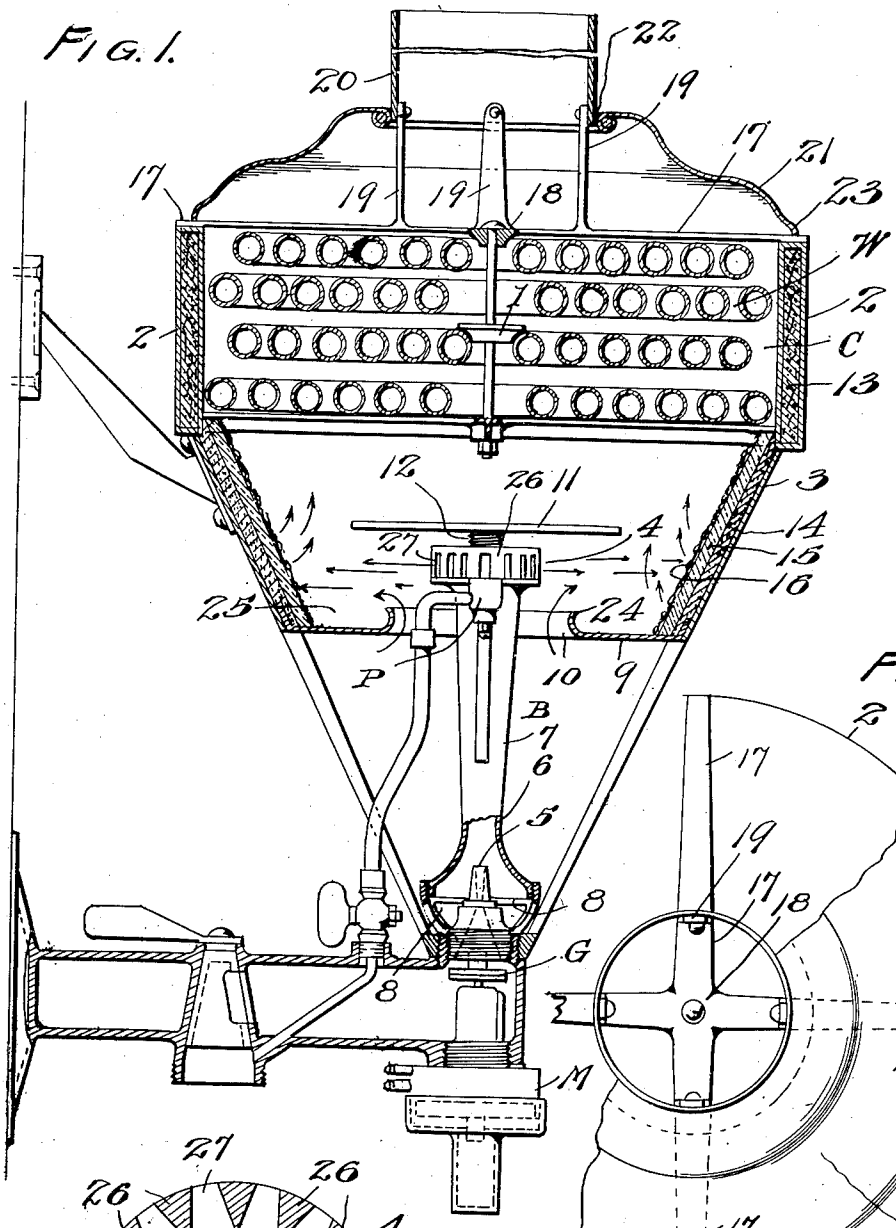
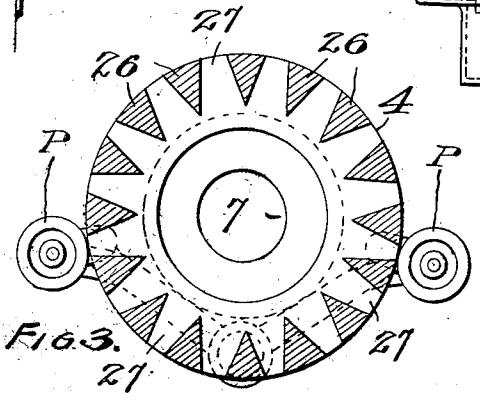


FIG. 2.

FIG. 3.



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WATER-HEATER.

1,346,952. Specification of Letters Patent. Patented July 20, 1920.

Application filed July 3, 1917. Serial No. 178,464.

To all whom it may concern:

Be it known that I, NELSON G. GOREAU, a citizen of the United States, residing at New Orleans, Louisiana, have invented certain new and useful Improvements in Water-Heaters, of which the following is a specification.

My invention relates to novel features of the combustion chamber and certain associated features especially adapted for use in automatic water heaters, although the invention is adaptable to heaters whose action is not necessarily automatic.

Among the principal objects of the invention are to increase the efficiency of such heaters by reducing the radiating area of the whole structure, by regulating the amount of secondary air supplied, by dividing the flame and controlling the course of the flame and the radiation of heat so as to insure complete combustion and convey a very large part of the heat produced to the heating coil; to provide improved heat insulating means and heat refracting means; to prevent water which condenses within the combustion chamber from having access to the burner or pilot light; to retain such condensed water and evaporate it within the apparatus; to reduce the volumetric contents of the chamber to avoid violent explosions and to prevent damage to the combustion chamber and adjacent parts in case a body of gas is ignited within it.

The accompanying drawing shows one exemplifying embodiment of the invention, and, after considering this, it will be evident that the principles of the invention may be embodied in other forms, and I do not limit myself to details except as claimed hereafter.

Figure 1 is a vertical section through a water heater of automatic type, embodying the invention.

Fig. 2 is a top view partly in plan and partly in section.

Fig. 3 is a horizontal section through the burner head.

The combustion chamber C contains the water coil W, the arrangement of which may vary considerably, but in a preferred compact arrangement, a baffle plate 1, which may also be a coil supporting device, is arranged at the center of the coil to prevent hot gases from passing too directly up through the middle of the coil.

The combustion chamber may have a substantially cylindrical part 2 surrounding the coil and an inwardly converging lower part 3 within which the head 4 of the burner B is located. Preferably a single burner is employed and this may be of the general type described in my Patent No. 1,049,848, dated January 7, 1913, in which gas is supplied through the gas nozzle 5 adjacent to the throat 6 of the Venturi tube 7 and air is supplied to the intake of the Venturi tube at 8. Sufficient air is thus supplied within the burner to produce a hot blue frame at the head 4 and to prevent back-firing because the velocity of gases within the tube, due to the construction and arrangement of parts, is greater than the rate of flame propagation, as fully explained in the above-mentioned patent. Preferably, as best shown in Fig. 3, the burner head is in the form of an annulus having a plurality of uprights 26 forming between them openings or nozzles 27, through which gas issues, and when ignited forms an annulus of separate flame jets.

The bottom of the combustion chamber is closed by a pan 9 which has a central aperture 10 to accommodate the burner tube, and this aperture has an area calculated to induce sufficient secondary air adjacent to the burner head to support complete combustion and to limit the additional secondary air substantially to that amount, so that heat energy is not wasted in heating excess air. I have found that even when the opening 10 is restricted so much that combustion is somewhat incomplete, the efficiency is greater than when unlimited additional air is admitted to the combustion chamber.

Above the burner, in a preferred construction, is placed a baffle plate 11, and this may be adjusted vertically by means of a screw connection 12 with the top of the burner. A secondary mixing chamber is formed between the baffle plate 11 and pan 9 and the velocity of the flames issuing in an annular series of separate jets from the nozzles 27 out to the draft inspires a suitable amount of secondary air through the opening 10, and this air is drawn about the separate flame jets and supplies the necessary amount of additional air to insure complete combustion.

The part 2 of the combustion chamber surrounding the coil is preferably lined with suitable heat insulating material 13 which may be, for example, kieselguhr or other suitable insulating material, and the lower part 3 of the combustion chamber may have similar insulating material 14. Within this

insulating lining may be placed a layer 15 of refractory material, such as fire-brick, and within this may be located another lining 16 of fibrous asbestos, for example, which is representative of material which will become incandescent and highly heat-radiant when heated. Some one or all of the specified linings may be employed in different cases, but it will usually be desirable to provide a heat insulating lining 14 in addition to the other lining materials so that there will usually be at least an insulating lining and within that a refractory lining which will prevent the conduction of heat through the walls and therefore promote the development of very high temperature in the combustion chamber.

At the top of the combustion chamber is arranged a spider consisting of arms 17 radiating from a central boss 18, the ends of the arms 17 resting upon the top of the cylindrical part of the combustion chamber. The arms 17 carry uprights 19 to support the smoke pipe 20. A top plate or cover 21 is centrally apertured at 22 to accommodate the smoke pipe and the outer edge 23 of the cover rests upon the ends of the arms 17, The cover is free to slide up around the smoke pipe in certain cases as will be explained.

Preferably the bottom plate 9 about the aperture 10 is upwardly turned, providing a flange 24. This produces a reservoir or pocket 25 in the bottom plate surrounding the aperture 10, and condensed moisture produced from the products of combustion within the chamber is deflected by baffle plate 11 and so prevented from getting into the burner 4 and is also directed into the water pocket 25, which also receives the water which drops from the coil outside the baffle plate 11, and water which runs down the walls of the chamber. This water of condensation is thus prevented from dripping onto the floor and is disposed of as will be described.

When the burner is lighted the flame is directed outwardly and somewhat downwardly by the baffle plate 11 and strikes the refractory lining 15 or 16 of the lower part of the chamber. The flame is thus directed upwardly and inwardly between the periphery of the baffle plate and the wall 3 of the chamber to the coil. The course of the flame is thus made long enough to permit complete combustion before it strikes the coil, avoiding cooling of the flame and incomplete combustion which results in other cases from the flame striking the coil prematurely. The heat developed by the flame is also refracted by the linings 15, 16 upwardly and inwardly to the coil with very little loss through the outer walls of the chamber due to the insulating linings 13 and 14, and due also to the small area of the combustion chamber, which is in turn due to the efficient type of burner employed in connection with the arrangement of the coil and other features of the combustion chamber which permit high heating capacity within relatively small compass.

The baffle plate 11 may be adjusted vertically by the screw 12 to vary the flame opening between the periphery of the baffle plate 11 and the adjacent wall 3 of the combustion chamber.

The flame issuing from the burner in the course described strikes or passes close to the water pocket 25 and evaporates water therein, and the steam passes out through the smoke pipe with the products of combustion.

Ordinarily the cover 21 rests in the position shown and guides the burned gases to the smoke pipe, but if at any time a body of gas is trapped within the combustion chamber and ignited, the explosion lifts the cover 21 and permits the exploding gases to escape without injuring the combustion chamber; and the cover then immediately falls back into position.

A main gas valve G is provided for the main burner and a pressure motor M is provided for the gas valve. A pilot light is also provided in a pocket P adjacent the burner head 4 and this pilot light is protected from water of condensation by the baffle plate 11.

I claim:

1. In a water heater, a casing, a water container in the upper portion of the casing, said casing having a lower part fashioned with downwardly converging walls, and a burner within the lower part of said casing.

2. The same as claim 1, with the addition of a refractory lining in the lower part of the casing presented toward the flame from the main burner at an angle to deflect flame and radiate heat upwardly toward said container.

3. The same as claim 1, with the addition of a plate located above the burner to direct flame toward the walls of the lower part of the casing.

4. The same as claim 1, with the addition of a pan at the bottom of the casing to receive and hold water of condensation, said pan having an opening adjacent to the burner to admit secondary air.

5. The same as claim 1, with the addition that the burner has a plurality of separate radial gas nozzles to deliver flame in separate annularly arranged jets.

6. In a water heater or the like, the combination of a casing, an element to be heated and a combustion chamber within the casing, a burner, and a movable cover at the top of the casing to permit free escape of gases when a large body of gas is ignited within the chamber.

7. In a water heater or the like, a casing comprising an upper part, a lower part constituting a combustion chamber partly closed at the bottom by a pan, a burner extending through an aperture in said pan and having a burner head within the combustion chamber, said aperture providing for the admission of secondary air to the burner, and a plate above the burner forming a secondary mixing space.

8. In a water heater, the combination of a casing, an element to be heated located near the top of the casing, a burner within the casing and below said element, and a pan located near the bottom of the casing and below the burner to intercept and retain water of condensation falling from said element and the walls of the casing.

9. The same as claim 8, with the addition of means for directing flame from the burner toward the pan, to cause evaporation of the water of condensation therein.

10. The same as claim 8, with the addition of a deflector located above the burner, to protect the burner from water of condensation and to divert flame toward the pan.

11. In a water heater or the like, a casing, a heat receiving element and a burner therein, and a plate located above the burner to protect the burner from water of condensation.

12. In a water heater or the like the combination of a burner comprising a head having one or more jet openings and means for supplying gas and primary air anterior to the jet openings, a chamber containing the burner head and constituting a secondary mixing space, means for admitting a limited amount of secondary air to said chamber where said air has access to the jets of gases issuing from the jet openings, and a combustion chamber communicating with the first named chamber in which combustion of the gases is completed.

13. Same as claim 12 with the addition of an outer wall forming one of the limits of said first named chamber, said wall being arranged to deflect flame and transmit radiant heat to the combustion chamber.

14. Same as claim 13 with the addition that said wall is arranged diagonally to the flow of gases from the jet openings.

NELSON G. GOREAU.