Jan. 23, 1934. J. A. DE VILBISS 1,944,408

FUEL BURNER

Filed Dec. 7, 1932

Fig. 2.

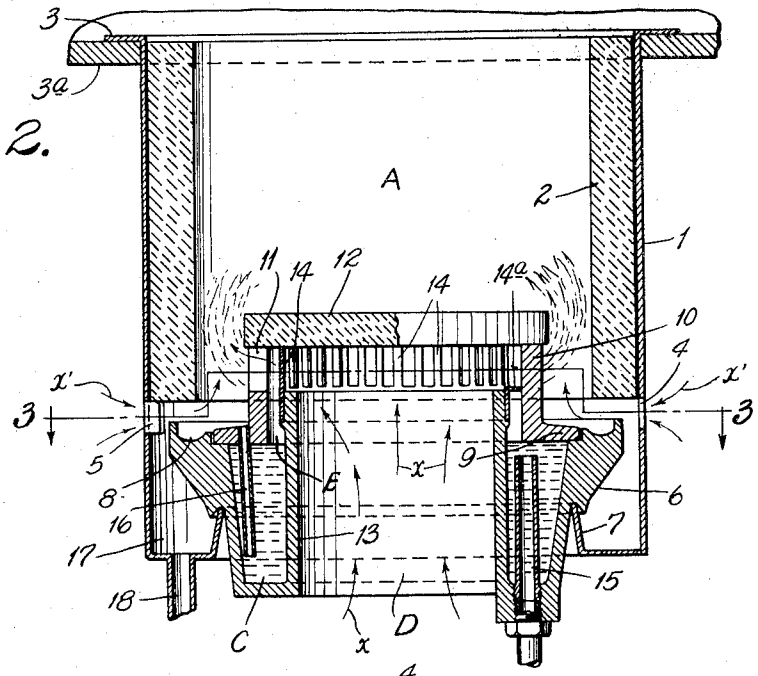


Fig. 3.

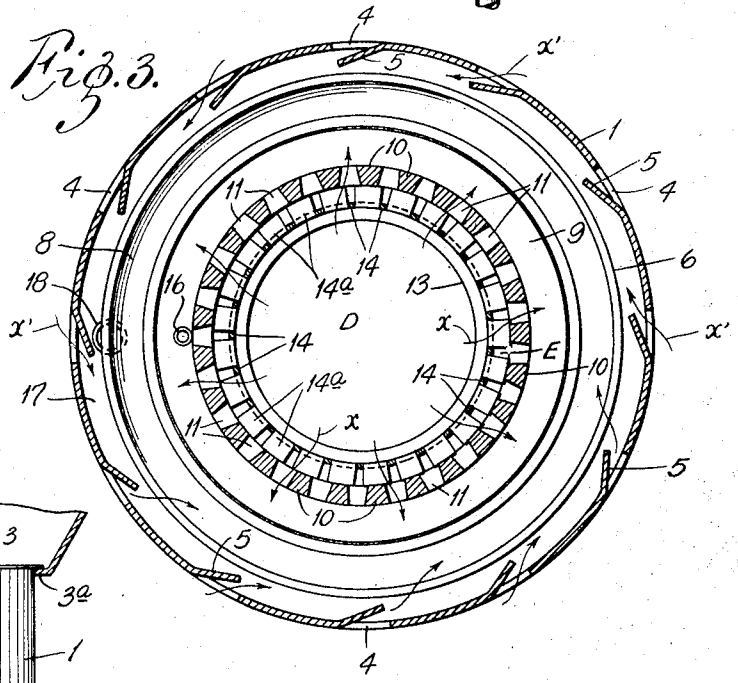
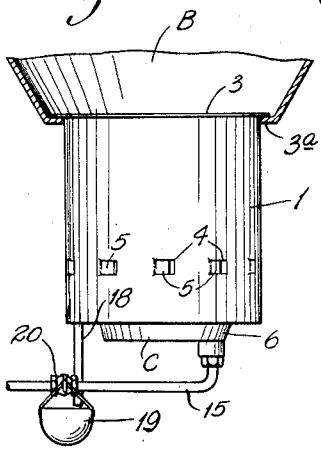


Fig. 1.



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FUEL BURNER

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8 Claims. (Cl. 158—69)

This invention relates to fuel burners of the type in which the fuel is admitted to a substantially annular heated space that surrounds a passageway through which the air is drawn by the natural draft of the stack or chimney of the furnace, boiler or other apparatus with which the burner is used.

The main object of my invention is to provide a fuel burner of the general type mentioned, that is efficient and economical in the consumption of fuel, inexpensive to construct, easy to install and clean, and of sufficiently simple design and rugged construction to stand up successfully under long or continuous usage.

To this end I have devised a fuel burner which differs from prior fuel burners of the general type mentioned, in that the heated space to which the fuel is supplied consists of a closed annular chamber provided with gas ports or other restricted outlet disposed in such relationship with an air passageway which said chamber surrounds, that the air flowing through said passageway creates or exerts a suction on said outlet that causes gases or vaporized fuel to be drawn through the same and thoroughly mixed with air to produce substantially a clean flame. The burner preferably comprises a combustion chamber, referred to for convenience as a flame chamber, that is separate and distinct from the combustion chamber of the apparatus with which the burner is used, and arranged so that the combustible mixture or fuel and air will be ignited in said flame chamber, and the resulting flame thereafter admitted to the combustion chamber of the apparatus with which the burner is used. At or adjacent the restricted outlet leading from the fuel chamber is a baffling means that impedes the flow of the air and causes the air to exert a strong suction on the gas ports or restricted outlet leading from the fuel chamber.

The fuel chamber can be constructed in various ways without departing from the spirit of my invention, but it preferably consists of a substantially closed annular space formed in a structure that is heated by the heat of the burner and provided with two annular rows of spaced baffling devices arranged at opposite sides of a circular row of gas or fuel ports formed in the top wall of said gas chamber, said heated structure having a center air inlet surrounded by the gas chamber and constructed so that the air will flow upwardly through said inlet, and thence laterally across the restricted fuel outlet in the top wall of the fuel chamber. In order to reduce the cost of the burner and facilitate the cleaning and installation of same, a tubular member, preferably lined with a refractory material, is used to form the flame chamber, and the heated structure that contains the fuel chamber and the baffling means, is removably mounted in the lower end portion of said tubular member and is made up of three parts, to wit, a comparatively heavy or thick, ring-shaped casting provided with an annular space, a removable cover plate for said annular space forming a restricted outlet for same and provided with a circular row of upwardly-projecting, spaced baffling devices, and a baffle plate supported by said baffling devices and disposed so as to impede the air flowing upwardly through said ring-shaped casting and deflect said air laterally across said restricted outlet into the flame chamber of the burner.

I have herein illustrated my invention embodied in an oil burner, but I wish it to be understood that the invention is applicable to any burner that can be operated with fuel, which is of such a character or nature that the fuel can be admitted to and heated in an annular chamber, and the resulting gases or vaporized fuel thereafter drawn by suction through ports or a slot leading from the fuel chamber and mixed with air to produce a combustible mixture.

Figure 1 of the drawing is a side elevational view, illustrating my improved burner installed in operative position in a heating apparatus.

Figure 2 is an enlarged vertical sectional view of the burner; and

Figure 3 is a horizontal sectional view, taken on the line 3—3 of Figure 2.

In the drawing, A designates the flame chamber of the burner which is preferably formed by a substantially tubular-shaped member 1 having a refractory lining 2 and provided at its upper end with a laterally-projecting flange 3 that rests upon a supporting flange 3^a (see Figure 1) at the lower end of the combustion chamber B of the apparatus with which the burner is used. Mounted in the lower end portion of the tubular member 1 is a structure that comprises or contains a substantially closed annular fuel chamber C, a main air passageway D surrounded by said fuel chamber, a restricted fuel outlet E that leads upwardly from the fuel chamber C, and a baffling means at the upper end of the main air passageway D constructed so that the air flowing upwardly through the center passageway D, as represented by the arrows x in Figure 2, will create or produce a strong suction on the fuel

outlet E that cause gases or vaporized fuel to be drawn from the fuel chamber C and thoroughly mixed with air to produce a combustible mixture which ignites and burns in the form of a substantially clean flame in the flame chamber A. Auxiliary air is preferably admitted to or supplied to the flame chamber A by auxiliary air ports 4 produced by forming slits in the tubular member 1 and bending the slitted portions of said member inwardly so as to form angularly-disposed vanes 5 that impart a substantially swirling action to the inflowing auxiliary air represented by the reference character x' in Figure 2.

The structure that contains the fuel chamber C and the baffling means previously referred to, is heated by the heat of the burner, and it is herein illustrated as being composed of a comparatively thick or heavy ring-shaped casting 6 whose lower end portion is of reduced diameter so as to form a shoulder or ledge on said casting that rests upon an annular flange 7 at the lower end of the tubular-shaped member 1. The fuel chamber C, previously mentioned, is formed by a cored space in the casting 6, and at the upper end of said casting is an annular fuel cup 8 that is adapted to receive liquid fuel which is ignited when the burner is first set in operation, so as to impart heat to the casting 6. The cover plate, previously mentioned, that constitutes the top wall of the fuel chamber C, is formed by a part 9 that fits loosely in a circular depression in the top side of the casting 6, and said cover plate is provided with an upwardly-projecting flange or rim that has vertical slots formed in same, so as to produce an annular row of spaced baffling devices 10 that are separated from each other by slots 11. A horizontally-disposed baffle plate 12, preferably formed of refractory material, is mounted upon the spaced baffling devices 10. As shown in Figure 2, the upwardly-projecting flange or rim on the cover plate 9, which is slotted to form the spaced baffling devices 10, is so proportioned with relation to the tubular center part 13 of the casting 6 that constitutes the side wall of the main air passageway, that a relatively narrow, annular slot is formed between said parts, which narrow slot constitutes the restricted gas or fuel outlet E leading from the fuel chamber C. Preferably, and as herein illustrated, an annular row of auxiliary baffling devices 14 is arranged at the upper end of the main air passageway D, directly opposite the slots 11 between the baffling devices 10, so as to impede the flow of the air traveling into the flame chamber A. The auxiliary baffling devices 14, just described, can be formed easily and at a low cost by mounting a sleeve-like member on the upper end of the tubular center member 13 of the casting 6, and slitting the upper edge portion of said sleeve-like member and then bending alternate slitted portions of said member outwardly and downwardly to form ears or vanes 14^a (see Figure 3) that overhang the restricted gas or fuel outlet E leading from the fuel chamber C, the portions 14 of said sleeve-like member that remain in a vertical position constituting the auxiliary baffling devices 14, previously described. Obviously, the auxiliary baffling devices 14 may be formed in various other ways, and while it is not necessary that the burner be equipped with a series of spaced vanes 14^a that overhang the restricted fuel outlet E leading from the fuel chamber, I prefer to construct the burner in this way, as the gaps or spaces between the vanes 14^a form, in effect, a series of ports that lead from the fuel chamber C.

Any suitable means may be used for supplying or admitting fuel to the fuel chamber C, and when my invention is embodied in an oil burner, as herein illustrated, oil is supplied to the fuel chamber C by a fuel admission pipe 15 that is arranged vertically in the fuel chamber C with its upper end terminating at a point considerably above the bottom of said chamber. An overflow pipe 16 that is carried by the cover plate 9 projects downwardly from said plate into the fuel chamber C, so as to cause liquid fuel to be supplied to the fuel cup 8 when the burner is first set in operation. The overflow pipe 16 also causes liquid fuel to escape from the fuel chamber C into an automatically-operating fuel cut-off device when the flame in the flame chamber A is extinguished. As shown in Figures 2 and 1, the upper end of the overflow pipe 16 terminates in the top side of the cover plate 9, and consequently, oil which escapes from the upper end of said overflow pipe 16 will find its way into the fuel cup 8, and thus form a puddle of fuel that can be ignited simply by dropping a match into the fuel cup 8, when it is desired to set the burner in operation. Similarly, if the supply of liquid fuel to the burner is continued after the flame in the flame chamber A has become extinguished, the fuel supplied to the cup 8 by the overflow pipe 16 will fill said cup, drain over the top edge of same and then collect in an oil trough 17 at the lower end of the tubular member 1, which is provided with an outlet pipe 18 that leads to a bucket or other trip-off device 19, associated with the control valve 20 in the oil supply pipe 15, with the result that the supply of liquid fuel to the burner will be automatically cut off when the valve 20 closes, due to the bucket 19 moving downwardly after it has become filled with fuel from the oil trough 17.

To set the burner in operation it is only necessary to open the valve 20 in the oil supply pipe 15, whereupon oil will flow into the fuel chamber C, and thence escape from said chamber through the overflow pipe 16 into the fuel cup 8. The fuel in the cup 8 is then ignited so as to heat up the casting 6 and cover plate 9, and after the temperature of said parts has been raised, the air that is drawn into the flame chamber A through the main air inlet D by the natural draft of the combustion chamber B of the apparatus, will create a sufficient suction on the restricted outlet E leading from the fuel chamber C to cause gases or vaporized fuel to be drawn from said fuel chamber and mixed with air to produce a combustible mixture which burns in the flame chamber A in the form of substantially a clean flame. When the burner is in operation the two annular rows of baffling devices 10 and 14 that are arranged at opposite sides of the restricted outlet E leading from the fuel chamber C will interrupt or impede the flow of the air through the main air inlet D, so effectively that the gases or vaporized fuel evolved from the fuel in the heated chamber C and drawn out of the restricted outlet E leading from said chamber, will be mixed with the air in the proper proportion to produce substantially perfect combustion in the flame chamber A, it, of course, being understood that auxiliary air is admitted to the flame chamber by the auxiliary air ports 4.

A burner of the construction above described is inexpensive to construct; it is easy to clean and install and it is of sufficiently simple design and

rugged construction to insure its standing up successfully under long and continuous usage.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A fuel burner, comprising a flame chamber which is in direct communication with the combustion chamber of the apparatus with which the burner is used, a relatively heavy or thick metal member arranged so as to be heated by the heat of the burner and provided with a substantially annular-shaped fuel chamber that surrounds a main air inlet, a cover plate that forms a restricted outlet for said fuel chamber, and a baffling means arranged at the upper end of said main inlet and constructed so as to cause the main air supply to flow transversely across said restricted outlet and thence into the flame chamber.

2. A fuel burner of the kind described in claim 1, provided with a fuel cup arranged adjacent the point where the air from said main air inlet enters the flame chamber.

3. A fuel burner of the kind described in claim 1, comprising means for supplying auxiliary air to the flame chamber, and a holder at the lower end of the flame chamber for fuel that is used to set the burner in operation.

4. A fuel burner, comprising a substantially tubular member adapted to be mounted at the lower end of a combustion chamber so as to form a flame chamber, a casting positioned in the lower end of said tubular member so as to serve as a closure for same, a substantially annular-shaped fuel chamber formed in said casting, a main air inlet in said casting surrounded by said fuel chamber, a cover plate for the fuel chamber that forms a restricted outlet for same, spaced baffling devices projecting upwardly from said cover plate, a substantially horizontally-disposed baffle plate at the upper end of said main air inlet sustained by said baffling devices, and a substantially annular fuel cup on said casting.

5. A fuel burner of the kind described in claim 4, provided with auxiliary baffling devices arranged in staggered relation with the baffling devices on the cover plate, and means for permitting liquid fuel to escape from said fuel chamber and pass into said fuel cup under certain conditions.

6. A fuel burner of the kind described in claim 4, provided with means for supplying liquid fuel to said fuel chamber, means for permitting fuel to overflow from said fuel chamber and enter said fuel cup, a liquid fuel trough arranged under said cup, and an automatic cut-off device for the liquid fuel supply adapted to be operated by fuel that drains from said fuel trough.

7. A fuel burner, comprising a substantially tubular shaped member adapted to be suspended from the bottom of a combustion chamber so as to form a flame chamber, a ledge at the lower end of said tubular member, a substantially ring-shaped casting surrounded by said ledge and sustained by same, said casting having an annular fuel chamber, a cover plate fitted loosely in a recess in the top side of said casting and provided with an annular row of upwardly-projecting, spaced baffling devices, said cover plate constituting a restricted outlet for said fuel chamber, a fuel cup on said casting that surrounds said cover plate, a substantially horizontally-disposed baffle plate sustained by said baffling devices, and a sleeve-like member combined with the center tubular portion of said casting and provided at its upper end with an auxiliary row of baffling devices and with laterally-projecting vanes that overhang the restricted outlet leading from the fuel chamber.

8. A fuel burner, comprising a substantially annular, closed fuel chamber adapted to be heated by the heat from the burner, a main air supply surrounded by said fuel chamber, ports leading from said fuel chamber, means whereby the natural draft of the combustion chamber of the apparatus with which the burner is used will cause air to flow cross-wise of said ports and exert a sufficient suction on same to cause fuel to be drawn from said ports and commingled with air in such ratio as to produce a combustible mixture, two concentrically-arranged, annular rows of baffling devices arranged adjacent the ports leading from said fuel chamber, and a substantially horizontally-disposed baffle plate at the upper end of the main air inlet for directing the air laterally between said baffling devices.

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