Aug. 8, 1933. A. E. MARSHALL 1,921,937

OIL BURNING APPARATUS

Original Filed April 23, 1928

FIG. I.

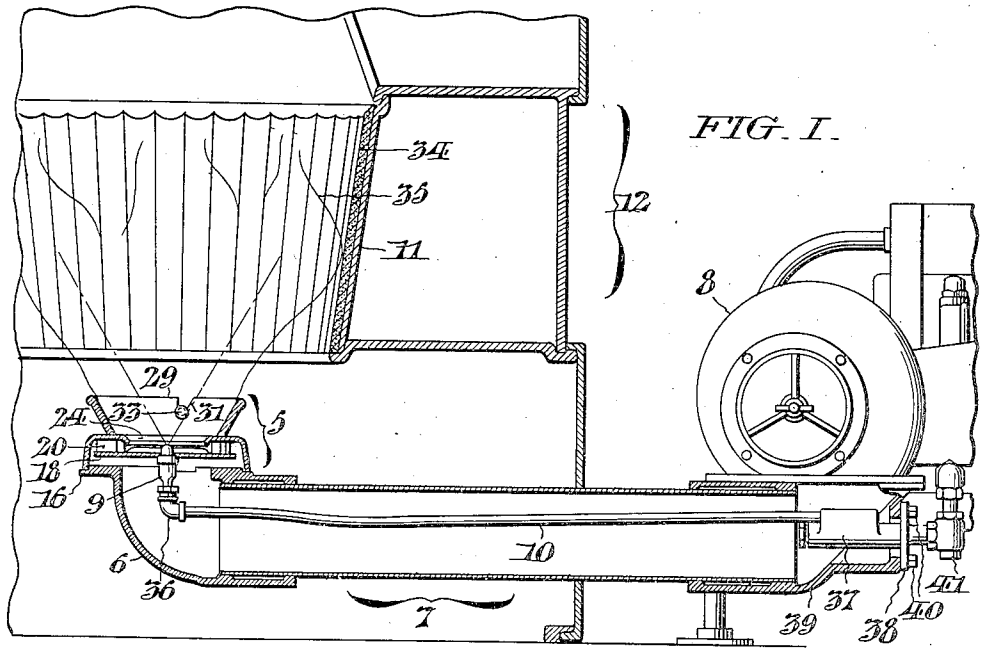


FIG. III.

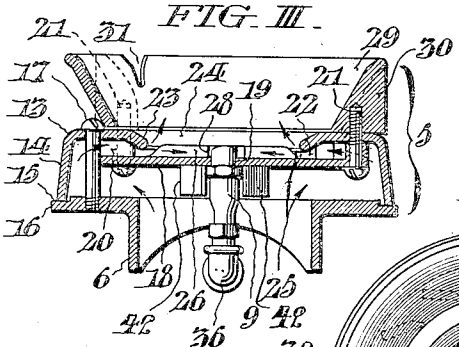
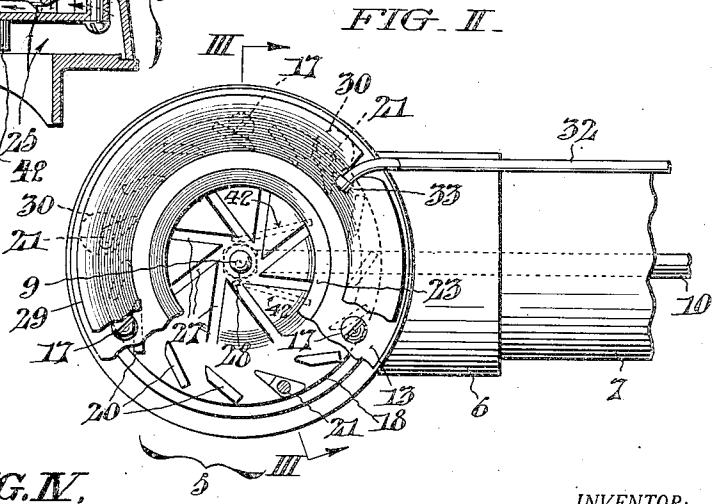


FIG. II.



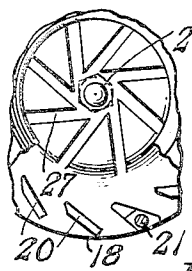


FIG. IV.

WITNESSES

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OIL BURNING APPARATUS

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Original application April 23, 1928, Serial No. 272,077. Divided and this application February 21, 1929. Serial No. 341,679

11 Claims. (Cl. 158—1.5)

This invention relates to oil burning apparatus useful in connection with domestic heaters or furnaces, the subject-matter of the instant case being a division from my co-pending application for patent, Serial Number 272,077, filed April 23, 1928.

More particularly the present invention has reference to improvements associated with the spray burner structure, the primary object being to provide a device by which the liquid fuel will be atomized and discharged into the heater or furnace fire-box in a manner best adapted to effect complete combustion of said fuel.

Another object of the invention is to construct the burner so that the air for supporting combustion is supplied about the spray nozzle in a most efficient manner.

With the stated objects in view, my invention essentially resides in the structure and component parts thereof, all as more particularly set forth in the following descriptive matter.

The embodiment of my invention shown by the accompanying drawing is a practical form thereof, although it is to be understood that modifications in the construction and arrangement of the several parts may be resorted to without departing from the spirit of said invention as tersely featured in the subjoined claims.

In the drawing:—

Fig. I is a fragmentary sectional view showing my improved burner in association with a typical hot-air domestic heater.

Fig. II is a plan view, drawn to a larger scale, of the burner head which occupies the fire-box of the heater.

Fig. III is a sectional view of the burner, taken approximately as indicated by the arrows III—III on the preceding view; and, Fig. IV is a fragmentary detail view of a modified feature of the invention.

Throughout the views, similar reference characters are applied to corresponding parts, while I have chosen to illustrate my invention as embodied in an oil burner structure involving a vertically-discharging burner head, comprehensively designated 5, that is connected to an upturned elbow 6. This elbow 6 is suitably secured to the inner end of a horizontal duct or conduit 7 adapted to supply combustion supporting air under pressure from a rotary blower 8 in conformity with known practice.

Fuel oil is supplied under pressure to the spray nozzle 9 located centrally within the burner head 5 by way of a feed pipe 10, connecting with a conventional pump—not shown; while it is to be noted the burner head 5 is conveniently disposed below the fire-box 11 of a typical domestic or house heating furnace fragmentarily indicated at 12.

The burner head 5, it will be observed, is of hollow circular configuration, embodying a cover member 13 with a depending perimetric rim 14 to rest on a circumferential seat 16 in the horizontal top flange 16 of the elbow 6. The cover member 13 may be secured to the elbow 6 by screws 17 taking into the flange 16; or, said cover may simply repose by its own weight on the seat 15, thereby enabling easy removal through a furnace door without withdrawing the burner head 5 and conduit 7.

Horizontally within the burner head 5 at a level substantially mid-way between the top flange 16 of the elbow 6 and the top of the cover member 13, is a baffle or deflector in the form of a circular plate 18 having a central aperture 19 to accommodate the oil spray nozzle 9. The deflector or baffle plate 18 does not quite reach the depending rim 14 of the cover member 13, so that the combustion supporting air may flow about its perimetric edge, as shown by the arrows in Fig. III. Adjacent its periphery the baffle plate 18 is provided with a series of tangentially-disposed deflector vanes 20 that extend into contact with the cover member 13, certain of said vanes being pierced for passage of screws 21 whereby the baffle plate 18 is secured to the cover member 13. The air passing around the edge of the baffle plate 18 is caught by the deflector vanes 20 and swirled into an annular space 22 behind a down-turned lip 23 that extends about the central discharge opening 24 through the cover member 13, said lip terminating short of the baffle plate 18 to define a restricted annular outflow interval 25 for the combustion supporting air.

As shown, the medial portion 26 of the baffle plate 18 is raised slightly within the area of the discharge opening 24, and provided with a number of grooves 27 which may be cotangential—as shown—with respect to the deflector vanes 20: or they may be counterwise directed, as indicated in Fig. IV, so that the "spin" of the oil and air are in opposed directions. A portion of the combustion supporting air discharged through the restricted annular interval 25, beneath the down-turned lip 23 of the cover member 13, enters the grooves 27, and, as a consequence, is swirled still more for induction—at accelerated velocity—into an annular space 28 immediately around the oil spray nozzle 9.

The burner head 5 is further fitted with an up-

wardly-flared guard or "pot" ring 29 which has socketed lugs 30 which slip over but do not engage the ends of the screws 21 protruding above the cover member 13, thereby ensuring easy removal of said guard ring when desired without disturbing the burner. The pot ring 29 is notched, as at 31, for passage of a small caliber gas pipe 32 with a pilot tip 33. Any other type of ignition means may, of course, be substituted if desired in lieu of the pilot tip 33.

In the operation of the burner head 5, the vertical spray discharge of oil, from the nozzle 9, is met by the swirl of air induced in the immediately surrounding space 28 as a consequence of having traversed the tangential grooves 27, of the baffle plate 18, to the end that atomization of the oil spray is effectively promoted. At the same time, a proportionate quantity of the air gyrating at a lower velocity escapes around the edge of the lip 23, through the discharge opening 24, and mixes with the atomized oil within the confines of the pot ring 29. Through the described functioning of the various parts, of the burner head 5, a radially-spreading "tulip-shaped" vertically-discharging flame is obtained, the same reaching outward but not actually impinging against the refractory wall 34 of the fire-box 11, within the heating furnace 12, after the manner graphically indicated at 35 in Fig. I, with obvious avoidance of carbon deposit and attainment of the maximum heating effect from the fuel.

Referring again to the fuel feed, it will be noted the spray nozzle 9 is connected to the inner end of the pipe 10 by means of an elbow fitting 36, and that said pipe is provided at the outer end with an automatic drain valve 37, such as is fully described and claimed in the application for patent hereinbefore identified in the opening paragraph of this specification. This drain valve 37 has an integrally formed flange 38 serving as a closure for the rear end of the blower outlet 39, into which the air conduit 7 is conventionally fitted, while said valve—and connected parts—is secured in position by bolts 40 in an obvious manner.

The characteristic construction of the burner head 5 facilitates ready removal of its component parts separately from the heating furnace 12, the procedure being as follows:—The pot ring 29 is first lifted off, thereby rendering accessible the heads of the screws 17 securing the cover member 13. Upon removal of the screws 17, when employed, the cover member 13 can, in turn, be lifted out together with the attached baffle plate 18 for inspection, cleaning or renewal. Furthermore, it will be apparent that the spray nozzle 9, feed pipe 10 and valve 37, can be withdrawn—as a connected unit—from the air conduit 7, by releasing the coupler connection 41 to fuel supply and removing the bolts 40; while introduction of said unit is facilitated by providing, on the underside of the baffle plate 18, a pair of converging lugs 42, Figs. II and III, which guide the spray nozzle 9 directly to the aperture 19.

Attention is also directed to the fact that the area between the baffle plate 18 and perimetric rim 14 of the cover 13 is substantially equal to, or greater than, the cross-sectional area of the conduit 7. If the area of the conduit 7 is greater, the air supply, or more correctly the air pressure resulting from the revolutions of the blower 8 have to be increased, and more motive power is required; with a resultant "stingy" flame and difficulty in securing complete combustion of the oil.

The foregoing description conveys a clear understanding of the objects prefaced in the opening statements of my invention, and while said description is directed solely towards the constructed illustrated, I desire it understood that the privilege is reserved of resorting to all the mechanical changes to which the device is susceptible, the invention being defined and limited only by the terms of the appended claims.

Having thus described my invention, I claim:

1. An oil burning apparatus for furnaces embodying an air blower, an air flow conduit leading from the blower into the furnace equipped at its inner end with a vertically discharging burner head, an oil spray nozzle in the burner head, said burner head having a shallow hollow circular body with a central discharge opening in its top surrounded by a down-turned lip, and a deflector within the burner head in the form of a flat circular plate having upstanding tangentially-disposed vanes adjacent its periphery reaching to the top of the burner head to swirl the air into an annular space between the down-turned lip and said plate for discharge inwards through a restricted annular interval, defined by said lip, into an annular space around the oil spray nozzle exposed within an axial aperture of the deflector.

2. An oil burning apparatus for furnaces embodying an air blower, an air flow conduit leading from the blower into the furnace and equipped at its inner end with a vertically discharging burner head, an oil spray nozzle co-axial of the burner head, said burner head having a shallow hollow circular body with a central discharge opening in its top, and a deflector within said head in the form of a flat circular plate with its medial portion slightly raised within the burner opening and grooved tangentially to guide the air into a clearance around the oil spray nozzle exposed within an axial aperture of said deflector.

3. An oil burning apparatus for furnaces embodying an air blower, an air flow conduit leading from the blower into the furnace equipped at its inner end with a vertically-discharging burner head, an oil spray nozzle supported co-axial of the burner head, said burner head having a central discharge opening through its top with a down-turned lip, and a deflector within said head in the form of a circular plate with upstanding tangential deflecting vanes adjacent its periphery reaching to the burner body top to swirl the air into an annular space behind the down-turned lip for discharge inwards through a restricted annular interval defined by said lip, the deflector also having its medial portion slightly raised within the burner discharge opening and grooved cotangentially with respect to the deflecting vanes aforesaid to guide a portion of the air into a clearance around the oil spray nozzle exposed within a central aperture of the deflector.

4. In oil burning apparatus for furnaces, an air blower, an air flow conduit leading from the blower into the furnace and terminating into a centrally-apertured burner head, said burner head, including an axially-apertured deflector plate having vanes and grooves effective to spin portions of the air in opposed directions, and an oil feed assemblage removable as a unit from the end of the air conduit comprising a tube fitted at one extremity with a spray nozzle for registry in the aperture in the burner deflector plate, and an attached cover plate to close the outer end of said air conduit.

5. In oil burning apparatus for furnaces, an air blower, an air flow conduit leading from the blower into the furnace terminating in a centrally apertured burner head, an axially apertured deflector plate in said head having tangential vanes proximate its periphery with tangential grooves about the aperture therein to effect spin of peripheral and axial portions of the air in opposite directions, and an oil feed assemblage removable as a unit from the end of the air conduit comprising a tube fitted at its inner extremity with a spray nozzle for registry with the aperture in the burner deflector plate, and at its outer extremity with an automatic drain valve having an integrally formed cover plate to close the rear end of the air flow conduit.

6. In oil burning apparatus for furnaces, an air blower, an air flow conduit leading horizontally from the blower into the furnace and having its inner end upturned to support a vertically-discharging burner head, a centrally-apertured deflector plate in said head having tangential vanes on its upper face and having convergent guides on its under side adjacent the aperture, and an oil feed tube within the air flow conduit equipped at its inner extremity with a vertical spray nozzle registrable with the central aperture in the burner baffle plate, said tube being secured to a cover plate closing the outer end of the air flow conduit so as to be removable as a unit, together with its nozzle and the cover plate, from the air flow conduit aforesaid.

7. In oil burning apparatus for furnaces, an air blower, an air flow conduit leading horizontally from the blower into the furnace and having its inner end upturned to support a vertically-discharging burner head, and an oil feed tube removable from the air flow conduit equipped at its inner end with an upturned spray nozzle for registry with a central aperture in the burner head, said burner head providing at its interior a convergent guide leading to the aperture aforesaid to facilitate entry of the discharge nozzle thereinto incidental to placement of the feed tube within the air conduit.

8. In an oil burner, the combination of a plate, a spray nozzle projecting axially from and substantially normally disposed to said plate, means for feeding air over the surface of said plate facing the nozzle discharge, said means imparting a whirling motion to the air, and means on said plate defining passages for directing a portion of said air against said nozzle to cool the same and prevent carbonizing.

9. In an oil burner, the combination of a plate, a spray nozzle projecting axially from and substantially normally disposed to said plate, means for feeding air over the surface of said plate facing the nozzle discharge, said means imparting a whirling motion to the air, and means on said plate defining passages tangentially disposed with reference to said nozzle for directing a portion of said air against said nozzle to cool the same and prevent carbonizing.

10. In an oil burner, the combination of a plate, an oil spray nozzle normal to the plate and projecting axially therefrom, means for feeding air over that surface of the plate facing the nozzle discharge, said means imparting a whirling motion to the air, and a plurality of projections on the plate surrounding the discharge end of and defining a plurality of passages for directing a portion of said air against said nozzle to cool the same and prevent carbonizing.

11. In an oil burner, a plate, an oil spray nozzle normal to the plate and projecting axially therefrom, means for feeding air over that surface of the plate facing the nozzle discharge, said means imparting a whirling motion to the air, and a plurality of projections on said plate surrounding the discharge end of, and defining a plurality of passages tangential to, said nozzle for directing a portion of said air against said nozzle to cool the same and prevent carbonizing.

ALBERT E. MARSHALL.