July 21, 1942. F. N. KAWAMURA 2,290,334

OIL BURNER

Filed May 27, 1940 2 Sheets-Sheet 1

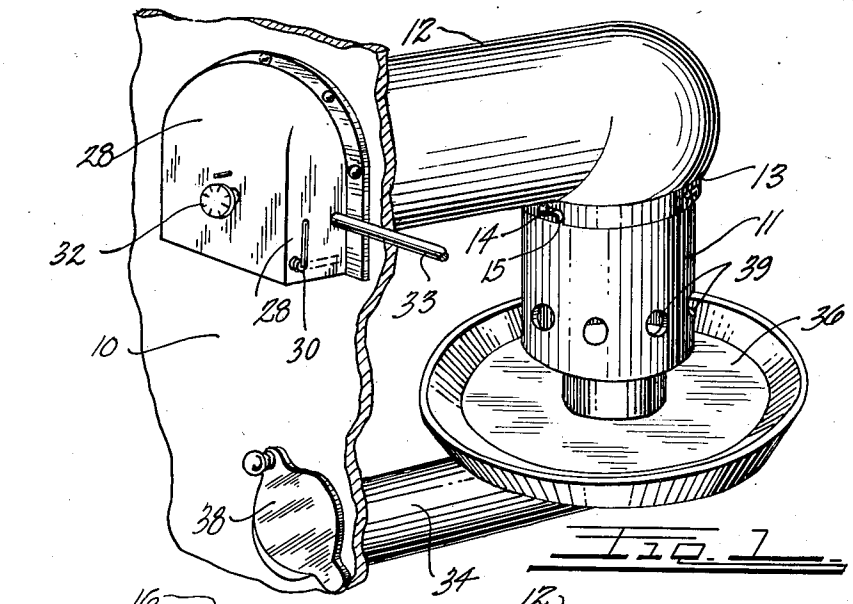

Fig. 1

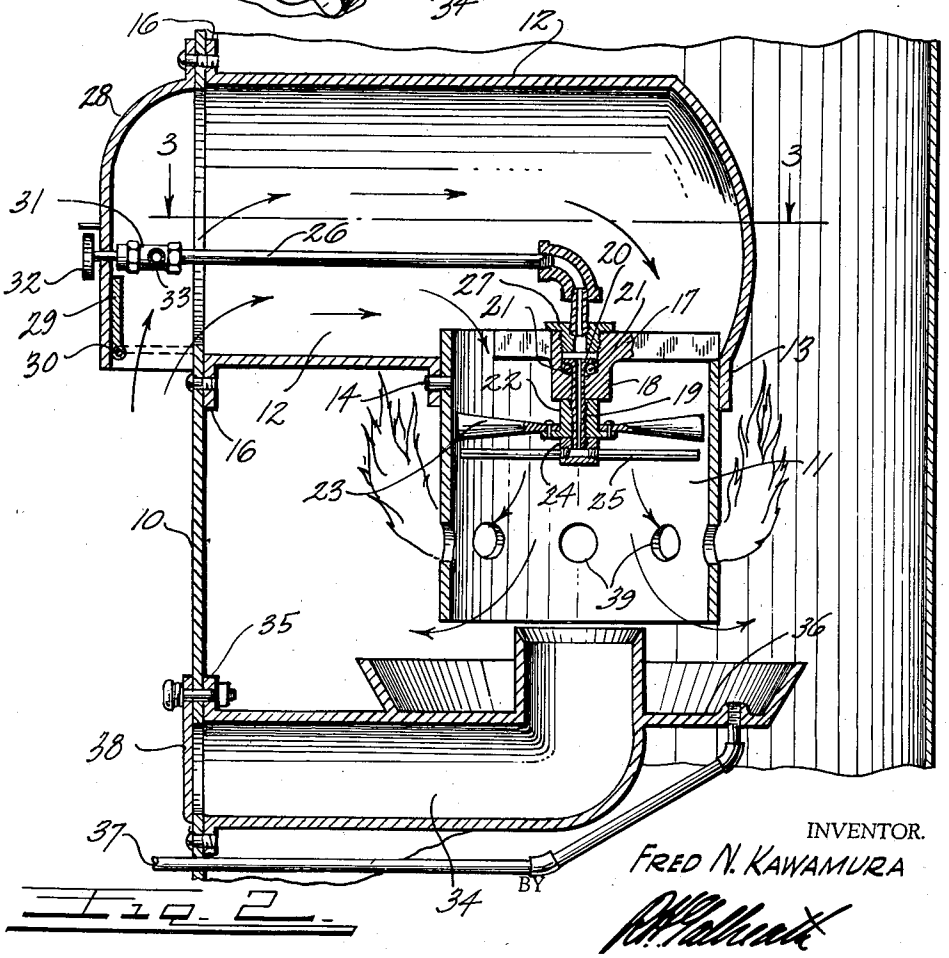

Fig. 2

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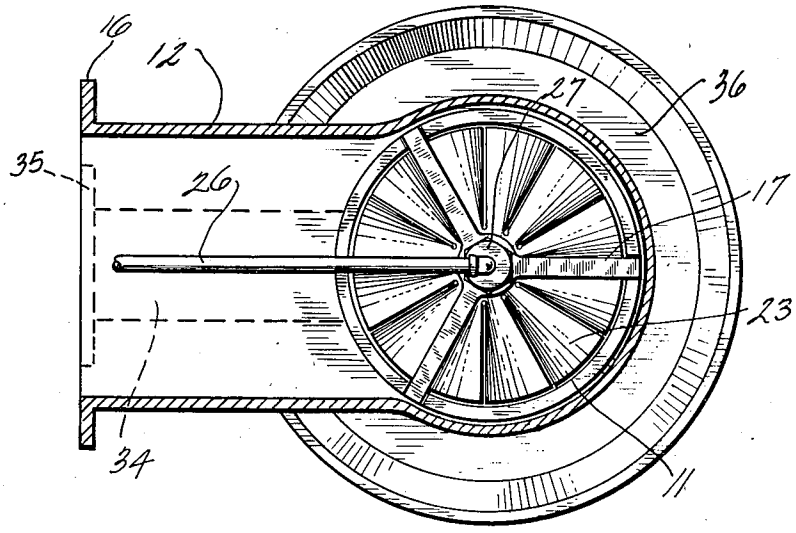

Fig. 2

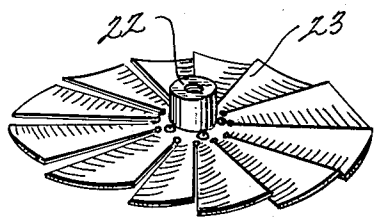

Fig. 4

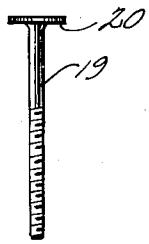

Fig. 5

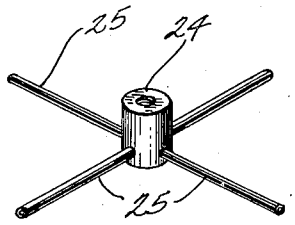

Fig. 6

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2,290,334

OIL BURNER

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Application May 27, 1940, Serial No. 337,474

1 Claim. (Cl. 158—53)

This invention relates to an oil burner, more particularly of the type employed in household heating appliances such as stoves, furnaces, hot-water heaters, etc.

The principal object of the invention is to provide a burner of this type which will produce a uniform, hot, smokeless flame with a maximum of heat value and with a minimum of fuel consumption.

Other objects of the invention are: to provide a mechanical fuel distributing device which will distribute the oil in a thin uniform film in a hot surface for instant uniform gasification; to operate the distributing device from the incoming air so that no motors or other driving mechanism will be required; and to provide a burner in which the supply of air will be automatically proportioned in accordance with flame demands.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention reference is had to the accompanying drawings which form a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description:

In the drawings:

Fig. 1 is a perspective view of the improved burner with the enclosing heater or stove enclosure.

Fig. 2 is an enlarged vertical section through the burner in place in a typical heater or stove enclosure.

Fig. 3 is a horizontal section, looking downward, taken on the line 3—3, Fig. 2.

Fig. 4 is a detail perspective view of the windwheel employed in the burner.

Fig. 5 is a detail view of the windwheel shaft.

Fig. 6 is a similar view of the oil distributing head.

The invention may be placed within the fire box or chamber of any desired heating device. Such a device is indicated on the drawings by the housing 10. It is to be assumed that the housing is connected with a smoke stack as is usual in such devices.

The burner itself comprises a vertical, cylindrical carburation chamber 11 suspended from a tubular air intake arm 12. The arm 12 is formed with a downwardly depending skirt 13 through which the cylindrical wall of the chamber 11 extends. The upper edge of the wall projects above the bottom of the arm to form a baffle for the incoming air. The chamber 11 is detachably secured to the arm by means of pins 14 which are carried by the chamber wall and enter into bayonet slots 15 in the skirt. A simple turn therefore attaches or detaches the chamber.

The outer extremity of the air intake arm 12 is provided with a flange 16 by means of which the arm is riveted, bolted or otherwise secured to the inner face of the housing 10. This attachment provides the entire support for the arm and carburetion chamber.

The upwardly extending edge of the wall of the chamber 11 is notched at three places to receive the three arms of a bearing spider 17. The mid-portion of the spider is depressed to form a guide bearing 18 drilled for the passage of a hollow shaft 19. At its top the center of the spider is counter-bored for the passage of a thrust bearing flange 20 formed on the upper end of a hollow shaft 19. Suitable ball bearings 21 support the thrust bearing flange in the counterbore.

The hollow shaft extends below the bearing to receive a hub member 22, of a windwheel 23, and a second distributor hub 24 from which a plurality of hollow spoke tubes 25 project. The lower extremity of the shaft is threaded and the two hub members are screwed thereon, the hub 24 acting as a jamb nut to hold the windwheel hub in place thereon. The hollow spoke tubes 25 communicate through the hollow interior of the distributor hub, with the passage through the hollow shaft 19. The windwheel consists of a circular disc in which a plurality of radial cuts are made to form windvanes. The vanes are turned at an angle as shown in Fig. 4 to give a rotative pin-wheel effect in the moving air.

Fuel oil is fed to the upper extremity of the hollow shaft through an oil feed line 26 which is threaded into a bushing 27 closing the top of the counterbore in the bearing spider 17.

An air hood 28 is secured to the outer face of the housing 10 over the entrance to the air intake arm 12. This hood is open at its bottom and the bottom opening is controlled by means of a damper 29 mounted on a damper shaft 30 which is turned on the exterior of the hood to form an operating handle as illustrated.

The oil feed line 26 extends from an angle valve 31 within the hood. The stem of the angle valve extends outward through the hood to a valve control disc 32 convenient to the operator. An oil supply pipe 33 conducts oil to the angle valve.

An igniting tube **34** extends inwardly from the housing and turns upwardly co-axially with and below the carburetion chamber. The ignition tube is formed with a flange **35** by means of which it is secured to the inner face of the housing to be supported thereby. A drip pan **36** is formed integrally with and surrounds the up-turned extremity of the ignition tube **34**. The drip pan is provided with a drain pipe **37** extending from a point slightly above the bottom of the pan outwardly through the housing **10**. The entrance to the ignition tube is controlled by means of a pivoted door **38**.

Operation

The oil is ignited by inserting a lighted taper or roll of paper into the ignition tube **34** after which the door **38** is completely closed. The burning oil soon heats the wall of the carburetion chamber to an oil vaporizing temperature and the down draft induced in the chamber **11** by the natural stack-draft of the heating device causes the windwheel to rotate.

The rotating windwheel whirls the spoke tubes **25** and throws the oil centrifugally therefrom against the hot inner surface of the carburetion chamber. The oil is thrown with considerable force in a uniformly distributed thin annular sheet resulting in instant vaporization and instant and intimate intermixture with the whirling air from the rotating wheel vanes.

When the burner is initially started, a thin film of oil may be observed on the interior of the carburetion chamber about the spoke tubes. After a few minutes operation, however, the chamber wall becomes sufficiently heated to instantly vaporize this thin film of oil and thereafter the interior wall remains clean and dry.

There is absolutely no combustion in the chamber **11**. The flame commences as the gaseous air mixture leaves the chamber. It will be noted that the chamber wall is provided with a series of burner openings **39** above its open bottom. When the supply of oil is turned low, the gas exits through these openings in individual flames such as illustrated in Fig. 2. When the gas supply exceeds the capacity of these openings, the excess exits from the open bottom of the chamber in an ascending annular flame about the entire carburetion chamber.

Ordinarily during operation, the damper **29** remains fully open for the air supply to the flame is automatically controlled by the windwheel **23**. Naturally, more air will be passed through this wheel at high speeds than at low. The speed of the wheel is dependent upon the amount of draft and the draft is dependent upon the amount of flame. The flame is, of course, dependent upon the amount of fuel oil supplied through the valve **31**. Therefore, the only adjustment necessary to regulate the heat supplied is attained by operation of the valve control disc **32**. The windwheel serves as a source of power for the oil distributor.

The oil distributor serves both as a means for uniformly distributing and intermixing the fuel with the air and as a centrifugal pump. Naturally, the whirling tubes act to create a suction in the oil line so as to draw more oil therethrough at high speeds than at low. Therefore, the oil supply is also semi-automatically controlled in proportion to the air flow. The pumping action of the distributor has an additional advantage when using crude or heavy industrial oils in that it facilitates the flow of the oil through the feed line. In actual practise, the device has been found to operate with high efficiency on any type of oil, such as, crude petroleum, fuel oil, distillate, industrial oil, crank-case drainings, etc.

The ignition tube and oil pan have no function whatever in the operation of the burner after ignition. The pan serves simply as a safety feature to collect the overflowing oil should the supply be accidentally left open without ignition.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claim, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

In an oil burner of the down-draft combustion chamber type, means for distributing fuel oil in said chamber comprising: a bearing spider in said chamber; a vertical bearing bore in said spider at the axis of said chamber; a counterbore at the upper extremity of said bearing bore; a hollow shaft extending downwardly through said bearing bore; a thrust bearing flange on said shaft within said counterbore; ball bearings supporting said bearing flange; a hub member fixed to said shaft below said bearing bore; a windwheel mounted on said hub member; a completely closed hollow distributor hub secured on the lower extremity of said shaft below said hub member, the hollow in said shaft opening to the hollow interior of said distributor hub; a plurality of hollow radial spokes extending outwardly from said distributor hub and communicating with the hollow interior thereof; and means for feeding fuel oil under pressure into the counterbore in said spider so that the latter will flow through said hollow shaft into said hub to create a pressure which will force the oil through said hollow spokes.

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