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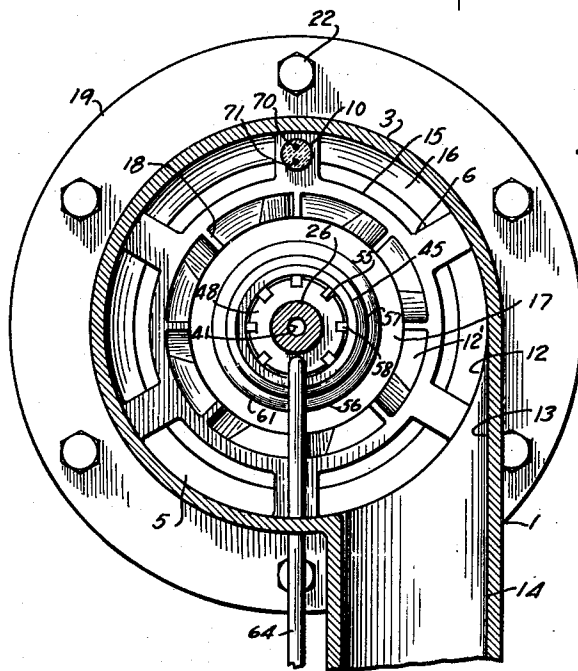
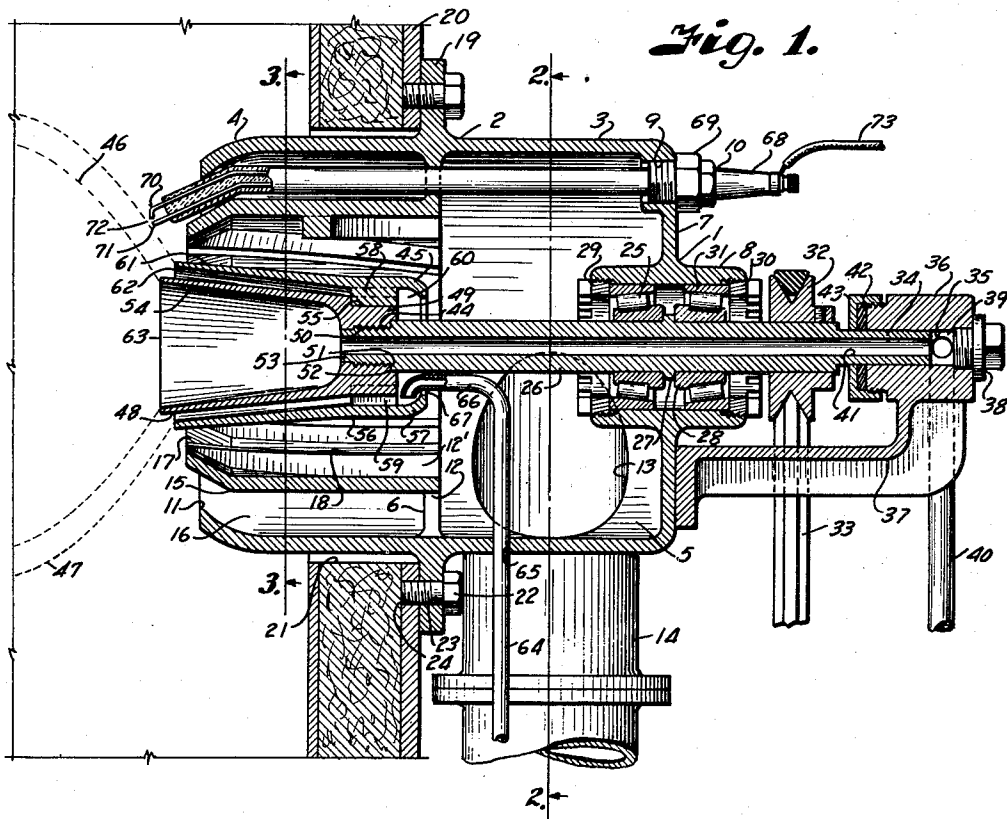
F. S. THOMAS

2,214,568

FUEL BURNER

Filed Feb. 17, 1939

2 Sheets-Sheet 1



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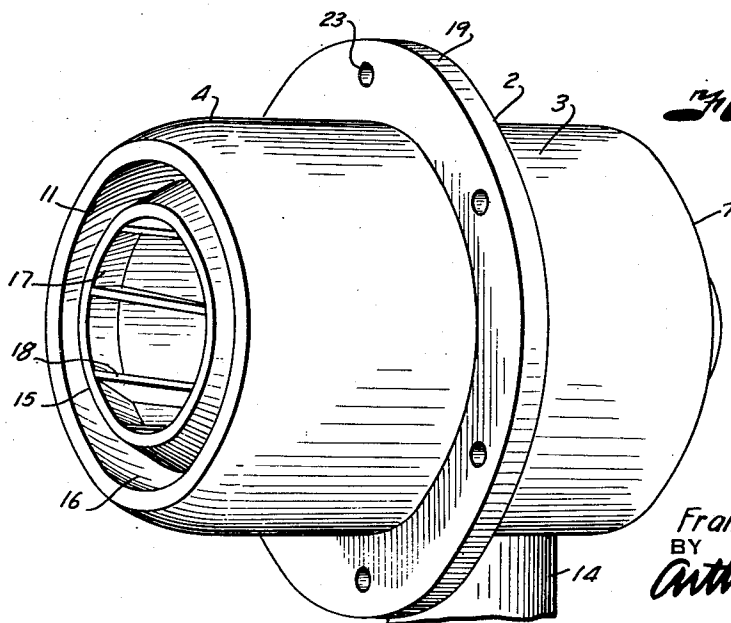
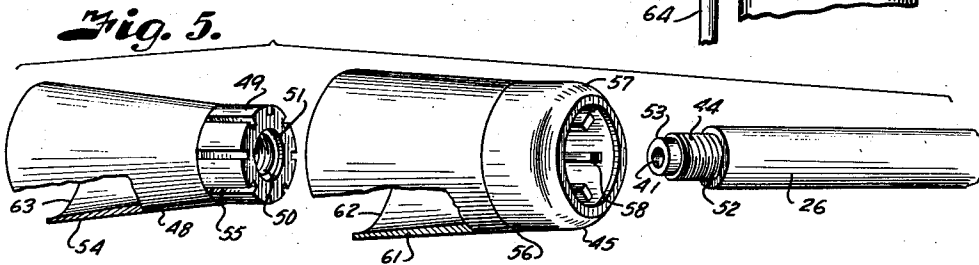
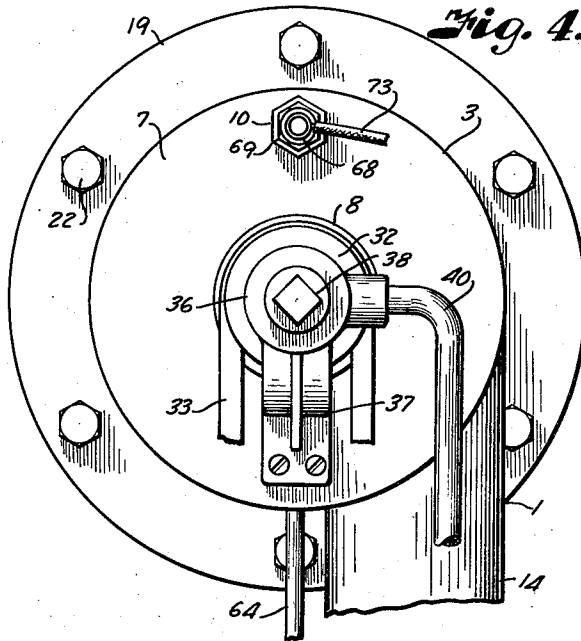
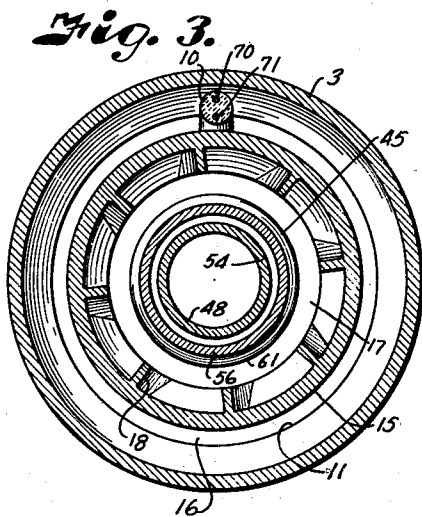
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2,214,568

FUEL BURNER

Filed Feb. 17, 1939

2 Sheets-Sheet 2



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FUEL BURNER

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8 Claims. (Cl. 158—77)

This invention relates to fuel burners, and particularly those capable of burning heavy fuels such as the less expensive hydrocarbon oils.

It is well known that fuels of this character are economical and have a high B. t. u. content but their viscous character renders them difficult to regulate and they will not ignite readily. They are, therefore, not adapted for use in intermittently operated burners, or burners under automatic or thermostatic control.

It is, therefore, a principal object of the present invention to provide a burner constructed to operate efficiently using the less expensive viscous fuels, and which is adapted for automatic control responsive to variable heating requirements.

Other objects of the invention are to provide a burner constructed with passageways that are not subject to clogging incidental to the use of heavy fuels; to provide a burner capable of accurate regulation of the fuel consumption proportionate to the heat desired; to provide a burner construction wherein the heavy fuel is discharged in a conical spray concentrically with a readily vaporizable fuel spray; and to provide a construction which insures ignition of the readily vaporizable fuel prior to contact with the heavy fuel.

In accomplishing these and other objects of the invention, as hereinafter pointed out, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a longitudinal section through a burner embodying the features of the present invention.

Fig. 2 is a cross-section through the burner on the line 2—2 of Fig. 1.

Fig. 3 is a similar section on the line 3—3 of Fig. 1.

Fig. 4 is a rear elevational view of the burner.

Fig. 5 is a detail perspective view of the parts of the rotary atomizing unit and actuating shaft shown in spaced relation to better illustrate the construction thereof.

Fig. 6 is a detail perspective view of the burner housing, particularly illustrating the air discharge nozzle.

Referring more in detail to the drawings:

1 designates a burner constructed in accordance with the present invention, and which includes a housing 2, having a cylindrical body 3 forming a nozzle portion 4 and an air inlet chamber 5 which are separated by a spider-like diaphragm 6. The rear end of the air inlet chamber

5 is closed by a wall 7 having an axially arranged bearing housing 8 and a threaded opening 9 for mounting an igniting device 10, hereinafter described. The opposite end of the cylindrical body converges to form a central opening 11, whereby combustion supporting air passing from the inlet chamber 5 through a series of openings 12 arranged circumferentially of an axial opening 12' in the spider is directed toward the extended axis of the burner and in contact with the fuel as later described. The air is admitted under pressure tangentially of the chamber 5 through an opening 13 in the wall thereof by way of an air supply conduit 14 best shown in Fig. 2.

Supported by the spider-like diaphragm 6, coaxially of the cylindrical body 3, is an air directing nozzle 15, also of cylindrical shape and of smaller diameter than the nozzle portion 4 to provide an annular air passageway 16 connected with the openings 12 in the spider. The forward end of the nozzle 15 also converges toward the axis of the burner to form a constricted opening 17. The tip of the nozzle 15 projects beyond the nozzle portion of the housing, as shown in Fig. 1. In order to assure spiral movement of the air so as to effect thorough mixture with the atomized fuel and complete penetration of the flame, the inner circumference of the air directing nozzle 15 is provided with a plurality of spirally arranged air directing fins 18 which extend from the spider 6 to the tip of the nozzle, as clearly shown in Fig. 1.

The burner housing thus described is provided with a peripheral flange 19 by which it is adapted to be mounted on the wall of a fire-box 20, with the nozzle portion 4 projecting through an opening 21 therein, as shown in Fig. 1. The flange 19 is secured to the fire-box wall by fastening devices, such as cap screws 22, extending through openings 23 in the flange and into threaded openings 24 of the fire-box wall. Mounted within the bearing housing 8 is a pair of antifriction bearings 25 journalling a shaft 26. The shaft 26 has a collar 27 engaged between the inner races 28 of the respective bearings to anchor the shaft against longitudinal movement upon manipulation of adjusting rings 29 and 30, which are threaded into the respective ends of the bearing housing and engage the outer races 31 of the bearings. The rear end of the shaft projects from the bearing housing a sufficient distance to mount a driving pulley 32, which is actuated by a belt 33 driven by a suitable prime mover (not shown). The rear end of the shaft has a reduced extension 34 rotatably engaged within one

end of a bore 35 that is formed in a bearing 36 carried from the burner housing by means of an arm 37. The outer end of the core 35 is closed by a threaded plug 38 which cooperates with the adjacent end of the shaft to form an inlet chamber 39, by which a fuel, such as a heavy hydrocarbon oil, is admitted from a supply pipe 40 to an axial channel 41 extending longitudinally of the shaft. The shaft extension is sealed with respect to the bearing 34 by means of a packing 42 retained in sealing relation therewith by a cap nut 43 threadingly engaged with exterior threads on the bearing housing. The opposite end of the shaft extends within the nozzle 15 and is provided with a reduced threaded neck 44 for mounting a rotary atomizing unit 45 whereby the heavy viscous oil discharged through the channel is atomized and delivered into the fire-box in a conical spray, as indicated by the dotted lines 46, and whereby an igniting fuel is discharged in a similar conical spray circumferentially of the spray 46, as indicated by the dotted line 47.

The vaporizing cup unit constitutes an important part of the present invention as it adapts the burner for operation with a heavy viscous fuel and permits of intermittent or thermostatic control of the burner through ignition of the vaporized heavy oil by the readily combustible fuel, which in turn is ignited by the ignition device 10, previously mentioned. The vaporizing unit includes an inner cup 48, including a hub portion 49 having an axially threaded bore 50 engaging the threaded neck of the actuating shaft, and which is provided with an annular recess 51 for engagingly receiving the shoulder portion 52 of the shaft, as shown in Fig. 1. The threaded portion of the bore terminates short of the inner face of the hub to accommodate a pilot-like tip 53 on the terminal end of the shaft, whereby the cup is securely locked on the shaft. The cup also includes an outwardly and forwardly flaring wall portion 54 for receiving the oil discharged from the central channel of the shaft and which effects centrifugal feed of the oil in the form of a conical, swirling spray into the fire-box, as indicated by the dotted line 46, the flare and length of the wall portion of the cup being such as to attain the desired spread and penetration of the fuel into the fire-box.

The exterior portion of the hub has ways or grooves 55 for mounting an outer cup 56 thereon. The outer cup 56 includes a ring-like body 57, having inwardly directed radial ribs 58 engaging within the ways 55. The inner circumference of the body 57 is of larger diameter than the outer circumference of the hub 49 so as to provide passageways 59 between the ribs 58. The rear end of the body 57 curves inwardly over the shaft to form an annular fuel receiving chamber or trough 60, through which a readily combustible fuel is discharged through the passageways 59, circumferentially of the inner cup, for centrifugal discharge against the interior flaring wall 61 of the outer cup 56. The annular lip 62 of the outer cup terminates short of the lip 63 of the inner cup so that the fuel is discharged therefrom in rearwardly spaced relation with the discharge of the fuel from the inner cup. The sprays are thus kept separated upon their initial entry into the fire-box, so that the readily combustible fuel is ignited and in burning condition prior to contact thereof with the heavy fuel. This is important for the reason that should the fuels become blended prior to ignition of the light fuel, they would be difficult to ignite by the

ignition device and the blend would not burn properly.

The readily combustible or kindling fuel is delivered by way of a pipe 64, extending through an opening 65 in the bottom of the air inlet chamber to a point adjacent the shaft where it terminates in a lateral spout 66 projecting through the opening 67 that is formed between the shaft and the inwardly curved portion of the outer cup.

The ignition device 10 includes an insulator 68, carried by a fitting 69 threaded into the opening 9, similar to a conventional spark plug. The insulator 68, however, is of sufficient length to project through the length of the burner housing where it terminates in an angular extension projecting through the nozzle-like opening of the outer air passageway. Carried within the insulator are electrodes 70 and 71 having the terminal ends thereof projecting from the insulator and forming a spark gap 72 adjacent the outer fuel spray. One of the electrodes may be grounded to the fitting 69, and the other electrode connected by a conductor 73 with a suitable current supply whereby a spark is caused to occur across the spark gap.

In operating a burner constructed and assembled as described, combustion supporting air is delivered tangentially of the air inlet chamber under sufficient pressure so that it is caused to move in a spiral path through the outer passageway 16, and in a similar path through the inner passageway circumferentially of the cups by aid of the spirally arranged vanes 18. Primary air is simultaneously delivered to the atomizing cup 56 through the opening 67 for mixture with the kindling fuel. The kindling fuel is delivered through the pipe 64, and the heavy fuel is delivered through the pipe 40 under control of suitable valves (not shown), responsive to a thermostat or other control means operable incidental to heat conditions to be maintained in the fire-box.

The igniting device is connected with the source of electric current through a suitable interrupting device and the vaporizing unit is rotated. When the automatic control devices function to turn on the fuels, the liquid fuels are respectively admitted through the pipes 40 and 64 for discharge onto the inner surfaces of the respective cups. Rotation of the cups produces centrifugal movement of the fuels that draws them outwardly at high velocity and discharges them in atomized form from the lips of the cups, as indicated by the dotted lines 46 and 47. The kindling fuel moving in contact with the spark passing across the terminals of the igniting device, is readily ignited to effect instantaneous combustion thereof, which in turn ignites the inner spray of less readily combustible fuel, so that the heavy fuel is kept burning efficiently as long as the fuel valves are open. When the fuel is shut off, the flow to the atomizing cups is suspended to stop operation of the burner. The cups may be continually rotated and the igniting device kept functioning so that when the fuels are again turned on through actuation of the automatic control, the burner is again started.

It is thus apparent that I have provided a burner which is capable of automatic control and intermittent operation, and which is adapted to use the heavy, inexpensive fuels. The amount of light fuel required is relatively small in that it is only used to kindle and maintain combustion of the heavy fuel. The coaxial arrangement of

the sprays, with the heavy fuel forming the inner spray, assures instantaneous ignition of the heavy fuel with a minimum amount of the lighter fuel.

What I claim and desire to secure by Letters

Patent is:

1. In a burner of the character described, a pair of coaxial cups having annular fuel discharge lips, means for feeding separate liquid fuels to said cups, means for rotating the cups to effect centrifugal discharge of said fuels from said lips, and means initially igniting one of said fuels to kindle the other of said fuels.

2. In an oil burner of the character described, a pair of coaxial cups having annular fuel discharge lips one set in advance of the other, means for feeding separate liquid fuels to said cups, means for rotating the cups to effect centrifugal discharge of said fuels from said lips, and means initially igniting the fuel discharged from the rearmost lip to kindle the other of said fuels and maintain combustion thereof.

3. In a burner of the character described, separate centrifugal atomizing means, means for feeding separate liquid fuels to said atomizing means for effecting centrifugal discharge of said fuels, means initially igniting one of said fuels to kindle the other of said fuels, and means for supplying combustion supporting air to the burner and having connection with said separate atomizing means to direct a portion of the combustion supporting air through said atomizing means and between said liquid fuels to prevent commingling thereof prior to ignition of said kindling fuel.

4. In an oil burner of the character described, a pair of coaxial cups having annular fuel discharge lips, means for feeding separate liquid fuels to said cups, means for rotating the cups to effect centrifugal discharge of said fuels from said lips, means initially igniting one of said fuels to kindle the other of said fuels, and means for discharging spirally converging streams of combustion supporting air around said cups.

5. An oil burner including a housing having a nozzle portion, a hollow shaft rotatably mounted in the housing, an atomizing cup mounted on said shaft in the nozzle portion of said housing, means connected with the shaft for delivering a

liquid fuel to said cup, a second cup mounted coaxially with the first cup, means for delivering a liquid kindling fuel to said second cup, means for rotating the shaft to effect centrifugal discharge of the liquid fuel from said cups, means associated with the housing for initially igniting said kindling fuel, said cups being relatively supported with respect to each other and the housing to provide passages for combustion supporting air between and around said cups, and means for supplying combustion supporting air to said passages.

6. An oil burner including a housing having a spider-like partition dividing the housing into a nozzle portion and an air inlet chamber, a hollow shaft rotatably mounted in the housing, an atomizing cup mounted on said shaft, means connected with the shaft for delivering a liquid fuel to said cup, a second cup mounted coaxially with the first cup, means for delivering a liquid kindling fuel to said second cup, means for rotating the shaft to effect centrifugal discharge of the liquid fuel from said cups, means associated with the housing for initially igniting said kindling fuel, and an air directing nozzle encircling the cups and carried by said spider-like partition to effect discharge of combustion supporting air.

7. In a burner, separate centrifugal means for respectively discharging a liquid kindling fuel and a less combustible liquid fuel, means supporting said centrifugal means for rotation about a common axis, means for rotating said centrifugal means whereby said liquid fuels are discharged in coaxial conical sprays, and means for separately conveying the liquid fuels to said centrifugal means.

8. In a burner, separate centrifugal means for respectively discharging a liquid kindling fuel and a less combustible liquid fuel, means supporting said centrifugal means for rotation about a common axis, means for rotating said centrifugal means whereby said liquid fuels are discharged in coaxial conical sprays, means for separately conveying the liquid fuels to said centrifugal means, ignition means, and means supporting the ignition means in the zone of combustion of said kindling fuel spray.

FRANK S. THOMAS.