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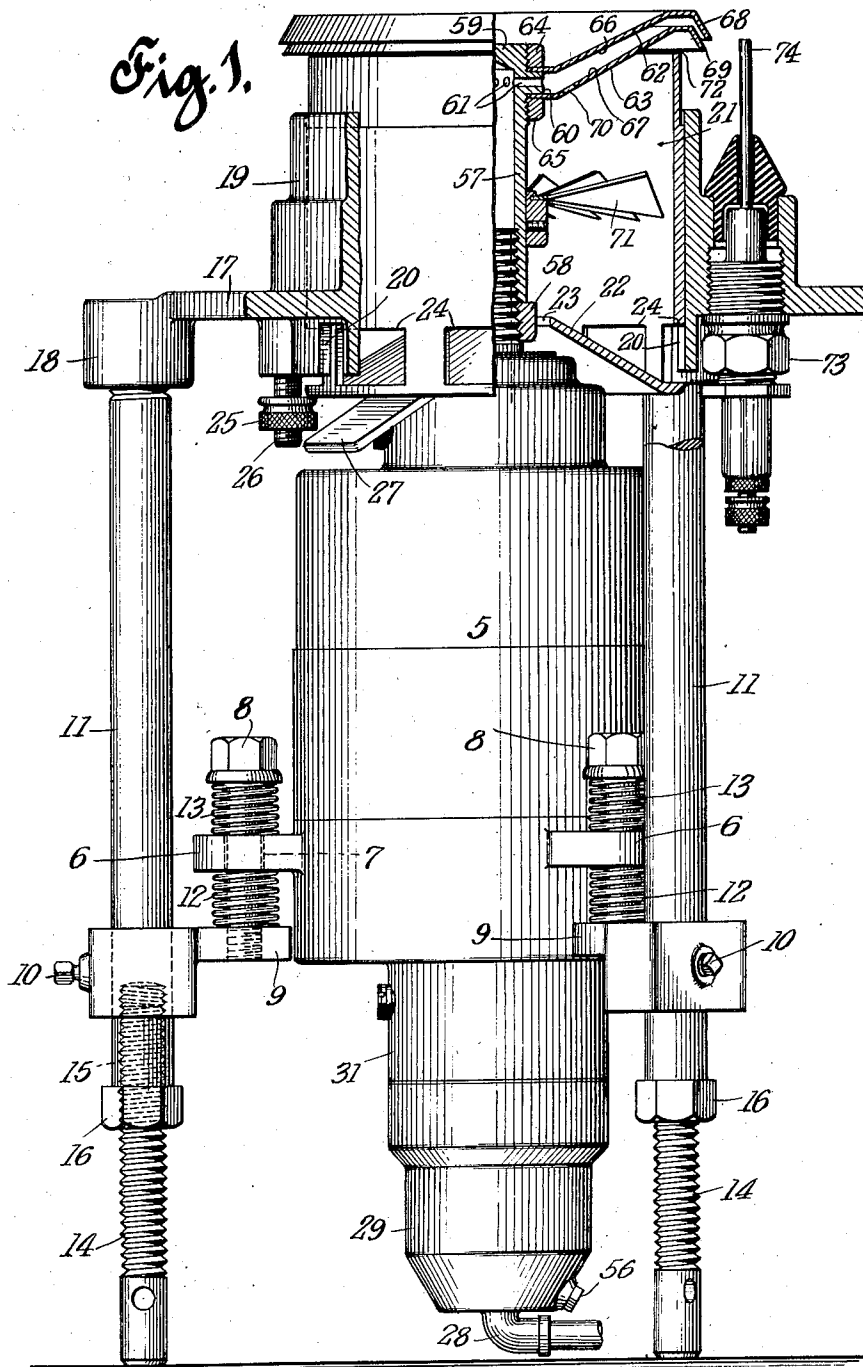
J. J. HAWXHURST

1,935,318

OIL BURNER

Filed Sept. 23, 1930

2 Sheets-Sheet, 1



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Fig. 2.

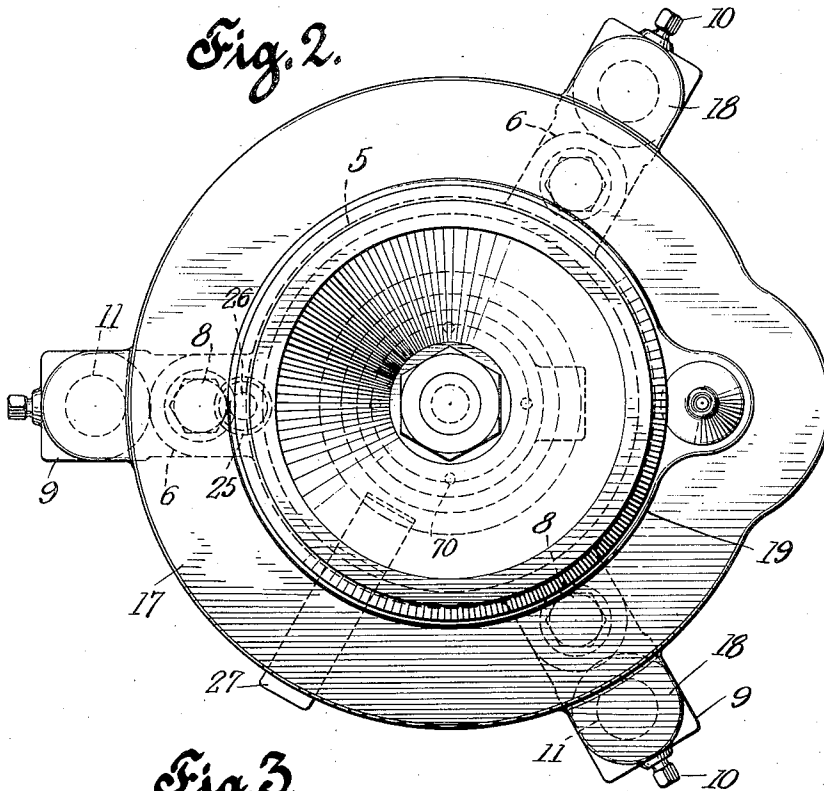


Fig. 3.

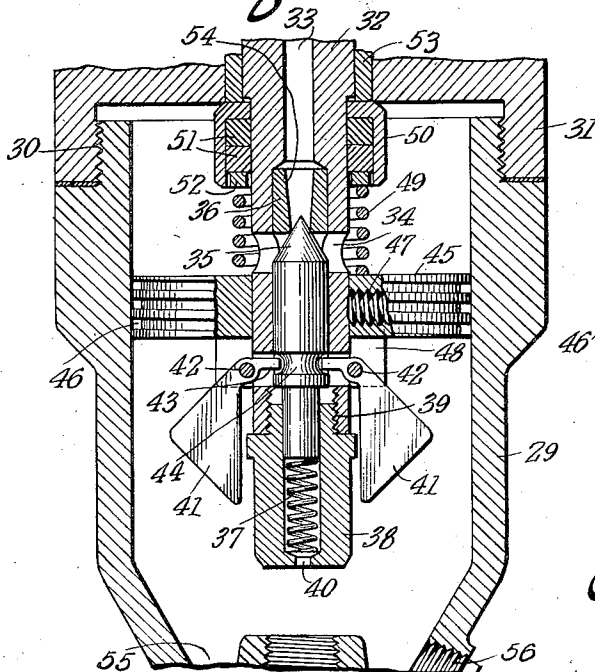
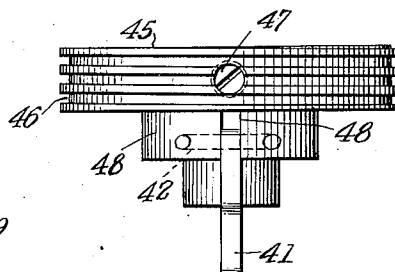


Fig. 4.



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OIL BURNER

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Application September 23, 1930
Serial No. 483,779

20 Claims. (Cl. 158—77)

This invention relates to oil burners generally, and special objects of the invention are to improve on the atomization of the fuel, to provide better control and regulation of the air, both for atomization and for combustion, to provide reliable efficient ignition of the flame, to quiet the running of the motor, to provide positive feed of fuel to the burner head and to provide reliable automatic shut off of the fuel in case of failure of the motor or reduction of motor speed below a safe limit.

Other desirable objects and the novel features of construction, combinations and relations of parts entering into the invention will appear as the specification proceeds.

The drawings accompanying and forming part of the specification illustrate one practical commercial embodiment of the invention, but it should be understood that the illustration is primarily for purposes of disclosure and that the structure may be modified in various respects all within the true spirit and broad scope of the invention.

Fig. 1 is a side elevation of the burner with portions of the burner head broken away and appearing in section; Fig. 2 is a plan view of the machine; Fig. 3 is a broken enlarged sectional detail of the automatic centrifugal fuel valve; Fig. 4 is a detail of the impeller disc.

In Fig. 1 an electric motor is indicated at 5 mounted with its shaft vertical and supported in this fashion by the three outstanding lugs 6 on the motor frame, having the oversize holes 7 for the bolts 8, threaded into the brackets 9, secured adjustably by set screws 10 on the posts 11, there being springs 12, 13, surrounding said bolts above and below the motor lugs, whereby to resiliently support and cushion the motor structure on the tripod stand thus provided.

For vertical and levelling adjustments of the motor tripod or stand, there are provided in the illustration the long foot bolts 14 screwed at 15 up into the hollow lower ends of the motor legs and secured by lock nuts 16.

At the top, the three legs or posts of the motor stand are connected by a spider or head structure 17 having sockets 18, in which the ends of the legs are screwed and carrying a central upstanding collar or ring 19. The lower end of this central ring or collar is shown as notched at 20 for air valving purposes.

Slidably and rotatably seated within the neck or collar of the burner, there is shown a valve sleeve 21 having a truncated bottom 22 open at the center at 23 for passage of the motor shaft

and having air ports 24 in the sides of the same for cooperation with the air supply ports or notches 20 in the fixed collar.

A nut 25 engaged on a screw stem 26 dependent from the head structure serves by engagement with the lower rim of the valve sleeve to support and regulate the vertical relation of the valve sleeve in the head and a handle 27 projecting outwardly from the bottom of the valve sleeve enables rotary adjustments of the valve member to be readily made.

The oil enters at the bottom through a connection 28 into a well 29, shown in Fig. 3, as screwed at 30 in a hub enlargement 31 of the motor case.

The shaft 32 of the motor is shown as extending down into the well or oil receiving chamber and as having a passage 33 extending upwardly therethrough for carrying the oil to the atomizing head.

The lower end of the hollow motor shaft is shown as having ports 34 in the sides of the same for admission of oil from the supply chamber and the flow of oil up through the shaft is automatically governed by a needle valve 35 slidably mounted in the end of the shaft and cooperating with the end of a valve seat collar 36. The valve is shown urged to its closed position by a spring 37 seated in a thimble 38 screwed at 39 to the end of the shaft. This thimble is shown as perforated at the bottom at 40 to prevent building up of pressure against the end of the valve. The automatic control of the valve is effected in the illustration by a pair of triangular weights 41 pivoted at 42 on the motor shaft and having angularly related lugs or lever arms 43 entering an annular groove 44 in the valve, said weights operating centrifugally as the motor reaches a predetermined speed to open the valve for the flow of oil up through the motor shaft.

While the oil may be fed by gravity, it is preferred at present to feed by positive pressure. This is accomplished in the illustration by the provision of an impeller on the motor shaft. The form of this impeller may vary, according to different operating conditions, such as the speed of the motor, viscosity of the fuel, etc. Thus it may be in the nature of a fan, a turbine or a rotor with inclined slots or openings therein, or it may consist simply as illustrated of a rotor disc having a screw threaded rim portion 46 cooperating with the walls of the supply chamber to operate as a screw lift. This impeller is shown as adjustably fixed on the motor shaft by a set screw 47 and said impeller is made to serve the additional purpose of a support for the weighted

governor levers by providing it with dependent lugs 48 serving as mountings for the lever pivots 42. In addition, the impeller disc is utilized in the illustration as an abutment for the spring 49, which holds the shaft packing in place. This packing is shown as a cup 50 containing packing material 51 engaging the shaft and held by a retainer ring 52 engaged by the spring, the closed end of the cup having a free rotating engagement with the bushing 53, which forms the lower shaft bearing. This construction provides a practically frictionless packing for the lower end of the shaft, preventing fuel oil from working up into the motor around the shaft.

In addition to the positive pressure feed provided by the screw impeller, there is provided in the illustration a negative pressure lift above the oil inlets in the shaft by means of the upwardly expanding or inverted tapered throat 54 in the valve sleeve 36, this throat operating on centrifugal principles to create a lift tending to draw the oil in through the ports and upward around the point of the tapered valve, in effect overcoming a "lagging" tendency of the oil to pass in through the side ports and up around the valve.

The weights of the centrifugal valve agitate the oil in the lower part of the supply chamber tending to lighten the same and to throw off dirt or impurities in the oil, which may collect in the settling portion 55 of the chamber surrounding the oil inlet, the latter having a drain plug 56 for cleaning purposes.

The oil passing up through the hollow motor shaft continues on up through a tubular extension 57, Fig. 1, screwed on the upper end of the shaft and secured by locking nut 58. This tubular extension has a closed upper end 59 and below that an annular outstanding flange 60 with a series of radial perforations 61. Flange 60 serves as a spacer for two atomizing discs 62, 63, secured against the upper and lower sides of the flange by the nuts 64, 65. These discs are shown as of substantially similar dished form having upwardly angled inclined faces 66, 67, forming between them an upwardly and outwardly flaring passage and terminating in reversely angled downwardly inclined lip portions 68, 69. The lower disc is shown as having openings 70 therein, adjacent the oil outlets 61 for the admission of a current of air between the discs. This air current may be supplied entirely by the stack draft, but in the illustration a fan 71 is shown mounted on the tubular extension of the motor shaft for drawing air in through the valved ports of the burner head and for forcing it up between the atomizing discs and over the lip 72 of the air valve, beneath the atomizing discs. In addition to the air taken in through the valve ports, a certain proportion of air is taken in through the central opening 23 in the conical bottom in the air valve, which latter thus creates a stream of air converging over the motor and exerting a cooling tendency on the same. This conical bottom structure of the air valve also makes the burner more compact in its vertical dimensions since the upper bearing portion of the motor can be made to set up into the lower portion of the air valve after the manner illustrated in Fig. 1.

For ignition purposes, there is provided in the illustration a spark plug 73 secured in inverted relation in the flange portion 17 of the burner head and having a single upstanding electrode 74 spaced off to the side of the atomizing discs. By this arrangement, a spark or series of sparks is

drawn between the stationary electrode and the edges of the whirling discs substantially in line with the annular mouth provided between the downturned lips of the discs. The whirling electrode prevents carbon deposit and the stationary electrode may be positioned inside the zone of combustion, both being thereby maintained in effective condition. It will be understood that suitable electric control mechanism may be connected with the spark plug.

In addition to its atomizing action, the upper disc 62 serves as a cover over the oil outlets 61 preventing clogging of the same from carbon or the like, which may drop from the furnace structure and this upper disc is furthermore a protection from the furnace heat, preventing vaporization, such as might interfere with proper atomization of the fuel. The fuel thrown out through the radial outlets 61 crosses the air stream entering through the openings 70 in the lower disc and striking the upwardly inclined baffle surface 67 of the lower disc, travels outwardly up over the surface of this disc, from whence it is thrown a second time across the air stream between the discs against the downwardly directed lip of the upper baffle plate. The oil or mixture in a more or less thoroughly atomized state is then forced downwardly by centrifugal action through the somewhat restricted annular passage between the downturned lips of the discs and burns in the completely atomized form off from the rims of the discs. The additional air admitted into the burner head and escaping up over the stationary lip 72 beneath the arched rim of the lower disc aids in supporting combustion. This secondary air stream is preheated in its confinement and passage through the burner head and may be controlled in volume and pressure by the rotary and vertical adjustments of the air valve, as first described. Thus with rotary adjustments by the handle 27, the effective size of the ports may be increased or decreased to pass more or less air and the raising or lowering of the valve sleeve by adjustments of the nut 25 decreases or increases the size of the annular air outlet over the lip 72, so as to raise or lower the outlet pressure. The ports 24 in the valve sleeve are shown as of greater height than the depth of the notches 20 in the burner head, so that vertical adjustments of the sleeve may be made without affecting volume adjustments previously made by turning the handle 27. If the motor should slow down below a safe speed or should stop, the supply of fuel will be automatically cut off and fuel will not again be admitted to the burner head until the motor has reached the predetermined proper speed. The automatic fuel control valve may be held in its closed position by a spring of sufficient strength to insure proper seating and safe closure of the valve. The impeller may be designed to give any desired positive feed pressure and the centrifugal accelerating throat above the valve assures proper oil feed past the valve. The substantially frictionless packing for the lower end of the motor shaft prevents fuel oil working up into the motor and without placing any objectionable friction load on the motor. The cushioning of the motor between supporting springs keeps the motor running quietly. The feature of supplying all the air, both for atomization and for combustion up through the burner head is particularly important, because in this way all the air necessary for burner operation is supplied from below the burner and discharged into or immediately below the burner flame. The

fan provides a positive flow of air and becomes particularly important, as the air flow is restricted by adjustment of the air valve. Thus definite positive flow of air is assured irrespective of the adjustments for volume and velocity. The impeller on the lower end of the motor shaft may be utilized in the manner of a suction pump to actually lift the oil from the tank to the burner. This enables the placing of the tank at a lower level, which is advantageous for many reasons.

As the invention is of a broad nature, it will be apparent that many changes in structure may be made without departure from the real scope of protection.

What is claimed is:

1. In an oil burner, a hollow shaft member having an annular flange pierced to form an oil outlet and screw-threaded portions at opposite sides of said flange, atomizing discs at opposite sides of and spaced by said flange and nuts engaged on said screw-threaded portions for securing the discs in spaced relation.

2. The combination in an oil burner, of a substantially vertical rotating tubular shaft forming a fuel conduit and provided near the upper end of the same with a lateral oil outlet and a pair of sheet metal discs secured on said shaft, one above and the other below said oil outlet, said discs being of generally truncated conical shape and arranged in closely spaced nested relation substantially parallel with each other to form a narrow annular discharge throat extending from the oil outlet in inclined relation to the shaft axis, the lower disc being perforate to admit air from below into said annular throat, means for forcing air up through the lower perforate disc and means for supplying oil up through the rotating tubular shaft to pass out with the air through said narrow annular discharge throat between the discs.

3. The combination in an oil burner, of a substantially vertical rotating tubular shaft forming a fuel conduit and provided near the upper end of the same with a lateral oil outlet and a pair of sheet metal discs secured on said shaft, one above and the other below said oil outlet, said discs being of generally truncated conical shape and arranged in closely spaced nested relation substantially parallel with each other to form a narrow annular discharge throat extending from the oil outlet in inclined relation to the shaft axis, the lower disc being perforate to admit air from below into said annular throat and said lower disc having a downwardly projecting dependent downwardly angled discharge flange about the rim of the same.

4. The combination in an oil burner, of a substantially vertical rotating tubular shaft forming a fuel conduit and provided near the upper end of the same with a lateral oil outlet and a pair of sheet metal discs secured on said shaft, one above and the other below said oil outlet, said discs being of generally truncated conical shape and arranged in closely spaced nested relation substantially parallel with each other to form a narrow annular discharge throat extending from the oil outlet in inclined relation to the shaft axis, the lower disc being perforate to admit air from below into said annular throat, said lower disc having a downwardly angled discharge flange about the rim of the same and an annular burner head of less diameter than and disposed beneath said downturned rim of the lower disc.

5. The combination in an oil burner, of a substantially vertical rotating tubular shaft forming

a fuel conduit and provided near the upper end of the same with a lateral oil outlet and a pair of sheet metal discs secured on said shaft, one above and the other below said oil outlet, said discs being of generally truncated conical shape and arranged in closely spaced nested relation substantially parallel with each other to form a narrow annular discharge throat extending from the oil outlet in inclined relation to the shaft axis, the lower disc being perforate to admit air from below into said annular throat, said lower disc having a downwardly angled discharge flange about the rim of the same, an annular burner head of less diameter than and disposed beneath said downturned rim of the lower disc, the annular throat between the discs being in communication with the interior of the burner head through the perforate lower disc and means for forcing air from below up through said burner head and thereby providing a stream of air out through the annular throat and another stream of air between the edge of the burner head and the downturned rim of the lower disc.

6. The combination in an oil burner, of a substantially vertical rotating tubular shaft forming a fuel conduit and provided near the upper end of the same with a lateral oil outlet and a pair of sheet metal discs secured on said shaft, one above and the other below said oil outlet, said discs being of generally truncated conical shape and arranged in closely spaced nested relation substantially parallel with each other to form a narrow annular discharge throat extending from the oil outlet in inclined relation to the shaft axis, the lower disc being perforate to admit air from below into said annular throat, said lower disc having a downwardly angled discharge flange about the rim of the same, an annular burner head of less diameter than and disposed beneath said downturned rim of the lower disc, the annular throat between the discs being in communication with the interior of the burner head through the perforate lower disc and means for forcing air from below up through said burner head and thereby providing a stream of air out through the annular throat and another stream of air between the edge of the burner head and the downturned rim of the lower disc, said latter means including a fan on the rotating shaft below the lower disc and operating within the burner head.

7. The combination in an oil burner, of an upright stationary annular burner head, an air valving sleeve rotatably and vertically adjustable on said burner head, said sleeve and head having cooperating port elements for regulating flow of air in the vertical and circular adjustments of the sleeve, an atomizer shaft extending up through said adjustable sleeve and an atomizer head carried by said shaft and disposed in cooperative relation to said air valving sleeve.

8. The combination in an oil burner, of an upright stationary annular burner head, an air valving sleeve rotatably and vertically adjustable on said burner head, said sleeve and head having cooperating port elements for regulating flow of air in the vertical and circular adjustments of the sleeve, an atomizer shaft extending up through said adjustable sleeve and an atomizer head carried by said shaft and disposed in cooperative relation to said air valving sleeve, said sleeve having a bottom wall partially closing the lower end of the annular burner head.

9. The combination in an oil burner, of an up-

right stationary annular burner head, an air valving sleeve rotatably and vertically adjustable on said burner head, said sleeve and head having cooperating port elements for regulating flow of
 5 air in the vertical and circular adjustments of the sleeve, an atomizer shaft extending up through said adjustable sleeve and an atomizer head carried by said shaft and disposed in cooperative relation to said air valving sleeve, said
 10 atomizer head including a disc member overstanding the edge of the vertically and circularly adjustable sleeve and forming in conjunction therewith a variable annular air passage.

10. The combination of a substantially vertical
 15 rotating tubular shaft forming a fuel conduit and provided with a fuel outlet at the upper end portion of the same, discs of generally truncated conical form secured in spaced generally parallel relation on the shaft with the space therebetween
 20 in communication with the fuel outlet of the shaft, the upper disc having at the rim of the same a downwardly extending flange forming a lip overstanding the discharge passage between the discs, the shaft having a shouldered portion
 25 and the fuel discharge passage extending through said shouldered portion, the discs being separately formed and secured against opposite sides of said shouldered portion and whereby they are definitely spaced.

30 11. In an oil burner, a tubular vertically disposed motor shaft having a screw threaded upper end, a hollow shaft member having a screw threaded engagement on the upper end of said
 35 motor shaft and provided with an annular flange pierced to form an oil outlet and with screw threaded portions at opposite sides of said flange, atomizing discs on said hollow shaft member at
 40 opposite sides of and spaced by said flange and nuts engaged on said screw threaded portions for securing said discs in a definitely spaced relation determined by said flange.

12. In an oil burner, a tubular vertically disposed motor shaft having a screw threaded upper
 45 end, a hollow shaft member having a screw threaded engagement on the upper end of said motor shaft and provided with an annular flanged pierced to form an oil outlet and with screw threaded portions at opposite sides of said flange, atomizing discs on said hollow shaft member at
 50 opposite sides of and spaced by said flange, nuts engaged on said screw threaded portions for securing said discs in a definitely spaced relation determined by said flange and a fan adjustably
 55 secured on said hollow shaft member below said spaced discs and carried by said same motor attached shaft member.

13. In an oil burner, a tubular vertically disposed motor shaft having a screw threaded upper
 30 end, a hollow shaft member having a screw threaded engagement on the upper end of said motor shaft and provided with an annular flange pierced to form an oil outlet and with screw threaded portions at opposite sides of said flange, atomizing discs on said hollow shaft member at
 65 opposite sides of and spaced by said flange and nuts engaged on said screw threaded portions for securing said discs in a definitely spaced relation determined by said flange, said discs being upwardly inclined from the plane of said oil outlet
 70 and one having a downwardly angled, dependent inclined oil directing flange at the rim of the same.

14. In an oil burner, a vertically disposed hollow shaft member having an annular flange
 75 pierced laterally to form an oil outlet, atomizing

discs secured on said shaft member in engagement with opposite faces of said flange and thereby held in definitely spaced relation and with the space therebetween in line with said oil outlet, said discs being inclined upwardly from the
 80 plane of said oil outlet and one terminating in a downwardly extended inclined oil directing flange.

15. In apparatus of the character disclosed, the combination of a substantially vertical rotating tubular shaft forming a fuel conduit, said
 85 shaft having a shouldered portion with a lateral fuel outlet therethrough in communication with the internal fuel conduit of said tubular shaft, discs secured on said shaft at opposite sides of
 90 said shouldered portion and spaced thereby to form an annular discharge throat, the upper of said discs having a downwardly projecting flange at the rim of the same overlapping the edge portion of the lower disc to restrict and control the
 95 discharge of fuel between the discs and means for supplying fuel up through the tubular shaft to the lateral discharge outlet aforesaid.

16. In apparatus of the character disclosed, the combination of a substantially vertical rotating tubular shaft forming a fuel conduit, said
 100 shaft having a shouldered portion with a lateral fuel outlet therethrough in communication with the internal fuel conduit of said tubular shaft, discs secured on said shaft at opposite sides of
 105 said shouldered portion and spaced thereby to form an annular discharge throat, the lower of said discs having a downwardly projecting flange at the rim of the same and beneath the upper disc to control the discharge of fuel from between the two discs and means for supplying
 110 fuel up through the tubular shaft to the lateral discharge outlet aforesaid.

17. In apparatus of the character disclosed, the combination of a substantially vertical rotating tubular shaft forming a fuel conduit, said
 115 shaft having a shouldered portion with a lateral fuel outlet therethrough in communication with the internal fuel conduit of said tubular shaft, discs secured on said shaft at opposite sides of
 120 said shouldered portion and spaced thereby to form an annular discharge throat, said discs each having a downwardly projecting flange at the rim of the same and arranged with the downturned flange on the upper disc overlapping the
 125 downturned flange of the lower disc and means for supplying fuel up through the tubular shaft.

18. In combination, an upright tubular rotating shaft having a lateral discharge outlet near
 130 the upper end of the same, atomizing discs secured on said shaft in spaced relation above and below said lateral discharge outlet, said discs being inclined upwardly from said lateral discharge outlet to form an upwardly and outwardly divergent annular discharge throat and having
 135 flanges at the edges of the same angled in respect to the upwardly flaring portions of the disc and cooperating to form a flow controlling annular discharge mouth and means for supplying fuel up through the tubular shaft.

19. In an oil burner, the combination of an upright atomizer shaft, an atomizer head on the
 140 upper end of said shaft, an upright stationary annular burner head beneath said rotating atomizer head, an air valving sleeve concentrically related to said annular burner head, said sleeve and burner head having cooperating port elements at the lower portions of the same variable
 145 in the rotary adjustments of the sleeve and the upper end of the sleeve projecting up beneath
 150

the atomizer head to define in conjunction there-
with an annular air discharge passage, means
for forcing air through the ports of the sleeve,
means for shifting the sleeve circularly to vary
the air inlet ports and means for shifting the
sleeve vertically to vary the annular discharge
passage.

20. In apparatus of the character disclosed, the
combination of a rotating tubular shaft forming
a fuel conduit and having near the end of the
same a lateral fuel discharge outlet with shoul-
ders at opposite sides of the same, fuel distrib-
uting discs engaged with said shoulders and defi-
nitely spaced thereby at opposite sides of said

fuel discharge outlet, said discs being of trun-
cated conical form and faced to form an annular
discharge throat flaring outwardly away from
the end portion of said shaft, said discs having
flanged rim portions in spaced relation to de-
fine an annular discharge mouth at the outer
end of said flaring discharge throat and one of
said flanged rim portions being flared at a sharp
angle reversely to the conical formation of said
disc to provide a flaring annular fuel controlling
lip, means for supplying fuel through the tubular
shaft and means for furnishing a supply of air
to said flaring lip flange of the disc.

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