

May 2, 1939.

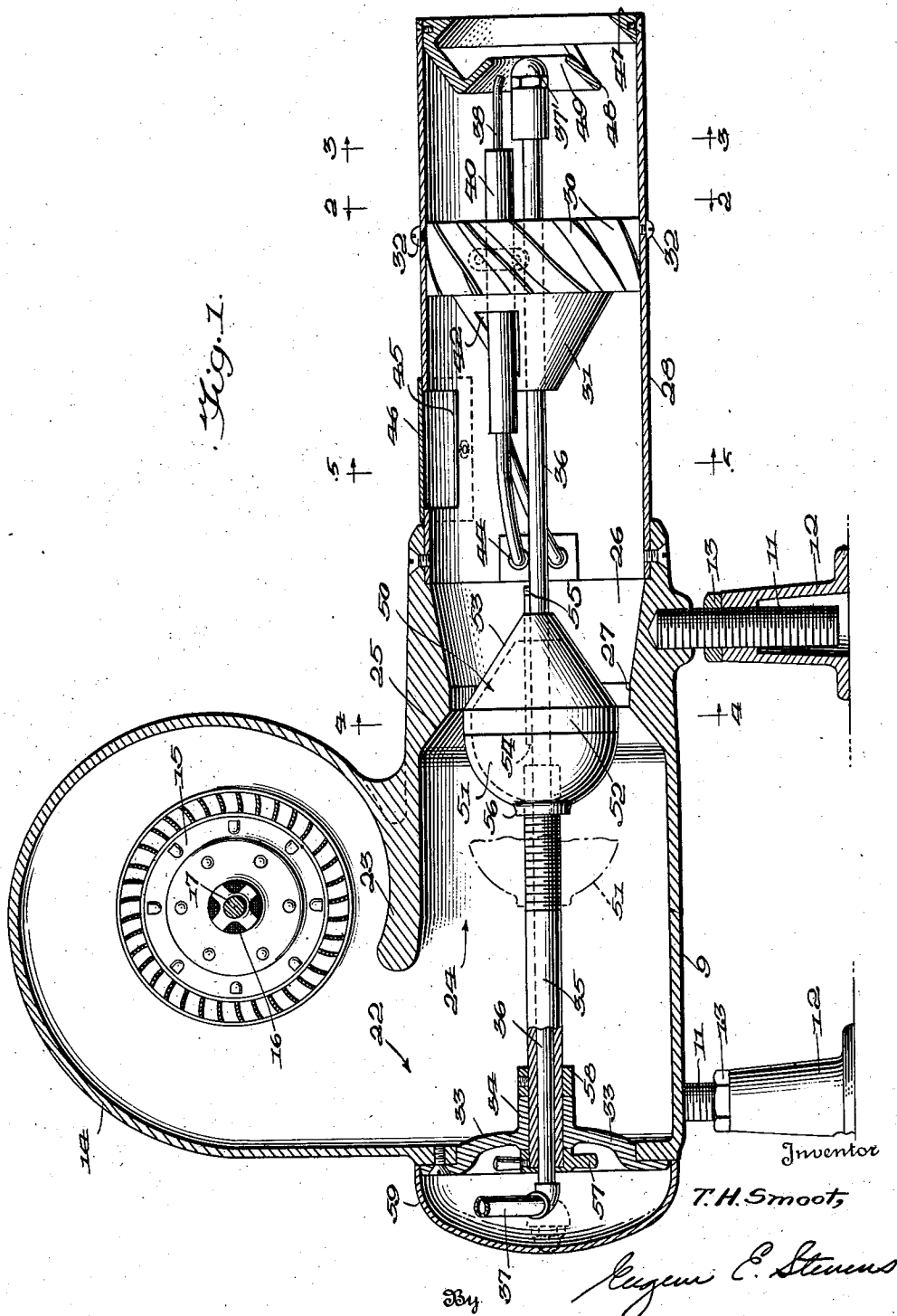
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2,156,405

OIL BURNER

Filed Dec. 20, 1935

3 Sheets-Sheet 1



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Fig. 4.

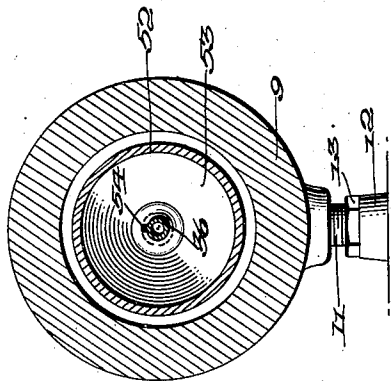


Fig. 3.

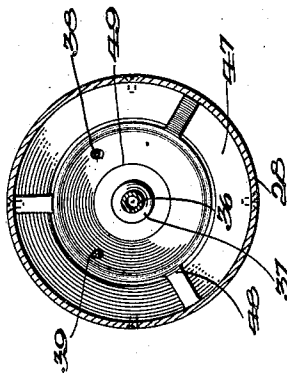


Fig. 2.

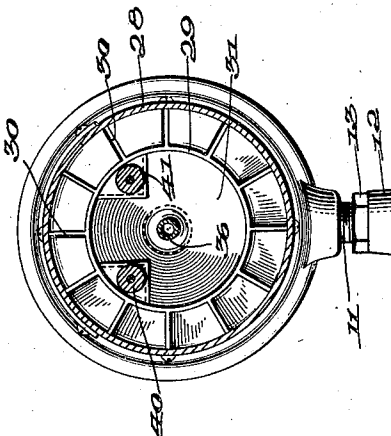


Fig. 5.

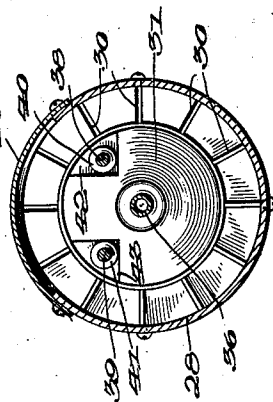
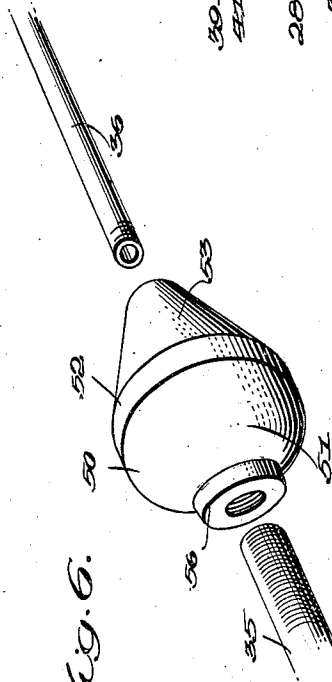


Fig. 6.



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3 Sheets-Sheet 3

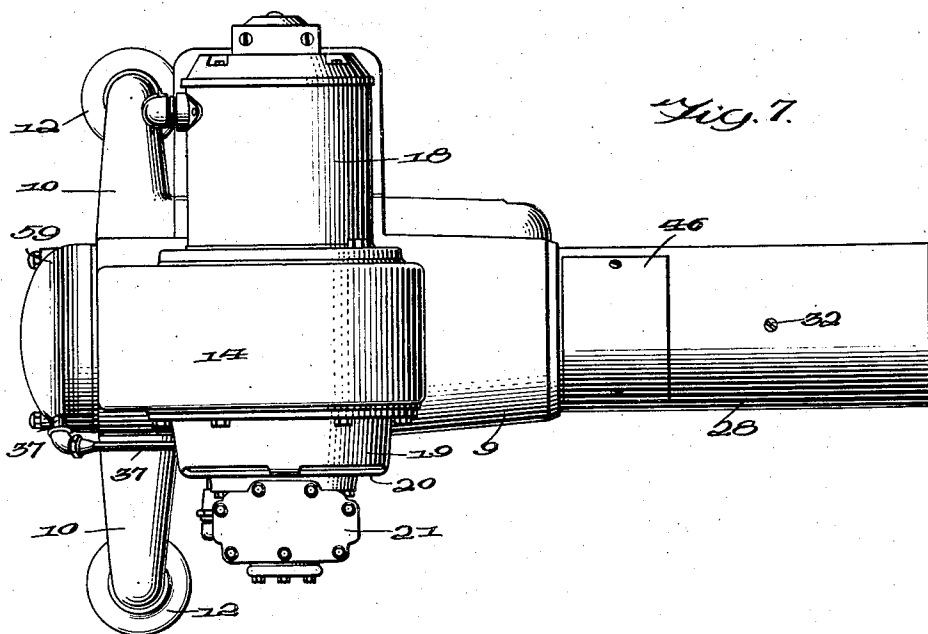


Fig. 7.

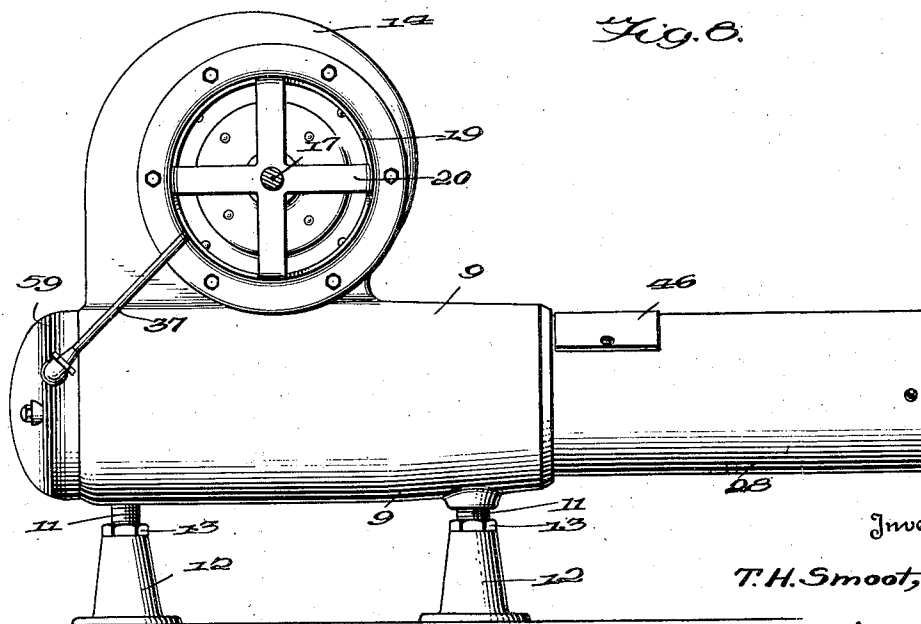


Fig. 8.

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UNITED STATES PATENT OFFICE

2,156,405

OIL BURNER

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4 Claims. (Cl. 158—76)

This invention relates to fluid fuel burners of the pressure type wherein a jet of fluid fuel, such as oil, is ignited and mixed with a stream of air issuing from the nozzle of the burner.

Heretofore in the art of pressure type oil burners and the like the customary practice has been to ignite the oil and mix it with air issuing from the nozzle end of a blast tube through which air is forced under the pressure of a fan, the fan being housed in a casing provided with a shutter controlled opening through which air is admitted, the volume of air being regulated by adjustment of the shutter means on the inlet side of the fan. This prevalent practice of the prior art results in a lowered efficiency as the air propulsion means works against a partial vacuum on its inlet side and which is created by closing movement of the air volume regulating means.

An object of the present invention is to provide an air blast fluid fuel burner provided with air volume control means located on the air discharge side of the air pump.

Another object is to provide in a burner of such character means for obtaining uniform air pressure within the air blast tube.

A further object is to provide in a burner of this character novel means for regulating and controlling the air flow.

Other objects will be apparent from the description, among these being to provide novel structural details of assembly together with means for imparting directional movement to air within the blast tube whereby upon issuing from the nozzle the air is caused to expand uniformly under the action of centrifugal force.

The present disclosure constitutes an exposition of a practical structural embodiment by which the invention is reduced to practice. It is to be understood that the details as shown and described are capable of variation within any limits not inconsistent with the scope of the invention as claimed.

In the drawings:

Figure 1 is substantially a vertical longitudinal section through a burner constructed in accordance with the invention, and illustrating certain details of the internal mechanism in elevation.

Figure 2 is a section taken on line 2—2 of Fig. 1.

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

Figure 4 is a section on the line 4—4 of Fig. 1.

Figure 5 is a section on the line 5—5 of Fig. 1.

Figure 6 is a group perspective view illustrating assembly details of an element of the air volume

control means.

Figure 7 is a top plan view of the burner, on a reduced scale.

Figure 8 is a side elevation of the burner with the oil pump removed.

In the illustrated embodiment the burner comprises a main body portion 9 consisting of a substantially cylindrical hollow casting provided at its rear end with a pair of integral oppositely extending lateral support arms 10 disposed in a common horizontal plane the outer ends of the support arms being operatively engaged with elevation adjustment screws 11 in screw jacks 12 and which are operated in the usual manner by adjustment nuts 13. At the forward end of the cylindrical body and substantially in the vertical plane of its axis there is arranged a third elevation adjustment comprising another traveling screw 14 mounted in a screw jack 12 and operated by the adjusting nut 13.

Diametrically opposite the axial base line of the burner, as determined by the location of the supporting means as described, the body portion is provided with an integral vertically upstanding fan housing 14 within which is mounted suitable air propulsion means, such as a turbine blade fan generally designated as at 15 having a hub portion 16 rigidly connected with a rotatable shaft 17 extending transversely through the fan housing and driven by suitable power means, comprising in this embodiment an electric motor 18 suitably secured to the integral casting comprising the body portion 9 and the fan housing 14.

The fan housing 14, at the side opposite to that on which the motor 18 is mounted, is provided with an air inlet hood 19 having a vertical open face or grill 20 that is permanently open to permit of unobstructed air entry to the fan and so proportioned that the fan receives on its inlet side not less than the maximum volume of air which the fan is capable of moving. The face 20 or an appropriate part of the hood 19 provides a mounting for a fuel oil pump 21 that is operatively connected with the shaft 17 driven from the motor 18. It will be noted that with respect to the fan the motor 18 and the oil pump 21 are balanced at opposite sides of the fan housing, the three units being axially aligned. The motor, the fan and the oil pump are thus located in transverse axial alignment above the cylindrical body of the burner.

The fan housing has a vertical discharge 22 directed downwardly into the rear end of the cylindrical body portion 9, the housing being rearwardly extended somewhat beneath the fan by a web 23 to provide a plenum chamber 24 of uni-

form internal diameter from its rear end to a conical valve seat 25 formed in the forward end of the chamber. As shown in Fig. 1 the conical seat 25 opens to a venturi 26 located forwardly thereof and between the seat 25 and the inner end of the venturi the wall of the body portion is formed with a cylindrical bore 27 to provide a restricted cylindrical throat through which air passes from the plenum chamber to the venturi or relief chamber 26.

At its forward end the cylindrical body portion 9 has suitably secured thereto an axial extension consisting of an air blast tube or barrel 28 having a uniform internal diameter from end to end which is less than the internal diameter of the plenum chamber and which provides an axial continuation of the plenum chamber 24.

The barrel 28 is provided with means for changing the direction of air flow through the barrel for the purpose of imparting a swirling motion to the air as it issues from the nozzle end of the barrel. In the illustrated embodiment this means consists of an air spiral comprising a hub 29 of a diameter less than the diameter of the barrel and carrying a series of spirally directed vanes or blades 30 which extend between the hub and the inner wall of the barrel, contacting the inner wall of the barrel through the entire extent of their outer edges. Slidable axially in close fitting engagement through the hub 29 is electrode mount 31 having an inwardly directed apex so constructed that no air may pass except through the spaces between the spirally directed blades 30. The air spiral is anchored in position within the barrel by means of attaching elements 32.

The barrel 28 in conjunction with the plenum chamber of the body 9 provides a cylindrical air discharge passage having a restricted throat 27 the bore of which is cylindrical and is coaxial with the cylindrical bore of the plenum chamber and the barrel. In its rear wall the body 9 is provided with an assembly port covered by a detachable closure plate 33 formed with a central hub 34 which provides a bearing for an axially elongated sleeve member 35 coaxial with and rotatably mounted upon an oil discharge pipe or conduit 36 which extends axially throughout substantially the entire longitudinal extent of the air discharge passage of the burner. At the rear end of the burner the oil discharge pipe 36 extends through the detachable closure 33 and connects with a conduit 37 that leads to the oil pump. At the forward portion of the burner the oil pipe 36 is supported by the apex portion of the holder 31, through which holder the pipe 36 passes in close fitting engagement. At its forward end the oil pipe 36 is provided with a conventional discharge tip 37' through which the oil issues to be ignited by electrodes 38 and 39 mounted in bushings 40 and 41 passed in sealed engagement through the conical holder 31 through counter-sunk sockets 42 and 43 provided therein for the purpose. The electrical leads for the electrodes are carried through bushings 44 in the wall of the barrel and the barrel is further provided with a port 45 closed by a detachable cover plate 46 through which access may be had to the electrical connections within the air passage.

At its forward or nozzle end the barrel 28 is provided with a reducing annulus 47 carrying an internally directed spider baffle 48 provided with an annular deflector 49 surrounding the oil tip 37' in coaxial spaced relation. The volume of air passing through the discharge passage is reg-

ulated at the outlet end of the plenum chamber, being controlled by valve means cooperable with the reduced throat 27 and seat 25 and adjustable axially of the discharge passage. In the disclosed embodiment such valve means comprises a hollow substantially obloid member 50 having a semi-spherical rear end portion 51, a cylindrical central portion 52 the axial extent of which is equal to or greater than the axial extent of the cylindrical throat 27, and a conical front end portion 53, the three portions being integral and merging into one another.

An important feature of this invention resides in the fact that the maximum external diameter of the movable valve 50, as defined by its central cylindrical portion 52, is appreciably less than the internal diameter of the restricted cylindrical throat 27 whereby there is at all times a clearance between the valve and the throat so that the valve member may be shifted axially for movement entirely through the throat. The valve member 50 is mounted for sliding movement axially along the pipe 36, being restrained against rotation thereon by a gib 54 by which the valve and pipe are keyed together. A lateral tip 55 provides a stop means on the gib which defines the limit of forward axial movement of the valve, this limit being the maximum closing extent of the valve. The rear end or semi-spherical portion 51 of the valve member has a hub 56 for traveling threaded engagement over the externally threaded extent of the sleeve 35 so that as the sleeve 35 is rotated the valve is caused to move either forwardly or rearwardly depending upon the direction of rotation of the sleeve. This rotation of the sleeve is accomplished by means of a handle member 57 rigidly secured at the outer end of the sleeve where it projects through the detachable closure plate 33. A bearing sleeve 58 rigidly attached to the operating sleeve 35 on the inner side of the hub 34 cooperates with the handle member 57 to restrain the operating sleeve against axial movement over the supporting pipe 36. The dotted line position of the valve 50 as shown in Fig. 1 indicates the position assumed by the valve in maximum open position. A detachable cap 59 secured on the rear face of the burner body protects the adjusting handle 57 against accidental manipulation and upon removing the cap 59 and detaching the closure 33 the valve assembly may be withdrawn axially through the assembly port, the diameter of the port being greater than the maximum diameter of the valve member.

As shown in Fig. 1, it will be noted that the plenum chamber and air discharge barrel are located in perpendicular relationship with respect to the line of air flow as discharged through the fan outlet 22. By this arrangement the air pressure within the plenum chamber becomes a static pressure so that the air flow is constant and unaffected by directional current ordinarily imparted where there is direct fan discharge.

In the operation of the burner there is no regulation or control of air on the inlet side of the fan, the fan inlet being unrestricted and therefore receiving the full rated capacity. The fan thus moves its full rated volume of air into the plenum chamber building up a static pressure therein and the air flow volume is controlled in the discharge passage by means of the valve 50, as described. Due to the clearance provided at all times between the cylindrical portion 52 of the valve and the cylindrical throat 27 of the air passage it will be evident that there will

at all times be a straight line air flow past and around the valve, securing uniform delivery to the barrel 28. As the air travels along the barrel 28 it is deflected peripherally of the barrel by the deflecting action of the conical member 31. As the air can only pass the hub 29 through the spiral blades 30 it will be obvious that the air will be given a swirling motion and directed at the same time against the wall of the barrel so that when it issues through the nozzle annulus 47 it is traveling with a swirling motion which causes an expansion and dispersion by the action of centrifugal force. In order to relieve any vacuum creation at the area immediately adjacent the oil tip 37 the deflector 49 has been provided which insures that sufficient air will be passed directly around the tip to preclude the formation of a vacuum.

The venturi 26 provides an expansion chamber relieving air constriction immediately beyond the valve and this relief insures that the air flow will be directed along the periphery of the barrel 28 and not confined to its axial center. By dispersing the air flow to travel along the peripheral inner surface of the discharge barrel there is obtained a greater freedom for air flow as it is not obstructed by the electrodes and nozzle adjacent the axial center of the discharge tube.

30 Having described my invention what I claim is:

1. An oil burner having, in combination, fuel supply means, air supply means, an air blast tube connected to said air supply means, an oil discharge pipe extending axially through said tube and connected to the fuel supply means, said tube having a constricted throat, air control valve means carried by said pipe and movable axially thereon into and entirely through said throat, a valve actuating member carried by said pipe and movable thereon to operate said valve means, and means at the end of the oil discharge pipe for spraying oil into the air leaving said air blast tube.

2. An oil burner having, in combination, fuel supply means, air supply means, an air blast tube connected to said air supply means, an oil discharge pipe extending axially through said tube and connected to the fuel supply means, said tube having a constricted throat, an air control valve carried by said pipe and movable axially thereon, said valve being of a size to pass entirely through said throat with a clearance therebetween in all positions of the valve, a valve

actuating member supported by said pipe and movable thereon to operate said valve for adjustment in and through said throat, said valve having a surface presented to the line of air flow of a shape to direct air passed thereby to the periphery of the tube beyond the valve, and means at the end of the oil discharge pipe for spraying oil into the air leaving said air blast tube.

3. An oil burner having, in combination, fuel supply means, air supply means, an air blast tube connected to said air supply means and having a constricted throat including a cylindrically bored passage, an oil discharge pipe extending axially through said tube and passage and connected to said fuel supply means, an air control valve carried by said pipe and movable thereon into and entirely through said throat passage, a valve actuating member supported by said pipe and movable thereon to operate said valve for adjustment in and through said throat passage, said valve having a substantially semi-spherical portion presented to the line of air flow, a cylindrical portion extending therefrom, and a conically reduced portion therebeyond, the maximum diameter of said valve being appreciably less than the diameter of said cylindrical throat passage, and means at the end of the oil discharge pipe for spraying oil into the air leaving said air blast tube.

4. An oil burner having in combination, fuel supply means, air supply means, a hollow tubular air discharge member, a plenum chamber therein in communication at one end with the air supply means, a constricted throat in the other end of said member, an air expansion chamber beyond said throat, an oil discharge pipe supported at one end in and extending through a wall of the plenum chamber axially through said throat and into the air expansion chamber, a fixed support in said air expansion chamber for the other end portion of said oil discharge pipe, means on said support to direct air in a helical path along the wall of said expansion chamber prior to discharge therefrom, an air volume control valve movable axially on said oil discharge pipe into and through said throat, valve actuating means carried by said pipe and movable thereon to operate said valve, fuel atomizing means on said oil discharge pipe in the discharge end of said air expansion chamber, and means for igniting the atomized fuel.

THEOPHILUS H. SMOOT.