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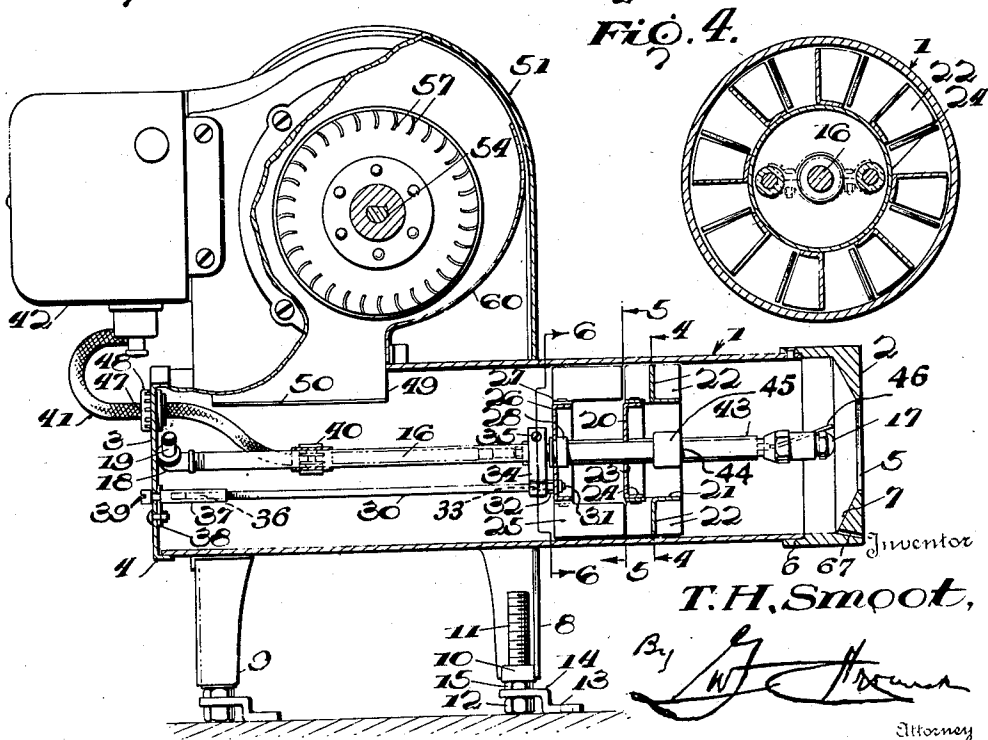
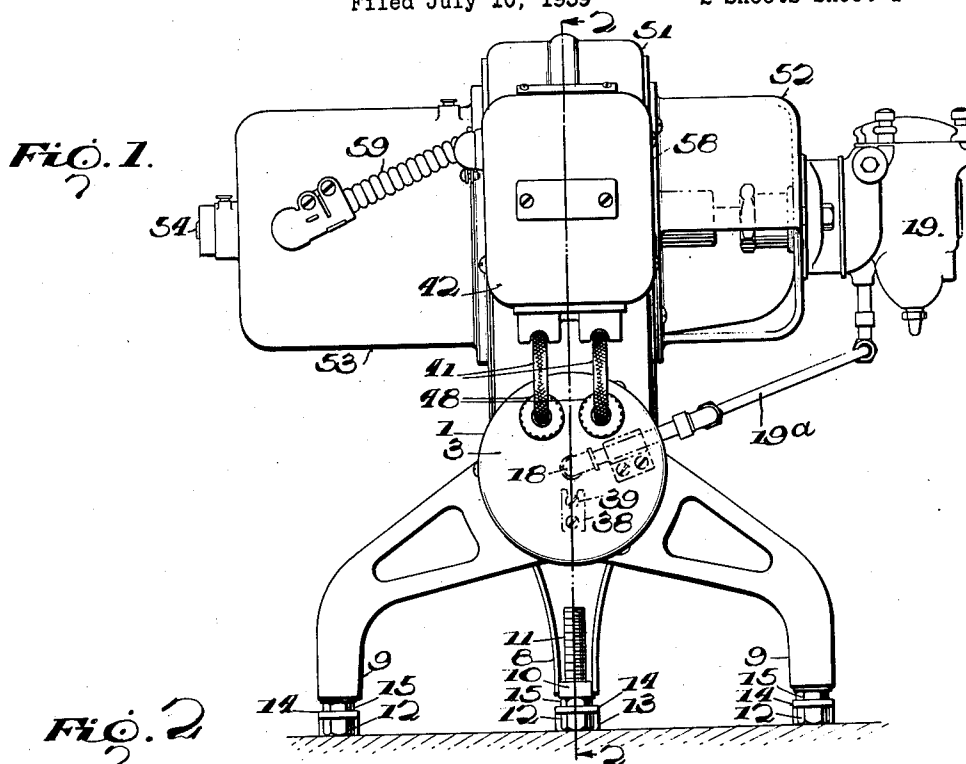
T. H. SMOOT

2,232,040

FLUID FUEL BURNER

Filed July 10, 1939

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

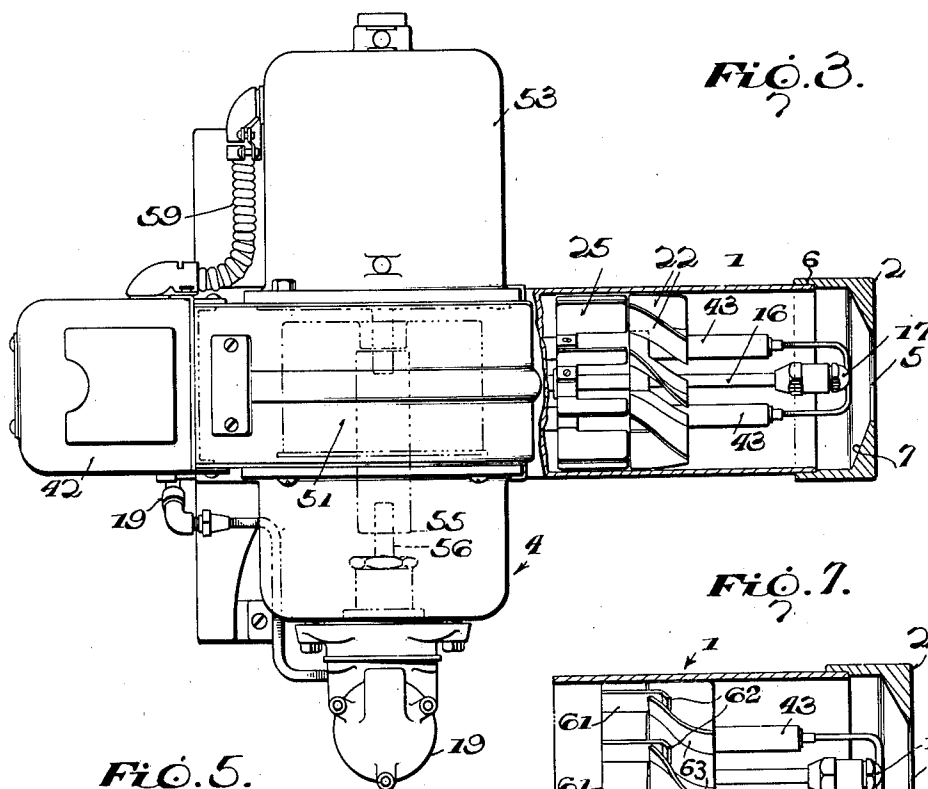


FIG. 7.

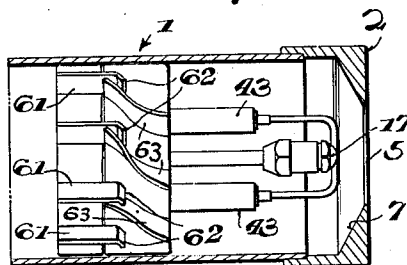
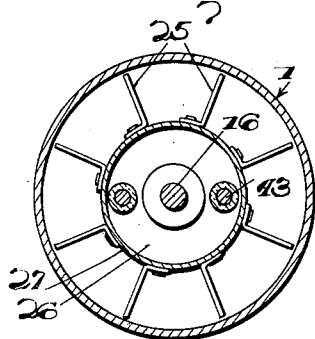


FIG. 5.



FiC.8.

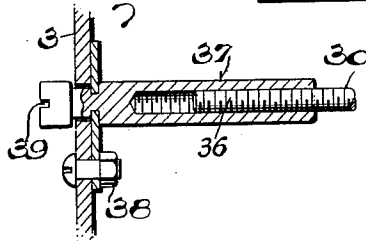
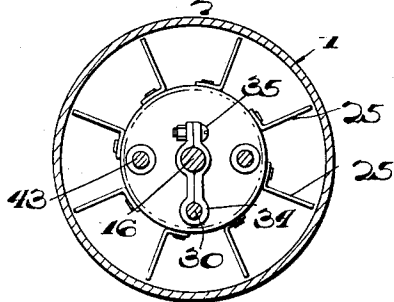


FIG. 6.



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UNITED STATES PATENT OFFICE

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FLUID FUEL BURNER

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9 Claims. (Cl. 158—76)

The invention relates to a fluid fuel burner.

An object of the invention is to provide a simple, practical and efficient oil burner equipped with an oil spray nozzle and with means for enveloping the oil spray in a helically discharged rotating envelop of air having sufficient turbulence for causing the fine misty oil spray and air to intimately commingle and thoroughly mix.

A further object of the invention is to provide an oil burner equipped with helical air directing passages and adapted to deliver air to the said passages under sufficient pressure and velocity to impart to the air the desired rotating motion for producing the necessary turbulence of flow for intimately mixing the air and oil spray.

It is also an object of the invention to provide means for varying the cross-sectional area of the helical passages, so that, when the feed of the fuel is reduced, the volume of air may be correspondingly reduced without reducing the velocity of the air passing through the helical passages, whereby the velocity of the air and the direction thereof may be maintained so that the air when free to pass through the helical passages will always be discharged with the force required to produce the desired rotary motion and turbulence for producing an intimate mixture of the oil spray and air.

A further object of the invention is to provide means operable exteriorly of the oil burner for adjusting the air controlling means substantially micrometrically from a full open position to a position in which the spiral air passages will be entirely closed.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings and pointed out in the claims hereto appended, it being understood that various changes in the form, proportions and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:

Figure 1 is an end elevation of an oil burner constructed in accordance with this invention.

Figure 2 is a longitudinal sectional view of the same partly in section, the section being taken on the line 2—2 of Figure 1.

Figure 3 is a plan view of the oil burner partly in section.

Figure 4 is a detail transverse sectional view taken substantially on the line 4—4 of Figure 2.

Figure 5 is a similar view taken on the line 5—5 of Figure 2.

Figure 6 is a detail sectional view taken on the line 6—6 of Figure 2.

Figure 7 is a detail horizontal sectional view illustrating another form of air regulator.

Figure 8 is an enlarged detail sectional view illustrating the means for adjusting the operating rod of the air regulator.

In the accompanying drawings in which is illustrated the preferred embodiment of the invention, the oil burner comprises in its construction a horizontally disposed cylindrical blast tube 1 provided at its front end with a nose 2 and having its rear end closed by a circular cap or cover 3 provided at its periphery with an annular flange 4 which is fitted over the rear end of the blast tube and detachably secured to the same by any suitable means which will permit the cover and the associated parts to be readily removed as a unit, as hereinafter explained.

The blast tube is constructed of any suitable material and the nose 2 which consists of a cylindrical section is preferably in the form of a casting provided at the front with an opening 5 and having at its inner end an interior annular recess 6 which receives the front end of the body portion of the blast tube, the nose being secured to the tube in any suitable manner.

The nose is provided with an annular surface 7 radially inclined to the axis of the tube, which extends from the cylindrical portion of the nose to the opening 5 forming an outwardly tapering outlet. The blast tube is supported by a front centrally arranged leg 8 and a pair of laterally spaced rear legs 9. The legs, which are suitably secured at their upper ends to the blast tube at the bottom and sides thereof, may be constructed of any suitable metal and the legs are approximately U-shaped in cross section. The front leg is substantially straight and vertical, while the rear legs are approximately L-shaped and have inclined upper portions and vertical lower portions. The upper portions extend downwardly and outwardly from the sides of the blast tube and space the lower vertical portions from each other.

Each leg is provided at its lower end with a threaded opening preferably formed by a nut 10 and receiving a vertical screw 11 having a head 12 at its lower end and passing through a leg clamp 13 and adapted to be adjusted to vary the length of the leg so that the blast tube may be readily leveled and set in a horizontal position.

The leg clamp 13 which is constructed of suitable metal is secured to the supporting surface and is provided with an approximately L-shaped arm or portion 14 through which the screw passes and which is engaged at its under side by the head 12 of the screw at its upper face by a jam nut 15 for locking the screw in its adjustment. The leg clamps may be secured to the supporting surface in any desired manner and the adjustment of the front and rear legs will enable the oil burner to be accurately positioned for use.

Within the blast tube is arranged a horizon-

tal fuel pipe 16 provided at its front end with a nozzle 17 and extending rearwardly from a point rearwardly spaced from the opening 5 to the rear portion of the blast tube and provided adjacent the cover 3 with an elbow 18 which connects the fuel pipe 16 with the pump line 19 of a centrifugal pump 19. The centrally arranged horizontal fuel pipe is supported within the blast tube by an air regulator comprising a fixed annular support 20, a cylindrical member 21, and an annular series of blades or vanes 22 having helicoidal surfaces. The circular support 20 consists of a disk having a central opening 23 to receive the fuel pipe 16 and an annular peripheral flange 24 arranged in spaced relation with the inner surface of the blast tube. The cylindrical member 21 is suitably secured at its rear end to the peripheral flange 24 of the circular support 20 and extends forwardly therefrom.

The blades 22 of the annular series extend radially from the cylindrical member 21 to the inner surface of the blast tube and are suitably secured at their inner longitudinal edges to the said member 21. These blades form helical passages for the air and the velocity of the air impinging against the helicoidal surfaces of the blades 22 imparts to the air a rotating motion, which will induce so much turbulence of flow that the fine misty oil spray and air are intimately mixed.

The size or cross-sectional area of the helical air passages is adjusted by means of an annular series of straight longitudinal blades 25, which are secured to a slidable support 26 of substantially the same construction as the fixed support 20 and consisting of a disk having a central opening to receive the fuel pipe and provided at its periphery with an annular flange 27 to which the straight longitudinal blades 25 are secured. The slidable support 26 is provided at its center with a hub 28 which is slidably mounted on the fuel pipe.

The slidable support 26 is connected to the front end 29 of an operating rod 30 by nuts 31 and 32 arranged on the front end of the rod, which is threaded for the reception of the said nuts. The nuts 31 and 32 clamp the front end of the operating rod to the slidable support and the rod 30 passes through an opening 33 in a guide 34 extending from the fuel pipe and provided with a clamp 35 for securing it to the same. The rear end 36 of the operating rod 30 is threaded and is engaged by an interiorly threaded adjustable thimble 37, which is mounted on the cover 3 and which is adapted to be rotated exteriorly of the cover for adjusting the longitudinal blades 25. The thimble 37 is swiveled to the cover 3 preferably by a detachable plate 38, and it is provided in its outer end with a groove 39 adapted to receive a screw driver or other tool for rotating the thimble, which provides substantially a micrometer adjustment for the air regulator. By adjusting the straight longitudinal blades forwardly and rearwardly, the cross-sectional area of the helical passages is varied without varying the configuration of the blades or vanes against which the air impinges, so that the adjustment of the air distributor will cause different volumes of air to pass through the air distributor at a uniform velocity and without any change in the direction of the air. By this means the air may be controlled to suit the adjustment of the fuel control, so that, when an adjustment is made to reduce the amount of fuel discharged by the nozzle, the volume of air simultaneously

discharged may be reduced without lessening the velocity of the air or causing any change in the direction of the discharged air, whereby the discharged air, whether the amount is the full capacity of the air regulator or a less amount, will be discharged with the same rotary motion and will envelop the oil spray and produce sufficient turbulence to cause an intimate mixture of the air and oil spray.

Mounted on the fuel tube at the rear portion thereof is a cable support 40, which is preferably in the form of a clamp and which receives cables 41 extending from a transformer 42 to right- and left-hand electrodes 43 located at opposite sides of the front portion of the fuel tube. The electrodes are supported by an electrode holder 44 mounted on the fuel tube and extending from opposite sides thereof and having side clamps 45 for holding the electrodes. Any suitable form of electrode holder may be employed, and the electrodes are provided with inclined terminals 46 extending upwardly and forwardly and spaced apart above the front end of the nozzle and adapted to produce sparks for igniting the fuel in the usual manner.

Cables 41 extend through the upper portion of the cover 3 at opposite sides thereof and are provided with insulating bushings 47 having heads at their inner ends and provided at their outer ends with clamping nuts 48 for drawing the heads of the bushings tightly into clamping engagement with the inner face of the cover 3, whereby the bushings and the cables are firmly supported on the cover 3. When the cover 3 is unfastened from the rear end of the blast tube, the fuel pipe, the air regulator, the electrodes and the associated parts may be removed as a unit and the said parts constitute a combustion unit which may be readily placed within the blast tube and removed therefrom. The blast tube 1 is provided at its rear portion with a top opening 49, into which extends the outlet 50 of a volute fan casing 51 mounted upon the rear portion of the blast tube and suitably secured to the same.

The pump 19 is located at one side of the fan casing and is connected therewith by means of a pump supporting bracket 52. Secured to the opposite side of the fan casing is an electric motor 53 having a motor shaft 54 extending into the fan casing and connected by a suitable coupling 55 with the shaft 56 of the pump 19. The coupling 55, which is preferably in the form of a cylindrical member or shaft section, has mounted on it a fan 57 which operates in the volute fan casing.

The pump bracket which is preferably in the form of a housing is open at the bottom and closed at the top and sides and is arranged over an inlet opening 58 formed in the upper portion of the side wall of the fan casing at the pump side of the same. The motor and the transformer are bolted or otherwise secured to the fan casing and the transformer is connected by a section 59 of Greenfield cable or other suitable means with the feed wires, not shown, for supplying the motor with electric current.

The fan casing 51 is provided at its lower portion with a curved cut-off plate 60 extending upwardly from the front end of the opening 49 in the top of the blast tube 1 and secured at its upper end to the upper portion of the fan casing adjacent the bottom of the inlet opening 58. The cut-off plate 60 gradually converges downwardly towards the fan and constricts the air passage leading to the outlet 50 of the fan, which is

adapted to supply to the blast tube air having the desired velocity and volume, and it is capable of maintaining a steady, uniform air pressure within the blast tube.

- 5 Referring now to Figure 7, adjustable air regulating blades 61 are provided at their front ends with angularly disposed terminal portions 62, which are arranged in substantial parallelism with helical surfaces of the blades 63 in each
10 adjustment of the longitudinal air regulating or controlling blades 61.

Various other forms of blade or air regulating or controlling element may be employed for varying the cross-sectional area of the air passages
15 for maintaining the velocity of the air without changing its direction when the volume of air is varied to correspond to changes or adjustments of the fuel feed.

The blast tube is provided at the bottom with
20 a drain opening 67, which may be formed in the nose 2 at the bottom thereof, as clearly illustrated in Figure 2 of the drawings, but it may be provided at any other desired point.

The burner of the present invention is not only
25 adapted for burning oil as a fuel, but gas or any other analogous or equivalent fluid fuel may be used.

What is claimed is:

1. In a fluid fuel burner, in combination, a blast
30 tube, a fuel pipe located within the blast tube and provided with a nozzle, and an air regulator including a series of blades having helicoidal surfaces defining a series of helical air passages surrounding the fuel pipe in rear of the nozzle for
35 imparting rotary motion to air passing through the blast tube, and means for varying the effective cross-sectional area of the helical passages to maintain the velocity and the direction of the air passing through the passages constant while
40 varying the volume of the air passing through the blast tube.

2. In a fluid fuel burner, in combination, a blast
tube provided at the front end with an opening and having an annular surface radially inclined
45 to the axis of the tube at the said opening forming a forwardly and inwardly tapered outlet, a fuel pipe located within the blast tube and provided with a nozzle spaced from the outlet of the blast tube, and an air regulator including a series of
50 blades having helicoidal surfaces defining an annular series of helical air passages surrounding the fuel pipe in rear of the nozzle for imparting rotary motion to air passing through the blast tube, and means for varying the effective cross-
55 sectional area of the passages to maintain the velocity and the direction of the air passing through the passages constant while varying the volume of air passing through the blast tube.

3. In a fluid fuel burner, in combination, a blast
60 tube, a fuel pipe located within the blast tube and provided with a nozzle, and an air regulator including an annular series of blades having helicoidal surfaces and arranged around the fuel pipe in spaced relation in rear of the nozzle and forming
65 helical air passages adapted to impart a rotary motion to air passing through the blast tube, and means for varying the effective cross-sectional area of the helical air passages to maintain the velocity of air passing through the helical pas-
70 sages constant while varying the volume thereof.

4. In a fluid fuel burner, in combination, a blast tube, a fuel pipe located within the blast tube and

provided with a nozzle, and an air regulator including a series of blades having helicoidal surfaces and arranged around the fuel pipe in spaced relation in rear of the nozzle and forming helical
5 air passages adapted to give a rotary motion to air passing through the blast tube, and blades movable across the helical air passages for varying the effective cross-sectional area of the same to maintain the velocity of air passing through
10 the helical passages constant while varying the volume thereof.

5. In a fluid fuel burner, in combination, a blast tube, a fuel pipe located within the blast tube and provided with a nozzle, and an air regulator including an annular series of blades having helicoidal surfaces and arranged around the fuel pipe in spaced relation in rear of the nozzle and forming
15 helical air passages adapted to give a rotary motion to air passing through the blast tube, and longitudinally slidable blades movable across the air passages for varying the effective cross-sectional area of the same.

6. In a fluid fuel burner, in combination, a blast tube, a fuel pipe located within the blast tube and provided with a nozzle, and an air regulator including a series of blades having helicoidal surfaces and arranged around the fuel pipe in spaced relation in rear of the nozzle and forming helical
25 air passages adapted to give a rotary motion to air passing through the blast tube, longitudinally slidable blades movable across the air passages for varying the effective cross-sectional area of the same, an operating rod having a threaded rear end, means for connecting the front end of the rod with the slidable blades, and a rotary thimble
30 having a threaded engagement with the rear end of the rod for adjusting the slidable blades.

7. In a fluid fuel burner, in combination, a blast tube, a fuel pipe located within the blast tube and provided with a nozzle, and an air regulator including a fixed circular support surrounding the
40 fuel pipe, an annular series of blades having helicoidal surfaces carried by said support and forming helical air passages adapted to impart rotary movement to air passing through the blast tube, and adjustable blades movable across said air
45 passages for varying the effective cross-sectional area of the same.

8. In a fluid fuel burner, in combination, a blast tube, a fuel pipe located within the blast tube and provided with a nozzle, and an air regulator including a fixed support, a series of blades having
50 helicoidal surfaces mounted on the fixed support and forming helical air passages around the fuel pipe, a slidable support surrounding the fuel pipe, and longitudinally slidable blades mounted on the slidable support and arranged to move across said
55 helical air passages to vary the effective cross-sectional area of the same.

9. In a fluid fuel burner, a blast tube, a fuel
60 pipe located within the blast tube and provided with a nozzle, and an air regulator including a series of fixed blades having surfaces defining a series of air passages extending generally in the direction of a helix having a central axis coincident with the axis of the tube, said passages imparting a swirling motion to air passing through
65 the blast tube, means for varying the effective cross-sectional area of the helical passages, and means extending through a wall of the blast tube
70 for adjusting said varying means.

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