Nov. 21, 1950 J. M. CARROLL 2,531,027

OIL BURNER

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FIG. 1.

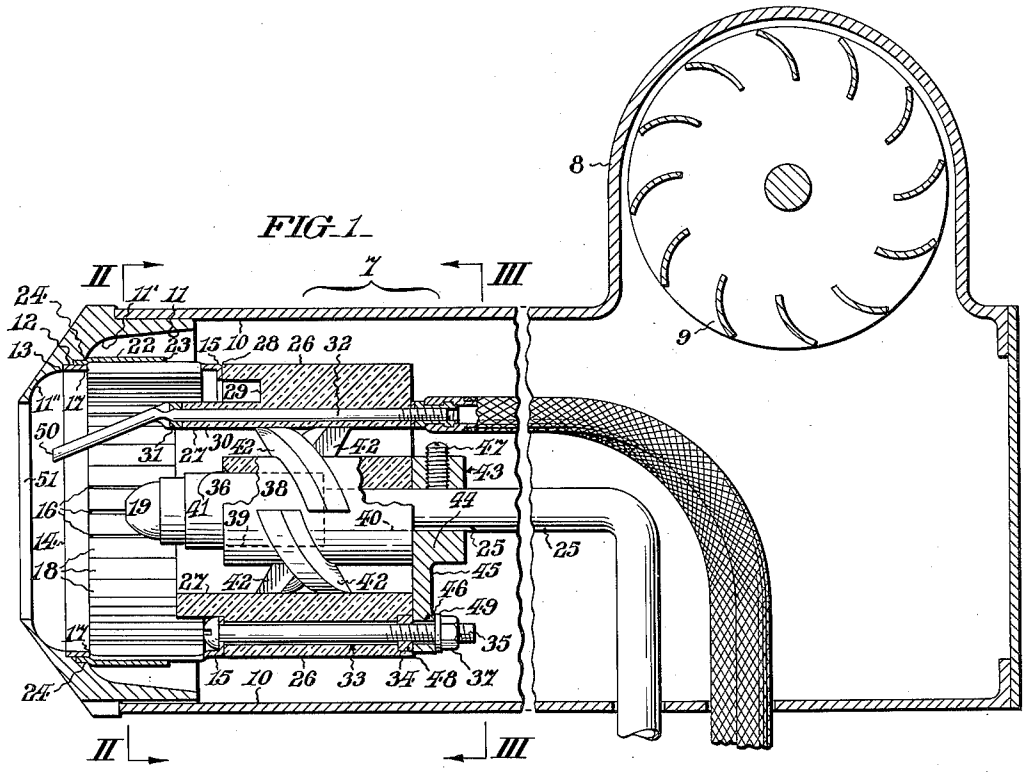
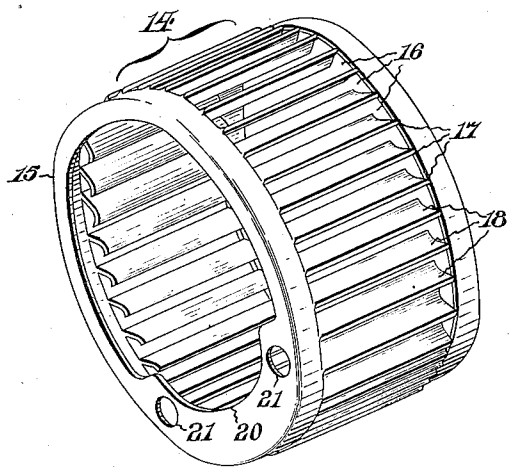


FIG. 4.



WITNESSES

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FIG. 2.

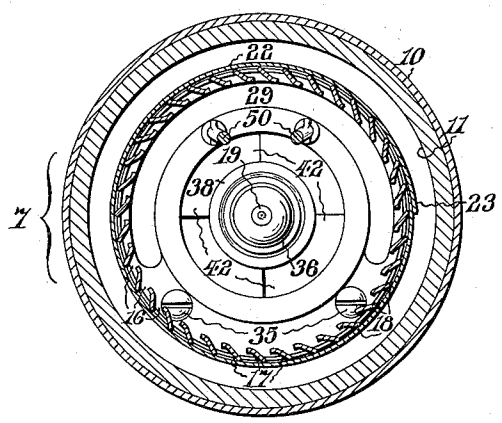


FIG. 3.

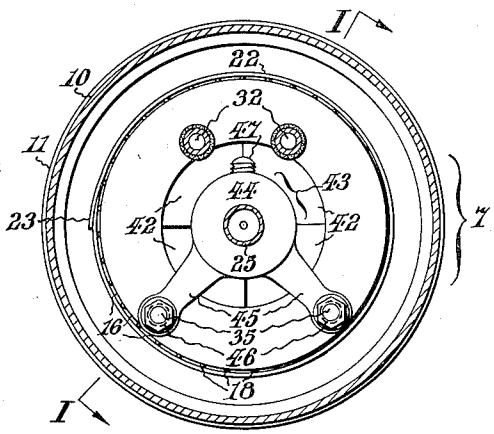


FIG. 5.

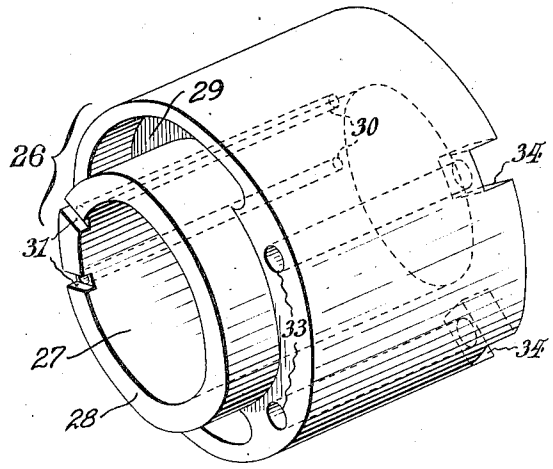
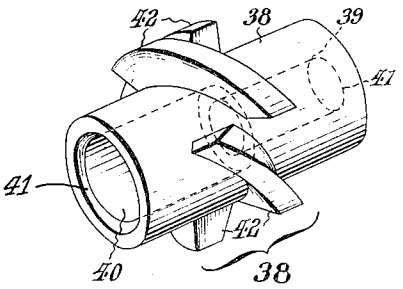


FIG. 6.



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UNITED STATES PATENT OFFICE

2,531,027

OIL BURNER

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Application December 17, 1947, Serial No. 792,282

7 Claims. (Cl. 158—1.5)

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This invention has general reference to oil, gas, powdered coal, and other burners and more particularly relates to the type or form of burner shown and described in a prior application filed by Thomas W. Murphy under Serial No. 650,859 on February 28, 1946, now Patent 2,505,336, April 25, 1950, which burner includes electric ignition and air stabilizing means, the latter being intended to improve and insure more efficient combustion of the fuel.

Difficulty has, however, been experienced in the prevention of undesirable spark jump in burners of the type referred to and it is a primary object of the present improvements to effectively overcome such disadvantage.

Another object of this invention is to improve the guiding means for the air so as to positively obtain uniformity of the air stream or streams as well as to direct the same relative to the oil spray so that the possibility of asymmetry in the flame is, to all practical intent, eliminated.

Other objects with ancillary advantages of this invention, will hereinafter appear or be specifically referred to, and said invention accordingly comprises the features of construction, combination and arrangement of parts hereinafter disclosed and illustrated by the accompanying two sheets of drawings; wherein:

Fig. 1 is a broken longitudinal section through a high or low pressure type oil burner, for example, embodying the improvements of this invention, said section being taken approximately as indicated by the arrows I—I in Fig. 3.

Fig. 2 is a cross-section of the burner taken on the plane designated by the arrows II—II in Fig. 1.

Fig. 3 is a similar cross-section on the plane III—III in Fig. 1.

Fig. 4, sheet 1, is a perspective view of an air stabilizing device hereinafter fully described.

Fig. 5 is a perspective view of the support for the stabilizing device made in accordance with my present improvements; and,

Fig. 6 is a perspective view of a novel type of air-whirling device forming a part of this invention.

In describing the form of this invention exemplified by the accompanying drawings, specific terms will be employed for the sake of clarity, but it is to be understood the scope of said invention is not thereby limited; each such term being intended to embrace all equivalents which perform the same function for an analogous purpose.

Referring more in detail to the drawings a

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typical oil burner is comprehensively designated by the reference character 7, said burner having an offset 8 housing a blower fan 9 for the supply of air to support combustion. The blast tube 10 preferably has a conical choke ring 11 attached to its outer end. In accordance with my present improvements the choke-ring 11 includes aligned bores 11' and 11'' with an intervening counterbore 12 for concentric securement therein of the plain end 13 of a squirrel-cage air stabilizer 14 of novel formation. This stabilizer 14, as best understood from Figs. 1 and 4, is preferably made of thin steel tubing to include, in addition to the plain end 13, a main body portion having the wall lengthwise slit at intervals, between said plain end 13 and the opposing inwardly-flanged end 15, for provision of lengthwise slots 16 with the intervening strips 17 forced inwards to define tangentially-pitched curvilinear-section blades 18 effective to direct the air passing inwardly to and around the oil spray nozzle 19 with a swirling motion. Attention is here directed to the provision of the squirrel-cage stabilizer inturned flange 15 with a segmental portion 20 of greater width than the remainder, and that said portion 20 is formed with spaced holes 21; and that the blades 18 preferably project inwardly and outwardly of the body portion wall.

Frictionally gripping the squirrel-cage air stabilizer 14 is an annular spring steel split band or controller 22 of determinate width with the ends over-lapped at 23; said controller having one edge slightly rolled inwards at 24, see Fig. 1, in order to close in the outer portion of the stabilizer slots 16 and also to positively ensure snug grippage of said controller 22 around the blades 18, as readily understood by those conversant with the related arts. Obviously the width of the controller 22 may be such as to cover a greater portion of the blades 18 when desirable or necessary or the output volume of the fan 9 be too low; in other words, the width of the controller 22 may be varied to accommodate such adjustment or interchange.

Referring again to the nozzle 19 the same is conventionally attached to the fuel supply pipe 25 and said parts jointly afford bearing for an annular-section body 26, see Fig. 5 to best advantage. This body 26 is preferably made of plastic earth, porcelain or other suitable insulating material to include an axial bore 27, a diametrically reduced end 28 with a concentrically-related segmental recess or groove 29 and, in addition, spaced longitudinal holes 30 having radial notches 31 at one end for the passage of electrode wires 32; and opposing similarly directed borings 33 with

end grooves 34 for the passage of clamp bolts 35, later on herein again referred to.

Slidable into the bore 27 of the body 26 and engageable on the jet nozzle body portion 36 and the connected portion of the supply line 25, is an interrupted air whirling device 38 likewise formed of the same material as the annular-section body 26. The device 38 as best understood from Figs. 2 and 6 is of sleeve-like formation including a stepped bore 39, 40 and the former part 39 being snugly engageable on the nozzle body portion 36 and the latter part 40 correspondingly fitting the oil supply pipe 25, while the outer end of the bore 39 may be slightly flared at 41, Figs. 1 and 6. It is also observable that the air whirling device 38 embodies four or more segments 42 of frustum cross-section and preferably wider at the root than at the periphery. In other words and as viewed in Fig. 2, the four or more segments 42 constitute spaced convolutions inclined at an angle of approximately sixty-degrees relative to the horizontal.

After the parts 25, 38 and 26 have been coaxially assembled, and in order to secure them together I, preferably, employ a spider device 43, see Figs. 1 and 3, said spider device embodying an attaching section 44 with radially directed arms 45 preferably including an angle of ninety-degrees and having apertures 46 through the free ends spaced for registration with the bores 33 in the insulator head 26, and securement, against relative disalignment, by aid of a set-screw 47 threadedly engaged through the section 44, in an obvious manner. Clamp bolts 35 are now passed into the air-stabilizer segmental portion holes 21, through the insulator body bores 33 for screw-threaded engagement by spacer nuts 48 inset in the insulating material body end grooves 34, and free passage through the spider-arm apertures 46 for reception of lock washers 49 and nuts 37, whereby the several parts aforesaid are rigidly secured together in cooperative assembly.

Having described the structural features of my invention it will be readily apparent that with the electrode terminals deflected convergingly inwards, as indicated at 50 in Figs. 1 and 2, toward the axis of the fuel oil stream discharging from the nozzle 19, and by mounting said electrode terminals through the insulating material body 26, with the axially related device 26; and the surrounding squirrel-cage air stabilizing device 14, being located as shown, there will be set-up, in the forward portion of the burner blast-tube 10, an outer annular column of air directed inwardly through the slots 16 of said stabilizing device with incidental swirling flow. The concentrically related air whirling device 38 effectively and properly controls the low pressure or vacuum area created by the device 14, and thereby enables thorough mixing of the whirling air flows with the fuel sprayed from the nozzle 19, whereupon the resultant mixture is ignited by the electric current spark across the electrode terminals 50. In other words, low pressure air is delivered, as in most high or low pressure type oil burners, by the blower fan 9 into the blast tube 10 for passage into the air stabilizer 14, as well as in a generally helical or whirling column through the bore 27 of the insulator body 26, with restricted discharge through the outlet opening 51 of the conical choke ring 11. It is to be further noted that the segments 42 of the air whirling device 38 may, obviously, be pitched to effect a right-hand or a left-hand annular flow of air through the bore 27 of the body 26, as deemed expedient or desirable.

From the foregoing it is felt the merits and advantages of my invention will be clearly understood by those conversant with the art; while it is equally apparent the position of the electrodes 32, or in fact their use, is not limitative, inasmuch as other means such as gas or hand firing may be employed.

While my invention has been described more or less in detail, it is obvious that changes will suggest themselves in adapting said invention to other than the specific usage set forth, or which employ gas, powdered coal, etc., instead of oil but all such changes are contemplated as fall within the terms and scope of the following claims.

Having thus described my invention, I claim:

1. In a fuel burner, a blast tube, means for driving combustion supporting air downstream through said blast tube, a fuel feed nozzle in said blast tube, a fuel feed conduit connected to said fuel feed nozzle, an outer air stabilizer having vanes disposed in surrounding relation to said nozzle with substantially unobstructed free space therebetween, said vanes being disposed longitudinally in said blast tube each extending at least partially upstream in said blast tube of said nozzle and constructed to direct air inwardly through said stabilizer, and inner air whirling sleeve on said fuel feed conduit, and a plurality of air whirling segments angularly attached to said air whirling sleeve wholly upstream of said nozzle to impart whirling motion to the inner air around said nozzle.

2. In a fuel burner, a blast tube, means for driving a stream of combustion supporting air axially therethrough, a fuel feed nozzle axially disposed in said blast tube, a fuel feed conduit connected to said fuel feed nozzle, an outer air stabilizer having vanes disposed annularly in said blast tube in surrounding relation to said fuel feed nozzle with substantially unobstructed free space therebetween, said air stabilizer vanes each extending at least partially upstream of said nozzle in said blast tube, a sleeve of insulating material constructed to interfit with the fuel feed nozzle and with the fuel conduit, and an air whirling element in the form of a plurality of convoluted segments of insulating material arranged in an interrupted helical configuration on said sleeve, said convoluted segments being constructed of insulating material and positioned upstream of said nozzle on said sleeve.

3. In a fuel burner, a blast tube, means for driving a stream of combustion supporting air axially therethrough, a fuel feed nozzle axially disposed in said blast tube, a fuel feed conduit connected to said fuel feed nozzle, a squirrel-cage outer air stabilizer disposed annularly in said blast tube in surrounding relation to said fuel feed nozzle with substantially unobstructed free space therebetween upstream of said nozzle, said air stabilizer having longitudinal vanes each extending at least partially upstream of said nozzle and constructed to direct air from outer portions of the blast tube in whirling motion inwardly toward said nozzle, and an inner air whirling sleeve of insulating material axially supported on said fuel supply conduit upstream in the blast tube of said fuel feed nozzle, said air whirling sleeve having a plurality of angularly disposed air whirling elements of insulating material constructed to whirl the inner air of the blast tube in a helical annular inner column across the stream of outer air from the air stabilizer, con-

tacting said stream of outer air at a point upstream of said nozzle.

4. In a fuel burner, a blast tube, means for driving a stream of combustion supporting air axially therethrough, a fuel feed nozzle in said blast tube, a fuel feed conduit connected to said fuel feed nozzle, an outer air stabilizer having vanes disposed in surrounding relation to said nozzle, said vanes being disposed longitudinally in said blast tube each extending at least partially upstream of said nozzle and constructed to direct air inwardly through said stabilizer, a tube of insulating material supported by the fuel burner in aligned extension of the air stabilizer and terminating upstream of said nozzle to provide substantially unobstructed free space between said stabilizer and said nozzle, an inner air whirling sleeve in the bore of said tube, and a plurality of air whirling segments angularly attached to said air whirling sleeve wholly upstream of said nozzle.

5. In a fuel burner, a blast tube, means for driving combustion supporting air therethrough, a fuel feed nozzle axially disposed in said blast tube, a fuel supply pipe connected to said fuel feed nozzle, a choke-ring at the nozzle end of said blast tube, said choke-ring having the form of an annulus including aligned bores of different cross-sectional area with an intervening counterbored seat, an air stabilizing means having its outer end seated in said counterbored seat and having a plurality of elongated slots through its wall with spaced blades effective to annularly whirl the entering air, an insulating material hollow body supported by the fuel burner in aligned extension of the air stabilizing means, interrupted helical means of insulating material in the bore of said hollow body effective to divert a part of the combustion supporting air with whirling annular flow intersectingly through the air whirling in the air stabilizing means, and means adapted to limit the flow of air into the stabilizing means.

6. In a fuel burner, a blast tube, means for driving combustion-supporting air therethrough, a fuel feed nozzle axially disposed in said blast tube, a fuel supply pipe connected to said fuel feed nozzle, a choke-ring at the nozzle end of said blast tube, air stabilizing means seated in the choke-ring, said air stabilizing means being in the form of a squirrel-cage having one end plain and the other end inwardly flanged to provide a relatively wider segmental portion, the main body of said air stabilizing means being slitted lengthwise to define elongated openings with

tangentially-pitched curvilinear-section blades projecting inwardly therethrough, said spaced blades being effective to annularly whirl the entering air, an insulating material hollow body supported by the fuel burner in aligned extension of the air stabilizing means, interrupted helical means of insulating material in the bore of said hollow body effective to divert a part of the combustion supporting air with whirling annular flow intersectingly through the air whirling in the stabilizing means, and means adapted to limit the flow of air into the stabilizing means.

7. In a fuel burner, a blast tube, means for driving combustion supporting air through said blast tube, a fuel feed nozzle axially disposed in said blast tube, a fuel supply pipe connected to said fuel feed nozzle, a choke-ring at the nozzle end of said blast tube, an air stabilizing means comprising an annular wall seated in the choke-ring and having elongated slots through said wall with spaced blades effective to annularly whirl the entering air, an annular body of insulating material supported by the fuel burner in aligned extension of the air stabilizing means, interrupted helical means in the bore of a hollow body, said sleeve-like structure supporting said helical means, said helical means comprising convoluted segments of trapezoidal cross section having sides inclined at an angle of approximately sixty degrees relative to the horizontal and being effective to divert a part of the combustion supporting air with helical annular flow intersectingly through the air whirling in the stabilizing means, and means adapted to limit the flow of air into the stabilizing means.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,953,483	Higinbotham	Apr. 3, 1934
1,990,088	Noe	Feb. 7, 1935
2,066,806	Smith et al.	Jan. 5, 1937
2,120,387	Bargeboer	June 14, 1938
2,156,121	Macrae	Apr. 25, 1939
2,163,915	Reif et al.	June 27, 1939
2,181,527	Vollmer	Nov. 28, 1939
2,262,525	DeLancey	Nov. 28, 1941
2,308,439	Carroll	Jan. 12, 1943
2,458,372	Grimmeisen	Jan. 4, 1949
2,473,347	Sanborn	June 14, 1949