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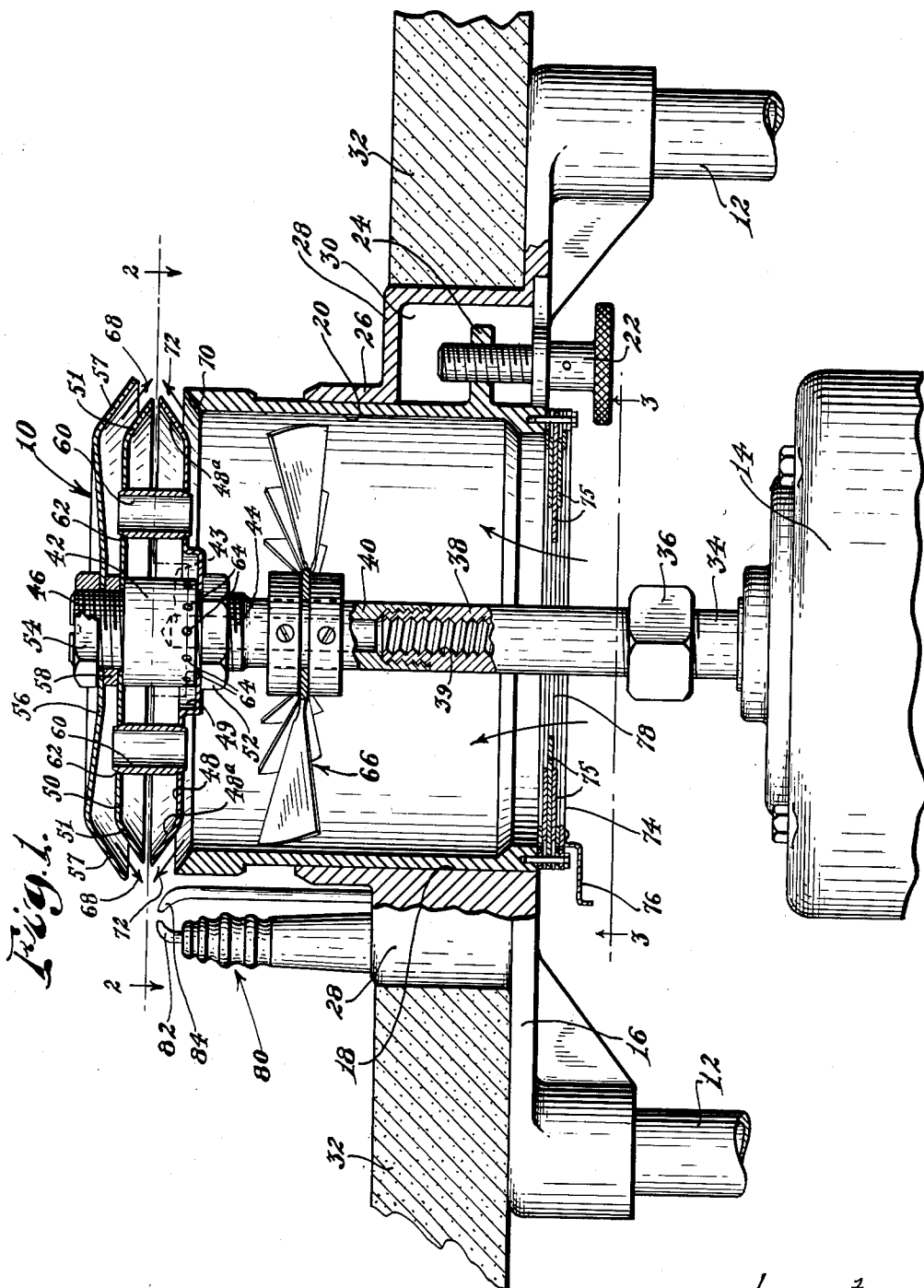
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ROTARY OIL BURNERS

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2 Sheets-Sheet 1



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Fig. 2.

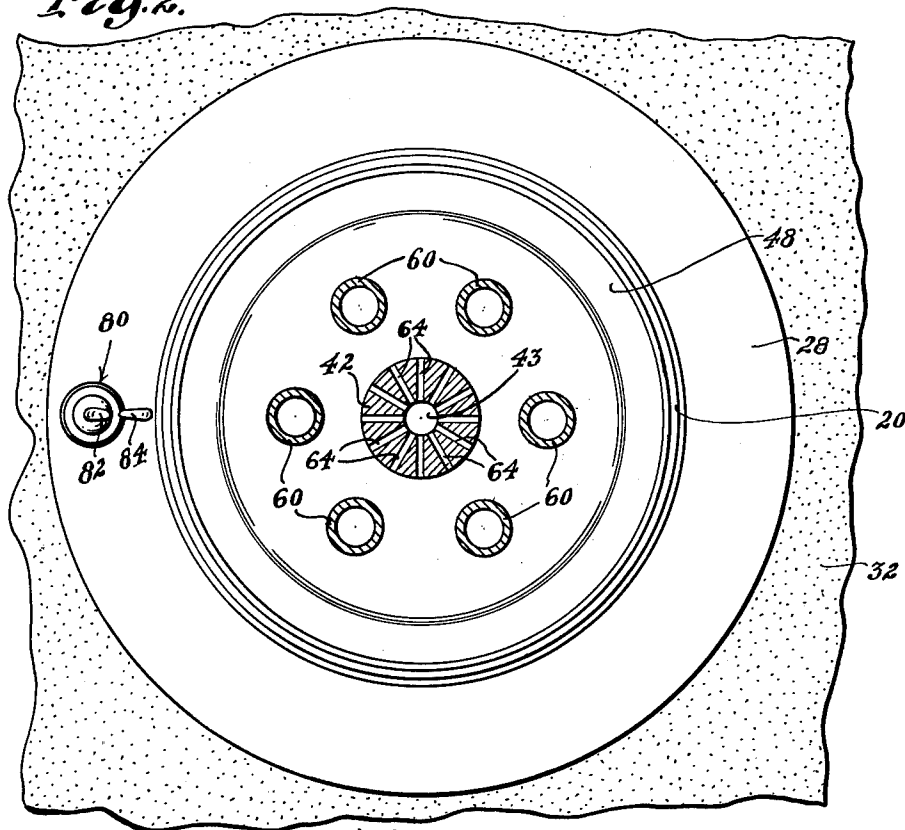
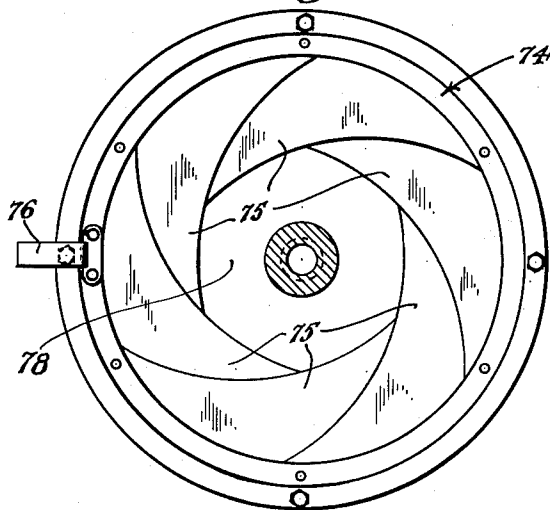


Fig. 3.



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ROTARY OIL BURNERS

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This invention relates to improvements in rotary type oil burners. It relates more particularly to improvements in the rotary heads of such burners whereby oil supplied to the rotating heads is more efficiently and effectively delivered substantially undiluted from the head to an annular region of combustion at which substantially improved combustion is attained with a resulting substantial reduction of carbon deposits on the burner head and interiorly of the heater in which the burner operates.

Oil burners of the general type to which the invention relates customarily have a rotary head comprising a pair of dished plates or disks fixed in spaced relation on the end of a hollow shaft through which oil delivers between the plates or disks and is discharged between the spaced peripheral lips of the disks due to the combined action of centrifugal force and air pressure. The oil becomes atomized and/or vaporized as it moves outward between the hot plates or disks and the mixture of discharged oil and air is ignited exteriorly of the head where additional air is supplied to aid combustion. Usually this additional air is a forced annular stream, or two intersecting streams, directed across the path of the discharging mixture of oil and air.

The more efficient varieties of rotary oil burners heretofore available have been only passably efficient when operating conditions have been most favorable, such as when relatively low viscosity No. 2 oil has been used. None of the prior rotary oil burners, so far as we are aware, has been capable of handling the heavier oils, such as No. 6 oil, for example.

We have discovered that the efficiency of rotary oil burners is notably increased when the atomized and/or vaporized oil is discharged from the rotary head in a substantially undiluted condition. In other words, it has been discovered that the prior pre-mixing of oil and air within the rotary head, instead of aiding ignition and combustion exteriorly of the head, actually has been the cause of failures of ignition means to ignite the fuel and in sluggishness in the extension of a flame around the full circle of discharge of fuel from the rotating head. But, perhaps more important, we have discovered that the heretofore accepted practice of pre-mixing of the oil with air within the head is in large measure responsible for the prevalent carbon deposits which relatively quickly build up on burner parts and on heater surfaces.

Experiments and actual experience have demonstrated that oil which is atomized and/or vaporized within the rotary head of an oil burner in absence of introduced air, and which is discharged in a substantially undiluted state, ignites readily and quickly at an exterior region of substantial addition of air for combustion, and a flame at one point of ignition rapidly spreads around the entire circle of the burner head. We have found this to be true regardless of the viscosity of the oil so long as it can be flowed to the burner head in a continuous stream. For example, No. 2 oil and No. 6 oil appear to ignite and burn equally well when discharged in substantially

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undiluted state from a rotary oil burner head as herein disclosed. But the efficiency of the combustion of the substantially undiluted discharge from a burner head as herein described is so relatively high that substantially no carbon deposits form interiorly of the heater, and from 200° to 500° greater heat production is attained with less oil consumption, as compared with the more efficient types of prior comparable rotary oil burners.

It is, therefore, among the objects of our invention to provide a rotary oil burner wherein substantially all of the air from combustion is supplied exteriorly of the burner head at an annular region to which substantially undiluted oil delivers in an atomized and/or vaporized condition.

Another object is to provide a rotary oil burner without whose head oil is atomized and/or vaporized without air being introduced into the atomizing portion of the head, and is discharged from the head substantially undiluted into the region of intersection of two annular forced streams of air which are directed across each other following passage in cooling relation to the rotating head. According to the invention, the oil is atomized and/or vaporized between two rotating plates or disks, and air is forced in multiple confined streams through the plates or disks without contacting the oil, and the streams of air combine and discharge annularly as one of the said intersecting forced streams, while the other intersecting forced stream issues from a region of bathing contact with exterior surfaces of one of said plates or disks.

Yet another object of our invention is to provide a rotary oil burner wherein relatively light oils and relatively heavy oils may be similarly atomized and/or vaporized within a rotating head, with absence of introduced air, and be discharged from the head in a substantially undiluted state to an annular region of combustion at which forced streams of air supply the oxygen for combustion. The invention, for the first time, so far as we are aware, makes it possible and efficiently practical to burn heavy oils as well as light oils in rotary oil burners, and combustion is substantially more efficient, regardless of the initial viscosity of the oil, as compared with the efficiency of prior comparable oil burners when burning relatively light, low viscosity oils.

Still another object is to provide a rotary oil burner wherein oil of substantially different viscosities may be atomized and/or vaporized within a rotary head from which streams of air for cooling the head are excluded, whereby substantially undiluted oil discharges from the head into intersecting streams of air whose total volume and relative volumes, may be selectively varied to suit particular conditions. According to the invention, a fan or blower draws air into a passage whose entrance is manually adjustable to control the volume of air passing into the passage, and some of the air entering the passage is driven through multiple tubes from one side to the other of the head and thence downwardly and outwardly as one of said intersecting streams of air, the balance of the air entering said passage being driven upwardly and outwardly through an adjustable annular opening and constituting the other of said intersecting streams of air.

It is, moreover, our purpose and object generally to improve the structure and operative efficiency of oil burners, and especially rotary head types of oil burners.

In the accompanying drawings:

Fig. 1 is a cross-sectional view, with some parts in elevation, of the upper portion of a rotary oil burner embodying features of our invention;

Fig. 2 is a plan view, in cross-section on line 2—2 of Fig. 1; and

Fig. 3 is a bottom plan view with the shaft in cross-section on line 3—3 of Fig. 1.

Referring to the drawings, our improved rotary oil burner head, indicated generally at 10, may be supported in any conventional manner such as by the legs or posts 12 extending down to a floor or the like, with an electric motor 14 mounted on and between the legs 12, usually with provision for adjustment of the motor vertically along the legs. Also, it is customary to provide for independent adjustment of the lengths of legs 12 in order to be able to set the axis of the rotary burner in a vertical position when the floor on which the legs are resting is uneven.

Legs 12, at their upper ends carry a generally horizontally disposed annular platform 16 which has a relatively large central opening 18 therein within which a sleeve 20 is vertically adjustable by means of an adjusting screw 22 which is rotatably fixed on platform 16 and which threadedly engages a projecting ear 24 on sleeve 20. The platform 16 has an upstanding annular flange portion 26 closely surrounding sleeve 20, and the flange has an annular enlargement 28 thereon, a hollow portion 30 of which accommodates the adjusting screw 22 and ear 24. Inner portions of refractory floor elements 32 of the heater ordinarily rest on the platform 16 outward of and all around the flange enlargement 28.

The vertically disposed motor shaft 34 is driven in a conventional manner by the electric motor 14, and is of conventional hollow construction for passage of oil upward therethrough from any suitable supply of oil connected to the lower end of motor shaft 34. The rotary oil burner head 10 is mounted on an extension of motor shaft 34, for rotation with the motor shaft.

All of the structure thus far described is more or less conventional in rotary oil burners.

Our present invention provides improvements in the rotary head of the oil burner, and certain novel combinations of features therewith, which produce definitely new and beneficial results as compared with prior rotary oil burner structures and procedures.

The hollow motor shaft 34 has its upper end connected at 36 to a hollow extension shaft 38 which in turn is connected to the hollow shaft 40 on which the elements of the rotary head of the burner are rigidly mounted.

The upper end portion of shaft 40 has the cylindrical enlargement 42 thereon, and has two threaded portions 44, 46 of smaller diameter at opposite sides of enlargement 42. Two dished plates or disks 48, 50 are arranged respectively on the threaded portions 44, 46 and are rigidly secured against opposite ends of enlargement 42. Lower plate 48 is shown secured by nut 52. Upper plate 50 is secured by nut 54, with a third dished plate 56 and spacing collar 58 intervening between enlargement 42 and the nut 54.

However, according to the invention, a series of tubular passages extend across the space between the plates 48, 50 and these, preferably, are provided by relatively short rigid tubes 60 which conveniently are assembled in the plates 48, 50 prior to securing of upper plate 50 against the enlargement 42. As represented, the opposite ends of the short tubes 60 are exteriorly tapered for entering holes 62 in the plates 48, 50. The holes 62 are slightly smaller in diameter than the exterior diameter of the tubes so that the tapered end portions of the tubes become tightly gripped as the plates are pressed toward each other on the opposite tapered ends of the tubes, and the tubes plug the holes against any appreciable passage of air therethrough around the tubes. The subsequent securing of the upper plate 50 against enlargement 42 of shaft 40 produces a rigid rotor structure having substantial tubular passages extending across the space between the plates 48, 50.

In the illustrated embodiment of the invention, the lower dished plate 48 is formed with the relatively shallow cup portion 49 surrounding the lower portion of the

enlargement 42, and the tubes 60 are located outward of the cup 49.

The hollow or bore of shaft 40 extends into and terminates within the enlargement 42 of the shaft, as at 43, and a series of relatively small passages 64 extend radially through the enlargement 42, as best seen in Fig. 2, from the hollow or bore 43 thereof, and at an elevation preferably within the walls of cup portion 49 of plate 48.

The third dished plate 56 is spaced above the plate 50 and becomes clamped between nut 54 and spacing collar 58 simultaneously with the clamping of plate 50 against enlargement 42 of shaft 40.

Air is drawn into adjustable sleeve 20 through the lower end of the sleeve by a suitable fan or blower 66 mounted on shaft 40, and the fan propels the air upwardly within sleeve 20 toward the rotary head 10. A substantial amount of the propelled air passes through the short tubes 60 which deliver into the space between the plates 50, 56 whence the air discharges outwardly and downwardly between the parallel peripheral margins 51, 57 of disks 50, 56, respectively, as indicated by the arrows at 68 in Fig. 1. Another substantial amount of the air propelled upwardly by fan 66 discharges outwardly and upwardly between the inclined peripheral margin 48a of lower plate 48 and the generally parallel bevelled top surface 70 of adjustable sleeve 20, as indicated by the arrows at 72 in Fig. 1. Each of the discharging streams of air is a substantial annular forced stream, and the two streams intersect each other outward of the peripheral lips of the plates 48, 50.

The volume of air entering adjustable sleeve 20 may be regulated to suit particular operating conditions by any suitable valve means at the entrance end of the sleeve. A manually operable shutter-type of valve, indicated generally at 74, is herein represented on the lower entrance end of sleeve 20, with an actuating handle 76 by which the shutter elements 75 may be operated to reduce or increase the size of the passage at 78 through the valve. The amount of air discharging between the top surface 70 of sleeve 20 and the peripheral margin 48a of lower plate 48 may be varied by raising or lowering sleeve 20.

Inasmuch as it is intended that the oil burner apparatus herein illustrated and described shall burn relatively heavy oils as well as the lighter oils, it is recommended that the hollow shafts through which the oil is conducted to the rotary head 10, or any desired portion thereof, be provided with means, such as the interior threads 39 in the extension shaft 38, for inducing or aiding the upward travel of oil within the shafts and especially the heavier and more viscous oils. A similar result may be attained by inserting a closely coiled spring within the hollow of any one or more of the shafts 34, 38, 40.

According to the invention, the oil is conducted upward through the shafts 34, 38, 40 and delivers between the plates or disks 48, 50, through the radial passages 64 in the enlargement 42 of shaft 40, preferably delivering within the cup portion 49 of the lower plate or disk 48, whence the oil is carried outward on and between the plates 48, 50 by centrifugal force as the head 10 rotates at relatively high speed. However, atomization and/or vaporization of the oil occurs between the plates 48, 50 without introduction of air between the plates and without the conventional pre-mixing of oil and air within the rotating head. A substantial volume of air is propelled in cooling relation to the elements of the rotating head, but none of this air gets into the space between plates 48, 50 where atomization and/or vaporization of the oil occurs. Hence, substantially undiluted oil delivers outward between plates 48, 50 to the slightly spaced peripheral lips thereof and discharges between the lips substantially in a horizontal plane with a further atomizing action due to the centrifugal discharge of the oil annularly all around the rotating head. The air tubes 60 aid in the atomizing process between plates 48, 50. Also, the discharging oil is thrown directly into the region of inter-

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section of the two forced annular streams of air discharging from the head at and in the general direction of the arrows 68, 72 in Fig. 1, which accomplishes further atomization of the oil as well as supplying the air which supports efficient combustion when the mixture is ignited by any suitable means, such as the electrical means 80 for producing a spark across the gap between the electrodes 82, 84 at a location at or close to the region of mixing of oil and air.

As earlier pointed out herein, our improved rotary oil burner is notably more efficient and more economical to operate than any prior rotary oil burner of which we are aware, due primarily, it is believed, to avoidance of the conventional pre-mixing of oil and air within the rotating head and the resulting discharge of substantially undiluted oil to the region of ignition and addition of air. Also, the provision for ready adjustment and regulation of the volume of air entering within the sleeve 20, and for ready adjustment and regulation of the intersecting annular air streams, particularly the lower stream, permits a greater sensitivity of control of the flame to be exercised, as compared with prior comparable oil burners. It is considered of major importance that a properly adjusted burner as herein disclosed produces from 200° to 500° more heat, with lower fuel consumption, than any of the available commercial rotary oil burners, and combustion is so efficient and so relatively complete that the customary carbon deposits within a heater are substantially eliminated. Prior ignition difficulties are non-existent with our improved oil burner, and the improved ignition and greatly improved efficiency are not dependent upon use of low viscosity oil. Experience has demonstrated that our improved burner operates with comparable efficiency regardless of the viscosity of the oil so long as it can be flowed to and through the radial passages 64 in the enlargement 42 of shaft 40. Furthermore, the burner as herein disclosed burns the heavier oils with relatively low or small flow of oil to the burner. For example, our burner operates efficiently with No. 6 oil flowing at a rate as little as one gallon per hour. Prior efforts to burn heavy oils in the heretofore available rotary oil burners have involved means for inducing a relatively high rate of flow of oil to the burners.

A further feature of advantage of our improved oil burner results from the substantial exclusion of air from the atomizing region within the rotary head, which makes flash-backs into the head impossible because of the lack of combustion-supporting air within the head. Such flash-backs into the heads of prior rotary oil burners are likely to occur if and when the temperature at the head becomes unduly elevated.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

We claim as our invention:

1. In a rotary oil burner, a shaft mounted for rotation in a generally vertical position, a head fixed concentrically on the upper end portion of said shaft and having spaced upper and lower walls defining an atomizing chamber therein, and peripheral means for centrifugal discharge from said atomizing chamber annularly around said head, there being an axial flow passage within said shaft and openings leading from said passage into said atomizing chamber, whereby oil carried upwardly within the shaft delivers through said openings directly into said atomizing chamber, power means for rotating said shaft and head thereby to effect atomization of oil delivered into said atomizing chamber and to discharge a generally horizontally directed stream of atomized oil from said chamber centrifugally and annularly around said head, means substantially spaced below said head for propelling air in cooling relation to said rotating head, means defining a plurality of conduits extending across said atomizing chamber and open at the lower and upper sides of said rotating head whereby a substantial portion of said pro-

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pelled air passes through the head to the upper side thereof while being maintained out of mixing relation to oil in the atomizing chamber, and means for directing said air at the upper side of the head outwardly and downwardly and other portions of said propelled air outwardly and upwardly in two annular streams which intersect each other and the discharging stream of atomized oil at a location relatively outward of but closely surrounding the periphery of the rotating head.

2. In a rotary oil burner, a shaft mounted for rotation in a generally vertical position, a head fixed concentrically on the upper end portion of said shaft and having spaced upper and lower walls defining an atomizing chamber therein and peripheral means for centrifugal discharge from said atomizing chamber annularly around said head, power means for rotating said shaft and head, walls defining a relatively large air passage around said shaft below said head, means within said air passage substantially spaced below said head for drawing air into the passage and propelling it upwardly in cooling relation to said head, conduits crossing said atomizing chamber for conducting a substantial amount of said propelled air from the under side to the upper side of said head while maintaining said conducted air out of said atomizing chamber, means at the upper side of said head for directing said substantial amount of air outwardly and downwardly in an annular stream adjacent to the periphery of said head, means at the under side of said head for directing another substantial amount of said propelled air outwardly and upwardly in an annular stream which intersects the first mentioned annular stream generally opposite the said peripheral discharge means of said head, said shaft having an axial flow passage therein and openings leading from said axial passage into said atomizing chamber, whereby oil carried upward within said shaft delivers into said atomizing chamber and becomes atomized therein and discharged peripherally of said head substantially in an undiluted state, and substantially at the region of intersection of said annular streams of air, and ignition means for igniting said discharged oil in the presence of combustion-supporting air from said intersecting streams.

3. In a rotary oil burner, a rotating head having an atomizing chamber therein and peripheral means for centrifugal discharge from the chamber annularly around said rotating head, means for propelling air in cooling relation to said head, a plurality of relatively short tubes fixed on said rotating head and extending through the atomizing chamber for conducting one substantial amount of the propelled air across said atomizing chamber from the lower side of said head to the upper side thereof, means at the upper side of said head and rotating therewith for guiding the air from said tubes outwardly and downwardly, in an annular stream, across the general plane of discharge from said chamber, another substantial amount of said propelled air being directed in an annular stream outwardly and upwardly in general direction to intersect the first mentioned annular stream at an annular location outward of and opposite said peripheral discharge means of the head, means for delivering oil into said atomizing chamber, said chamber being closed against entrance of any of said propelled air, whereby oil delivered to and atomized within said chamber discharges centrifugally from said head substantially undiluted by introduced air, the said discharge being into the annular region of intersection of said annular streams of air, and ignition means for igniting the oil in the presence of combustion-supporting air from said intersecting streams.

4. In a rotary oil burner, an atomizing head rotatable on a generally vertical axis and adapted to discharge atomized oil in a substantially undiluted state generally in a horizontal plane and annularly all around the head, said head being closed against entrance of any appreciable amount of air into its region where atomizing of the oil occurs, means for delivering oil into said atomizing region

of the head, a large-diameter sleeve below said head and having its upper edge spaced below a peripheral portion of said head thereby to provide an annular air passage therebetween, a plurality of short open ended tubes extending through said head from the lower to the upper side thereof, means within said sleeve for propelling air upwardly through the sleeve with some of the propelled air passing through said tubes to the upper side of said head and some passing between said head and the upper edge of said sleeve, and manual means for raising and lowering said sleeve relative to said head thereby to vary the proportion of said propelled air that passes between said head and said upper edge of the sleeve.

1,543,235
1,569,580
1,695,030
1,697,254
1,935,318
2,072,587
2,088,742

10

104,246
802,855
457,841

References Cited in the file of this patent

15

UNITED STATES PATENTS

1,064,467 Fesler ----- June 10, 1913

Scheminger ----- June 23, 1925
Scheminger ----- Jan. 12, 1926
Scheminger ----- Dec. 11, 1928
Webster ----- Jan. 1, 1929
Hawxhurst ----- Nov. 14, 1933
Greenwalt ----- Mar. 2, 1937
Hayward ----- Aug. 3, 1937

FOREIGN PATENTS

Great Britain ----- Mar. 1, 1917
France ----- June 22, 1936
Great Britain ----- Nov. 30, 1936