March 21, 1950 R. D. SCHOENWETTER 2,501,414

PRESSURE ATOMIZING TYPE OIL BURNER

Filed Nov. 20, 1945 3 Sheets-Sheet 1

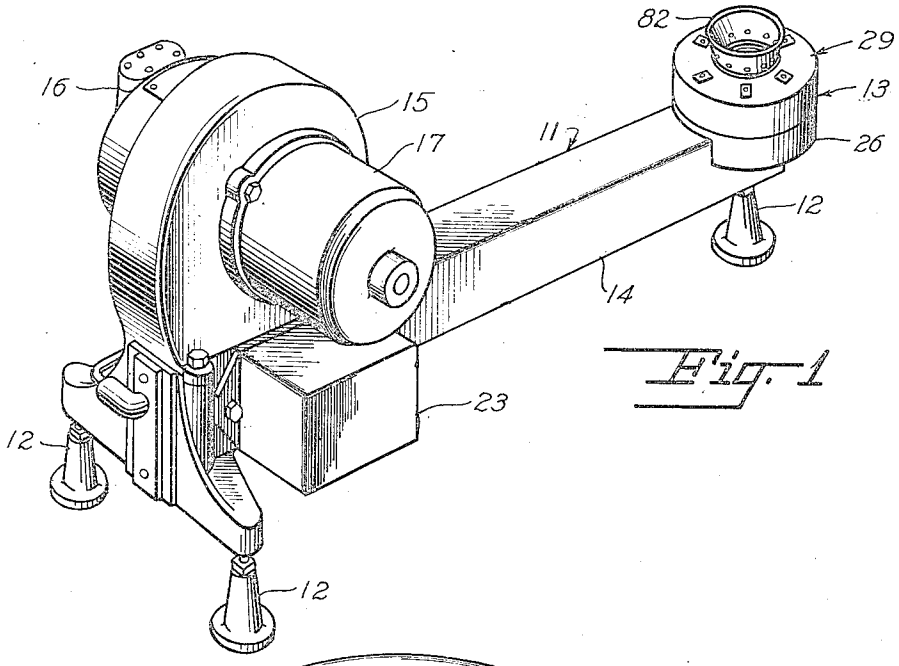
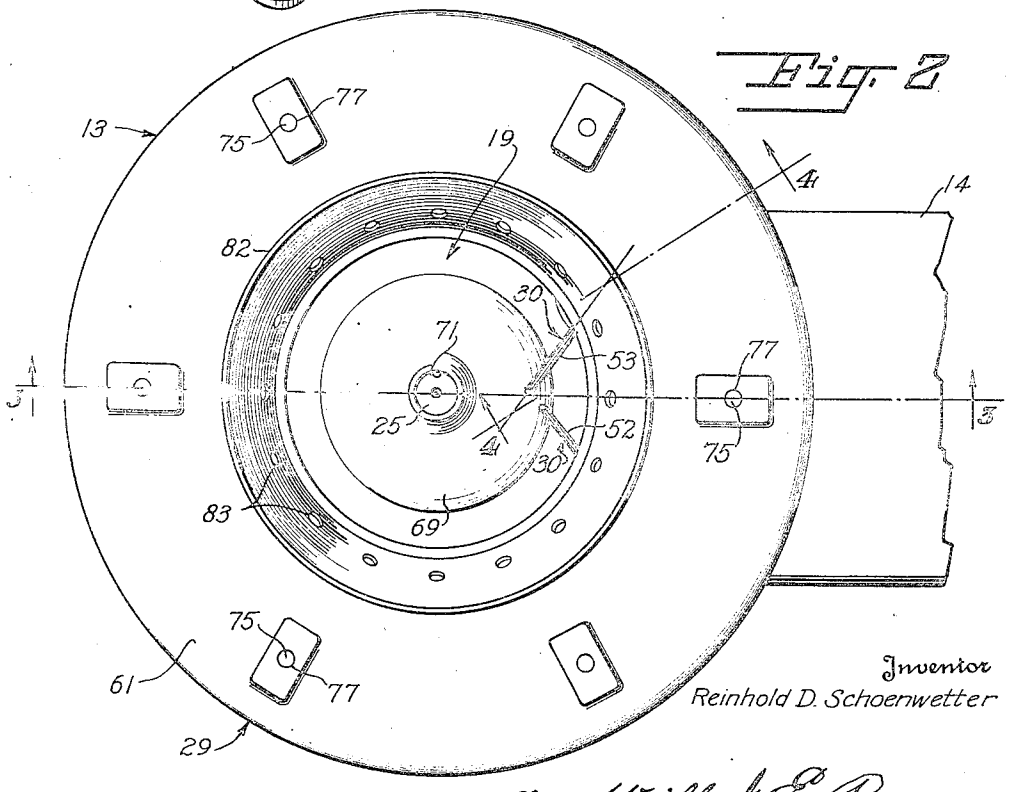


Fig. 1

Fig. 2



Inventor
Reinhold D. Schoenwetter

By Wilfred E. Lawson
Attorney

March 21, 1950 R. D. SCHOENWETTER 2,501,414

PRESSURE ATOMIZING TYPE OIL BURNER

Filed Nov. 20, 1945 3 Sheets-Sheet 2

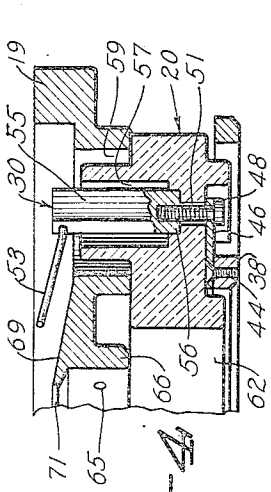


Fig. 4

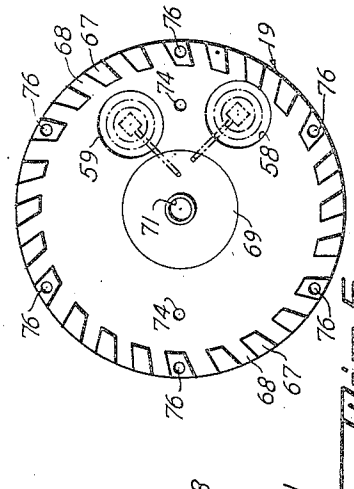


Fig. 5

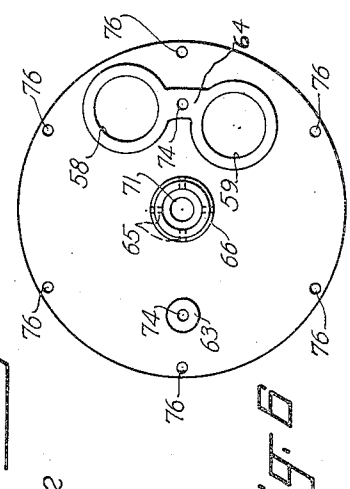


Fig. 6

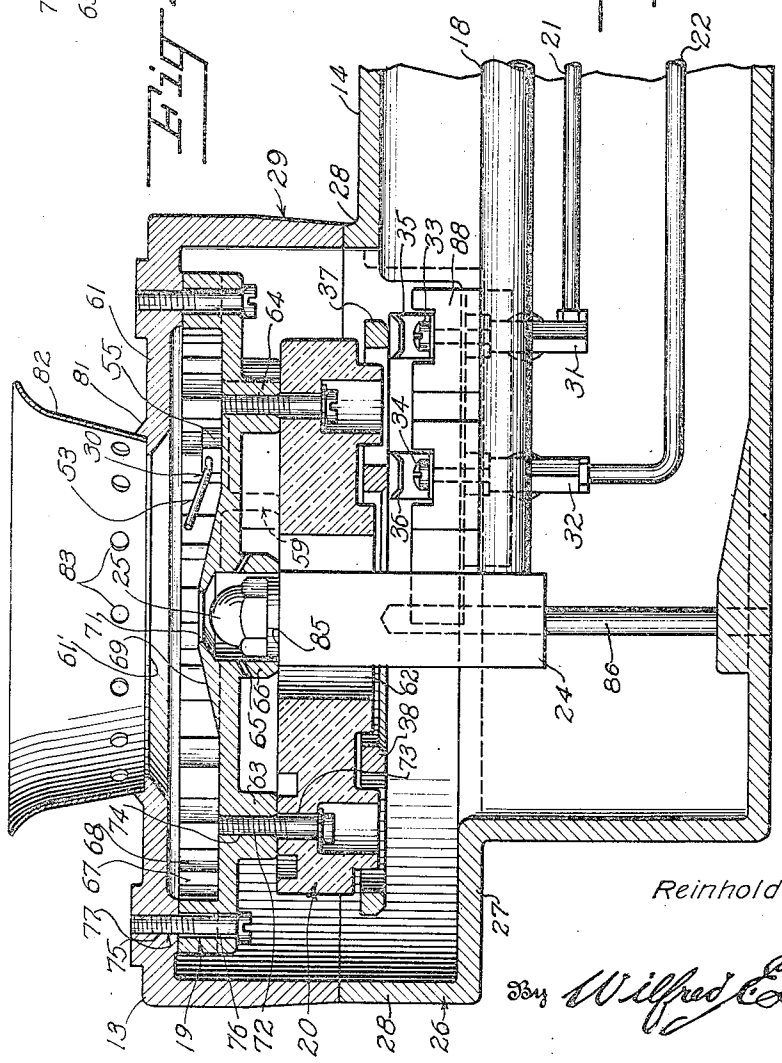


Fig. 3

Inventor
Reinhold D. Schoenwetter

By Wilfred E. Lawson
Attorney

March 21, 1950 R. D. SCHOENWETTER 2,501,414

PRESSURE ATOMIZING TYPE OIL BURNER

Filed Nov. 20, 1945 3 Sheets-Sheet 3

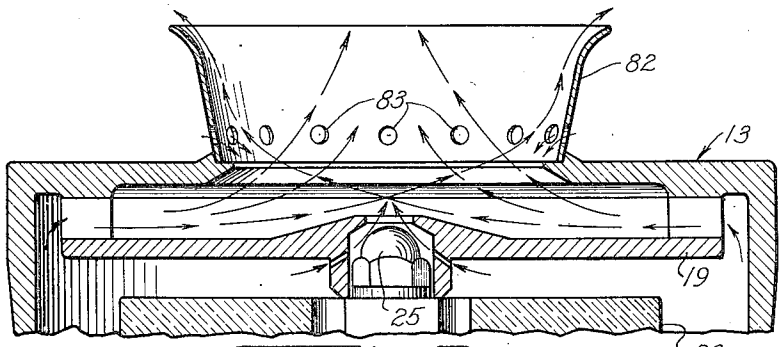


Fig. 7

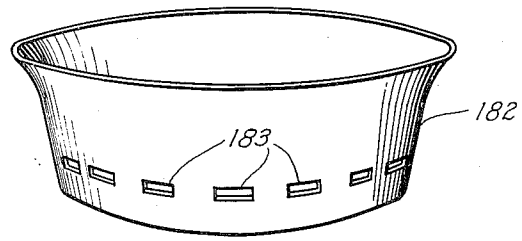


Fig. 8

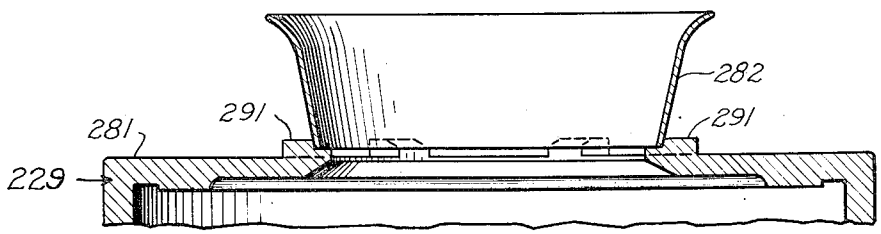


Fig. 9

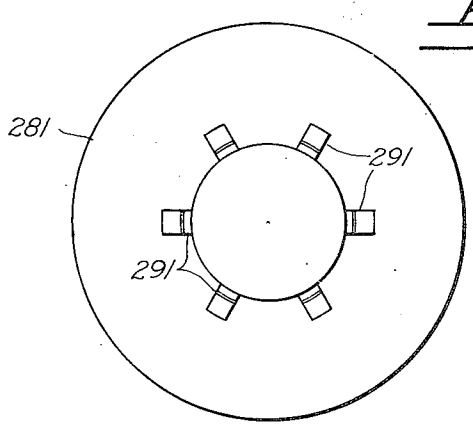


Fig. 10

Inventor
Reinhold D. Schoenwetter

By Wilfred E. Lawson
Attorney

Patented Mar. 21, 1950 2,501,414

UNITED STATES PATENT OFFICE

2,501,414

PRESSURE ATOMIZING TYPE OIL BURNER

Reinhold D. Schoenwetter, Rosslyn, Va., assignor, by mesne assignments, to Swirling Heat Corporation, a corporation of Delaware

Application November 20, 1945, Serial No. 629,781

9 Claims. (Cl. 158—28)

1

This invention relates generally to oil burners and more particularly to the pressure atomizing type of oil burner adapted for use in boilers and furnaces of residence heating systems.

In the type of burner contemplated by this invention the burner is self-contained in that the commingling of the atomized oil and air depends entirely upon the combustion head which is an integral part of the burner and does not depend on a combustion chamber which is not an integral part of the burner but which is built within the firing chamber of the boiler to suit the particular size and shape of the boiler.

An object of the present invention is to provide a burner designed to control combustion efficiency by means which includes imparting to a combustion supporting series of air streams, a swirling motion which causes the air to commingle thoroughly with the atomized fuel, and thereby to form quickly a controlled combustible mixture which will burn in absolute suspension.

Another object of the present invention is to provide a burner structure having a combustion head plate having the center of the upper side, within which the nozzle is located, raised in the shape of a cone so that air blown in from the sides tangentially is caused to take an upward sweep and functions to prevent the formation of carbon on the nozzle.

A further object of the present invention is to provide a combustion head of improved design for oil burners, which produces a hollow tulip shaped and highly radiant flame with a high combustion efficiency.

Still further objects of the invention are to provide a means substantially to prevent the formation of carbon on the combustion head and nozzle; to provide means to insure complete combustion of fuel with the least amount of excess air; to provide means to cause air to envelop and flow over the nozzle; to provide means to cause an upsweep of the air past the burner nozzle; and to provide means to control the tendency to form undesirable areas of reduced air pressure within the combustion head.

A further object of the invention is the simplification of the design of an oil burner with the attendant or resulting saving in costs which is accomplished by increased combustion and operating efficiency and by a reduction in the need for servicing.

A feature is the provision of openings in the boss or sleeve surrounding the burner nozzle.

A further feature is the provision of a restriction in the bore of the combustion plate above the nozzle.

2

Further features are the provision of a dome-shaped combustion plate and the provision of a metal combustion ring provided with air openings.

Other objects and advantages of the invention will appear as the description of the same proceeds and the invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of the specification, with the understanding, however, that the invention is not confined to a strict conformity with the showing of the drawings but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a perspective view of a burner embodying the principles of my invention;

Figure 2 is a fragmentary plan view of a portion of the assembly shown in Figure 1, specifically illustrating the burner head and a small section of the blower tube in operative relation;

Figure 3 is a section taken on the line 3—3 of Figure 2;

Figure 4 is a fragmentary sectional view taken on the line 4—4 of Figure 2 having the burner head cover removed;

Figure 5 is a top plan view of the swirl-producing plate, drawn on a reduced scale;

Figure 6 is a bottom plan view of the swirl-producing plate, drawn on a reduced scale;

Figure 7 is a fragmentary diagrammatic view illustrating the air flow through and above the swirl-producing or combustion plate;

Figure 8 is a fragmentary view in perspective illustrating an alternate form of combustion ring;

Figure 9 is a fragmentary view in section illustrating another alternate form of combustion ring and its support; and

Figure 10 is a plan view of an alternate form of combustion head cover designed to support the combustion ring of Figure 9.

Referring specifically to Figure 1, the burner assembly 11 is shown supported on adjustable legs 12. The combustion head 13 and a portion of the air tube 14 are adapted to enter the combustion chamber or fire box of a conventional furnace heating unit. The manner in which the assembly is positioned and adjusted within such a combustion chamber forms no part of the present invention and no illustration or de-

scription is therefore believed to be necessary in this application.

Air and oil are supplied to the burner head 13 through the tube 14 by a suitable air wheel, (not shown), positioned within an air wheel housing 15 and constituting an air pump, and by means of an oil pump generally designated 16. The oil pump 16 and an electric motor 17 are mounted on the air wheel housing 15 and the air wheel itself is mounted on the shaft of the motor 17. The oil pump 16 may be driven by the motor 17 by suitable means not shown. The air passes through said tube 14 while the oil is conducted to the nozzle 25 by means of a suitable conduit 18, (see Figure 3) within said tube 14.

Referring particularly to Figure 3 it may be seen that the combustion head assembly 13 includes (for purposes later to be described) a combustion head cover 29, a swirl-producing plate or combustion plate generally designated 19, and an insulating plate generally designated 20. There are provided within said tube 14 bus bars 21 and 22, by means of which electrical energy to energize the ignition means, is supplied from the transformer 23 (Figure 1). The pump 16 discharges fuel at a predetermined pressure through a pressure controlling valve (not shown) located within the oil pump 16, into the conduit 18 which communicates with an adapter 24 from which oil is conducted to the atomizing nozzle 25. Guide members may be provided in the tube 14 for positioning the conduit 18 and the elements affixed thereto with respect to other portions of the device in assembling the burner.

Fuel oil when discharged under pressure from the orifice of said nozzle 25 becomes atomized and, if unmolested, assumes the shape of a cone of relative equal density throughout. However, I provide means later to be described whereby air supplied by the air wheel through the air tube 14 is divided and deflected so that it passes through the zone of atomized oil with an upwardly sweeping, swirling motion and so that the air thoroughly intermingles with the oil and causes the resulting flame to be hollow and assume the shape of a tulip. The inner portion 26 of the tube 14 has a shape conforming in plan substantially to the shape of the combustion head cover 29. It forms an upturned elbow at the inner end of the air tube 14, and is flared as at 27 and provided with a vertical cylindrical wall, as at 28—28, upon which the combustion head assembly 13 rests.

A shoulder 65 is formed on the upper face of adapter 24 and aids in positioning the combustion head assembly inasmuch as the upper part of the adapter, including the atomizing nozzle 25, extends upward into a bore 62 formed in the insulation plate 20 and inasmuch as a downwardly extending sleeve or projection 66 which surrounds the nozzle rests upon the shoulder 65.

A guide pin 86 positions the adapter 24 concentrically within the cylindrical wall 28 and in turn the shoulder 65 constituting the upper end of the adapter 24, cooperates with the sleeve 66 to position the combustion head assembly 13, including the combustion cover 29, concentrically with the cylindrical wall 28. Thus the combustion head assembly 13, including the combustion head cover 29, may be turned relative to the tube 14, on the upper face of the cylindrical wall 28. This construction allowing the head to be turned is for the purpose of adjusting the air flow so as to give the resulting flame a uniform

shape, to secure the most favorable condition for combustion of the fuel and air supplied to the burner-head, inasmuch as it is impossible to manufacture atomizing nozzles producing absolutely true and uniform oil sprays.

Since the igniters, generally designated 30, are carried by the combustion head 13 it is necessary to provide means by which the electric current to be supplied to said igniters from the bus bars 21 and 22 is conducted to said igniters. Referring especially to Figure 3, it may be seen that the bus bars 21 and 22 are connected to connectors 31 and 32. These connectors are secured to the bus bar insulator 88, and screws 33 and 34 secure spring contacts 35 and 36 to the upper side of said insulator 88. The insulator 88 is suitably mounted on a portion of the flare 27 of the inner portion 26 of the air tube 14. The contacts 35 and 36 bear upon bus rings 37 and 38 which are retained in position on the underside of the insulating plate 20 by bolts 44, the bolts being spaced so as to be insulated from each other and from other portions of the head. Each of the igniters 30 comprises an electrode or igniter tip such as the tips 52 and 53, Figure 2, each mounted in a square metal block 55 adapted to rest in a square recess 56 formed as the lower portion of an opening 57 formed in the insulating plate 20, see Figure 4. Each of the igniters 30 is held in position and connected to a bus ring by suitable screws 48 passing through connector strips 46 secured to the bus rings 37 and 38, the screws 48 passing through openings such as the opening 51 (see Figure 4) in the insulating plate 20. The upper ends of the blocks 55 and the igniter tips 52 and 53 extend through openings 58 and 59 formed in the swirl-producing plate 19. Thus the tips 52 and 53 extend into the space above the swirl-producing plate 19 between said plate 19 and the cover 29. The ends of the tips 52 and 53 approach each other near to the nozzle or burner tip 25 so that a spark produced by an electric current flowing through the electrodes and jumping the gap between the tips 52 and 53, will instantly ignite the mixture of air and atomized oil vapor formed by the flow of fuel from the nozzle 25 and of air from the air passages 68.

As previously stated, I provide means to break up the air which is being blown in by the air wheel in housing 15, into separate streams, one of which streams flows up around the sides of the burner and some of which air flows substantially tangentially to the cone of atomized oil being sprayed out of the burner tip 25. Air blown from the air wheel under pressure fills the air tube 14 and combustion head cover 29 and a portion thereof flows through a series of air passages 68 between projections 67 formed on the upper side of combustion plate 19, flowing in separate streams substantially tangentially to and through the cone of atomized oil being sprayed out of the nozzle 25.

Referring to Figure 3 it may be seen that a portion of the air from the tube 14 passes through a series of openings 65 into the interior of sleeve 66, surrounding burner tip 25 and thence up around the burner tip 25 to envelop and sweep the tip to prevent the formation of carbon thereon.

It will be understood, of course, that air being forced in through the air tube 14 fills the interior of the combustion head 29, passing upward through the central opening 62 in the insulating plate 20 and outward around the spac-

ing lugs 63 and 64 formed on the underside of combustion plate 19 to fill the space between the combustion plate 19 and the insulating plate 20. The air under pressure in this space between the plates is forced in through the openings 65.

The air flowing through the openings 65 is designed to prevent the formation of a vacuum within the sleeve 66 or chamber in which the nozzle is enclosed. It then flows upward through the opening 71 in the plate 19. Thus it prevents the last flick of the flame, when the burner comes to a stop, from striking the nozzle tip and prevents the deposit of carbon thereby.

As stated above I provide means to cause streams of air to flow in, substantially tangentially to the cone of atomized coil arising from the nozzle. The projections 67 are so shaped that the passages 68 between them define a path substantially tangential to a circle about the axis of the head which is also substantially the axis of the nozzle, and the axis of the cone of oil being forced from the nozzle. The various tangential streams striking the cone of atomized oil and the air flowing up from the sleeve 66 through opening 71, form a swirl of air which produces a very efficient mixture of air and fuel so that most efficient combustion of the oil is attained.

In addition I provide means to give an upward curve to the tangential streams of air. As shown most clearly in Figure 3, the plate 19 is formed with a symmetrical concentric mound or hollow truncated cone 69. The tangential streams of air from passages 68 striking this mound are turned upward and, striking the cone of atomized oil as it emerges (together with air coming through openings 65) from opening 71, break the oil up into a swirling, upwardly curving mixture of air and atomized oil which causes most efficient combustion of the fuel. At the same time the upward swing of the air serves to keep carbon from the plate 19 and the tip 25. It is to be especially noted that the streams of air flowing in substantially tangentially to the fuel cone, are substantially in the plane of the burner tip and that as the streams are turned upward by the shape of the mound 69 they strike the lower portion of the fuel cone substantially tangentially from all sides.

Throughout this specification I have referred to atomized oil. It is to be understood that by this term I refer to the spray of oil as it leaves the nozzle 25 and as it becomes mixed with air until it is consumed by the flame. It is to be further understood that initially the oil is in the form of a fine spray but that it only remains in spray form for an instant at the very moment that it leaves the nozzle but as it is carried upward heat of the flame causes it to vaporize and to become gaseous.

The insulating plate 20 is secured to the plate 19 by bolts 72 passing through recessed openings 73 in the insulating plate 20 and threaded into openings 74 in projections 63 and 64 formed on plate 19. The plate 19 is secured to the cover 29 by bolts 75 extending through openings 76 formed in the plate 19 and threaded in openings 77 formed in the cover 29. It may be noted (see Figure 6 that the projection 64 is larger than the projection 63 and is extended to include circular rims surrounding the openings 58 and 59 so as to form together with the projection 63 a stable abutment for the insulating plate 20. It may also be noted that the sleeve 66 formed on the plate 19 surrounds the burner nozzle 25 and inasmuch as the shoulder 85 of the adapter

24, is pressed against the sleeve 66 by the resiliency of the tube 18, the shoulder forms a substantially air-tight joint with the sleeve.

The top portion 61, of the combustion head cover 29 has therein the opening 61' through which the burning air and fuel mixture issues.

Encircling the opening 61' and resting upon the top 61 of the head, is a metallic outwardly flaring ring sleeve 82, the greater portion of its inner surface conforming to the surface of the frustum of a cone but having the upper portion thereof flared outwardly. In other words the ring 82 is a metal member with its inner surface shaped like the surface of the frustum of a cone and with its larger and upper end flared in bell-mouthed fashion.

The ring 82 assists in the formation of the flame shape in the form desired. However, the series of air streams flowing from the passages 68 over the upper surface of the head plate 19, tend to create a partial vacuum adjacent to the edge of the opening 61', which, except for the hereinafter described remedy, would cause formation of carbon on the lower portion of the ring and edge of the opening 61' and would also interfere with the proper shaping of the flame.

In the embodiment of the invention shown in Figure 3, the top 61 of the head cover 29, has formed thereon, around the opening 61', the rim 81 in which rests the bottom edge of the ring 82. In this construction, in order to prevent the formation of the vacuum or reduced pressure at the opening 61', the ring 82 is formed with a plurality of holes, through which air flows to break or reduce any vacuum which may form. This additional air also serves to aid in completing the mixture with air of any oil not previously mixed; the insuring of complete combustion; the cooling of the combustion ring, and the prevention of the deposit of carbon on the ring. If this vacuum should become too high or too large there is a tendency for the formation of carbon at these points. If the vacuum is completely broken down or becomes too small the control of the shape of the flame (i. e., the formation of the desired tulip shape of the flame) is lost. I control the amount of the vacuum and thus the shape of the flame and the elimination of carbon by a correct proportion of the size of the holes 83 to the size of the burner and the speed of the air. The size of the holes to be used depends upon the amount and speed of the air and oil being supplied and upon the size of the flame openings. Therefore, my invention is not limited to any specific size of openings, but to the principle of controlling the vacuum, the shape of the flame and the elimination of carbon by proper proportion of the size of the openings to the other factors. As an illustration of such proper proportioning I have found that with a combustion head having a diameter of approximately 7½ inches and using a flame control element similar to the combustion ring 82 with a diameter at its bottom of approximately 3¼ inches, 24 holes of $\frac{5}{32}$ inch diameter give proper control of vacuum, and the shape of the flame and excellent elimination of carbon deposits.

As suggested above my invention is not limited to the particular type of combustion ring illustrated nor to the specific method or apparatus for admitting air above described. For instance, instead of the combustion ring 82 which is the preferred form of construction, I may use a ring such as that shown in Figure 8 and designated ring 182. Instead of utilizing holes

the ring 182 has slits 183 formed therein of the proper size and proportion to admit air just sufficient to control the shape of the flame, eliminate the deposit of carbon, and reduce the vacuum pockets to exactly the desired extent.

Alternatively, I may support an imperforate ring 282 in the manner illustrated in Figures 9 and 10. Therein the ring 282 instead of being supported in substantially air tight relationship with an annulus such as the annular rim 81 of Figure 3, is supported upon a series of lugs 291 so that the ring 282 does not form an air-tight joint with the top 281 of the combustion head cover and a controlled amount of air may flow in beneath the ring between the ring and the combustion head cover 229 for the purposes described above.

It is known that the economical operation of a boiler or furnace, heated by the flame of an oil burner, requires not only that the combustion efficiency of the flame be of a high degree but, also, that it be highly radiant and that all of the radiant heat be directed against the walls of the fire chamber of the boiler and not absorbed by a refractory combustion chamber such as is required in connection with the use of gun type burners.

The present burner attains a high degree of economical operation through the direction of the flame vertically instead of horizontally so that no refractory combustion chamber is required and all of the radiant heat of the flame is directed to the walls of the boiler.

This vertical disposition of the oil discharging nozzle of the burner entails the problem of overcoming or preventing the formation of carbon on the nozzle and in the present invention this problem has been definitely solved by enclosing the nozzle in the chamber provided by the sleeve 66 and introducing a controlled amount of air under static pressure, into this chamber to issue therefrom with the oil discharged by the nozzle. Without the provision of the air introducing apertures or ports 65, a reduced air pressure or partial vacuum would be formed within the chamber around the nozzle which, when the burner is shut off, would attract the incompletely burned oil and form a carbon deposit on the tip of the nozzle. This action is, however, prevented by the sweeping of the air upwardly across the tip of the nozzle so that the partly burned spray of oil is lifted away from the nozzle and no carbon deposit results.

By the provision of the openings or holes 83 and 183, or the air passages between the lugs 291 beneath the ring 282, the formation of a reduced air pressure or partial vacuum at the edge of the opening 61' in the combustion head, is prevented. This also acts to prevent the formation or deposit of carbon upon the lower portion of the ring and maintains the proper form or shape of the flame.

The operation of my improved burner should be obvious from the above detailed description. Air forced by blower 15 through tube 14, passes through openings 65 and 68 and, mixing with atomized oil pumped in by pump 16 through tube 18 and out of burner tip 25, is mixed thoroughly therewith by the tangentially moving and upward curving and swirling action of the air. A spark produced between the electrodes 52 and 53 ignites the mixture to burn with a hot efficient flame. Inequalities in the flame are adjusted by rotating the upper portion 29 of the combustion head 13 upon the lower portion 28 thereof.

The air blown in through the small openings 65 attains a high rate of speed and envelops and sweeps the burner nozzle and thereby prevents carbon from forming thereon and also prevents the formation of a vacuum or lowered pressures within the sleeve 66. Air entering the sleeve 66 and leaving through opening 71 prevents the last flick of the flame, before the burner stops, from striking the nozzle 25 and the portion of the mound 69 around the opening 71. It also lifts any stray atomized oil into the flame. The combustion ring 82 being a hollow sleeve formed in frusto-conical shape with an outward flare at its upper portion accurately defines the best shape for the flame, and prevents the formation of vacuum or sub pressure pockets within the combustion head and flame. The air admission means, such as the holes 83 and 183 and the spaces between the lugs 291, beneath the ring 282 allows air to be drawn in for aiding in efficient combustion, cooling and prevention of carbon formation and aids in controlling the shape of the flame.

It is to be understood that the above described embodiment of my invention is for the purpose of illustration only and that changes may be made therefrom without departing from the spirit and scope of my invention except as limited by the appended claims.

I claim:

1. In an oil burner including a vertically disposed atomizing nozzle, wall means enclosing the nozzle defining a substantially circular burner head having a top opening concentric with the nozzle, there being a shoulder around the lower part of the nozzle and means for introducing air into the burner head below the nozzle; a plate disposed horizontally in the head and having a circular sleevelike portion encircling the nozzle and resting upon said shoulder, the plate being of smaller diameter than the interior of the head, means upon the top of the plate adjacent to the periphery thereof for directing air in streams across the top of the plate toward the central part thereof, means at the center of the plate and encircling the axis of the nozzle for deflecting the air streams upwardly through said top opening, said last means being extended inwardly across the upper end of said sleeve-like portion to partly cover the nozzle and form with the sleeve-like portion a chamber having a restricted central opening above the nozzle, flame shaping means supported on the head concentric with the first opening and through which the upwardly directed air streams and oil discharge from the nozzle pass, and means for introducing air into the nozzle enclosing chamber from beneath the plate.

2. An oil burner structure of the character stated in claim 1, in which said flame shaping means comprises a hollow circular sleeve open at its ends and of gradually increasing inside diameter from its lower end through the major part of its length and of sharply increasing diameter through the remainder of its length, the lower end edge of the sleeve resting upon the burner head.

3. An oil burner structure of the character stated in claim 1, in which said flame shaping means comprises a hollow circular sleeve open at its ends and of gradually increasing inside diameter from its lower end through the major part of its length and of sharply increasing diameter through the remainder of its length, the lower end of the sleeve resting upon the burner head.

and means for introducing air into the sleeve adjacent to the lower end thereof.

4. In an oil burner including a vertically disposed atomizing nozzle and a wall means enclosing the nozzle defining a substantially circular burner head, the burner head having a top opening concentric with the nozzle; means for introducing air into the burner head below the nozzle, a plate secured within the head and having a diameter less than the interior diameter of the head, said plate having a central depending sleeve into which the nozzle is received, the lower edge of the sleeve having tight contact with the nozzle, means for directing air from the periphery of the plate across the top thereof in a plurality of streams tangential to the center of the plate, means at the center of the plate for deflecting said air streams upwardly through said top opening comprising a circular mound having a central flat top provided with an opening concentric with and above the nozzle, said last opening having a diameter materially less than the inside diameter of the sleeve, air inlet ports through the sleeve below the plate, and a flame shaping means resting upon the burner head concentric with the first mentioned opening, said flame shaping means comprising a hollow sleevelike ring open at its ends and of gradually increasing diameter from its lower edge toward its top edge through the major portion of its length and of sharply increasing diameter through the remainder of its length to its top edge, said sleevelike ring having air inlet apertures formed therethrough adjacent to its lower edge.

5. In an oil burner including a vertically disposed atomizing nozzle and a wall means enclosing the nozzle defining a substantially circular burner head, the burner head having a top opening concentric with the nozzle; means for introducing air into the burner head below the nozzle, a plate secured within the head and having a diameter less than the interior diameter of the head, said plate having a central depending sleeve into which the nozzle is received, the lower edge of the sleeve having tight contact with the nozzle, means for directing air from the periphery of the plate across the top thereof in a plurality of streams tangential to the center of the plate, means at the center of the plate for deflecting said air streams upwardly through said top opening comprising a circular mound having a central flat top provided with an opening concentric with and above the nozzle, said last opening having a diameter materially less than the inside diameter of the sleeve, air inlet ports through the sleeve below the plate, and a flame shaping means supported upon the top of the burner head concentric with the first mentioned opening and comprising a hollow sleevelike ring open at its ends and of gradually increasing diameter from its lower end through the major part of its length, the remaining part of the length being of sharply increasing diameter to the top end, the supporting means for said flame shaping means comprising spaced lugs formed upon the head around the first mentioned opening whereby is provided a plurality of air inlet ports around said first opening and beneath the ring.

6. In an oil burner including an atomizing nozzle having an upwardly directed discharge tip, wall means enclosing the nozzle defining a substantially circular head having a top opening concentric with the nozzle and means for introducing air into the lower part of the burner head; a wide flat plate body having a central opening within which said nozzle is positioned, the air from the burner head flowing over the top surface of the body from the outer part of the head toward the central part of the body, spaced members upstanding from said surface around the perimeter of said body for dividing inflowing air into streams and for directing said air streams over said surface toward the said central part of the body, the central part of the body having a frusto-conical raised area having a smooth top wall surface, the said body opening extending axially through said raised area, said top opening having a wall having an upper portion which inclines upwardly and inwardly above and partially covers the tip of said nozzle, said top opening below the inclined portion of the said wall thereof being of a diameter appreciably greater than the greatest diameter of the nozzle, means for closing the lower part of said central opening around the nozzle forming a chamber in which the nozzle is enclosed, and means for admitting air into said chamber from below said plate body.

7. In an oil burner including an atomizing nozzle having an upwardly directed outlet, wall means enclosing the nozzle defining a burner head having a top opening concentric with the nozzle and means for introducing air into the burner head below the nozzle; means forming a chamber enclosing the nozzle and having a wall partially overlying the nozzle, said wall having a restricted outlet opening lying above the outlet of the nozzle and concentric with the first opening and with the nozzle, the said outlet opening having a diameter less than the diameter of the nozzle, means arranged in a circle around the nozzle for directing air inwardly in streams from the burner head toward the axial center of the nozzle, means encircling and immediately adjacent to the said restricted outlet opening for deflecting said air streams upwardly across the restricted outlet opening to pass through the first opening, and means for directing part of the air to the said nozzle enclosing chamber from below the said restricted outlet opening and below the tip of the nozzle to flow upwardly across the tip of the nozzle to and through the restricted outlet opening for preventing the formation of a vacuum around the nozzle tip in the nozzle chamber.

8. An oil burner structure of the character stated in claim 7, wherein the said chamber forming means comprises a cylindrical sleeve, a plate from which said sleeve extends downwardly, and the means for charging the chamber comprises air passages leading through said sleeve into the chamber from the underside of the plate.

9. In an oil burner including a vertically disposed atomizing nozzle, wall means enclosing the nozzle defining a substantially circular burner head having a top opening concentric with the nozzle, there being a shoulder around the lower part of the nozzle and means for introducing air into the burner head below the nozzle; a plate disposed horizontally in the head and having a circular sleeve like portion encircling the nozzle and resting upon said shoulder, a plate being of smaller diameter than the interior of the head, means upon the top of the plate adjacent to the periphery thereof for directing part of said air in streams across the top of the plate toward the central part thereof, means at the center of the plate and encircling the axis of the nozzle for deflecting the air streams upwardly through said

top opening, said last means being extended inwardly across the upper end of said sleeve like portion to partly cover the nozzle and form with the sleeve like portion a chamber having a restricted central opening above the nozzle, and means for introducing air into the nozzle enclosing chamber from beneath the plate.

REINHOLD D. SCHOENWETTER.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,160,929	Melas	Nov. 16, 1915
1,513,461	Johnson	Oct. 28, 1924
1,522,064	Johnson	Jan. 6, 1925
1,858,302	Marshall	May 17, 1932
1,924,938	Lewis	Aug. 29, 1933
1,953,483	Higinbotham	Apr. 3, 1934
2,204,451	Schoenwetter	June 11, 1940
2,253,266	Debler	Aug. 19, 1941
2,319,636	Schoenwetter	May 18, 1943