Jan. 11, 1944. W. W. HALLINAN 2,338,846

OIL BURNING APPARATUS

Filed May 28, 1940 3 Sheets-Sheet 1

Fig. 1

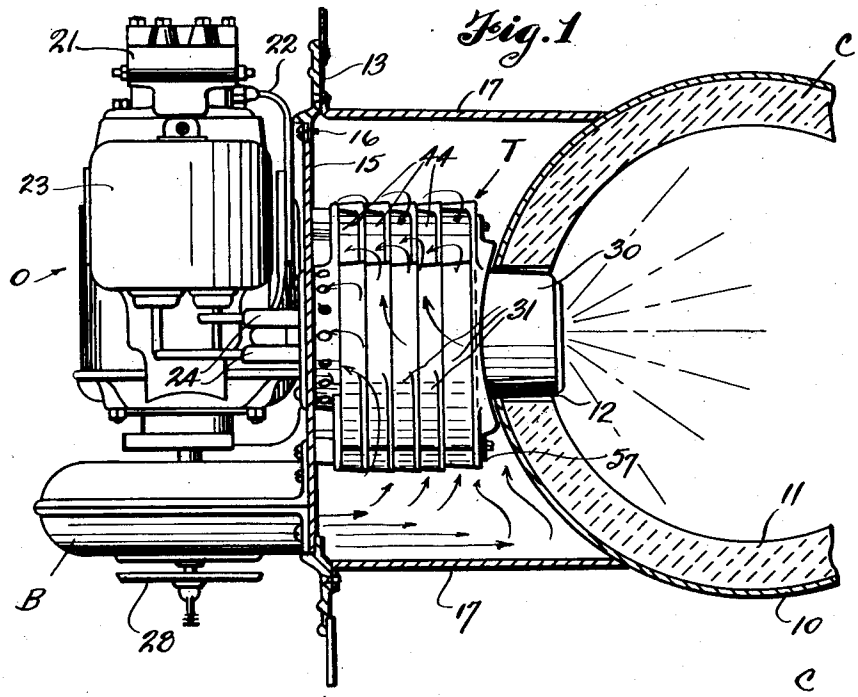
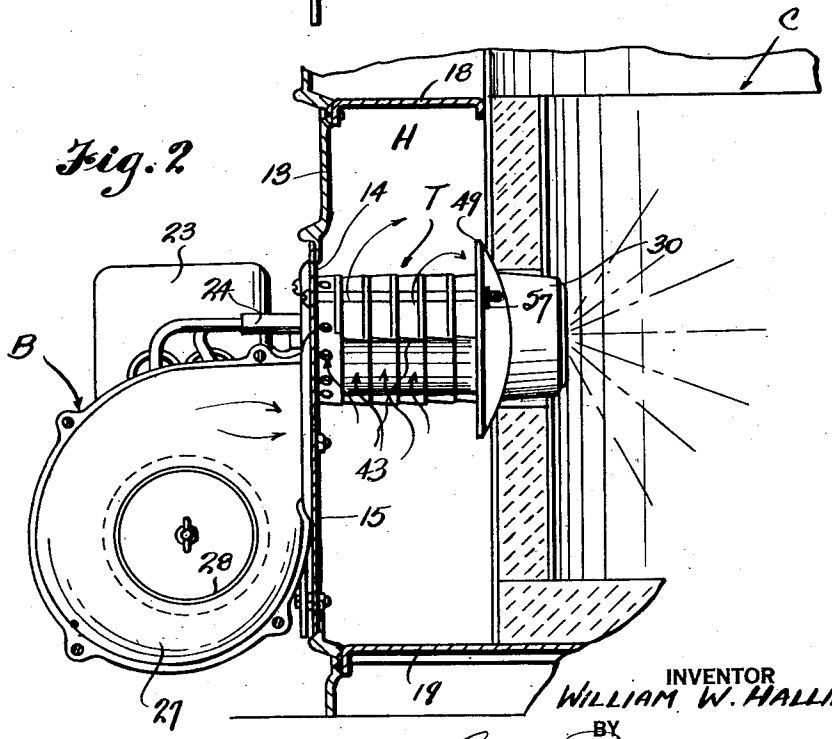


Fig. 2



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Filed May 28, 1940 3 Sheets-Sheet 2

Fig. 3

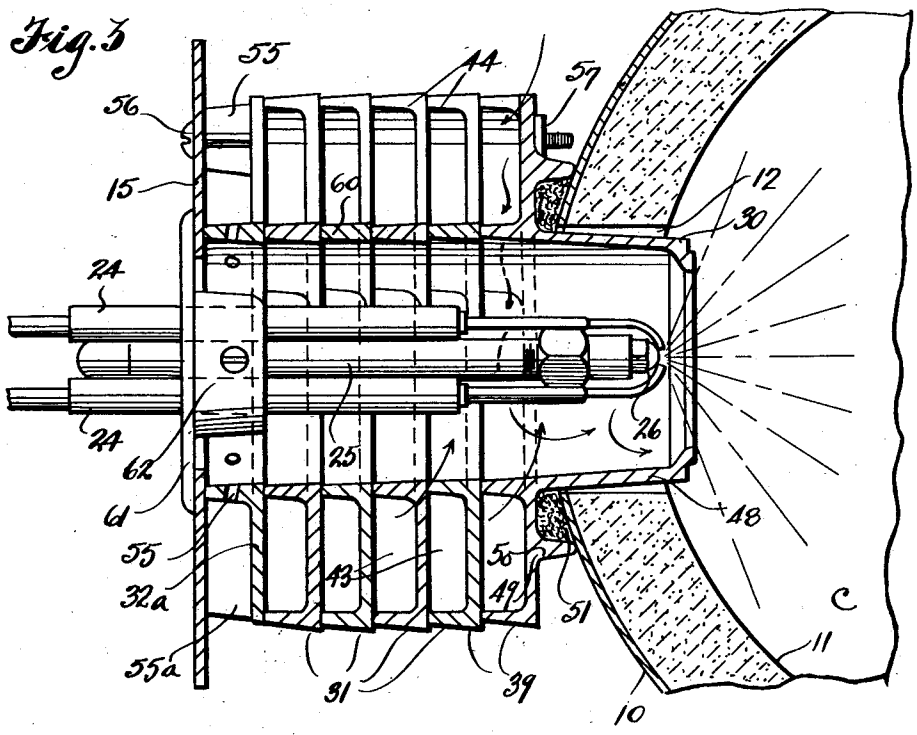
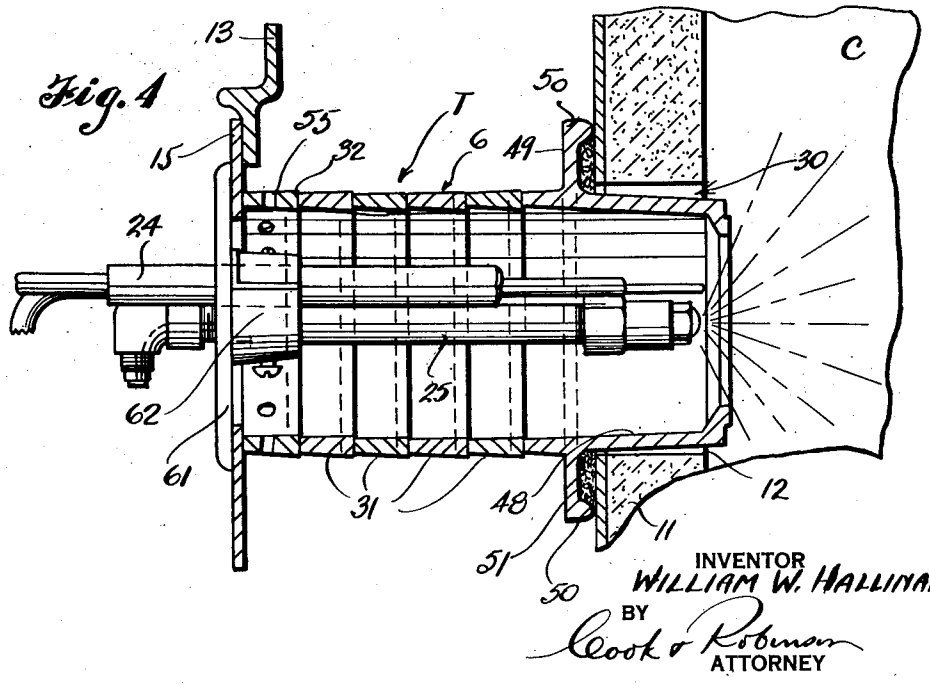


Fig. 4



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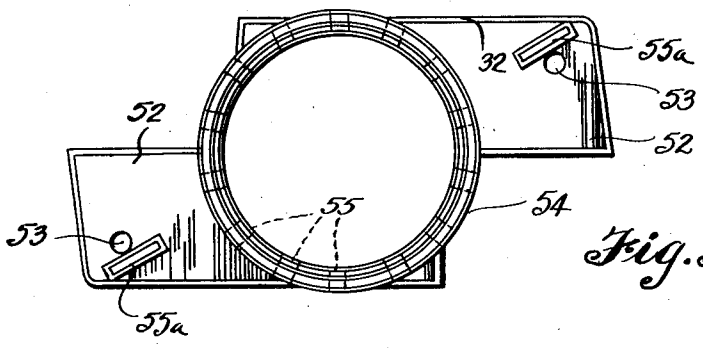


Fig. 5

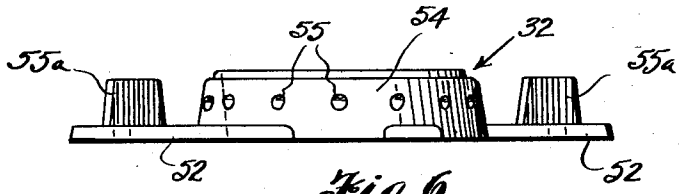
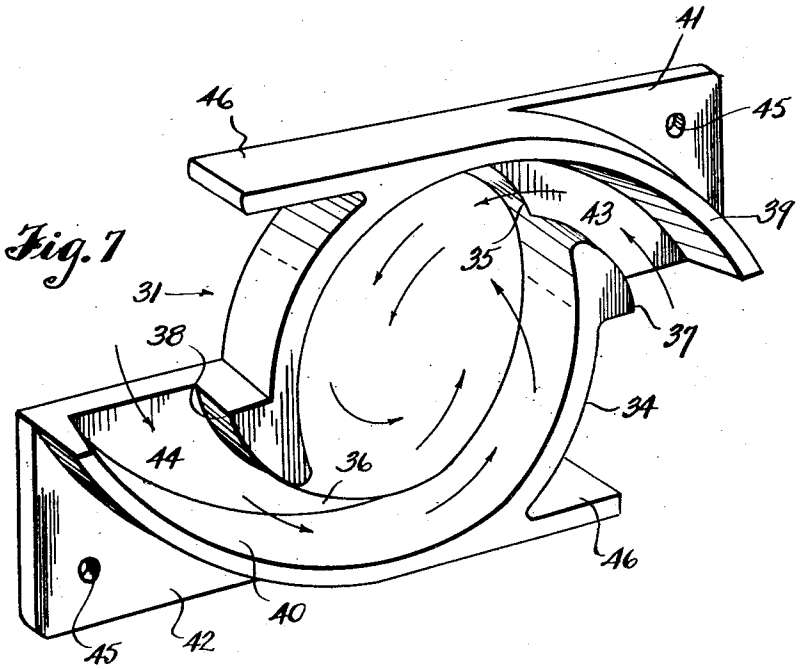


Fig. 6

Fig. 7



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UNITED STATES PATENT OFFICE

2,338,846

OIL BURNING APPARATUS

William W. Hallinan, Mendota, Ill.

Application May 28, 1940, Serial No. 337,633

4 Claims. (Cl. 158—1.5)

This invention relates to oil burning apparatus.

The invention, while being generally directed to oil burners, is particularly concerned with an improved means for supplying air to the vicinity of the fuel nozzle for most efficient combustion of the fuel injected through the nozzle into the combustion chamber.

As is well understood by those familiar with this art, it is necessary to supply air to the combustion chamber in the vicinity of the fuel-injecting nozzle for proper combustion.

Oil burners heretofore used or proposed each included in its construction a blower, from which air was directly forced into the combustion chamber by means of air tubes extending from the blower to the fuel-discharge nozzle within the combustion chamber.

Such constructions involving the direct air connection by means of tubes were not only costly in manufacture and installation, but unless they were maintained in perfect adjustment, proper carburetion was not obtained, with a resulting loss of heat from the fuel burned.

A further object of the invention is to provide means for introducing air to the combustion zone of an oil burner, and whereby air is supplied under pressure exteriorly of the combustion zone and constantly admitted to the combustion zone in a spirally moving air blast.

A still further object of the invention is to provide a package unit oil burner in connection with the furnace and including an air-admission turbulator and a single mounting plate for expeditious assembly of the unit with a combustion chamber.

A still further object of the invention is to provide an oil burning assembly comprising a combustion chamber, an air housing exteriorly of the combustion chamber, a fuel-admission pipe extending through the air housing into the combustion chamber, a blower for forcing air into the housing, and means surrounding the fuel pipe for directing the flow of air.

A still further object of the invention is to provide an improved air turbulator for admitting air with a whirling motion to the fuel nozzle of an oil burner.

For a more complete understanding of the nature and objects of the invention, reference will be had to the following detailed description taken in connection with the accompanying drawings, wherein is disclosed a preferred physical embodiment of the improved construction.

In the drawings—

Fig. 1 is a top plan view of the improved oil burning unit in operative association with a combustion chamber which is shown in horizontal section.

Fig. 2 is a right-hand side elevation of the unit shown in Fig. 1, with the combustion chamber fragmentarily shown in central vertical section.

Fig. 3 is a substantially axial horizontal section through the improved air turbulator showing its relation to the firing assembly and combustion chamber, which latter is fragmentarily shown in horizontal section.

Fig. 4 is a substantially axial vertical section through the structure illustrated in Fig. 3.

Fig. 5 is a front elevation of the front section of the improved air turbulator.

Fig. 6 is a bottom plan view of the front section of the air turbulator.

Fig. 7 is a perspective view of one of the air tube forming baffles included in the improved air turbulator.

Referring now to the drawings by reference numerals, and referring first to Figs. 1 and 2, O designates the oil burner proper in its entirety, B the air blower or fan, T the improved air turbulator, H an air housing, in which the turbulator is disposed and with which the blower is in communication, and C designates the combustion chamber.

The combustion chamber proper forms no part of this invention, but briefly described comprises a cylindrical metal casing 10 having a lining 11 of refractory material and the casing and lining are provided jointly with a circular opening 12 for a purpose later described.

The air housing H is provided by extending the air drum sheet all the way down to the floor, as indicated; the front of such extension comprising a casting 13 having a rectangular opening 14, to the margins of which opening a mounting plate 15 is removably secured, as by bolts 16, forming the front wall of the air housing and which is completed by opposite side walls 17, a top wall 18, and a bottom wall 19, which is, in effect, an extension from the base of the combustion chamber.

The oil burner O, blower B and air turbulator T are all secured to the mounting plate 15, thereby providing a unit oil burner assembly with the furnace; the burner O and blower B being secured to the outer face of the plate and the air turbulator T being secured to the inner face of the plate in a manner hereinafter specifically disclosed.

The burner assembly O comprises as its essential elements a pump body 21, fuel pipe 22 to the

firing assembly, transformer 23, electrodes 24, which, as indicated in Figs. 3 and 4, extend through and project beyond the inner face of the mounting plate 15, and a fuel feed pipe 25 having a fuel nozzle 26 extending parallel with and slightly below the electrodes 24.

The blower B includes a casing 27 having a suitable fan rotatably disposed therein and the casing is in communication with the air housing H through a suitable opening in the mounting plate 15. The casing 27 is provided with an air shutter or adjusting plate 28.

Contrary to the principle of direct air application from the blower to the combustion chamber, as heretofore practiced, in accordance with this invention, air is forced by the blower B into the air housing H, from which the air is directed to the combustion chamber by means of the improved air turbulator T, now to be described in detail.

Referring more particularly to Figs. 3 to 7, inclusive, the improved air turbulator comprises an air nozzle 30, a plurality of air tube baffles 31, and an air inlet section 32.

The nozzle 30, baffles 31, and section 32, when assembled, extend from the mounting plate 15, through the air housing to the combustion chamber, with the nozzle 30 extending through the opening 12 therein.

Inasmuch as the body portion of the nozzle 30 is similar in construction to the baffles 31, one of which is shown in perspective in Fig. 7, the latter will be first described, whereby the nozzle construction will then be better understood.

The baffles 31, which, in the specific embodiment of the invention disclosed, are four in number, but may be more or less, are preferably castings, and each comprises a tubular portion 34, which is interrupted adjacent the top and at the right-hand side, as at 35, and adjacent the bottom and at the left-hand side, as at 36.

The corresponding ends of the portion 34 adjacent the interruptions 35 and 36 are enlarged and have curved outer surfaces 37 and 38, respectively, and outwardly of such surfaces are similarly curved flanges 39 and 40, respectively, and which flanges project from plate portions 41 and 42, respectively, which project as integral extensions from the interruptions 35 and 36.

The surfaces 37 and 38, flanges 39 and 40, and the plate portions 41 and 42 provide air-admission channels 43 and 44 for admitting air from opposite sides of the baffle adjacent the top and bottom thereof to the air tube defined by the cooperating tubular portions 34 of the plurality of baffles 31.

The plate portions 41 and 42 are each provided with an aperture 45 for a purpose later described and the tubular portion 34 has a horizontal extension 46 at the top and bottom thereof with the free ends of the extensions substantially in vertical alignment with the inner edges of the mouths of the adjacent channels.

The air nozzle 30 is constructed in a similar manner to the baffles 31 in that opposite air-admission channels 43 and 44 are provided, as can readily be seen from Fig. 1. The portion 34 of the nozzle 30, however, is extended rearwardly in the form of a tapered tubular portion 48, providing the nozzle proper and which extends through the opening 12 with its air discharge end inwardly of the inner wall of the lining 11.

The nozzle 30 includes, in lieu of the plate portions 41 and 42 of the baffles, a rectangular plate portion 49 having a flange 50 curved to conform with the outer surface of the casing 10, and in the assembly, a sealing compound 51, as furnace cement, is disposed in the space defined by the casing 10, plate portion 49, and flange 50 for preventing the escape of air from the housing H into the combustion chamber externally of the turbulator T.

The air-balancing section 32, shown in detail in Figs. 5 and 6, comprises oppositely directed flanges or plate portions 52, similar to the baffle plate portions 41 and 42. The plate portions 52 are each provided with an aperture 53, which, in the assembled turbulator, are axially aligned with the apertures 45 in the baffles as well as similar apertures in the plate portion 49 of the nozzle 30.

The section 32 further includes a tubular portion 54 of a diameter equal to that of the portion 34 of the baffles but which is circumferentially continuous and which is provided with a circumferential series of air-admission holes 55. The plate portions 52 are each provided with a spacer lug 55^a adjacent the aperture 53.

The air nozzle 30, baffles 31, and air-balancing section are assembled in the manner clearly indicated in Figs. 1 to 4, inclusive, wherein the tubular portions 34 of the nozzle 30 and baffles 31 and the tubular portion 54 of the section 32 are abutted in axial alignment and wherein the air-admission channels 43 and 44 of the successive baffles, as well as the nozzle, are closed on their otherwise open sides by the plate portions 41 and 42 of the adjacent baffles and the plate portions 52 of the section 32.

With the various sections thus disposed, a bolt 56 is passed through an aperture in the plate 15 and each axially aligned series of apertures 45 and 53 in the baffles 31 and section 32 with the threaded ends of the bolts extending through similar apertures in the plate portions of the nozzle 30, whereupon the sections 30, 31 and 32 are drawn into contact with each other and the mounting plate 15 by nuts 57.

As thus assembled, all cooperating parts of the oil burner are secured to the single mounting plate, thereby providing a unit which is capable of ready assembly by securing the plate 15 within the opening 14 in the casting 13 with the nozzle 30 of the air turbulator T projecting through the opening 12 in the wall of the combustion chamber C.

In the fully assembled construction, the turbulator T comprises an air tube 60, which is closed at its front end by a firing assembly plate 61, which supports an electrode clamp 62 and which opens into the combustion chamber C through the tubular portion 48 of the nozzle 30.

The tube 60 is substantially coaxial with the fuel nozzle 26 and is in communication with the air housing through the channels 43 and 44, the former of which are disposed in a longitudinal series at the right of tube 60 and adjacent the top thereof and the latter of which are similarly disposed at the left of the tube and adjacent the bottom thereof.

This particular arrangement of the air channels causes a rapid turbulence of the air and causes the same to have a gyrating motion in its travel toward the discharge end of the nozzle 30, as is clearly indicated in Figs. 1 to 3 and 7.

In accordance with this invention and contrary to the direct application of air to the combustion zone, heretofore practised, the air is indirectly applied, which, due to the improved turbulator T, which causes the air to have a gyrat-

ing motion, not only improves the fuel combustion but renders the construction cheaper than those heretofore used for the direct application of air.

While it is believed that the installation and construction will be clear from the foregoing detailed description, it may be well to briefly describe the assembly and operation as follows:

The combustion chamber C, which may be of standard construction, is modified only to the extent of providing the air housing H in the manner above described.

The complete oil burner comprising the oil burner proper O, blower B, and air turbulator T, which are secured to the mounting plate **15**, is a unit and is readily installed by bolting the plate **15** to the margins of the opening **14** in the manner above described.

The blower B includes an air discharge opening in the plate **15** and the air turbulator extends through the housing H, with the tubular portion **48** of the nozzle **30** extending through the opening **12** in the wall of the combustion chamber C.

In operation, fuel is injected through the feed pipe **25** by the pump **21** at predetermined periods governed by the usual automatic controls and the blower B is operated simultaneously with the pump.

Air is injected into the housing H by the blower B, and in passing therefrom, the air enters the channels **43** and **44**, due to the arrangement of which, as disclosed, the air moves toward the fuel nozzle **26** within the tube **60** in a spirally advancing stream coaxially of the axis of fuel injection from the nozzle **26**.

Some of the air from the housing H enters the holes **55** in the section **32** for balancing the air within the tube **60** in order that the flame or active combustion will actually take place at a proper distance beyond the atomizing point, as otherwise the atomizing mechanism heats up and with oil flowing through will, in the course of time, carbonize and thus impair the proper fuel combustion.

It will be readily appreciated from the foregoing disclosure that a means for indirect air application to the combustion zone of an oil burner assembly is provided, which assures maximum combustion efficiency and which materially reduces the cost of oil burners to the purchasers thereof.

While only a single specific embodiment of the invention is disclosed, the same is to be considered as illustrative, and not restrictive, the scope of the invention being defined in the subjoined claims.

What is claimed as new and desired to be secured by U. S. Letters Patent is:

1. An oil burner comprising a housing forming a closed air chamber, means for maintaining air under pressure in the housing, an air turbulator comprising a hollow cylindrical body contained in said housing, said body being closed at its outer end and terminating at its inner end in a nozzle forming portion that is extended outwardly through a wall of the housing and thereby adapted to be directed into a combustion chamber, and means at the nozzle outlet for supplying atomized fuel to the outgoing air stream; said turbulator body having air inlet passages at intervals therealong and opening thereinto tangentially to the inner surface.

2. An oil burner comprising a housing forming a closed, air pressure chamber, means for maintaining a supply of air under pressure in said housing, an air turbulator contained in the housing and comprising a hollow cylindrical body, closed at one end and formed with a discharge nozzle at its other end projecting through the housing wall and adapted to be directed into a combustion chamber, and a fuel supply means for the burner including an atomizing nozzle located coaxially within the nozzle of the turbulator body; said cylindrical body being provided, at intervals therealong, with air inlet passages for supplying air from the housing under pressure to the tube tangentially to its inner surface.

3. In combination, a combustion chamber having a wall opening, a housing fitted to the chamber wall and forming therewith a closed air chamber, and having an opening in an outer wall thereof alined with the said chamber wall opening, means for supplying air under pressure to the housing, an air outlet device in the housing comprising a hollow, cylindrical body having a closure plate at its outer end fitted over the opening of the housing wall and terminating at its inner end in a restricted nozzle portion extended into the combustion chamber through its wall opening, a fuel delivery tube extending through the closure plate, into the turbulator and having a fuel atomizing nozzle at its end positioned centrally of the nozzle portion of the turbulator device; said turbulator body being formed to provide at close intervals along two opposite sides air inlet passages leading tangentially into the body and open at their outer ends to receive air from the closed housing.

4. An oil burner comprising a housing forming a closed air pressure chamber, means for maintaining a supply of air under pressure in said housing, an air turbulator contained in the housing and comprising a hollow cylindrical body, closed at one end and formed with a discharge nozzle at its other end projecting through the housing wall and adapted to be directed into a combustion chamber, and a fuel supply means for the burner including an atomizing nozzle located coaxially within the nozzle of the turbulator body; said turbulator body comprising a succession of juxtaposed sections, each comprising a tubular portion interrupted at opposite sides, with the tubular portion adjacent the interruptions enlarged and having outwardly directed convex surfaces, flanges spaced from such surfaces in conformity therewith and forming channels leading into the tubular portion for admission of air tangentially to the interior of the body.

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