

Aug. 3, 1943.

E. C. VOLLMER

2,325,893

LIQUID FUEL BURNER

Filed Feb. 14, 1941

2 Sheets-Sheet 1

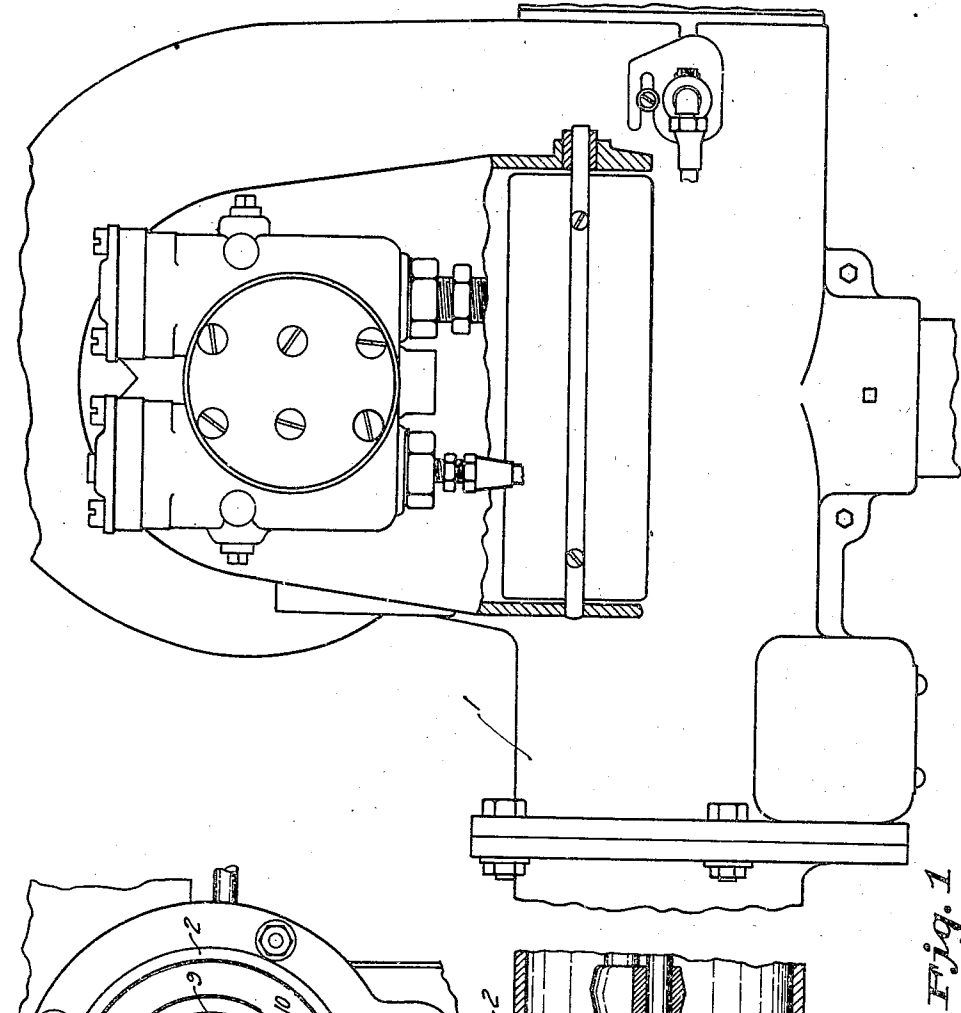


Fig. 1

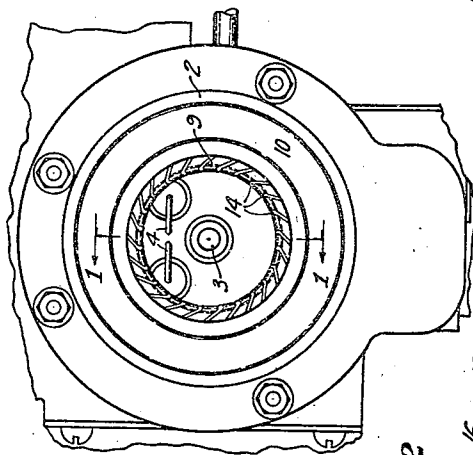
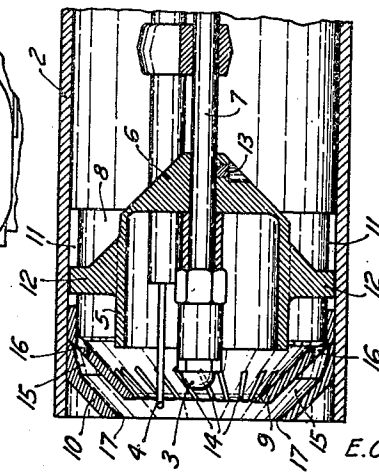


Fig. 2



INVENTOR.  
E.C. VOLLMER

BY  
Merrill M. Blackburn.

ATTORNEY

Aug. 3, 1943.

E. C. VOLLMER  
LIQUID FUEL BURNER  
Filed Feb. 14, 1941

2,325,893

2 Sheets-Sheet 2

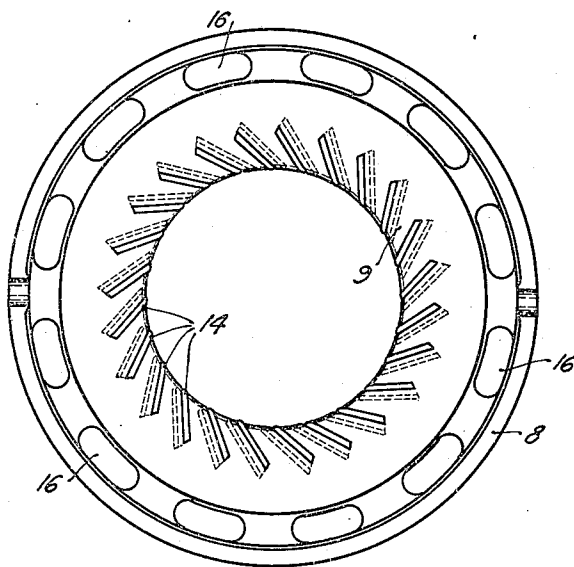


*Fig. 3*

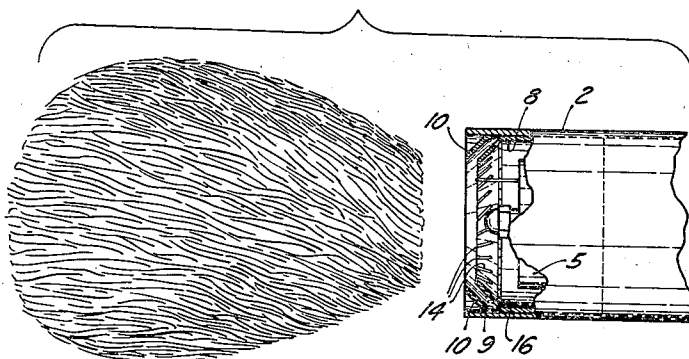


*Fig. 4*

INVENTOR.  
E. C. VOLLMER

BY  
*Merrill M. Blackburn*  
ATTORNEY

## UNITED STATES PATENT OFFICE

2,325,893

## LIQUID FUEL BURNER

Earl C. Vollmer, Rock Island, Ill., assignor, by  
mesne assignments, to The Lennox Furnace  
Company, Marshalltown, Iowa, a corporation of  
Iowa

Application February 14, 1941, Serial No. 378,855

3 Claims. (Cl. 158—76)

The present invention relates to the art of space heating and particularly to liquid fuel burners for such use. With the machines developed in the early history of this art, it was possible to attain high efficiency if there was high fuel consumption. Conversely, if the fuel consumption was low, then the efficiency also was low. It was also the almost universal experience that undesirable pulsations occurred in the furnace when the fuel consumption was low. With the structure of applicant's Patent No. 2,078,884, issued April 27, 1937, applicant overcame these undesirable pulsations, maintaining high efficiency with low fuel consumption. However, in order to provide the best burner possible, it was necessary to produce a burner which would have high efficiency in the low fuel-consumption range, would be without pulsations, and yet would cost less than other structures then on the market. In applicant's efforts to solve this problem, he evolved the structure of the present invention which admirably meets all of the above requirements.

In the drawings annexed hereto and forming a part hereof,

Fig. 1 represents a side view of a liquid fuel burner of the type referred to, partly in longitudinal, vertical section;

Fig. 2 represents a fragmentary front elevation of this structure, looking into the front end of the air tube;

Fig. 3 represents a rear elevation of the unit inserted into the air tube, looking forwardly toward the outlet thereof; and

Fig. 4 is a fragmentary view representing the front end of the burner and the flame located forwardly therefrom.

Reference will now be made in greater detail to the annexed drawings for a more complete description of this invention. The numeral 1 denotes generally a liquid fuel burner of the type referred to, the air-carrying tube thereof being denoted by the numeral 2, and the burner nozzle by the numeral 3. The fuel igniting means or electrodes are indicated at 4. These, as is customary, are located within the air tube 2 and between it and the burner nozzle 3. This is common construction and need not be referred to any further. An air-regulating member 5 in the form of a cup having a pointed bottom portion 6 is adjustable along the fuel pipe 7 which is located substantially axially of the air tube.

An air director or deflector, comprising a substantially cylindrical ring 8 and a pair of frusto-conical flanges 9 and 10, is mounted inside of the

forward end of the air tube and is provided with a pair of slots 11 for the reception of arms 12, projecting laterally from the cup 5. A set screw 13 normally holds the cup in adjusted position but may be loosened in order to permit adjustment of the air-regulator 5. However, after this has been properly set at the factory for a nozzle of any particular capacity, it is not supposed to be changed, except by a person thoroughly conversant with the burner and its operation. The characteristics of the present burner permit the unit to be permanently adjusted at the factory, with an efficiency closely approaching that of the burner of Patent No. 2,078,884. While it is possible to achieve a higher maximum efficiency with the adjustable burner, it has been found in practice that the burner of the present invention, on the average, operates at higher efficiency. This is true for the reason that the adjustment is not left to the judgment of furnace men, who are not thoroughly acquainted with the principles of burning oil, nor to the judgment of tinkering home mechanics.

In my work in connection with the development of this construction, I tried various inclinations for the frusto-conical walls 9 and 10, and found that an inclination of about 45° to the axis of the tube is preferable to any other. With this inclination and the slots 14 inclined at about 45° to the axis of the air tube, I found that with nozzles of 1, 1.25, and 1.35 gallons per hour capacity, I could get about 11.5% CO<sub>2</sub>, while with 30° or 60° inclination, the CO<sub>2</sub> content dropped to 10%, and with intermediate inclination, the CO<sub>2</sub> content varied accordingly. Furthermore, I found that variation of the inclination of the slots 14 with respect to the axis of the air tube also changed the efficiency of the burner. The planes of the slots 14, extended, intersect rearwardly from the point of emission of the fuel from the nozzle. Theoretically, this intersection should be in a point on the axis of the pipe 7, and this is substantially true.

Investigation has shown that the combustible mixture burns in a hollow figure having a generally annular cross-section. A study of this figure seems to indicate an internal enlargement thereof at points more remote from the nozzle, the same corresponding in general to the exterior of the flame, as shown in Fig. 4.

As indicated above, part of the air going through the air tube 2 goes between the regulating member 5 and the frusto-conical member 9, and part passes between the members 9 and 10. In order to make it possible for air to pass from

the tube 2 into the space 15 between the members 9 and 10, I provide a ring of openings 16 in the inner frusto-conical wall, and these allow passage of air therethrough into the space 15. This air tends to go out in somewhat conical form but it is disturbed, by the action of the air passing through the slots 14 which tends to cause rotary motion of the internal mass of the combustible emitted from nozzle 3. It has been indicated above that the regulator 5 may be adjusted longitudinally of the pipe 7. This is for the purpose of properly proportioning the air passing through the inner conical member and that passing through the space 15. In this connection it is desired to call attention to the fact that, if the edge 17 is a sharp edge rather than rounded, as is the outer edge of the frusto-conical member 9, the results are much improved over what they are with the rounded edge. It is difficult to determine the reason for the superiority of the present construction over the prior art but the fact remains, nevertheless, that the superiority exists.

While I have shown in the annexed drawings a preferred embodiment of my invention, I desire the same to be understood as illustrative only and not as limiting this invention, it being possible to depart from the specific disclosure without departing from the spirit of my invention as set forth in the appended claims.

Having now described my invention, I claim:

1. In an oil burner having an oil nozzle, an air tube, and fuel igniting means located between them; an air director in the forward end of the air tube, said air director tapering forwardly at an angle of approximately 45° with relation to the axis of the air tube and terminating in a sharp inwardly directed edge, and a second air director in the air tube and located inwardly from the first mentioned air director, said second air director tapering inwardly at substantially the same inclination as the first mentioned air director, said second air deflector having a substantially cylindrical extension fitting closely inside of the air tube, and being provided around the outer periphery of the tapered part with a plurality of openings leading from the air tube

to the space between the air directors, and the inwardly tapered portion of the second air director being provided with slots in its forward edge portion, the planes of said slots intersecting the axis of said air tube rearwardly from the forward face of the second mentioned air director and at an angle of approximately 45°.

2. In an oil burner having an oil nozzle, an air tube, and fuel igniting means located between them; an air director in the forward end of the air tube, said air director tapering forwardly at an angle to the axis of the air tube and terminating in a sharp inwardly directed edge, and a second air director in the air tube fitting closely within said tube to substantially prevent passage of air between the second air director and the air tube, said second air director being located inwardly from the first mentioned air director, said second air director tapering inwardly at substantially the same inclination as the first mentioned air director and being provided around the outer periphery of the tapered part with a plurality of openings leading from the air tube to the space between the air directors, the inwardly tapered portion of the second air director being also provided with slots in its forward edge portion.

3. In an oil burner having a nozzle and an air tube surrounding it; air-deflecting means located in the forward end of the air tube and comprising a pair of inner and outer approximately parallel inwardly tapered flanges having a substantial air-carrying space between them, the inner air deflecting flange having a tubular portion at its outer periphery fitting closely within the air tube and having forwardly directed openings in its outer part to conduct air from the air tube to the space between the flanges, and having slots through its forward portion, said slots having their planes inclined at approximately 45° with relation to the axis of the air tube with their point of intersection located rearwardly of the nozzle and substantially in the axis thereof, in combination with air-directing means located centrally of the air tube and forcing the air outwardly toward the said tubular portion.

EARL C. VOLLMER.