July 21, 1953 F. BANSCHER 2,646,109

BURNER FOR LIQUID FUEL

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Fig. 2

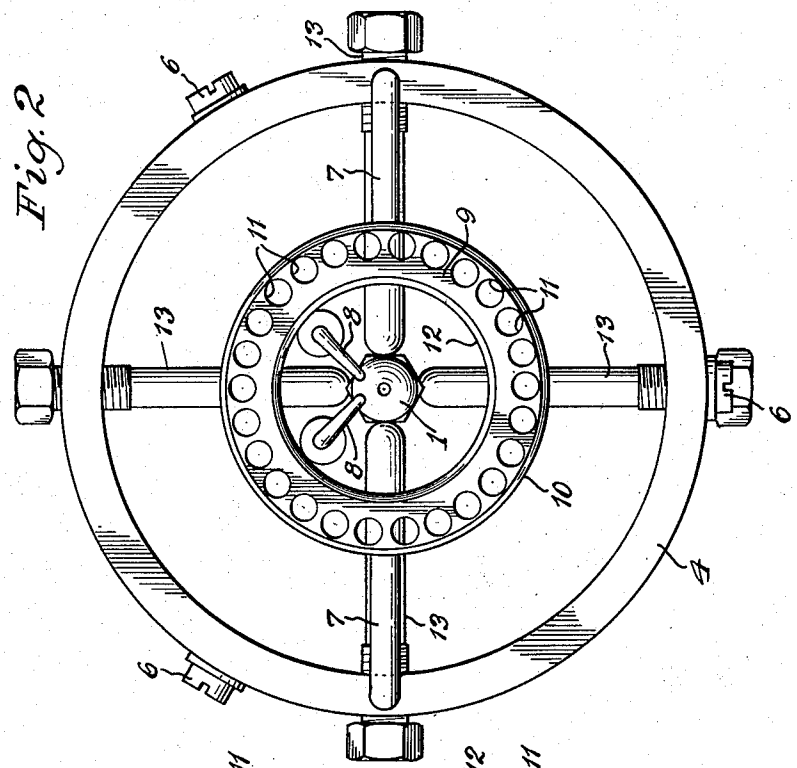
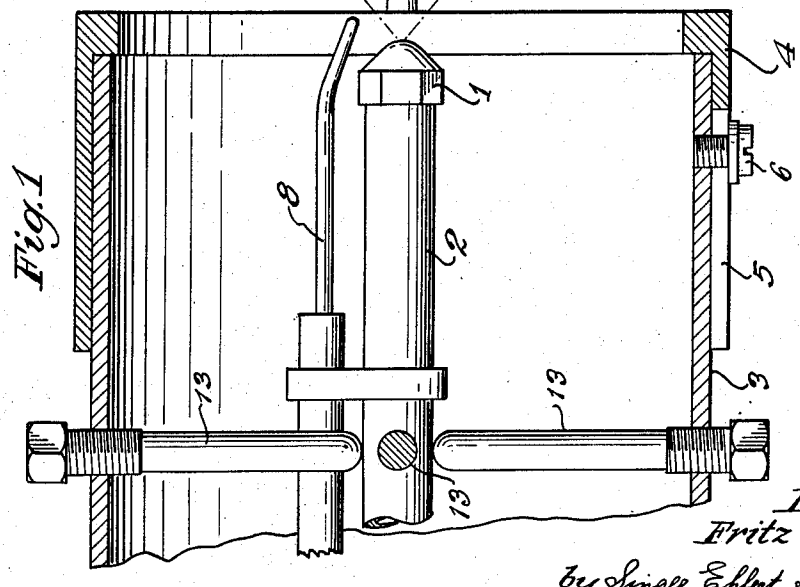


Fig. 1



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Fig. 4

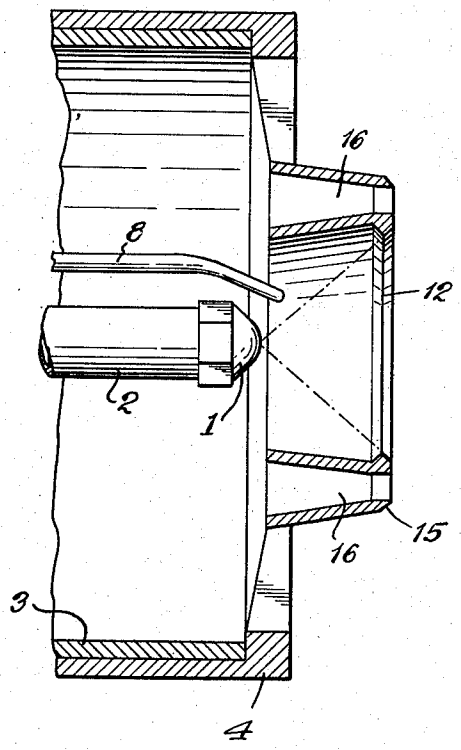


Fig. 3

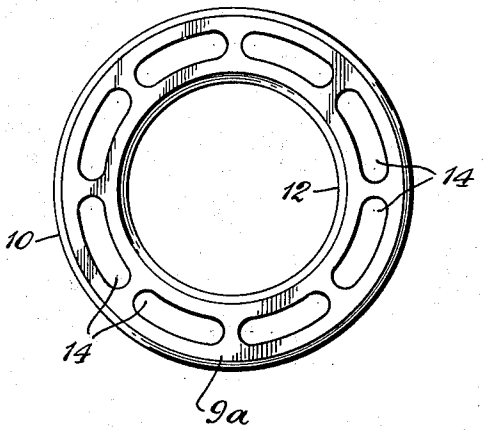


Fig. 5

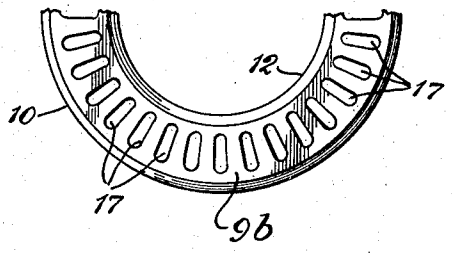
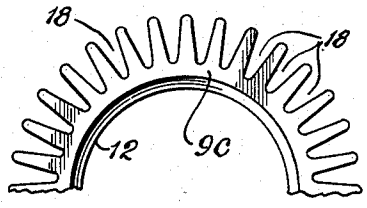


Fig. 6



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BURNER FOR LIQUID FUEL

Fritz Banscher, Basel, Switzerland

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In Switzerland June 29, 1946

Section 1, Public Law 690, August 8, 1946
Patent expires June 29, 1966

1 Claim. (Cl. 158—76)

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In pressure type oil burners already known, the ignition of the mixture of atomized liquid fuel and air takes place in the natural zone of vaporization, and the point of ignition, where the flame originates, is unstable.

For burning light or medium domestic oils, and light industrial fuel oil, with preheating, several methods have been proposed of stabilizing and shaping the flame, by applying special devices for the guiding of the air flow at the orifice of the blast tube, or by differently shaped jackets and funnels within which the flame originates, and through which it must pass before entering the fire box.

Experience has shown, however, that these methods of giving origin to and shaping the flame, when the liquid fuels mentioned above are used, have certain distinct disadvantages.

If the flame originates in the natural vaporizing zone and at an unstable ignition point, it is well known that such a flame floats at a varying distance from the nozzle, and various troubles may happen, whether air guiding means or special flame jackets etc. are applied or not, and whatever shape they may be given. E. g., the nozzle and burner head may be covered with a layer of coal particles, or the flame may be thrown back, or it may suddenly go out.

The worst and most dangerous of these troubles consists of the flame wandering away from the burner head to the back wall of the fire box and burning there, which is due to known irregularities in the operation of the burner, boiler or flues. As it is well known, this may result in troubles due to condensed water in the fire box and chimney, fuel and heat losses, and/or the chimney being set on fire, or explosions taking place in the boiler. This wandering away of the flame to the back wall may happen at the very moment of ignition (in the natural vaporizing zone and at an unstable ignition point), or at any later time during the on period of the burner. Experience shows that this danger is still greater when heavier industrial oils are used.

Although with the known arrangements mostly based on guiding the air flow, the shape of the flame may be well adapted to the shape of the fire box, yet the troubles named above, with the consequent dangers, cannot be eliminated as long as the flame originates in the natural vaporizing zone and at an unstable ignition point, instead of in a constructive vaporizing zone and at a stable ignition point.

The object of the present invention is a new arrangement for high pressure type atomizing

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burners aiming at shaping the flame and adapting it to the fire box.

The arrangement for atomizing liquid fuels, e. g. in oil burners, according to which air streams are guided to and conically introduced into the mantle of the spray cone formed by the oil spray ejected by the nozzle, is defined by the fact that the cone of the mixture of atomized oil and air is interrupted in a circular and variable way by an annular disk, whereby in the constructive vaporizing zone thus obtained, a stable ignition point is obtained, where a continuous and adjustable flame originates which is supported by and firmly clings to the annular disk.

According to the present invention an exchangeable annular disk is provided in front of the orifice of a nozzle attached to a pressure fuel conduit for liquid fuel. This disk is arranged within the atomizing zone of the burner and has a central opening and is attached to the burner head by means of two supporting arms in such a way that it may be slid in a direction parallel to the axis and then fixed in the desired position. The annular disk is provided with a series of holes in order to introduce a certain portion of the air supplied by a fan to the burner head into the vaporizing zone at the annular disk. The whole arrangement is designed to produce a continuous flame supported by and clinging to the disk.

Tests have shown that when using the described arrangement of the invention with light and medium fuel oils, and even with heavier ones with electric preheating in fully automatic oil burners, a flame can be obtained more efficient and safer in operation than any obtained before, a fact that is due to the cooperation of the various elements of the arrangement described.

The advantage of the arrangement described is that, in the very moment of ignition, a stable, bright, smokeless, continuous flame originates, is supported by and clings to the disk. This arrangement has none of the disadvantages of the floating flames known up to the present day. This new flame does not pass through and does not touch air guiding jackets or conical tubes, where layers of coal particles might be deposited and thus the diameter of the openings of these guiding parts might be restricted and the flame deflected. The arrangement of the invention is very simple from the mechanical point of view, is inexpensive, and can be used very advantageously also with existing pressure type atomizing oil burners which up to now could only burn very light domestic oils, but with the arrangement of the present invention heavier and

cheaper liquid fuels can also be used. The new arrangement can also be used with fully automatic oil burners provided with electrical preheating means for heavy fuel oils.

The drawing shows a number of examples of the arrangement of the present invention.

Fig. 1 shows a longitudinal section through one arrangement,

Fig. 2 is a frontal view, and the Figs. 3, 4, 5 and 6 show each a different modification of the arrangement.

As the drawing shows, the fuel supply pipe 2, that ends in the atomizing nozzle 1, is surrounded by the blast tube 3 guiding the air from the fan to the flame. A number of radially mounted pins 13 are in threaded engagement with the wall of the tube 3 and their inner ends engage the fuel supply pipe 2 and hold it in position centrally within the blast tube 3. A tube 4 is slid over the end of tube 3 and can be fixed on it in various positions by the screws 6 extending through slots 5 in the tube 4. To the end of tube 4, two supports 7 are attached horizontally and their ends hold an annular disk-shaped element 9 in a position concentric to the nozzle, and at this disk the flame originates. In the annular disk-shaped element, near its outer circumference 10, a series of closely spaced holes 11 is provided for the passage of air. At the inner edge of the annular disk-shaped element, there is a circular beveled edge 12 formed between the two faces of the disk-shaped element at which the oil and air-mixture spreading out conically is concentrically intercepted. The fuel mixture is ignited by means of the electrodes 8.

While the holes 11 in the annular disk-shaped element 9 (Fig. 2) are round, Fig. 3 shows a disk-shaped element 9*a* with holes 14 which are oblong in circumferential direction. Fig. 5 shows a disk-shaped element 9*b* with holes 17 which are oblong in radial direction, and Fig. 6 shows a disk-shaped element 9*c* with radial slots 18 in its outer circumference. There may also be attached a casing 15, in which an air guiding channel 16 is provided as shown in Fig. 4.

The annular disks 9, 9*a*, 9*b* or 9*c* are smaller in outside diameter than the blast tube 3, in fact, they are substantially equal to one-half of the diameter of the tube 3 and are arranged forwardly of said tube 3 and in axial alignment with the fuel supply pipe 2 and axially spaced from the nozzle 1 on said fuel supply pipe 2.

In operation, the nozzle 1 produces a conical spray of fuel oil directed against the annual disk-shaped element 9, and at the same time this fuel oil spray is mixed with the air which passes through the blast tube 3. The beveled edge 12 of the central opening of the annular disk-shaped element 9 intercepts the outer surface of the conical spray of fuel oil issuing from the nozzle 1 and prevents passage of the air stream through said central opening, but excess air in an optimum amount is fed to the flow path through the series of circumferentially arranged openings 11, 14 or 17 or the slots 18 and thus supports complete combustion, so that the burner flame will originate substantially in the plane of the disk-shaped element 9, 9*a*, 9*b* or 9*c* and project forwardly therefrom.

I claim and desire to secure by Letters Patent:

In a burner for liquid fuel, a nozzle having a predetermined spray angle for a predetermined oil viscosity and pressure whereby a conical spray is formed, a fuel supply pipe carrying said spray nozzle at its discharge end and adapted to set up vaporization of the fuel in a zone located a predetermined distance in front of said nozzle, an air tube concentrically surrounding the fuel supply pipe and nozzle, and an annular disk-shaped element of smaller outside diameter than said tube substantially equal to one-half the diameter of said tube and located forwardly of said air tube and arranged in axial alinement with the fuel supply pipe and nozzle and axially spaced in front of said nozzle, said annular disk-shaped element being provided with a series of spaced small round openings arranged circumferentially to provide a series of passageways concentrically surrounding the central opening of said annular disk-shaped member, said circumferentially spaced openings being adapted for the passage of air streams formed by air forced through said air tubes, the central opening of said disk-shaped element being provided with opposed beveled edges on its inner circumference extending between the two faces of the disk-shaped element, said disk-shaped element being mounted for axial adjustment with respect to the air tube and fuel nozzle and positioned with the beveled edge of the central opening in the annular disk-shaped element intercepting the outer surface of said predetermined spray angle of said nozzle whereby said edge prevents passage of the air stream through said opening but permits excess air in optimum amount to be fed to the flow path through said series of circumferentially arranged openings and thus support complete combustion such that the burner flame will originate substantially in the plane of the disk-shaped element and project forwardly therefrom.

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