May 15, 1928. 1,669,810

C. F. CLAPHAM

OIL BURNER

Filed April 5, 1926

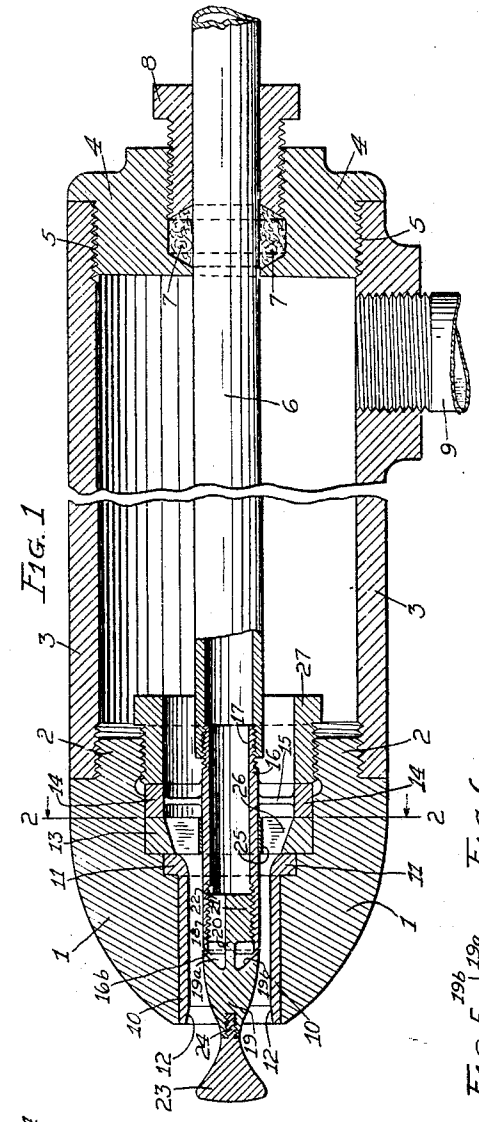


FIG. 1

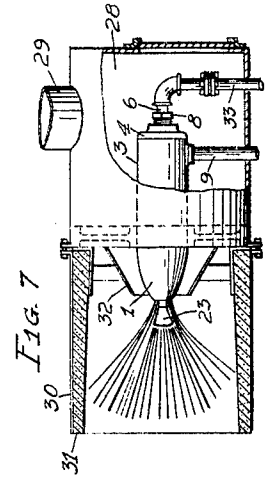


FIG. 7

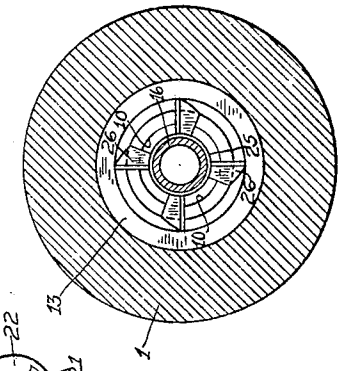


FIG. 2

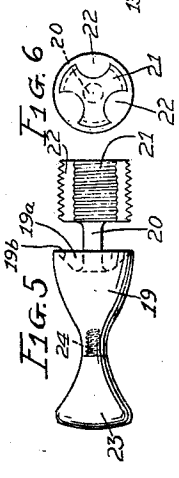


FIG. 6

FIG. 5

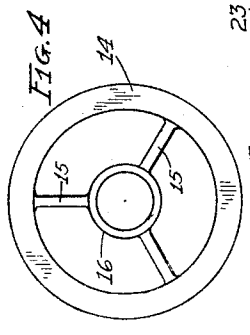


FIG. 4

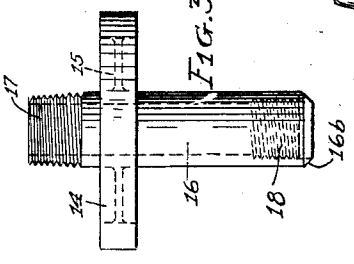


FIG. 3

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Patented May 15, 1928. 1,669,810

UNITED STATES PATENT OFFICE.

CHARLES F. CLAPHAM, OF CHICAGO, ILLINOIS.

OIL BURNER.

Application filed April 5, 1926. Serial No. 99,854.

My invention relates to improvements in oil burners, and more especially those designed to be used in connection with furnaces or boilers of heating plants, and it consists in the combinations, constructions, and arrangements herein described and claimed.

An object of my invention is to provide a burner for burning heavy oils, and which is so designed as to produce a maximum breaking up or atomization of the oil and a thorough mixture of the atomized oil with air prior to its ignition.

A further object of my invention is to provide a novel form of structure for accomplishing this complete atomization in which a thin sheet of oil is thrown across the path of an incoming stream of air under pressure.

A further object of my invention is to provide a device which will cause the ignited mixture of atomized oil and air to flare out in a cone having a wide angled apex, whereby a relatively short encasing tube may be used.

A further object of my invention is to provide a device in which an intimate mixture of the air and oil is assured through the centrifugal effect produced by blades, forming part of the burner.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which

Figure 1 is a vertical sectional view through a burner constructed according to my invention,

Figure 2 is a section along the line 2—2 of Figure 1,

Figure 3 is a detail view of a portion of the burner mechanism,

Figure 4 is a plan view of the mechanism shown in Figure 3,

Figure 5 is a side view of a deflector,

Figure 6 is an end view of the deflector shown in Figure 5, and

Figure 7 is a view, partly in section, showing the burner used in connection with an encasing tube.

In carrying out my invention, I provide a body portion 1 which has a reduced portion 2 threaded on its exterior to engage the threads of a cylinder 3. The latter has an end portion 4 which is also threaded to the cylinder, as shown at 5. This end portion 4 has a central opening arranged to receive a fuel inlet pipe 6 which passes through the cylinder 3, and which is provided with a stuffing box 7 having a movable member 8 by means of which the packing may be compressed around the inlet pipe 6. Leading into the interior of the cylinder 3 is a pipe 9.

The body portion 1 has a central bore arranged to receive a sleeve 10. This sleeve is provided with a head 11 at one end which fits in a recess in the head. The other end is slightly beveled or flared outwardly, as shown at 12. The head is also recessed to receive a washer 13, whose inner surface is beveled, as shown in the drawing. Disposed adjacent to the washer is a ring 14 in the shape of a wheel, which is connected by means of spoke-like members 15 with a tube 16, see Figure 3, having one end threaded exteriorly, as at 17, to engage the threaded end of the inlet pipe 6. The other end of the tube 16 is threaded, as shown at 18.

Arranged to cooperate with the tube 16 is a deflector member, such as that shown in Figures 1 and 5. This deflector has somewhat the shape of a double cone with a common apex. One of these conical-shaped members 19 is provided with a central extension or arm 20 bearing at its end a threaded cylindrical member 21 having a plurality of grooves 22 running longitudinally thereof on the outer portion. The threaded member 21 is arranged to enter the threaded portion 18 of the tube 16. It will be observed that the member 19 has a cup-shaped recess 19^a, and that the inner walls of this recess are inclined rearwardly; that is to say, toward the right in Figures 1 and 5, as shown at 19^b. It will also be observed that the end of the tube 16 is beveled, as shown at 16^b, so as to approximately parallel the beveled edge 19^b. The cone-shaped member 23 is secured to the member 19 by a threaded connection 24.

One of the main features of the invention consists in the provision of a series of deflector blades, which, in the present instance, are shown as being carried by a sleeve 25, the latter being mounted on the exterior of the tube 16, as shown in Figures 1 and 2. The planes of the blades 26 are inclined transversely with respect to the longitudinal axis of the device. In assembling the de-

vice, the sleeve 10 is inserted in the head, the washer 13 is placed in position, and the tube 16, bearing the wheel 14 and the blades 26 is placed in position and held securely by means of a nut 27. It will be observed that the outer edge of the blades is held by the inclined face of the washer 13, so that the parts are held securely in position.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. In Figure 7 I have shown a construction with which the device thus far described may be used. In the present instance, there is a chamber 28 with which a pipe 29 communicates. This is the low pressure air chamber, and the rear portion of the tube 3 and its connections are disposed therein. The front portion projects into a tube 30, which is preferably lined with a refractory lining 31. A hollow conical-shaped deflector 32 surrounds the head 1.

The air which enters through the pipe 9 into the space within the tube 3 is under high pressure as compared with the air in the chamber 28. In actual practice, I have used three pounds air pressure within the tube 3, while the air pressure in the chamber 28 is considerably lower, depending upon the size of the burner and the amount of heat to be generated. The fuel which enters the pipe 33 in connection with the pipe 6 may be at ten pounds pressure. As the air within the tube 3 passes the blades 26, it is given a rotary motion, and in passing onward it meets the thin sheet of oil issuing from the space between the parallel inclined surfaces 19^b of the cone-shaped member 19, and 16^b at the end of the pipe 16. Since this opening extends clear around the pipe, it forms a slot which is directed inwardly and outwardly at substantially an angle of 45°. In the drawings, I have shown a somewhat larger slot than would be used in actual practice, but this is for the purpose of illustration only. The width of this slot, of course, can be adjusted by means of the threaded member 21. The rotating column of air strikes the thin cone-shaped sheet of oil and tends to become thoroughly mixed with it. The mixture passes on and strikes the deflector 23. This deflector serves a very useful purpose, for I have found that without its use, there is a tendency for the oil to form in streams of more or less density, instead of being broken up or atomized; but with this deflector, there is a very complete breaking up of these streams, and the resulting flame is spread out into a cone having a wide angle at its vertex, as illustrated in Figure 7.

I have spoken of the fact that the deflector 23 tends to aid in breaking and spreading out the stream of atomized fuel. I find the inclined blades tend to aid in this effect, also broadening and shortening the flame, and holding it in the fire tube 30 when a strong draught of secondary, or low pressure air tends to blow it out. A long tube minimizes the tendency for the flame to blow clear of the tube, but is objectionable due to the greater likelihood of formation of carbon at its orifice. Furthermore, I have found that without these inclined blades, or deflector 23, and when using forced draft in order to increase the capacity, even with a relatively long fire tube, the ignited fuel would leave the tube and burn in the rear of the fire box of the boiler to which it was applied. This tendency is accentuated when starting up with a cold boiler and cold oil. The additional fining of the atomization by means of the deflector causes the ignition point of the stream to come closer to the nozzle, thereby ensuring ignition of all the atomized fuel, and eliminating what was formerly a wet area between the point where the flame strikes the tube and the nozzle.

Keeping the slotted oil orifice, formed by tube 16 and the deflector member shown in Figure 5, near the outlet of the sleeve 10 gives a greater margin against the likelihood of coalescence of the oil on the walls of the sleeve, and this is entirely eliminated by a correct balance of the oil and air pressures, together with the other forces which produce atomization of the oil, such as centrifugal force, expansion of the compressed air, and the breaking force caused by the deflector 23.

The deflector 32 regulates the supply of secondary and low pressure air. By its use a central and supporting stream of air is supplied at the nozzle, and another air stream passes round it to supply just the right amount of air required for complete combustion. This deflector, by having its area properly proportioned, also plays a part in the regulation of the flame.

While under certain circumstances, it is advisable to use the construction shown in Figure 1, with a low pressure chamber 28 and tube 30, as shown in Figure 7, yet the construction shown in Figure 1 forms in and of itself a very efficient burner, and may be used without the chamber or tube under certain circumstances, such as with a natural draft. Of course, the capacity of the burner may be greatly increased by adding a forced draft, but a fine atomization of the stream of oil issuing from the nozzle will be effected by my construction in every case.

I claim:

1. In a burner, a centrally disposed fuel tube, an air pressure chamber surrounding said tube, a discharge passage for the air from said air pressure chamber, one end of said fuel tube terminating in said air passage, a substantially conical-shaped valve

member disposed within said passage, said valve member having a central stem projecting from the larger end and adapted to extend within the tube, a perforated threaded connection member at one end of said stem, said threaded member being disposed within said tube and movable relative thereto to vary the distance between said valve member and the end of the tube, and a conical-shaped deflecting member having its apex secured to the apex of the conical-shaped valve member.

2. In a burner, a centrally disposed fuel tube, an air pressure chamber surrounding said tube, a discharge passage for the air from said air pressure chamber, one end of said fuel tube terminating in said discharge passage, a substantially conical shaped valve member disposed within said passage, said valve member having a central stem projecting from the inner end and adapted to extend within the tube, a perforated supporting member at one end of said stem, said supporting member being disposed within said tube and movable relative thereto to vary the distance between said valve member and the end of the tube, and a conical shaped deflecting member having its apex secured to the apex of the conical shaped valve member.

3. An oil burner construction, comprising a centrally disposed fuel tube, an air pressure chamber surrounding the tube, a discharge passage for the air from said air pressure chamber, and a deflector in the form of a double cone with a common apex carried at the end of the fuel tube, the end of said deflector adjacent to the tube being cup-shaped to receive the oil, and means for constraining the oil to move in a thin sheet over the cup-shaped surface and across the air pressure chamber.

CHARLES F. CLAPHAM.