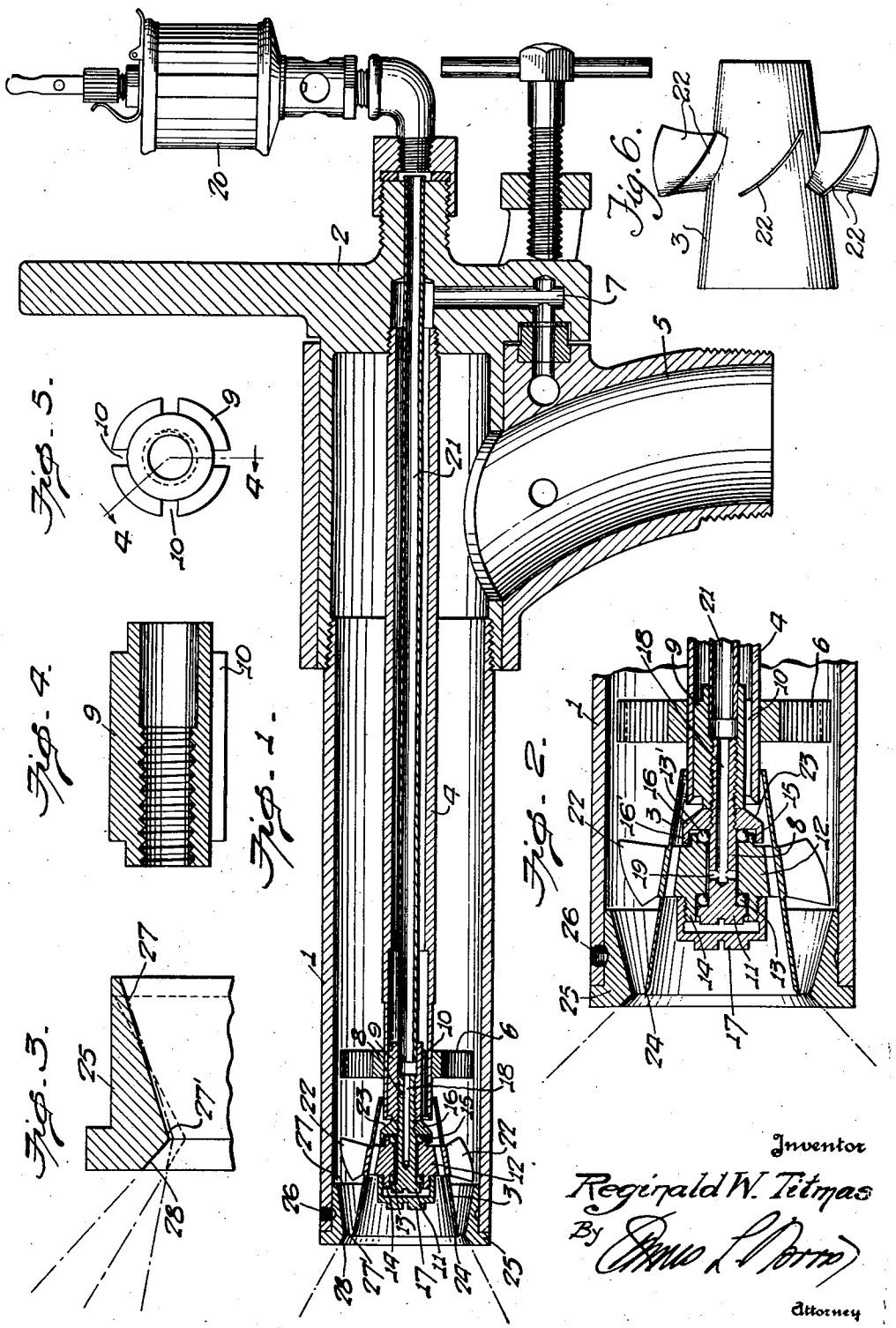
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OIL BURNER

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OIL BURNER

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This invention relates to liquid fuel burners of that type wherein the fuel oil is delivered to a cup rotated at high speed in order to atomize the oil by centrifugal force, and wherein the cup is rotated by the air used to project the atomized oil into the furnace.

The invention has for one of its objects the provision of a burner of the type just indicated which may be operated at low cost and with great efficiency.

To these ends, the cup is perfectly balanced on an anti-friction bearing and is provided with comparatively wide curved impeller blades to permit it to be rotated at a higher speed than has heretofore been attained by burners embodying air propelled cups. The cup is provided at its forward or delivery end with a knife edge, which splits the globules of oil as they are carried thereto by centrifugal force. The increased speed of the cup and the splitting of the globules result in the thorough atomization of the oil.

The invention further includes means for protecting the cup from the radiant heat of the furnace so as to prevent such heat from being conducted to and cracking the lubricating oil in the bearing. This is accomplished by disposing the entire cup within the tube through which the air used to project the atomized oil is carried to the furnace.

A further feature of the invention is that the tube, at its forward or delivery end, is provided with a tip of such formation as to thoroughly mix the atomized oil with the air and also to hold the flame on the end of the burner against the tendency of the draft of the furnace to withdraw it therefrom.

A further feature of the invention is that lubricant is supplied to the bearing for the cup by being conveyed through the entire length of the tube which carries the fuel oil to the cup. This arrangement, due to the fact that the fuel oil is heated before entering its tube, maintains the lubricant in free flowing condition, with the result that the proper lubrication of the bearing is assured.

With the foregoing and other objects and advantages in view, as will hereinafter appear, the invention consists in the preferred forms of construction and arrangement hereinafter described and claimed, subject to such modifications as come within the scope of the appended claims.

In the accompanying drawing:

Fig. 1 is a sectional view taken on a vertical plane extending centrally and longitudinally through an oil burner embodying my invention;

Fig. 2 is a sectional view, on a larger scale than Fig. 1, of the forward end of the burner;

Fig. 3 is a sectional view, also on a larger scale than Fig. 1, of the tip of the burner;

Fig. 4 is a sectional view of the bearing sleeve of the burner on the line 4—4 of Fig. 5;

Fig. 5 is an end elevation of the plug at the discharge end of the fuel oil tube which supports the bearing for the rotatable cup; and

Figure 6 is an elevation of the oil-atomizing cup.

The invention is shown applied to a low pressure oil burner of the type shown in Patent No. 1,604,955, granted November 2, 1926, to Baker, and comprises a burner tube 1, closed at its rear end by a cap plate 2, and an oil-atomizing cup 3 of truncated cone shape, rotatably mounted in the forward end of the tube. The fuel oil consumed by the burner is delivered to the interior of the cup 3 by a tube 4 supported centrally within the tube 1. The air for projecting the atomized fuel into the fire box of the furnace is delivered to the rear end of the tube 1 through a pipe 5 and passes about the cup as it escapes through the front end of this tube. The fuel oil supply tube 4 is supported at its rear end by the cap plate 2 and at its front end by a spider 6 adjacent the forward end of the tube 1. The tube 4 is supplied with oil through passages 7 formed in the cap plate 2.

In accordance with my invention, a shaft 8, upon which the oil atomizing cup 3 is rotatably mounted, is secured to a plug 9 mounted in the forward end of the tube 4 and secured in said tube against rotary and longitudinal movements with relation to the tube. The plug 9 has a plurality of longitudinal grooves 10 in its periphery through which the fuel oil passes from the tube 4 to the interior of the cup 3. The shaft 8 which is threaded in the plug 9 extends forwardly beyond the tube 4 into the cup 3, and is provided at its forward end with a head 11. A spider 12, secured within the cup 3 between the ends of the latter, is rotatably supported upon the shaft 8 by annular series of anti-friction balls 13 and 13'. The spider 12 is provided at its forward end with a flange 14 which forms a front ball race and at its rear end with a flange 15 which forms a rear ball race. The head 11 of the shaft 8 and a rear ball retainer 16 on the shaft retain the balls 13 and 13' in the said front and rear ball races. The forward end of the bearing is closed by a cap 17 threaded upon the flange 14. The rear ball retainer 16 is threaded upon the shaft 8 for adjustment relatively to the head 11

to take up any longitudinal play that may occur in the bearing. The ball retainer 16 is provided with a flange 16' which surrounds the flange 15.

The series of anti-friction balls 13 and 13' are located, respectively, on opposite sides of and at equal distances from the center of gravity of the oil atomizing cup 3 and thus perfectly balance the cup upon its bearing. The shaft 8 is provided with a longitudinal passage 18 which communicates at its rear end with the interior of the plug 9 and at its forward end by way of radial openings 19 with the interior of the bearing. Lubricant is supplied to the passage 18 from a lubricant container 20 mounted upon the cap plate 2 at the rear end of the burner, through a tube 21 extending through the tube 4 to the interior of the plug 9 and thence to the passage 18 of the shaft 8. Since the fuel oil delivered to the tube 4 is usually preheated, and since the tube 4 surrounds the tube 21, the lubricating oil is maintained in condition to flow freely to the bearing under all conditions while the burner is in use.

The oil-atomizing cup 3 is provided on its outer side with wide curved impeller blades 22 which are located between the series of anti-friction balls 13 and 13', and are acted upon by the air flowing through the tube 1 to impart rotation to the cup. The entire cup 3 is located within the tube 1 and is thus protected from the radiant heat of the furnace. This heat, which tends to crack lubricating oil, is thus prevented from being conducted by the cup 3 to the lubricating oil in the bearing of the cup.

The rear end of the oil-atomizing cup 3 surrounds the forward end of the tube 4. The rear ball retainer 16 is located within the cup 3 close to the forward end of the tube 4, and its rear end tapers rearwardly and forms a deflector surface 23 which throws the fuel oil discharging from the tube 4 against the inner wall of the cup. The forward end of the cup 3 is formed with a knife edge 24 against which globules of fuel oil are carried by centrifugal force and which serves to split the globules to form a fine mist.

A tip 25 is mounted in the forward end of the tube 1 and is secured therein by a screw 26. The interior of the tip 25 is of decreasing diameter, as at 27, from its rear end to a point 27' adjacent its forward end and is of increasing diameter, as at 28, from said point to its forward end, and thus presents a deflector surface which surrounds the forward end of the oil-atomizing cup 3, and which tapers from its forward end toward the knife edge 24 of the cup. As the air passes through the tip 25 it is deflected by the surface 27 toward the knife edge 24 of the cup 3 and across the path of the fine mist of fuel discharging from the cup. The thoroughly mixed air and fuel flow from the tip 25 along the forward conical surface 28 which, as stated above, flares outwardly from the forward end of the conical surface 27 between the constricted portion of said tip and the knife edge 24 of the cup 3. Thus the annular space between said constricted portion 27 of the tip and the knife edge 24 determines the size of the flame at the forward end of the burner. The surfaces 27 and 28 also tend to create a partial vacuum adjacent the forward end of the burner, which functions to hold the flame on the forward end of the burner against the tendency of the draft of the furnace to draw the flame forwardly therefrom. A series of tips having inner conical surfaces and forward conical surfaces disposed in different angular relation to the axes of the tips, as indicated by broken lines in Figure 3, may be provided for interchangeable engagement with the tube 1, whereby either the length or the width or both the length and the width of the flame may be varied.

From the foregoing, it will be understood that the oil-atomizing cup 3 is supported in a manner to permit it to be rotated at a comparatively high speed by air flowing through the burner tube 1 under comparatively low pressure. The high speed of the cup 3, together with the splitting of the oil globules by the knife edge 24 of the cup, effects the thorough atomization of the fuel oil, at a comparatively low cost. The relation of the deflecting surface 27 and constricted portion 27' of the tip 25 to the knife edge 24 of the cup 3 effects the thorough mixing of the atomized fuel oil with the air used to project the oil into the furnace. The bearing for the cup 3 will be subjected to comparatively little strain, due to the balancing of the cup on the bearing, and to the means employed for insuring an ample supply of lubricating oil to the bearing and for protecting the lubricating oil in the bearing from radiant heat. The cup 3 and its bearing may be easily removed from the tube 1 whenever it becomes necessary to clean the cup and adjust the bearing. The wide longitudinal channels or grooves 10 in the periphery of the plug 9 permit the fuel oil to be supplied in ample quantity to the interior of the cup 3.

What I claim is:

1. A liquid fuel burner comprising a burner tube, a fuel tube mounted in the burner tube, a fuel-atomizing cup rotatably mounted within the burner tube at the forward end of the fuel tube, said cup having a knife edge at its front end, a tip secured within the forward end of the burner tube about the forward end of said cup and having a deflecting surface tapering toward the knife edge of said cup, said tip having a conical surface flaring forwardly and outwardly from the knife edge of said cup, and impeller blades on said cup.

2. A liquid fuel burner comprising a burner tube, a fuel tube mounted in the burner tube, a bearing supported from the forward end of the fuel tube, a tube extending longitudinally through the fuel tube and communicating at its front end with the interior of said bearing, a lubricant container communicating with the rear end of said second named tube, a fuel-atomizing cup mounted on said bearing within said burner tube, and impeller blades on said cup.

3. A liquid fuel burner comprising a burner tube, a fuel tube mounted in the burner tube, a plug secured in the forward end of the fuel tube and provided with a plurality of fuel passages, a shaft extending forwardly from said plug, an anti-friction bearing carried by said shaft and including a member having a deflecting surface facing the discharge ends of said fuel passages, a fuel-atomizing cup surrounding said bearing and the discharge ends of said fuel passages, means supporting said cup from the bearing, and impeller blades carried by said cup.

4. A liquid fuel burner comprising a burner tube, a fuel tube mounted in the burner tube, a plug secured in the forward end of the fuel tube and provided with a plurality of fuel passages, a shaft extending forwardly from said plug, an anti-friction bearing carried by said shaft and including a member having a deflecting surface facing the discharge ends of said fuel passages, a fuel-atomizing cup surrounding said bearing and

the discharge ends of said fuel passages, means supporting said cup from the bearing, said shaft having a passage communicating with the interior of the bearing and the interior of said plug, a lubricant tube extending longitudinally through the fuel tube with its forward end located in said plug, a lubricant container connected to the rear end of the lubricant tube, and impeller blades carried by said cup.

5. A liquid fuel burner comprising a burner tube, a fuel tube mounted in the burner tube, a fuel-atomizing cup tapering forwardly and outwardly and rotatably mounted in the burner tube with its rear end surrounding the forward end of the fuel tube, said cup having a knife edge at its forward end, a deflector mounted in said cup adjacent the front end of the fuel tube, a tip mounted in the forward end of the burner tube and surrounding the forward end of said cup, said tip having an inner deflecting surface tapering toward the knife edge of said cup and being provided, forwardly of its said deflecting surface, with a second inner surface flaring forwardly and outwardly from the knife edge of said cup, and impeller blades carried by said cup immediately in rear of the first-named deflecting surface of the tip.

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