

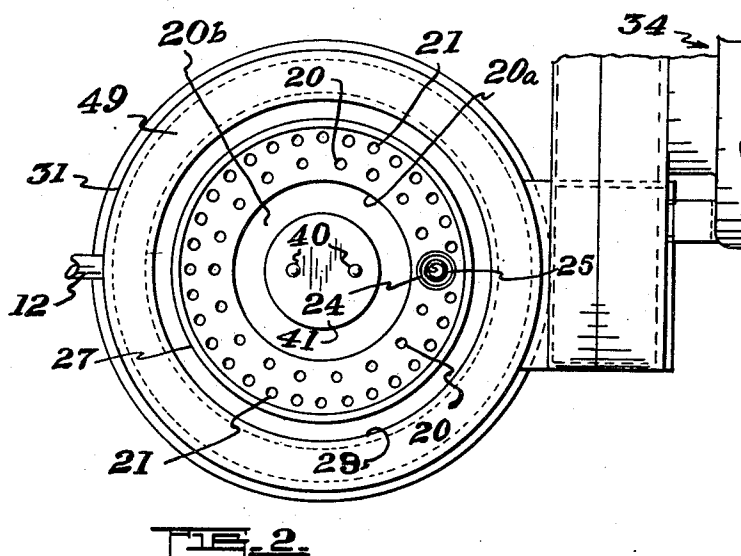
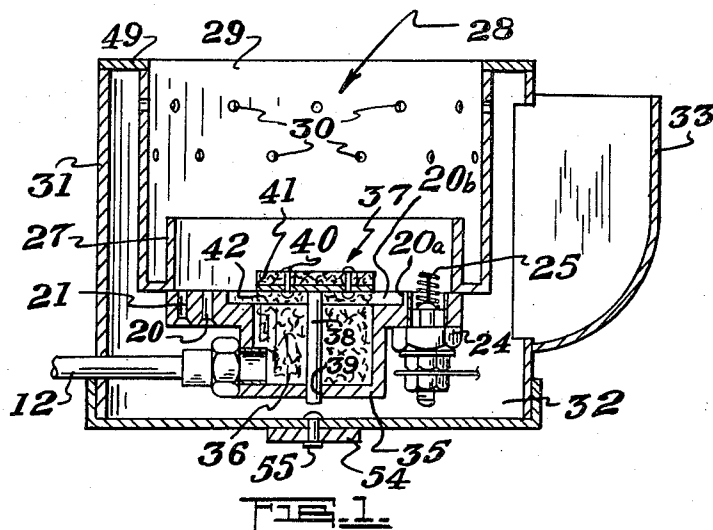
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POT TYPE OIL BURNER

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POT TYPE OIL BURNER

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1 Claim. (Cl. 158—92)

My invention relates to a liquid fuel burner, and more particularly to a liquid fuel burner of relatively small capacity which may be used, for instance, for the purpose of warming internal combustion engines and the like which must be started in very cold weather.

Burners according to my invention are particularly useful for purposes of warming vehicle engines during periods of sub-zero temperatures such as may be encountered during military operations under Arctic or subarctic conditions.

Conventional liquid fuel burners of small capacity depend, for carburetion of the fuel, to a large extent upon the application of heat to the incoming fuel to effect vaporization thereof, following which the vaporized fuel is admixed with an initial supply of air, usually termed the primary air, to effect distribution of the vaporized fuel within the burner, and the mixture thus produced is finally mixed with a further supply of air, usually termed the secondary air, to form a fuel mixture appropriate for efficient combustion, which mixture then burns at a predetermined level in the burner, which level is generally defined by a flame ring or circular baffle.

Burners of the above general description have been in wide use for a number of years and are, generally speaking, fairly satisfactory at normal temperatures, that is to say, temperatures between about 40° F. and 100° F. Even at these normal temperatures, however, burners of this type are subject to the disadvantage that the heating of the incoming fuel supply tends to crack the fuel to form carboniferous degradation products of a gummy character, which render necessary frequent cleaning or reaming of the ports through which the heated fuel must pass, in order to maintain the burner at its maximum operating efficiency. When burners of this type are used at temperatures very much below the freezing point, a great deal more heat must be supplied to the incoming fuel in order to effect its complete evaporation, and generally speaking the incoming fuel must be subjected to a higher temperature in order to raise the temperature of the fuel and vaporize it quickly enough to supply sufficient mixture to produce the required amount of heat to effect the purpose for which the burner is being used. This higher temperature results in increased cracking and degradation of the fuel, and in addition the low temperature of the incoming primary air supply tends to condense some of the higher boiling degradation products so that an increased amount of gummy deposit forms within the passages of the burner. The result is that burners of the above type become progressively less efficient during a period of use at low temperatures, and it is only a matter of time before it is necessary to shut down the burner to free the various parts thereof from the gummy deposits which tend to block the fuel inlets.

A further disadvantage of burners of the above type is that they require a warming-up period before their opera-

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tion may be initiated, which warming-up period increases as the ambient temperature decreases.

Accordingly, it is an object of my invention to provide a liquid fuel burner which will operate reliably and satisfactorily under conditions of extreme cold.

It is another object of my invention to provide a liquid fuel burner in which all difficulties arising from pre-heating of the fuel and the gummy products formed by degradation thereof are eliminated.

It is a further object of my invention to provide a liquid fuel burner which will operate in any position, that is to say, in which the flame produced may be directed either downwardly, upwardly, horizontally, or in any other direction.

It is a further object of my invention to provide a liquid fuel burner which will operate using any of the commonly known liquid fuels ranging from highly volatile, low viscosity fuels such as benzene or naphtha, up to and including liquid fuels of low volatility and relatively high viscosity such as domestic fuel oils, without requiring modification of the working parts thereof.

It is a still further object of my invention to provide a liquid fuel burner the heat output of which may be widely varied with a minimum of adjustment.

Other objects and advantages of my invention will appear as the description thereof proceeds.

According to my invention the incoming fuel is heated as little as possible before it leaves the port through which it enters the burner. The incoming fuel is distributed mechanically to a number of points where it is taken up in relatively fast moving jets of air which form the primary air supply of the burner. The jets and fuel then move into a portion of the burner where they are met by a relatively large number of relatively slow moving transverse air jets forming the secondary air supply transforming the total mixture of air and fuel into a turbulent mass in which the fuel is thoroughly dispersed. This turbulent mass of fuel mixture proceeds to the point of combustion without encountering any obstructing baffles or the like which would tend to disentrain any unvaporized fuel particles.

A liquid fuel burner according to my invention comprises a burner pot, the top end whereof is open and the bottom end whereof is provided with a centrally positioned fuel supply chamber filled with a capillary packing material such as steel wool or asbestos fibre, closed at the top and having peripheral fuel dispensing means for egress of the fuel into the bottom of the burner pot. Fuel supply means are provided to supply fuel to said fuel chamber under relatively low positive pressure, that is to say, a positive pressure of from about 1 to about 3 pounds per square inch. In the bottom of the burner bowl and surrounding the fuel dispensing means are a plurality of circular rows of air jets directed in a substantially axial direction with respect to the burner bowl, and air supply means are provided for forcing air under pressure through said jets. The bottom of the burner bowl is formed with a low circular shoulder situated between the fuel chamber and the innermost of said jets so that the points of admission of air to the burner pot are slightly above the points of admission of fuel, so that liquid fuel must flow over the shoulder to reach and be carried away in said air jets.

Around the side walls of the burner bowl are provided a plurality of secondary air inlets arranged in cooperation with suitable air supply means to admit secondary air to said burner bowl in relatively slow moving transverse streams.

Preferably according to my invention baffle means are provided in the region of the point of admission of the air jets forming the primary air supply, said baffle means being arranged to provide a space within the end of the

burner within which said air jets are free of the influence of the transverse air streams forming the secondary air supply.

According to a preferred embodiment of my invention electrical ignition means are provided in the base of the burner bowl in the region of the entry points of the air jets.

The several features of my invention will be understood more fully by reference to the following detailed specification which, with reference to the accompanying drawings, illustrates a number of embodiments of my invention.

In the drawings:

Fig. 1 is a longitudinal cross section of one embodiment of a burner according to my invention;

Fig. 2 is a top plan view of the burner illustrated in Figure 1.

Referring now more particularly to the drawings, the burner shown in Figure 1 is provided with a body portion 35 which is generally circular in shape and is bored to receive the fuel supply line 12 which is connected to a suitable arrangement, for instance an electric fuel pump (not shown) for supplying fuel at low pressure; that is to say, a pressure of from about 1 to about 3 pounds per square inch. The body portion 35 contains the fuel chamber 36 and is so constructed that all of the component parts thereof lie below the bottom of the burner bowl 28. A cap 37 is supported on a stem 38 which is secured in a suitable bearing 39 in the bottom of the body 35. The top part of the cap 37 is secured by the rivets 40 and consists of a layer of insulating material 41 which insulates the interior of the fuel chamber 36 from radiant heat generated in the combustion area of the burner. The fuel from the chamber 36 is fed to the burner through the annular space 42. The fuel chamber 36 is filled to the bottom of the cap 37 with a suitable fibrous packing material to ensure uniform distribution of fuel by means of capillary attraction, and referred to herein as a "capillary packing material." Suitable packings are well known in the art and include such things as steel wool, asbestos fibre and the like.

The body 35 is also provided with two circular rows of air delivery passages 20 and 21, the passages 20 being situated outwardly of the circular shoulder 20a so that fuel supplied through the space 42 will fill the shallow annular depression 20b before flowing into contact with the jets 21 and 22. The passages 21 and 22 are long in relation to their diameter and are belled out at their lower ends as at 22, to enhance the air flow characteristics of the passages so that when air is forced through them it will issue in the form of relatively high velocity jets.

Also suitably disposed in the body 35 in a suitable boring is a glow plug 24 or other suitable device provided with an electrical heating element 25 for providing initial ignition of the combustible mixture. It will be appreciated, however, that the burner may be lit manually, and that the design may be suitably modified to provide for manual ignition as an alternative form of ignition in the event of electrical failure.

The whole of the body 35 and its associated parts described above is mounted below the burner bowl 28 which is generally cylindrical in shape and comprises the inner cylindrical wall 29 which is pierced by a number of holes 30 to provide for the admission of secondary air to the burner bowl. Baffle means 27 may be provided adjacent the passages 21 in the form of a circular wall outside said passages 21 but within the cylindrical wall 29, so that the jets forming the primary air supply are not initially affected by the transverse air streams of the secondary air supply from the holes 30. The burner bowl is further provided with an outer wall 31 which completely surrounds the outside of the inner wall 29 in spaced apart relation thereto to provide the space 32 which in effect

forms an air intake manifold for the burner. The outer wall 31 is suitably constructed to accept the delivery tube 33 of a blower, indicated generally at 34 in Figure 2.

As the blower motor commences operation at a reduced speed, air is pumped into the space 32 between the inner and outer walls of the burner bowl and some of the air issues in relatively high speed jets out of the air delivery passages 20 and 21. This air carries fuel which, as previously mentioned, is supplied by means of a relatively constant pressure low pressure arrangement which may, for instance, take the form of an electric fuel pump (not shown) which commences operation as soon as the blower motor is started. The fuel carried in the air jets issuing from the passages 20 and 21 is immediately ignited by the igniter 24 and completely consumed as it passes through the burner bowl with the assistance of the secondary air entering through the holes 30 producing a hot flame in the upper region of the burner bowl.

The blower may then be made to operate at full speed and at the same time the igniter element 25 is cut out so that the igniter ceases to operate. This forces more air through the burner and through the air delivery passages 20 and 21 entraining more fuel and causing the burner to operate at its normal heat output, the level of combustion being raised.

When it is desired to shut the burner down during normal operation the fuel pump is shut off first but the blower motor is allowed to continue operation until all the fuel is used up and the flame therefore goes out. The blower motor is then, of course, shut off. Thus it will be observed that the burner is purged of fuel and danger of explosion and the like on restarting is eliminated.

It will also be seen from the foregoing that during operation of the burner according to the invention the air supplied to the burner being at ambient temperature which may be anywhere down to 65° below zero F., will maintain the bottom of the burner body including the body 35 and all its associated parts at a relatively cool temperature minimizing the formation and condensation of tarry cracking products of the fuel. The fuel is warmed to some extent by radiant heat being radiated downwardly from the point of combustion. This is minimized by means of the cap on the fuel chamber and an added precaution in this respect may be taken by use of an insulating pad 37 mounted on the top of the cap of the fuel chamber as shown. Thus while the fuel may be warmed to some extent it will be appreciated that it is warmed to a lesser extent the lower the ambient temperature due to the cooling effect of the primary air and the problems created by preheating and cracking of the fuel and consequent formation of gummy deposits in the burner passageways are avoided because the fuel is not subjected to sufficiently high temperatures to cause degradation until it is in the air jets and proceeding to the combustion area of the burner as a mixture of fuel and air. Any degradation products formed have thus no opportunity of depositing in the fuel supply ports.

The following example illustrates the advantages of my new burner over burners of conventional design:

EXAMPLE

Two types of commercially available burners and a burner constructed according to the present invention were tested under Arctic conditions at a Canadian Army Arctic testing station during periods when the average ambient temperature was below -30° F.

Heater A was a commercially available heater in which the fuel was supplied by means of an asbestos wick from which it was vaporized in a retort by the heat of the burner. Twenty-nine such burners were tested under like conditions, using the same fuel and type of fuel

