

Sept. 10, 1968

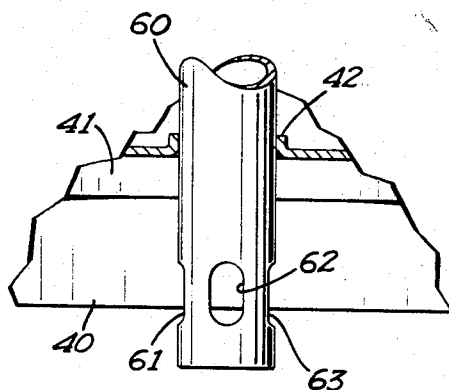
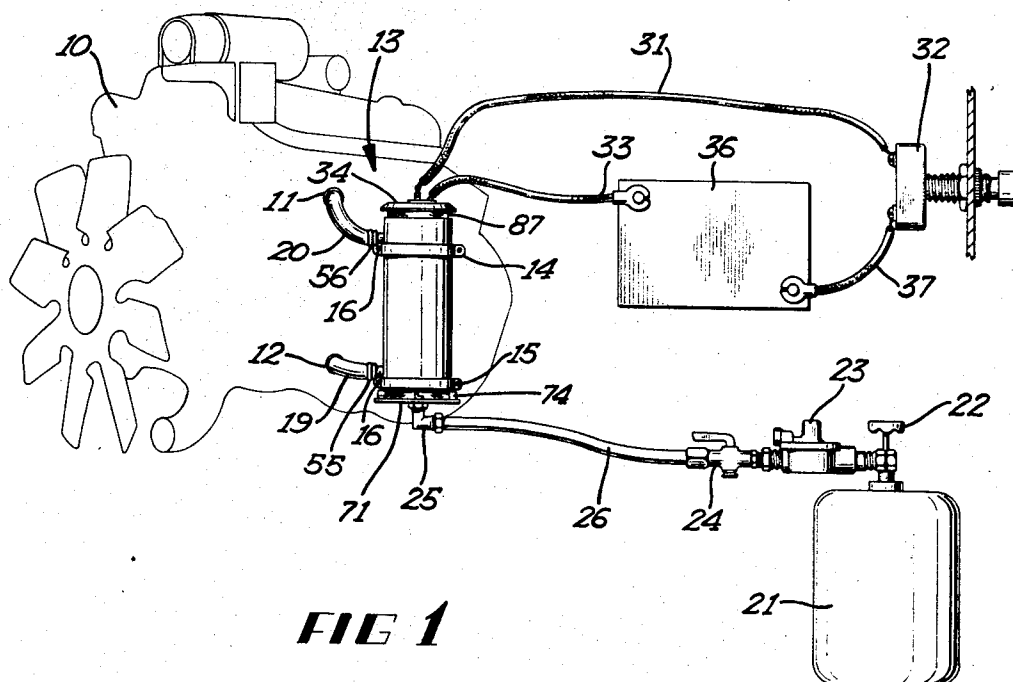
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PROPANE HEATER FOR INTERNAL COMBUSTION ENGINE

Filed Dec. 13, 1966

2 Sheets-Sheet 1



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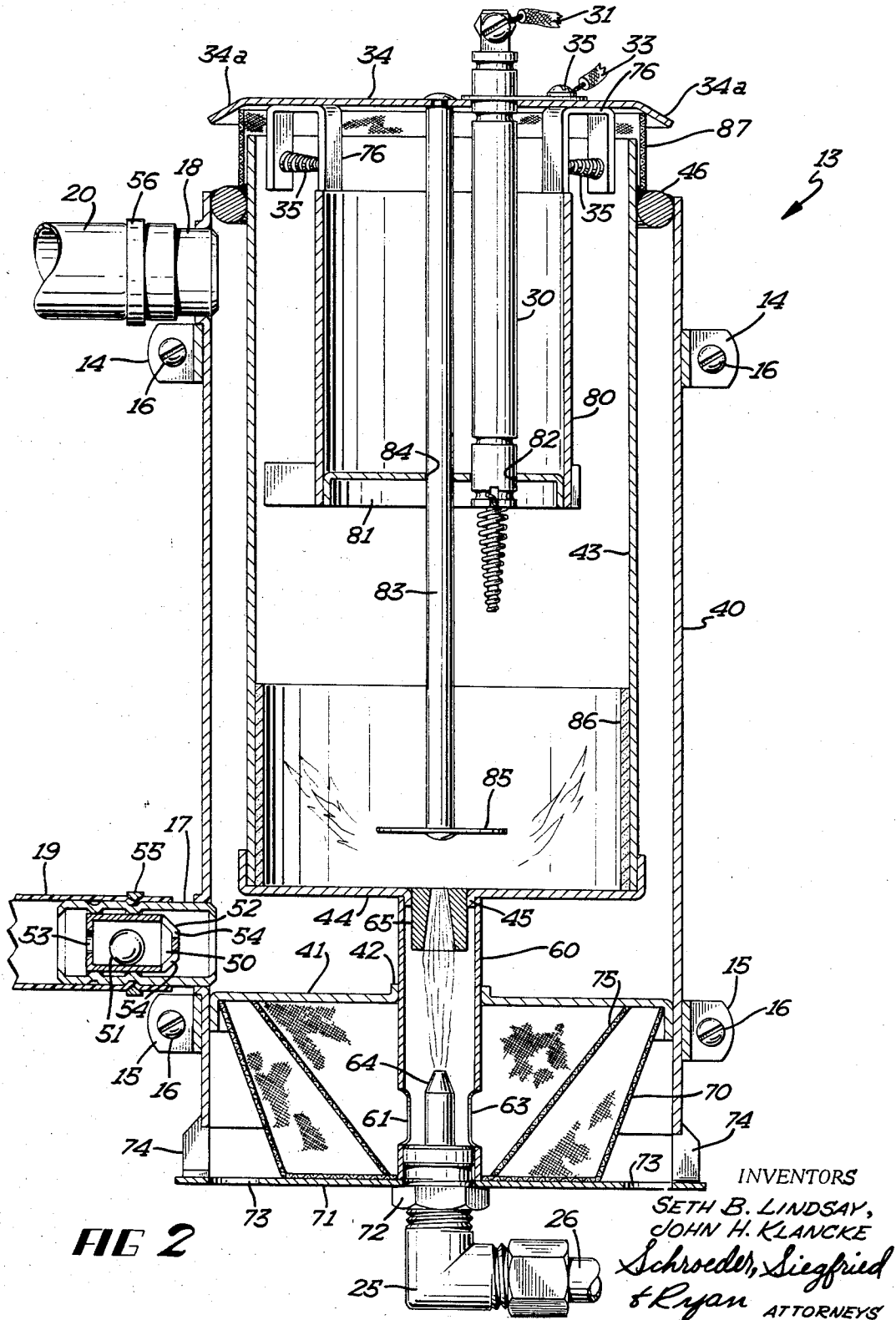
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PROPANE HEATER FOR INTERNAL COMBUSTION ENGINE

Seth B. Lindsey and John H. Klancke, Minneapolis, Minn.,
assignors to Phillips Manufacturing Company, Inc.,
Minneapolis, Minn., a corporation of Minnesota
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ABSTRACT OF THE DISCLOSURE

This disclosure is directed to a propane heater used in combination with the fluid cooling system of an internal combustion engine which is exposed to outdoor elements. The propane heater has a wind deflector to break up wind gusts and prevent the flame from being extinguished while providing a full heat flow through the heater by the proper ratio of the area of the input air ports to the vent area for the burned gases.

It is generally recognized that cold weather produces problems among equipment which is operated out-of-doors and where there is no convenient place to store the equipment such as the conditions where roads are being built, mining operations are taking place, or where farm tractors and other equipment are stored outside. If the equipment is disabled, time and money is expended in placing the equipment back in operating order. While numerous type devices have been developed for keeping internal combustion engines "warm," that is through the cooling system, they have been found to have certain disadvantages when operated in heavy winds. In other words, where the heater is well protected under the hood of an engine there generally is no problem but where the heater is exposed to external winds, quite often the wind will extinguish the flame in the combustion chamber and the heater will cease to function. It has also been found that heaters using propane gas provide a very economical means of fuel and are relatively clean.

The present heater is constructed to withstand 80 mile per hour winds and still remain "blow-out" proof. One such model may be used with a three to twenty-five gallon cooling system having an approximate overall size of 4.25 inches in diameter and 10.50 inches in height. A structure of this type burns approximately 6.75 ounces of butane per hour with an input rating of approximately 8600 B.t.u.'s per hour. The propane is delivered to the heater by the use of a gas regulator at approximately five pounds per square inch (p.s.i.).

It is therefore a general object of this invention to provide an improved propane gas fired fluid heater to be used in combination with an internal combustion engine.

It is another object of this invention to provide a propane gas heater having a construction to guard against extinguishing the flame by high winds.

It is still another object of this invention to provide a propane gas heater in which a proper mixture of air and gas is achieved through a construction where the vent area is a proper ratio of the area of input air.

It is still another object of this invention to provide a wind baffle to prevent a surge of air through the input air mixture holes to the heating mechanism.

These and other objects and advantages of the invention will more fully appear from the following descrip-

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tion, made in connection with the accompanying drawings, wherein like reference characters refer to the same or similar parts throughout the several views, and in which:

FIG. 1 is a diagrammatic view of the invention as found in the combination of a propane heater and an internal combustion engine;

FIG. 2 is a cross-sectional view of the heater taken through the ports of the heater; and

FIG. 3 is a fragmentary view of the end of the heating mechanism showing the input air vents.

FIG. 1 discloses an internal combustion engine 10 having a fluid type cooling system in which there is formed an upper port 11 and a lower port 12. Secured to the engine block, is a fluid tank type heater 13 which is fastened thereto by suitable means such as a pair of brackets 14 and 15 held in place by machine screws 16. Heater 13 has a lower port 17 and an upper port 18 which have hoses 19 and 20 connected to lower block port 12 and upper block port 11 respectively. To provide optimum performance, port 11 is generally disposed three inches or more above outlet 18 or heater 13.

A propane tank 21 has a shut-off valve 22 connected at the top thereof and is connected to a regulator 23. The regulator 23 is of standard design and sets the output pressure thereof at approximately five pounds per square inch (p.s.i.). Connected to regulator 23 is an operator controlled shut-off valve 24 which has its output connected to heater 13 at an inlet connection 25 through a tube 26 such as a 0.25 inch diameter copper tube.

Situated at the top of heater 13, is the upper end of a glow plug 30 which has an electrical conductor 31 connected thereto which is connected to one terminal of a push button switch 32. Push button switch 32 and shut-off valve 24 are located in a position convenient to the operator of the equipment. Another electrical conductor 33 is secured to a cover member 34 of heater 13 by suitable means such as a screw 35 and the other end is connected to a battery 36. The other terminal of the battery is connected to switch 32 by an electrical conductor 37 to complete the circuit when switch 32 is depressed.

Heater 13 has an outer cylindrical shell 40 which has ports 18 and 17 communicating therewith and has a disc or end portion 41 secured thereto by suitable means such as welding at a position disposed away from the lower end. Situated in the center of end disc 41 is a hole 42. Disposed within outer shell 40, is another cylindrical member 43 which has an end cap 44 secured thereto by suitable means such as welding at the lower end thereof. End cap 44 is disposed in spaced and confronting relationship with disc 41 and also has a hole 45 formed in the center thereof. Situated between the walls of cylindrical members 43 and 40, at the upper end thereof is a ring 46. Ring 46 is welded to the two members to form a water tight connection.

Secured in port 17, is a check valve 50 which has a ball 51 which is free to move in a cage 52, the cage having an inlet orifice 53 and outlet orifices such as the one designated numeral 54 which allows fluid to pass into the fluid containing area between disc 41 and end cap 44 but prevents flow outwardly or in reverse fashion. It will also be observed that a pair of hose clamps 55 and 56 are connected respectively about hoses 19 and 20 to secure them to ports 17 and 18.

A tubular member 60 (also see FIG. 3) is secured in holes 42 and 45 by welding and extends downwardly beyond the end of outer cylindrical member 40. Located near the lower portion of tubular member 60 are four in-

let air ports 61 through 63, the fourth being hidden by a burner nozzle 64. At the upper end of tubular member 60, is a restrictor element 65 which has a tapered orifice, the larger diameter being nearest nozzle 64 and the smallest diameter being furthest from nozzle 64.

Situated within the end below disc 41, is a dish-shaped screen member 70 which engages the under side of disc 41 at its outer periphery. The lower portion of screen 70 communicates with tubular member or barrel 60 and has a cover 71 held in place against screen 70 where a hole is formed in the center of cover 71 and a nut 72 secures cover 71 in place. A plurality of holes 73 are formed around the outer periphery of cover 71 to admit air. Also, a plurality of upstanding spacers 74 are secured to cover 71 and communicate with the edge of outer cylindrical member 40 to insure that screen 70 will not be collapsed when nut 72 is tightened. It should also be recognized that screen 70 may be made in more than one piece by forming a sleeve portion at the outer periphery communicating with the annular air space between cover 71 and the edge of cylindrical member 40. Another screen would then be secured in a flat manner against the bottom of cover 71 to cover holes 73. An inner screen 75 is secured between the bottom portion of disc 41 and cover 71 where it may communicate with barrel 60, the screen being formed in the shape of an inverted frustum of a cone.

The upper portion of the heater has a bracket 76 which is secured to cover member 34 and which is fastened to the upper edge of inner cylindrical member 43 by suitable means such as a screw 35. At least three brackets such as bracket 76 are used to support an inner tubular member 80 in the upper portion of the chamber within member 43. Another disc 81 is secured to the bottom portion of tubular member 80 and has a hole 82 formed therein to hold glow plug 30 in place. A centrally extending rod 83 is secured to cover 34 at the upper end by suitable means such as riveting or peening. Rod 83 also passes through a hole 84 which is formed in the center of disc 82. The lower end of rod 83 has a flame deflector disc 85 secured thereto by suitable means such as peening the end of rod 83. Disc 85 is disposed in spaced and confronting relationship with restrictor 65 so that upon gases emerging from restrictor 65 and becoming ignited, the flame is forced outwardly towards the outer periphery of cylindrical member 43. Located around the inner periphery of tubular member 43, is an asbestos sleeve 86. Asbestos sleeve 86 is used to insulate the combustion chamber (that portion lying within sleeve 86) from the walls of cylindrical member 43 so that all of the gases are burned before striking the cooler wall 43. If the gases are not burned and strike wall 43, an inefficient heater results along with a highly objectionable odor developed as the result of the unburned gases.

Situated between ring 46 and cover 34, is an annular screen 87 which forms a screen over the peripheral opening between the edge of inner cylindrical member 43 and cover 34. It has been found that optimum operational results occur when the peripheral area between cover member 34 and the end of cylindrical member 43 is approximately 18 times greater than the area of the four air ports located adjacent nozzle 64 in barrel 60. It will also be observed that cover member 34 has a depending peripheral lip 34a which extends slightly downward at an angle to cover the upper edge of the opening between cover 34 and the end of cylindrical member 43. It has been found that by the use of the downwardly depending lip, that the heater will withstand drafts by producing a reduced pressure area above cover 34 so that the hot expanding gases continue to move upwardly and out through the vent area, thus avoiding having the flame extinguished. By the use of the inverted frustum of a cone-shaped screen 75, any drafts which enter the bottom of the unit through cover 71 or through the openings between cover 71 and the edge of cylindrical member 40 are deflected to the extent that the air turbulence is reduced, thus avoiding a "flame-out" in the heating mechanism.

When the engine is operating and the cooling system

pump is in operation it is desirable to prevent reverse flow of liquid through the heater. Ball 51 moves to close port 53 due to any reverse flow exerted thereon by the pump operation to insure that the hotter and lighter fluid then moves out through port 18 to the upper port of the engine block.

It has also been found that the entire heater may be reversed in attitude, that is, the bottom may be placed at the top with the burner extending downwardly. When used in this manner, the check valve 50 and the upper and lower hoses 20 and 19 should be reversed to provide proper operation.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of the invention which consists of the matter shown and described herein and set forth in the appended claims.

What is claimed is:

1. The combination of an internal combustion engine having a fluid cooling system with upper and lower ports and a heater therefor comprising:

- (a) an enclosed and elongated fluid tank having a recessed portion formed in an outside wall thereof defining a chamber extending out through the end thereof, said tank having a first and second port at opposite ends thereof;
- (b) a check valve secured in said second port to allow fluid flow into said tank and prevent fluid flow therefrom;
- (c) a propane gas fired heating mechanism secured in said tank and extending into said chamber to form a combustion chamber, said heating mechanism including structure having air ports disposed outside said tank for admitting air to be mixed with the propane gas;
- (d) an outer screen cover secured between the outer end of said heating mechanism structure beyond the portion containing said air ports and the end of said tank adjacent said second port;
- (e) a wind deflector communicating with said outer end of said heating mechanism structure containing said air ports and said end of said tank adjacent thereto, said wind deflector constructed and arranged to lie within said outer screen cover, and deflect the wind entering the end and sides of said tank away from said air ports;
- (f) a pair of conduits connected between said first and second ports of said tank and the upper and lower ports of the engine cooling system;
- (g) and a cover member secured in spaced and confronting relationship with the end of said tank having said chamber communicating therewith, to form a vent for said combustion chamber.

2. The invention as set forth in claim 1 wherein the peripheral area between said cover member and the end of said tank is approximately eighteen times greater than the area of said air ports in said heating mechanism.

3. The invention as set forth in claim 1 including:

- (h) an asbestos sleeve disposed at the outer periphery and end of said combustion chamber and producing a thermal insulating wall.

4. The invention as set forth in claim 1 wherein said wind deflector includes:

- (i) a screen in the shape of an inverted frustum of a cone.

5. The invention as set forth in claim 1 wherein the walls of the end of said tank at the end communicating with said heating mechanism are separated by a fluid space.

6. The invention as set forth in claim 1 including:

- (j) a flame deflector assembly secured to said cover member cooperating with said chamber formed in said tank and having a first plate adjacent the end of said combustion chamber causing the burning mixture to move outwardly along the inner surface

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of said combustion chamber and having a second plate disposed between said first plate and said cover member to force the expanding hot gases to move along the surface of said chamber.

7. The invention as set forth in claim 1 including:

(k) a vent screen secured between said cover member and said tank, said member having a depending peripheral lip cooperating with said vent screen to prevent down drafts into said combustion chamber.

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WENDELL E. BURNS, *Primary Examiner.*