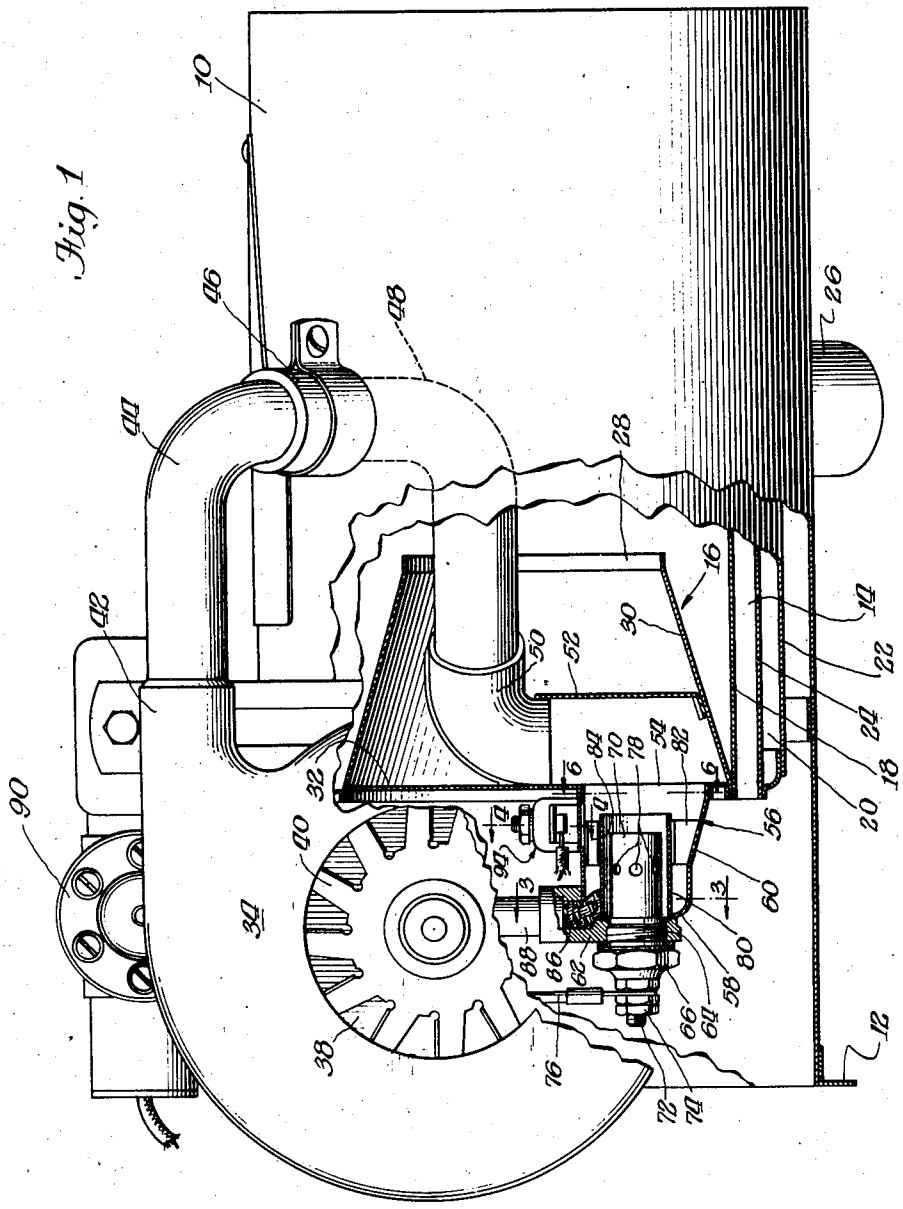
Sept. 13, 1949. V. N. TRAMONTINI 2,481,631

INTERNAL-COMBUSTION HEATER BURNER AND IGNITION MEANS THEREFOR

Filed Aug. 17, 1946 2 Sheets-Sheet 1

Fig. 1



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Fig. 2

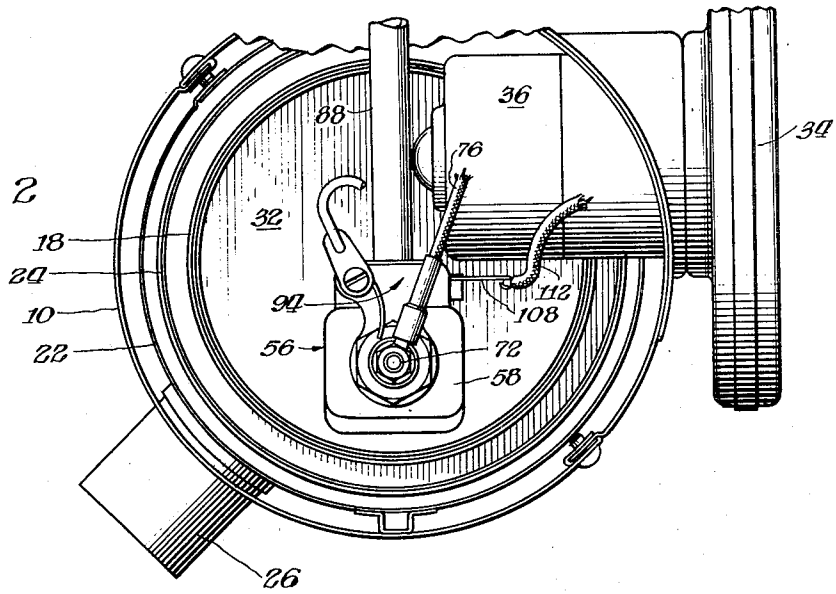


Fig. 4

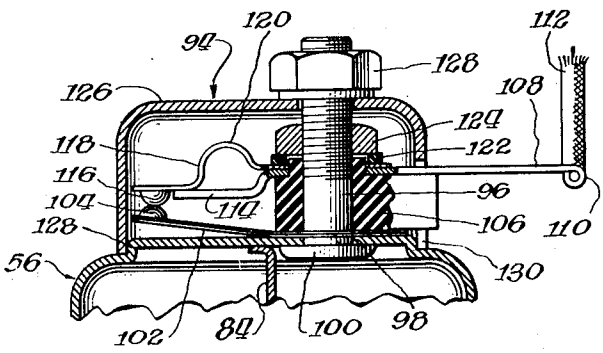


Fig. 3

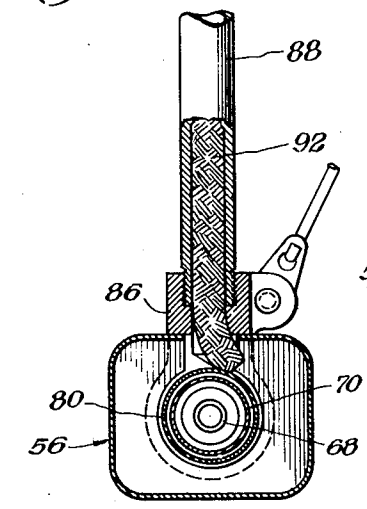


Fig. 5

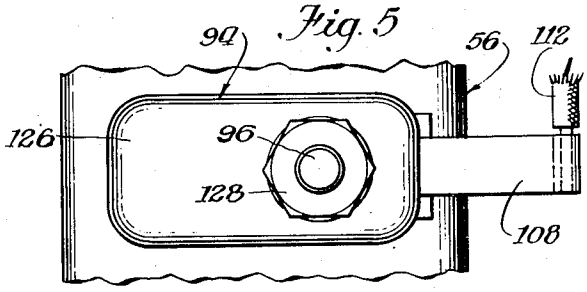
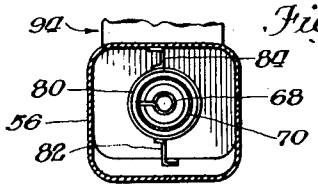


Fig. 6



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UNITED STATES PATENT OFFICE

2,481,631

INTERNAL-COMBUSTION HEATER BURNER AND IGNITION MEANS THEREFOR

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Application August 17, 1946, Serial No. 691,190

3 Claims. (Cl. 158—28)

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The present invention relates to heaters and more particularly to a small size, high output heater for automobiles and other vehicles.

The heater of the present invention is intended for operation with gasoline or similar liquid hydrocarbons as the fuel and may be considered as an improvement over the heater forming the subject matter of the present assignee's copending application of George W. Allen and Vernon N. Tramontini for "Heater" filed June 14, 1946 and which has been given Serial No. 676,776. Because of the similarities of the two heaters, reference is made to this copending patent application for a more detailed disclosure of the common subject matter. In general, the two heaters are similar excepting for the burners and certain of the control equipment. The improved burner and equipment directly operated therefrom and attached thereto forms the subject matter of the present invention.

It is an object of the present invention to provide a novel automobile or similar type combustion heater having improved starting characteristics, particularly when flooded or when hot, without sacrificing other desirable characteristics, such as the ability to start in extremely cold weather.

Another object is to provide a novel heater having an improved igniter control arrangement formed in conjunction with the burner.

Yet another object of the present invention is to provide an improved heater and burner therefor having the above characteristics together with good performance over a wide range of heat output, so that the heater is well adapted for quickly bringing the temperature within an automobile to a comfortable level even in extremely cold weather while also having the ability to operate efficiently at a very low rate of heat output, such as may be desired for maintaining the temperature within the vehicle only slightly above ambient in mild weather.

Still another object of the present invention is to provide an improved automobile or similar type heater which may be manufactured at low cost and which has desirable control characteristics.

Yet another object of the present invention is to provide a novel heater having the above advantages and which has good life characteristics and requires a minimum of attention in service.

Other objects and advantages will become apparent from the following description of a preferred embodiment of my invention which is illustrated in the accompanying drawings.

In the drawings, in which similar characters of

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reference refer to similar parts throughout the several views:

Fig. 1 is a side view of a heater embodying the present invention with a portion thereof broken away to show the burner in longitudinal medial section;

Fig. 2 is an end view of the burner end of the heater;

Fig. 3 is a vertical transverse sectional view through a portion of the burner and may be considered as taken in the direction of the arrows substantially along the line 3—3 of Fig. 1;

Fig. 4 is a vertical transverse sectional view through a portion of the heater illustrating primarily the construction of an igniter switch for automatically tuning the heater igniter off after combustion has been well started and the association of the switch with the burner. This view may be considered as taken in the direction of the arrows substantially along the line 4—4 of Fig. 1;

Fig. 5 is a top view of the switch illustrated in Fig. 4; and

Fig. 6 is a vertical transverse sectional view through a portion of the burner and may be considered as taken in the direction of the arrows substantially along the line 6—6 of Fig. 1.

The heater of the present invention comprises a cylindrical casing 10 through which air to be heated is passed, usually from left to right as seen in Fig. 1. For the purpose of making ventilating air duct connections, a flange 12 is shown at the left-hand end of the heater in Fig. 1 and may, of course, also be used at the opposite end or other means may be used as desired. Air to be heated is circulated through the ductwork and heater by a blower or fan, not shown, since such blowers frequently comprise a portion of the ductwork and are used for ventilation as well as heating, ventilation being accomplished by operating the ventilating air blower while the heater remains out of operation. If a heater of the present type is used on aircraft, ventilating air may be circulated therethrough by means of a scoop located in the exterior air stream, such scoops usually being attached to the fuselage or formed in the leading edge of the airplane wing.

Within the casing 10 the air to be heated passes around and through a heat exchanger 14 which may be of any suitable construction, but for the present purpose will be assumed to be of the type more fully described in the previously referred to copending application. In this type heated a burner 16, to be described in greater detail presently, supplies hot products of combustion to the space within an inner cylindrical

shell 18. This shell is, therefore, heated and the hot products of combustion pass therefrom through a longitudinally extending slot, not shown, into an outer annular space 20 formed between an outer shell 22 and an intermediate shell 24. The hot products of combustion in this space therefore heat the shells 22 and 24 and thereafter pass from the heater through an exhaust fitting 26 located adjacent the lower side of the heater and opposite the previously referred to slot. The fitting 26 is connected to the space 20 by way of an opening through the outer shell 22. Ventilating air to be heated passes longitudinally through the annular space between the casing 10 and the outer shell 22 and also longitudinally through the substantially annular passage 14.

The burner 16 is formed of sheet metal of an alloy having good resistance to corrosion at high temperature. Certain of the stainless steel alloys are suitable for this purpose and are preferably used for forming the burner 16 and the three cylindrical shells 18, 22 and 24.

The burner 16 is formed as a frustum of a cone and is so arranged within the heat exchanger that the smaller end 28 thereof is open and serves as the outlet for the products of combustion. The side wall or conical surface 30 of the burner extends toward the adjacent end of the heater and has a progressively increasing diameter and at its opposite end is closed by a back plate 32 which is substantially in the plane of the inlet end of the heat exchanger.

Air for combustion is supplied to the burner by a centrifugal blower 34 driven by a small electric motor 36, air being drawn inwardly at an opening 38 to a blower impeller 40 which forces the air outwardly and through an outlet 42 connected to a combustion air tube 44. This tube connects adjacent the surface of the heater by means of a fitting 46 with a similar air tube 48 located within the heater and which passes inwardly to a position within the inner shell 18 where it is curved so as to extend into the open end of the burner. Within the burner the tube 48 is connected to an elbow 50 which directs the air downwardly and tangentially in such manner as to cause it to follow a circular path inside the burner shell 30 and against the back wall 32. In order to confine the air against the back wall for a portion of a revolution, a semicircular baffle plate 52 extends from the elbow fitting 50 to the lower surface of the burner where it is secured by resistance welding or by any other suitable means. The baffle 52 is arranged in a vertical plane and extends from side to side of the burner from approximately the center of the burner downwardly.

The back plate 32 of the burner is provided with a generally rectangular opening 54 in the lower portion thereof, this opening being closed by a sheet metal cup or pocket-forming member 56 with its open end 58 fitted to the opening 54, the back plate 32 and contiguous edge of the cup 56 being sealed together by welding.

For convenience in reference, the closed end wall of the pocket forming member 56 is indicated by the numeral 58. The lower surface or floor 60 of the pocket slopes generally downwardly from the rear wall 58 to the opening 54 so that, as will be described presently, any gasoline entering the pocket will flow downwardly into the conical shell 30 of the burner. In other words, the downwardly sloping floor of the pocket 56 causes gasoline to flow forwardly while the rearwardly sloping wall 30 of the burner, being pitched in the opposite direction, causes the liquid fuel to be concentrated in the triangularly shaped zone at the juncture between the back wall 32 and the edge of the conical surface 30. The pitch of both the surfaces 60 and 30 is sufficient to cause the liquid fuel to be collected as above described regardless of whether the vehicle is operating upon a level surface or whether it is climbing or descending hills.

With the liquid fuel in this location it is in direct contact with the swirling air flowing from the fitting 50. Thus, the fuel and air are rapidly and easily mixed to provide efficient combustion. This mixing is promoted by passing the air tube 48 for a short distance through the zone occupied by the hot products of combustion so that the combustion air is preheated before entering the burner.

At its closed end 58, the pocket 56 is provided with a fitting 62 welded or brazed thereto which has a threaded opening 64 to receive the threaded head portion of an igniter 66. The igniter 66 is of the hot wire type and comprises a small diameter cylindrically wound loose coil 68 located coaxially within a shell 70. Preferably the coil is formed of Nichrome or similar high temperature resistance wire and has its outer end secured to the end of the shell 70 in any suitable manner, such as by staking in place and then brazing the joint thus formed. The opposite end of the coil 68 is similarly secured, that is, by brazing or the like, to the head of a screw 72 which passes through the head of the igniter body 66. In order to prevent electrical contact between the screw 72 and the body of the igniter, the portion of the screw 72 passing through the igniter body is insulated by a bushing of ceramic or similar material. The screw 72 serves as one terminal for the igniter and is secured by nuts 74 to an electric lead 76, the other terminal of the igniter being grounded.

In order to provide better starting characteristics the igniter shell 70 has a row of perforations 78 in the side wall thereof to facilitate the flow of fuel and air mixture around the igniter coil as will be described in greater detail presently. The igniter shell 70 is enclosed coaxially within a larger cylindrical sleeve 80, the rearward end of which is secured by brazing or the like to the previously mentioned fitting 62, the opposite end of the shell 80 projecting somewhat beyond the end of the igniter shell 70. So as to provide proper air flow characteristics within the pocket 56 and to prevent excessive turbulence a pair of vertical longitudinally extending baffles 82 and 84 are arranged below and above the sleeve 80 respectively. The lower baffle 82 extends from the sleeve 80 to the bottom of the pocket 56 at approximately the center line of the sleeve and pocket while the upper baffle 84 extends from the sleeve 80 to the upper surface of the pocket in alignment with the lower baffle 82. These two baffles prevent the rapid rotational flow of air within the conical chamber 30 from causing excessive turbulence within the rearward portion of the pocket 56.

The fitting 62 is formed to provide a vertical passage 86 open at the top which communicates with a fuel tube 88 extending to the top of the heater and which is there connected to a fuel control valve 90. This valve may be of the simple on-off type and it may also provide high and low positions. The particular valve forms no part of the present invention, but a suitable valve for this purpose is described in the present assignee's

copending patent application of George W. Allen, filed May 4, 1946, for "Control Valves" and which has been given Serial No. 667,395. The fuel tube 88 has an internal diameter of approximately a quarter of an inch or so and contains a wick 92 formed of heat and corrosion resistant material. For this purpose I have found that a wick formed of braided stainless steel wire is well suited. This wick extends for a considerable distance up into the tube 88 at its upper end, while the lower end passes through an opening in the upper rear corner of the sheet metal cup forming the chamber 56, so that the lower end of the wick projects into the pocket and rests against the upper surface of the shell 80. Thus, gasoline flowing downwardly in the tube 88 to the heater will be absorbed by the wick 92 and will be evenly fed out upon the surface of the shell 80.

To start the heater of the present invention, the igniter 66 and the blower motor 36 are energized, thereby starting the delivery of combustion air to the burner and at the same time heating the element 68 of the igniter. Simultaneously, the fuel is turned on by energizing the fuel control valve 90 and, if desired, the ventilating air blower, not shown, may be started or, in some systems, starting of the ventilating air blower may be delayed until the heater reaches a predetermined temperature. In any event, so far as ignition is concerned, the important considerations are that the igniter be energized, that the fuel be turned on, and that combustion air be supplied to the burner. Under these conditions, the igniter rapidly reaches ignition temperature and heats the shell 70 and in turn the shell 80. Therefore, a portion of the gasoline flowing from the wick 92 on to the shell 80 is vaporized even in extremely cold weather and this vapor is mixed with air which finds its way into the pocket, thereby forming a combustible mixture which is in turn ignited by the hot wire element of the igniter 66. Flame, therefore, flashes out into the main burner comprised of the shell 30 and the back plate 32. Meanwhile, gasoline will have passed over the shell 80 and into the bottom of the pocket 56 from which it drains into the main burner in which location it is subjected to the rapidly moving air stream delivered from the fitting 50. The air flowing over the gasoline mixes with the vapor and forms a combustible mixture which is ignited by the puff of flame from the igniter pocket. Combustion, therefore, is started in the main burner and proceeds until extinguished by de-energizing the valve 90.

Soon after combustion has been started, it is desirable to de-energize the igniter, both for the purpose of preventing the wastage of electrical energy and also because de-energizing the igniter prolongs the life of this element. The switch for accomplishing this purpose is indicated generally by the numeral 94 and comprises a headed stud 96 which projects upwardly through an opening 98 in the upper surface of the igniter pocket 56. After this stud has been located as above described with the head 100 against the inner surface of the top of the igniter pocket, it is secured by resistance welding or by brazing or in any other suitable manner to insure that it will remain fixed and that no leakage through the opening 98 will take place.

A bimetal strip 102 has an opening therethrough at one end to fit the stud 96 and is positioned with its lower surface over a considerable area in direct contact with the top surface of the igniter pocket. This strip 102 at its outer end is provided with a contact 104. An insulating block of ceramic material 106 is fitted over the stud 96 and rests against the upper surface of the strip 102 and upon its upper surface supports a terminal strip 108 formed of mild steel, brass, or the like.

The strip 108 is also insulated from the stud 96 by the ceramic bushing 106 and has an eye 110 formed at its outer end to facilitate soldering to an electrical conductor 112. The opposite end of the strip projects from the bushing 106 in the direction of the contact 104 and is bent so that its end 114 supports the end of a spring metal strip 118 having a contact 116 associated with the contact 104. The strip 114 lies in face to face relationship with the terminal strip 108 so as to insure good electrical contact between these members. Outwardly of the bushing 106 the spring strip 118 is formed with a loop or S-bend 120 so as to provide considerable flexibility. By bending the end portion 114 of the soft metal terminal strip, the contact 116 may be properly located while the spring action of the strip 118 permits the contact 116 to follow the contact 104 upwardly without unduly stressing either the bimetal strip 102 or the spring metal strip 118.

When the heater is cold, the contacts 104 and 116 are separated with the strip 118 supported by the end 114 of the terminal strip 108. When combustion is initiated in the combustion chamber, the temperature of the shell 56 will rapidly rise and heat therefore will be conducted from the top of the shell to the strip 102, thereby causing it to flex upwardly until the contacts 104 and 106 are closed. They remain closed until the metal of the combustion chamber has subsequently cooled below some predetermined value. The spring metal strip 120 is held in place, along with the terminal strip 108, the bushing 106 and the bimetal strip 102 by a washer 122 formed of insulating material which is clamped against the upper surface of the strip 120 by a nut 124 threaded upon the stud 96.

The switch just described is enclosed within a sheet metal cover 126 which slips over the stud 96 and has its lower edge seated around a pressed-out portion 128 of the upper surface of the igniter pocket 56. This cover is held in place by a nut 128 threaded to stud 96 and has a slot 130 at one side to permit passage of the terminal strip 108.

Contacts 140 and 116 are connected in series with a relay coil and a source of electrical energy, so that the relay is energized when the contacts are together. Energization of the relay opens a circuit from the electrical energy source to the igniter, thereby allowing the latter to cool after combustion has been established.

Having described my invention, what I claim as new and useful, and desire to secure by Letters Patent of the United States, is:

1. A liquid fuel burner comprising means forming a substantially conical combustion chamber disposed upon a horizontal axis and having a closed large end and an open small end, means for admitting combustion air into said combustion chamber, means forming a pocket communicating with substantially the bottom of said combustion chamber through said closed end, an electrical igniter of the hot wire type horizontally disposed within said pocket, a generally cylindrical shell enclosing said igniter, and means including a wick for delivering liquid fuel against said shell.

2. A liquid fuel burner comprising means forming a combustion chamber, means for admit-

ting combustion air into said combustion chamber, means forming a pocket communicating with said combustion chamber, an electrical igniter of the heated element type disposed within said pocket, a generally cylindrical shell partially enclosing said igniter and adapted to be heated thereby, and means including a wick in contact with said shell for delivering liquid fuel to said pocket.

3. A liquid fuel burner comprising means forming a substantially conical combustion chamber having a closed large end and an open small end, means forming a combustion air pipe arranged to introduce combustion air tangentially in a transaxial direction into said combustion chamber, means forming a small offset pocket communicating with said combustion chamber through said closed end at the bottom thereof, an electric igniter of the hot wire type horizontally disposed within said pocket, a generally

cylindrical shell partially enclosing said igniter and disposed to be heated by said igniter, and means including a metallic wick in contact with said shell for delivering all of the liquid fuel required by said combustion chamber to said pocket.

VERNON N. TRAMONTINI.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,382,721	Gerstenberger	June 28, 1921
1,903,364	Grant et al.	Apr. 4, 1933
2,174,818	Brace	Oct. 3, 1939
2,373,766	McCollum	Apr. 17, 1945
2,384,836	Holthouse	Sept. 18, 1945
2,396,205	Russel	Mar. 5, 1946