Sept. 7, 1937.

J. L. BREESE, JR

2,092,497

MEANS FOR HEATING ENGINES

Filed Dec. 20, 1933

2 Sheets-Sheet 1

FIG. 1.

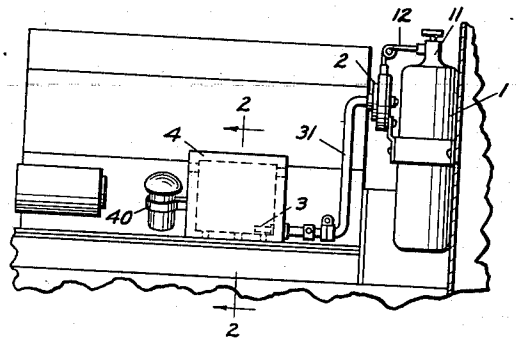
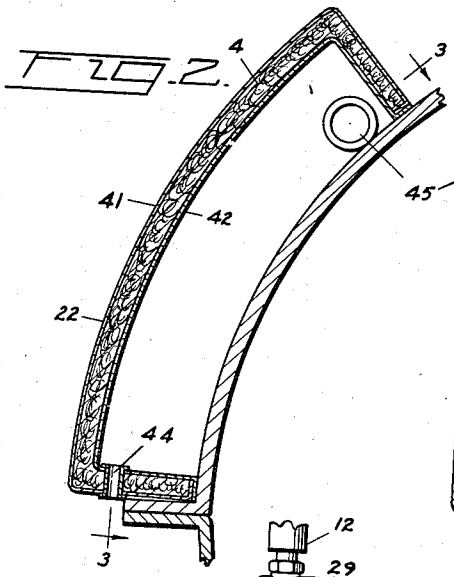


FIG. 2.



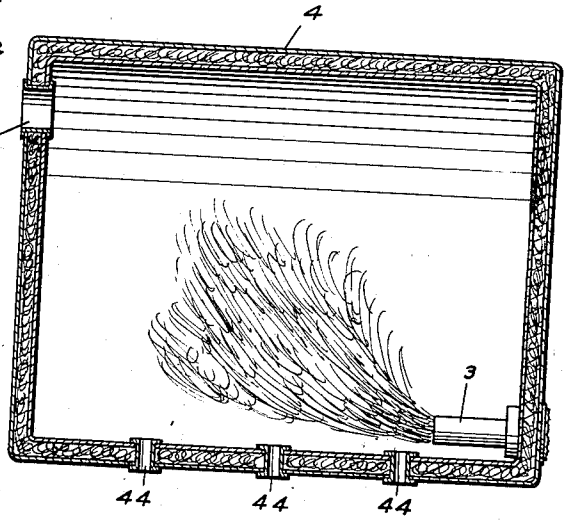


FIG. 3.

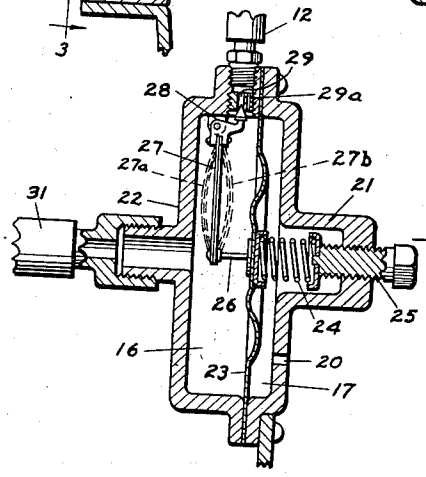


FIG. 4.

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MEANS FOR HEATING ENGINES

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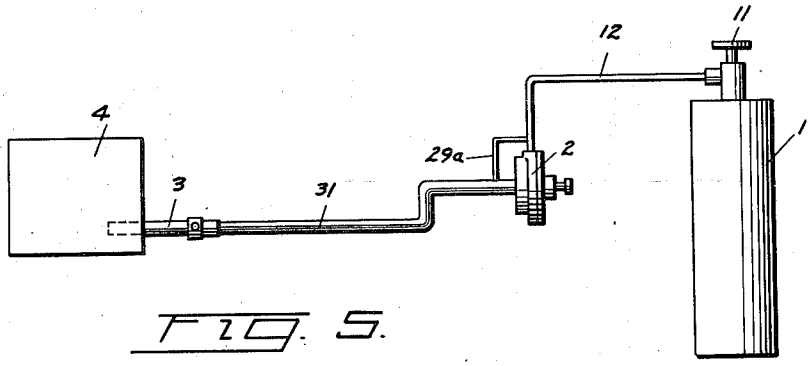


FIG. 5.

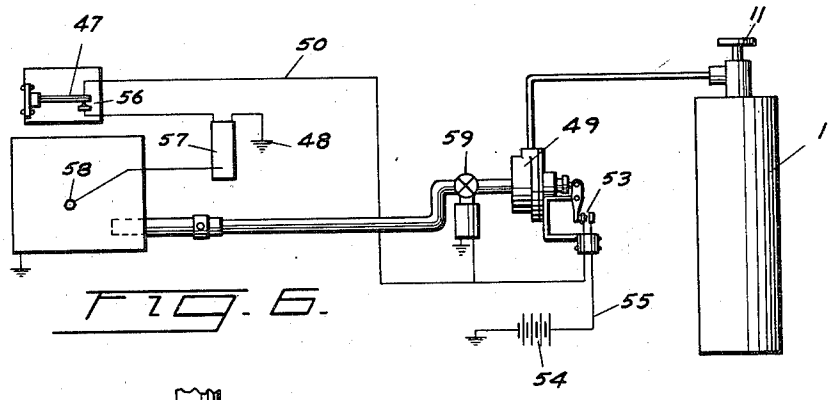


FIG. 6.

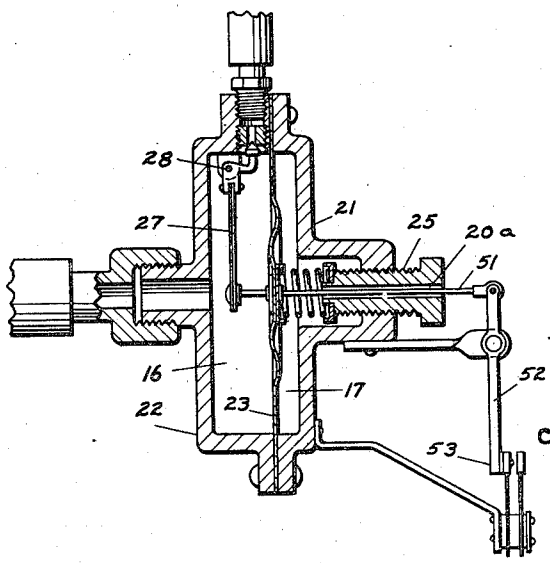


FIG. 7.

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MEANS FOR HEATING ENGINES

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Application December 20, 1933, Serial No. 703,181

1 Claim. (Cl. 123—196)

This invention relates to a method of and means for heating internal combustion engines and it has special reference to automobile engines.

It is a matter of common knowledge that in cold weather difficulties in engine starting and operation result from the following causes: solidification of the lubricating oil, as a result of which first, the film of oil between the bearing surfaces becomes so stiff that it acts as a drag on the turning over of the crankshaft and moving of the pistons, imposing thereby an excessive load upon the battery, the efficiency of which is considerably decreased by low temperature; and second, the normal functioning of the lubricating system is destroyed until the engine warms up and the oil regains its fluidity, in consequence whereof excessive engine wear results; washing down in starting the lubricant from the cylinder walls by excess liquid fuel coming in contact with cold cylinder walls, which also results in dilution of the oil and destroying its lubricating value. It is for the purpose of eliminating the above difficulties that it is desirable, in cold weather, to apply heat to the engine and thus prevent its temperature from falling below a predetermined level.

The object of this invention is to provide an effective method of applying heat to an engine, so as to assure the best transferring of heat to other places of engine structure; and to provide an apparatus using gas flame for carrying out said method, to assure automatic control of the gas flame, and its timely automatic ignition.

To these and other ends, the nature of which will be readily understood as the invention is hereinafter disclosed, my invention consists in the improved method comprising applying heat to the engine crankcase above the oil level, and in improved apparatus, hereinafter fully described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claim.

In the accompanying drawings, in which similar reference characters indicate similar parts in each of the views:

Figure 1 shows the apparatus of my invention installed under the engine hood of a motor vehicle;

Figure 2 is a transverse sectional view of the gas heater on the line 2—2 of Figure 1;

Figure 3 is a longitudinal sectional view of the gas heater taken on the line 3—3 of Figure 2;

Figure 4 is a sectional view of the reducing valve used in the construction shown in Figure 1;

Figure 5 is a diagrammatic view of the apparatus apart from the engine;

Figure 6 is a diagrammatic view of a modified, fully automatic construction of the apparatus of the invention; and

Figure 7 is a sectional view of the reducing valve used in the construction of Figure 6.

My method of heating engines consists in applying heat to the crankcase above the oil level, as mentioned, in order to transfer the heat by conduction, convection, and radiation to the parts of the engine which require it.

Application of heat to the bottom of the crankcase has a serious disadvantage due to the fact that such an application merely heats the oil in the oil pan, and is very inefficient for heating other parts of the engine structure. It would be necessary to heat the oil in the oil pan to a very high temperature in order to assure radiation effective to heat the engine pistons and the cylinder walls. The use of conduction for transference of heat is also very limited in this method due to the fact that the place of application of heat is too remote from the upper parts of the engine structure, and too much heat is lost through radiation into the atmosphere before it reaches said upper parts. Very large quantities of heat would have to be applied to an engine in order to heat it, because most of the heat would be misdirected and lost, and the efficiency of the heating process would be very low. In methods of heating engines consisting in application of heat to the exterior of the oil pan bottom, the disadvantage results from the wasting of the heat liberated outside of the crankcase.

By applying heat to the exterior of the crankcase of an engine above the oil level, or directly to the interior thereof, I make the transference of heat to the pistons and cylinder walls very efficient and effective due to a considerable shortening of the distance through which heat is to be conducted. Transference of heat by radiation is very effectively utilized in my method, due to the fact that a comparatively thin crankcase wall can easily be heated to a temperature assuring effective radiation, operating to heat the crankshaft bearings and the pool of oil in the oil pan to the temperature at which the oil is in a state of sufficient fluidity.

Transference of heat to the cylinder walls and to the pistons of an engine is also greatly increased in my method, inasmuch as circulation of air in the crankcase is more effectively induced by a hot crankcase wall, heated to a much higher temperature than the oil in the pan can be heated, or by directly heating the crankcase atmosphere. Another advantage of this method results from the fact that the heat is applied to the exterior of the crankcase at a sufficiently high level that the air under the engine hood is also heated, and a portion of the heat is transferred to the water jacket, carburetor, and other parts of the engine located under the hood.

The above-described method of my invention may be carried out by a great variety of means, including the apparatus now to be described, which uses a gas flame for heating the crankcase. Referring in detail to Figure 1, the construction shown therein comprises a high-pressure gas tank 1, a pressure-reducing valve 2, a Bunsen burner 3, and a gas heater 4. The apparatus is adapted to be permanently installed upon the automobile and may be attached by suitable clamps holding and securing said parts to convenient places under the hood.

The gas tank 1 constituting a gas supply source for the system is provided with a manually operable valve 11 allowing the tank to be disconnected from the apparatus for the purpose of re-charging. Other sources of gas supply may also be used in this construction.

By means of a suitable pipe 12 the tank 1 is connected to the reducing valve 2. Said valve comprises a casing made up of two parts 21 and 22 held together by flange bolts. Between the flanges is clamped a diaphragm 23, which separates the casing into two chambers 16 and 17. Chamber 17 communicates with atmosphere through an opening 20 provided in part 21; to the atmospheric pressure acting on this face of the diaphragm is added the pressure of a compression spring 24, adjustable by means of a screw member 25 threaded through member 21. To the other face of the diaphragm 23, opposite the spring seat, is affixed a stem 26, which stem is connected through a bimetallic element 27 to a pivoted valve member 28. Any two metals having substantially different coefficients of expansion may be used in the element 27. I prefer to use strips of invar and brass, placing the brass part of the element toward the diaphragm side, and the invar part away therefrom. The valve 28 is adapted to close the passage 29 provided in a threaded plug screwed into the opening of the body part 22, to which the end of the pipe 12 is connected. Said threaded plug is provided with a second passage or bypass 29*a*. The amount of gas supplied by said bypass 29*a* is not affected by the position of the valve 28, and it is sufficient to maintain the pilot flame at the burner 3.

The Bunsen burner 3 is connected to the reducing valve 2 by means of a pipe 31, and it is fitted into a wall of the heater casing 4, which casing is adapted to be fixed to the exterior crankcase wall above the oil level, thus enclosing a portion of said crankcase wall. Any suitable means for securing the casing 4 to the crankcase may be employed. I prefer to install the casing in such a manner that its lower side rests on the flange of the crankcase, and is restrained from moving sidewise by a clamp 40 securing it to the breathing tube of the engine. I also prefer to construct the heater casing of two stampings 41 and 42 which are held together by hollow rivets 44 forming vents through which the air enters the casing. A thimble 45 is provided at the upper portion of the casing, through which the products of combustion are discharged.

The space between said stampings 41 and 42 is filled with any suitable heat insulation, such as asbestos and the like.

The operation of my system thus far described is as follows: the tank 1 being filled with some combustible gas, such as protane, and the valve 11 open, the gas due to the pressure in the tank 1 fills the pipe 12 up to the opening 29. A small quantity of gas will pass through the bypass 29*a* to the chamber 16 and will operate to maintain the pilot flame at the burner 3. However, whether the gas will pass through the opening 29 depends upon the position of the hinged valve 28. The position of the valve 28 depends, first, upon the pressure of the gas in chamber 16 and, second, upon the temperature of the bimetallic element 27. By means of the adjusting screw 25 it is possible to set the valve 28 in such a position that, for a given temperature, it will maintain any desired pressure in the chamber 16. Once set in such a position, the valve 28 becomes automatically controlled by the temperature in chamber 16, and consequently by the temperature of the air surrounding the reducing valve. Should the temperature of the air in the vicinity of the reducing valve 2 drop below said predetermined point, the bimetallic element 27 will bend, assuming the position indicated in Figure 4 by 27*a*. It will be readily understood that such bending of the bimetallic strip 27 will tend to open the valve member 28 with respect to its seat, and to feed gas to the burner 3 more rapidly, thus increasing the flame at the burner 3 from its pilot size to the normal heating size. The rise of the temperature around the reducing valve above said predetermined point will similarly operate to close the passage 29, by reason of the bimetallic strip 27 assuming a position approaching that indicated on Figure 4 by 27*b*, and the flame will diminish to its pilot size.

When the increased amount of gas is supplied to the burner 3 and the flame reaches its normal heating size, the air will begin entering the casing 4 through the lower vents 44. The flow of the air being perpendicular to the direction of the burning gas stream, the flame will spread over practically the entire space within the heater. The hot gases passing over the crankcase wall are discharged through the thimble 45 toward the engine radiator, thus preventing, in a measure, the possibility of radiator freezing. Heat is also transferred by convection to other parts of the engine by the heated gases. Heating of the carburetor even in a slight degree is very beneficial, inasmuch as it will considerably facilitate starting. The portion of heat imparted to the crankcase wall is transferred by conduction to the cylinder walls, the heating of which operates to prevent solidification of the oil film contained between the cylinder and piston walls. Another considerable portion of the heat supplied to the exterior of the crankcase wall is transferred by radiation to the interior of the crankcase, and to the crankshaft bearings in particular, which operates to prevent solidification of the oil film contained therein. Some substantial portion of heat is also transferred by radiation to the contents of the oil pan, assuring fluidity thereof and facilitating the operation of the oil pump or other means transferring said contents to the cylinder walls and bearings. Considering the fact that in starting a very cold engine most of the lubricant is washed down from the cylinder walls by liquefied fuel, and considering further that solidification of oil in the oil pan destroys the normal functioning of the lubricating system and very little lubricant is supplied to the cylinder wall until the engine has been run for some time and the oil regains its fluidity, it will be readily understood that the combined effect of the heating of cylinder walls and of warming the pool of oil in the oil pan operates to decrease greatly the wear of the engine, a considerable part whereof occurs at the time of running a cold engine, and driving an automobile while its engine is still cold.

When the temperature under the engine hood rises high enough to raise the temperature of the bimetallic element 27, it will close the valve 28 as described, thus decreasing or entirely stopping the supply of gas to the burner 3, and consequently discontinuing the heating of the engine. The bypass 29a, however, will continue to furnish gas to maintain the pilot flame. If it becomes unnecessary to maintain the pilot flame, as in warm weather, the operation of the system may be completely discontinued by closing tightly the valve 11 of the tank 1. When the system is to be put in operation, the valve 1 should be opened and the gas ignited through a vent of the casing.

In the modified construction of the apparatus of my invention shown in Figures 6 and 7, the pilot flame is eliminated, and the burner is automatically ignited by means of a spark plug. This is achieved by providing the reducing valve 49 with a rod 51, said rod operating a switch 53 by means of a lever 52. When the bimetallic element 27 bends as a result of low temperature, its bending will operate to open the valve 28 and it will also produce a pull on the rod 51, causing lever 52 to close the switch 53 and allow the current to flow from the battery 54 through the lead 55, switch 53, lead 58, switch 56, and spark coil 57, to the ground at 48. As a result of this a high-tension current will be induced in the secondary winding of the spark coil 57 and a spark will occur in the spark plug 58.

The switch 56 is thermostatically controlled for the purpose of breaking the sparking current and discontinuing the spark after the burner is ignited. Said switch 56 includes two contact pieces, one stationary and the other on a bimetallic arm 47, to which the wire 58 is permanently secured. The points are normally held closed, but they are separated when the bimetallic arm bends due to heating. Inasmuch as the breaker 56 is located in close proximity to the gas heater, it will be heated very soon after the burner 3 is lit and it will operate to break the sparking circuit and discontinue the spark.

For purposes of safety it is necessary to have the spark occur at the burner before the gas reaches it, and also to prevent the flow of the gas to the burner when there is no current in the sparking circuit. These functions are performed by a solenoid controlled valve 59. When the switch 53 is closed it will complete not only the sparking circuit, but also the solenoid controlled valve circuit, in consequence whereof the valve 59 will operate to open the passage for the gas from the reducing valve 49 to the burner 3. When gas reaches the burner it is ignited by the spark plug 58, and the gas flame begins to heat the portion of the crankcase wall enclosed by the casing 4 and the engine in general as described above. When the temperature of the air immediately under the switch 56 rises, the resulting bending of the bimetallic arm will operate to separate the contact pieces and to break the sparking current, in consequence whereof the spark ceases. Heating of the crankcase will continue until the temperature under the engine hood rises to the point at which the valve 28 is set to close, whereupon the switch 53 will be opened, thereby breaking the solenoid controlled valve circuit, in consequence whereof said solenoid controlled valve will operate to shut off the gas.

It will be understood in view of the foregoing, that inasmuch as no bypass for the gas is provided in this modified construction, closing of the valve 28 will operate to put the system out of operation, with the gas shut off by said valve 28 and the solenoid controlled valve 59, and the sparking circuit broken at 56. It will be noticed that the reducing valve 49 of the modified construction is made with special atmospheric opening 20a, into which the rod 51 is loosely fitted.

It will be understood that although I have herein shown and described the preferred constructions of the apparatus of my invention by which my method of heating engines can be successfully carried out, I am in no way limiting said method of my invention to this particular form of means inasmuch as many others will suggest themselves to those skilled in the art as a result of the above disclosures. Thus, as above noted, the burner 3 may be positioned inside the crankcase where its heat will be directly communicated to the crankcase atmosphere, air for combustion being supplied through a port leading from the outside, and the products of combustion being exhausted through the breather tube. Alternatively, the burner may project through the crankcase wall so that the flame lies entirely within the crankcase, while the air for combustion comes from the base of the burner which is outside of the crankcase. In either of these constructions, it may be advantageous to control both the flow of gas and the spark by means of the ignition circuit in the known manner, as by connecting valve relay 59 and spark relay 57 in the primary circuit of an electrical starting device of the type known commercially as "Startix". The "Startix" is a device wherein an electrical switch is employed to actuate the starting motor to crank the engine, upon merely closing the ignition circuit by turning the ignition switch. If for any reason the engine should stall while the ignition circuit is closed, it is automatically cranked. The flame, in this construction, will preferably be of such size as to give very rapid heating upon turning on the ignition switch, a constant spark being maintained during the duration of the flame, which will be extinguished by shutting off the fuel when the desired temperature is reached.

I claim:

A temperature control apparatus for an internal combustion engine having an electric ignition system, cylinders and a crankcase including an oil reservoir, comprising a storage tank adapted to hold combustible gas under pressure, a pressure reducing valve having an inlet, an outlet, and an adjustable spring pressed diaphragm, an auxiliary valve member positioned to close the inlet, temperature responsive means operably connected to the auxiliary valve and to the diaphragm to control said valve in accordance with temperature and pressure, a stove including an insulated chamber fixed to the side walls of the crankcase above the normal oil level in the reservoir and having apertures in the walls thereof to admit air and to permit the escape of the products of combustion, a nozzle discharging into said chamber and communicating with the outlet of the pressure reducing valve, a spark plug in the walls of the stove, and electric means including a switch operable by said temperature responsive means to cause the spark plug to function when the temperature drops to a predetermined degree.

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