July 24, 1951 J. R. GARDNER ET AL 2,561,467

ENGINE PREHEATER

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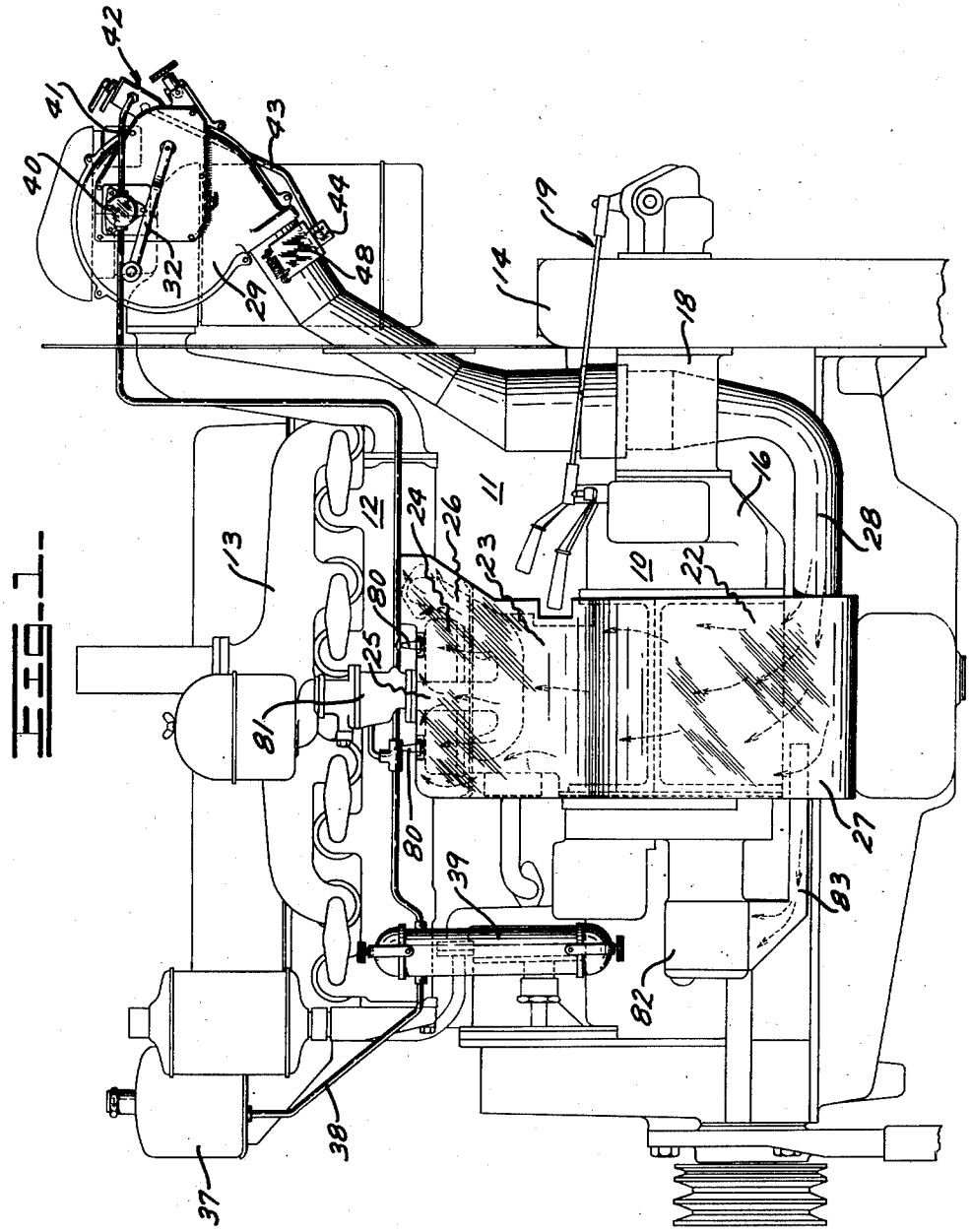


FIG. 1

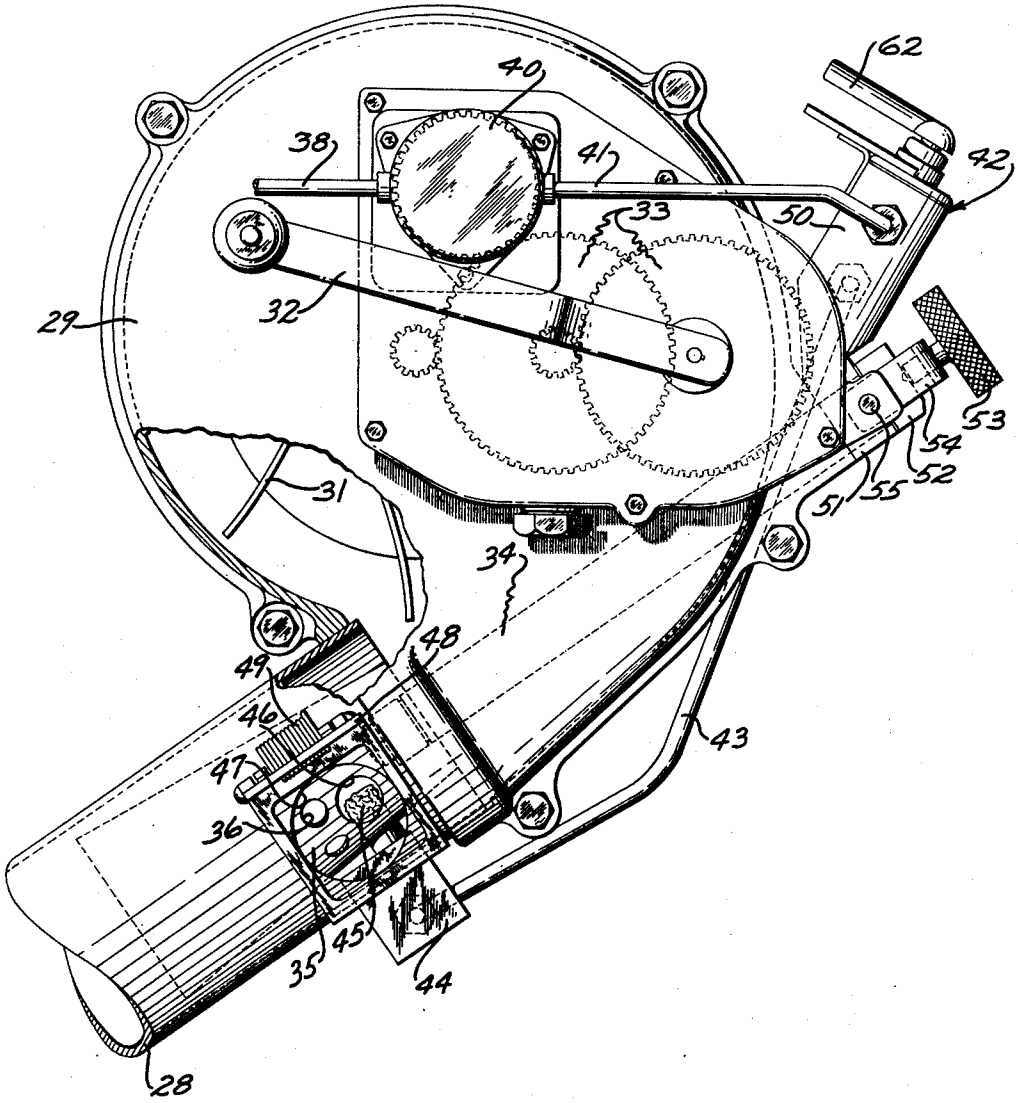
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ENGINE PREHEATER

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FIG-2-



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ENGINE PREHEATER

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Fig. 3.

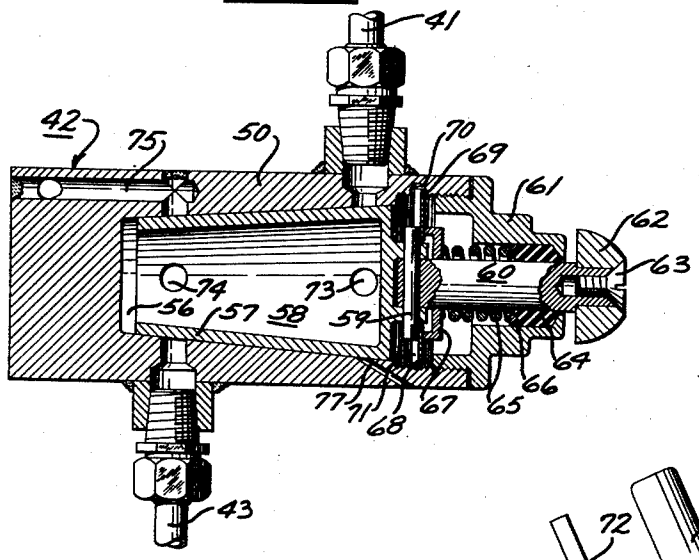
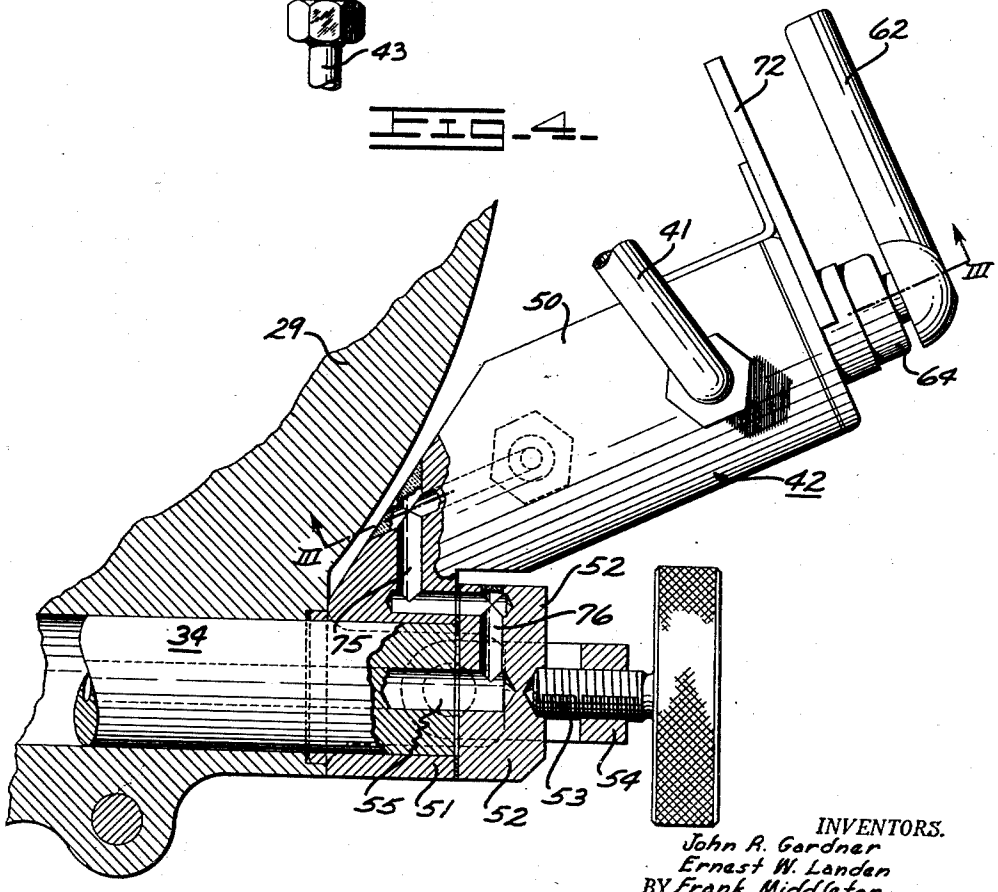


Fig. 4.



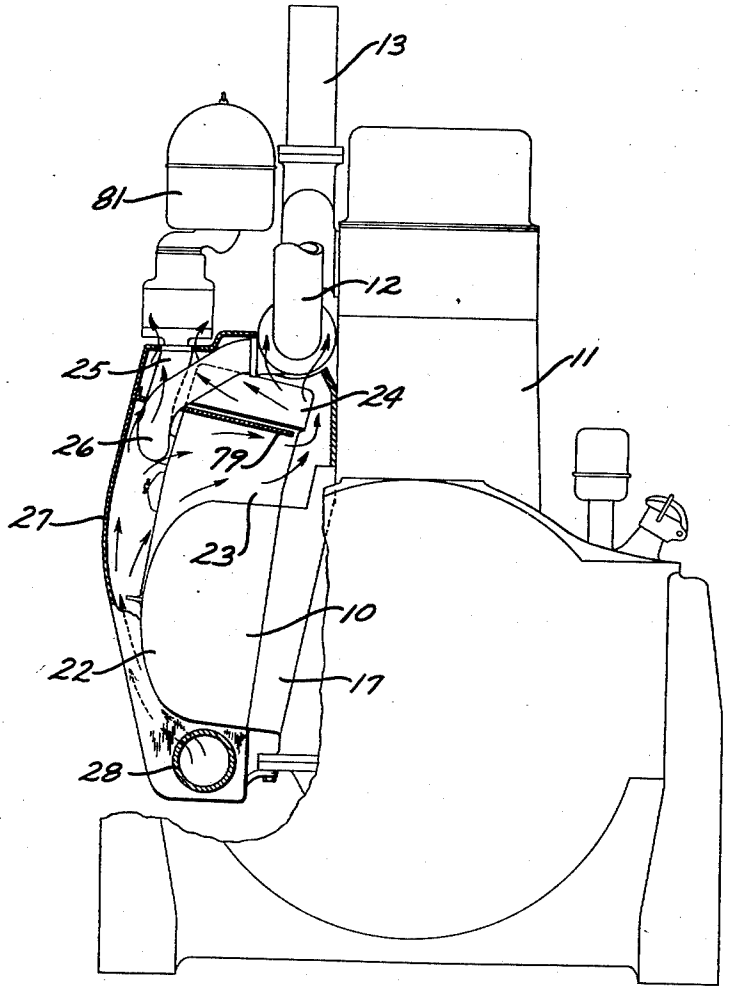
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ENGINE PREHEATER

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FIG. 5.



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UNITED STATES PATENT OFFICE

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ENGINE PREHEATER

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Application June 25, 1949, Serial No. 101,366

8 Claims. (Cl. 123—142.5)

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This invention relates to engine preheaters of the type employed for warming an engine prior to starting and is particularly adapted for use on engines which have been exposed to extremely cold temperatures such as are commonly encountered in the Arctic regions.

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

One of the principal problems of engines which have been exposed to extremely cold temperatures for extended periods of time is that of starting. At extremely low temperatures, the lubricating oil becomes so viscous that it is impractical to use conventional starting devices to crank the engines. In addition, the ignition of the engine fuel becomes more difficult as the temperature decreases. As a result, it has been the practice in the past to either provide heated storage facilities for engines operated in such temperatures or to leave the engines running continuously, only shutting them down for necessary repairs and servicing. For general utility of engine powered vehicles operating in such areas, it is impractical always to provide heated storage facilities and as prolonged operation at idling speeds causes rapid engine wear it is highly desirable to provide some means of starting the engines quickly as well as to obtain satisfactory operating temperatures within the engine.

It is, therefore, an object of the present invention to provide means for heating and conditioning an engine which has been exposed to extremely cold temperatures to facilitate starting. It is another object of this invention to provide an engine preheater which may be mounted directly thereon and transported with the engine at all times. It is another object of this invention to provide a heater for an internal-combustion engine of unusually simple and rugged design with all manually adjustable parts designed for convenient handling by personnel wearing heavy protective mittens.

Other objects and advantages of this invention will be made apparent in the following specification wherein reference is made to the accompanying drawings.

In the drawings:

Fig. 1 is a view in side elevation of an engine which is provided with a preheating mechanism incorporating the present invention;

Fig. 2 is a view in side elevation of a blower and fuel control mechanism forming part of the

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preheater with parts broken away to more clearly illustrate the invention;

Fig. 3 is a fragmentary sectional view taken along the line III—III of Fig. 4;

Fig. 4 is a fragmentary view in side elevation with parts broken away to more clearly illustrate the invention; and

Fig. 5 is a view in end elevation of the engine illustrating the manner in which the engine is shrouded with parts broken away to more clearly illustrate the interior baffling and the direction of flow of the hot air.

Figs. 1 and 5 illustrate a typical application of the present invention to a spark ignition engine indicated generally at 10, employed for cranking a compression ignition engine of a well known type comprising a cylinder block 11, intake manifold 12, exhaust manifold 13 and a fly-wheel (not shown) but which is disposed within a bell housing 14. Although the invention is illustrated in its association with the starting engine 10, it will be readily apparent that it is equally applicable to the main Diesel engine or to other types of engines not provided with a separate starting engine. The starting engine 10 is rigidly secured to a mounting pad 17 formed on the Diesel engine cylinder block and is provided with a suitable driving pinion (not shown) but enclosed with a housing 18 to provide a driving connection to the Diesel engine fly-wheel. Suitable control linkage indicated generally at 19 is provided for selective engagement of the driving connection.

Preheating of the spark ignition engine 10 to facilitate starting is accomplished by circulating heated air about the crankcase, cylinder block, cylinder head, intake and exhaust manifolds indicated by the reference characters 22, 23, 24, 25, and 26 respectively. These parts are enclosed within a shroud 27 communicating by way of a duct 28 with a blower housing 29. As is illustrated in Fig. 2, the blower housing contains a blower fan 31 adapted to be rotated by means of a hand crank 32 through gears indicated at 33. The air from the blower is heated by the combustion of fuel sprayed through a nozzle 34 into a burner tube 35 disposed within the air duct and which is provided with perforations 36 to permit intermixing of the air and fuel.

The fuel for heating the air may be the same as that used for operating the starting engine and is contained within a tank illustrated at 37 in Fig. 1. A pipe 38, which is provided with a filter 39 therein, provides communication be-

tween the tank 37 and a pump 40 carried on the blower housing. The pump 40 is adapted to be driven by the gears 33 also driving the blower fan for supplying fuel under pressure through a pipe 41 to a selector valve indicated generally at 42 in Fig. 2. The selector valve serves to direct fuel either to the fuel nozzle 34 or through a pipe 43 to an igniter 44 carried in the air duct 28. The igniter is adapted to contain a measured quantity of fuel and is provided with a wick portion 45 extending into the burner tube. Openings 46 and 47 provided in the burner tube and air duct respectively, permit lighting of the wick which will continue to burn until all of the fuel in the igniter is exhausted. The lighted wick serves to ignite the fuel from the nozzle which after ignition will continue to burn until the fuel supply is shut off by the selector valve. The opening 47 in the air duct is adapted to be closed by a hinged cover 48 which is urged toward its closed position by a spring 49.

As is best illustrated in Figs. 3 and 4, the selector valve 42 comprises a valve body 50 detachably secured to the blower housing 29 by means of an extending foot portion 51 having a suitable opening therein to accommodate the body of the spray nozzle 34. The spray nozzle is provided with a collar 52 which is urged into contact with the foot portion of the selector valve body holding it securely against the blower housing 29. The spray nozzle and the valve body are held against the blower housing by a set screw 53 having threaded engagement with a U-shaped bracket 54 pivotally connected as at 55 to the blower housing. This connection permits the selector valve and the nozzle to be removed from the blower housing for inspection and is easily handled by an operator wearing heavy mittens.

The valve body 50 is provided with a tapered bore 56 for the reception of a hollow valve plug 57 forming a cup-like chamber 58 therein. The valve plug is connected by means of a pin 59 with a stem portion 60 extending through a suitable opening provided in a bonnet 61, closing the open end of the bore 56. At its extending end, a handle 62 is rigidly secured as by a cap screw 63 to the stem portion. A suitable packing member indicated at 64 is provided to prevent leakage of fuel about the valve stem. A spring 65 is disposed about the stem and is interposed between a thrust washer 66 bearing against the packing 64 and a cupped retainer 67. The retainer 67 bears against a disc 68 adapted for limited sliding movement in the bore 56 but which is held against rotation by an extending ear 69 which is received in a drilled recess 70 provided in the valve body. A plurality of recesses 71 are provided in the disc for the reception of the extending ends of the pin 59 which cooperate with the spring loaded disc to permit the operator to identify by feel the various positions of the valve plug. A plate 72 is provided on the valve body adjacent the handle 62 and may be marked with suitable reference indicia to aid the operator in the selection of the various valve positions. The valve plug is provided with spaced ports 73 and 74 providing communication with the chamber 58. The ports are located so that when the valve plug is positioned to permit fuel from the pipe 41 to enter the chamber 58 through port 73, port 74 will register with a passage 75 provided in the valve body. The passage 75 communicates with a passage 76 provided in the spray nozzle which terminates in a suitable spray orifice (not shown) for spraying fuel into the burner tube 35. To fill the igniter 44,

the valve plug is turned to a position in which the port 74 communicates with the pipe 43 and port 73 registers with a vent passage 77 provided in the valve body which is open to the atmosphere. With the valve plug in this position, the fuel within the cup-like chamber 58 is free to flow through the fuel line 43 to the igniter 44. Thus, the chamber 58 serves as a measuring cup to control the amount of fuel supplied to the wick 45.

In operation, the heated air enters the shroud 27 from the duct 28 and passes upwardly around the starting engine crankcase 22 and cylinder block 23 as indicated by the arrows in Figs. 1 and 5. The shroud is provided with an internal baffle 79 to insure that a substantial portion of the heated air circulates about the cylinder block before passing inwardly around the extending end of the baffle to the cylinder head. The baffle is provided with a suitable opening to accommodate the inlet and exhaust manifolds 25 and 26 of the starting engine and this opening is of sufficient size to permit the flow of a part of the hot air upwardly around the inlet manifold. After circulating around the cylinder head, the hot air is exhausted from the shroud through suitable openings which also accommodate the inlet manifold, the spark plugs shown at 80, and an opening adjacent the Diesel engine inlet manifold 12. Thus by controlling the direction of flow of the exhausting air, preheating of the starting engine carburetor indicated at 81, the spark plugs, and the inlet manifold of the Diesel engine is accomplished. Provision is also made to heat the starting engine magneto 82 by means of a bar 83, of a good heat conducting material, one end of which extends into the shroud where it is heated by the incoming hot air. At its opposite end, the bar is in intimate contact with the magneto which is heated by conduction. It is desirable to utilize conducted heat rather than hot air for preheating the magneto to eliminate the possibility of condensation of the products of combustion on this part.

By directing a stream of hot air against the crankcase, cylinder block, and cylinder head, the lubricating oil and engine coolant may be raised to a satisfactory operating temperature thus enabling starting in much less time than would otherwise be possible. In addition, by directing a substantial proportion of the exhausted hot gases against the inlet manifold of the Diesel engine, the temperature of the incoming air to the Diesel is substantially increased, facilitating its starting.

We claim:

1. A preheater for an internal combustion engine comprising an air blower, driving means independent of the engine for the blower, means for heating the air from the blower, a single shroud substantially entirely enclosing the engine and duct means between the blower and the shroud.

2. A preheater for an internal combustion engine comprising an air blower, driving means independent of the engine for the blower, a single shroud enclosing the engine, a duct from the blower to the shroud, means for heating the air from the blower and baffling means disposed within the shroud for directing the flow of heated air about critical parts of the engine.

3. A preheater for an internal combustion engine comprising an air blower, driving means for the air blower, means for heating the air from the blower, shroud means enclosing parts of the engine, a duct providing communication be-

tween the air blower and the shroud, and a heat conducting element extending from the interior of the shroud to engine parts outside of the shroud to prevent the formation of condensates on said parts.

4. A preheater for an internal combustion engine comprising an air blower, shroud means enclosing parts of the engine, duct means providing communication between the air blower and the shroud, a burner tube disposed within the duct means, and means for spraying fuel into the burner tube.

5. A preheater for an internal combustion engine comprising an air blower, driving means for the air blower, shroud means enclosing parts of the engine, duct means providing communication between the air blower and the shroud, a burner tube disposed within the duct means, a fuel system for heating the air in the duct comprising a fuel supply tank, a pump, driving means for the pump actuated upon operation of the air blower, and a spray nozzle for spraying the pumped fuel into the burner tube.

6. In a preheater for an internal combustion engine which includes an air blower, driving means for the air blower, shroud means enclosing parts of the engine, duct means providing communication between the air blower and the shroud, and a burner tube disposed within the duct means, a fuel system for heating the air in the duct comprising a fuel supply tank, a pump, driving means for the pump, a spray nozzle for spraying fuel into the burner tube, and an igniter having a wick extending into the burner tube for igniting the fuel therein.

7. A preheater for an internal combustion engine comprising an air blower, driving means for the air blower, shroud means enclosing parts of the engine, duct means providing communication between the air blower and the shroud, a burner tube disposed within the duct means, a fuel supply tank, a pump, driving means for the pump, a spray nozzle for spraying fuel into the burner tube, a continuously burning wick for igniting the fuel in the burner tube, and a selector valve adapted to direct fuel from the pump selectively to the wick and the spray nozzle.

8. A preheater for an internal combustion engine comprising an air blower, driving means for the air blower, shroud means enclosing parts of the engine, duct means providing communication between the air blower and the shroud, a burner tube disposed within the duct means, a fuel supply tank, a pump, driving means for the pump, a spray nozzle for spraying fuel into the burner tube, a continuously burning wick for igniting the fuel in the burner tube, a selector valve adapted to direct fuel from the pump selectively to the spray nozzle and to the wick, and means to limit the quantity of fuel supplied to the wick upon any single operation of the selector valve.

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