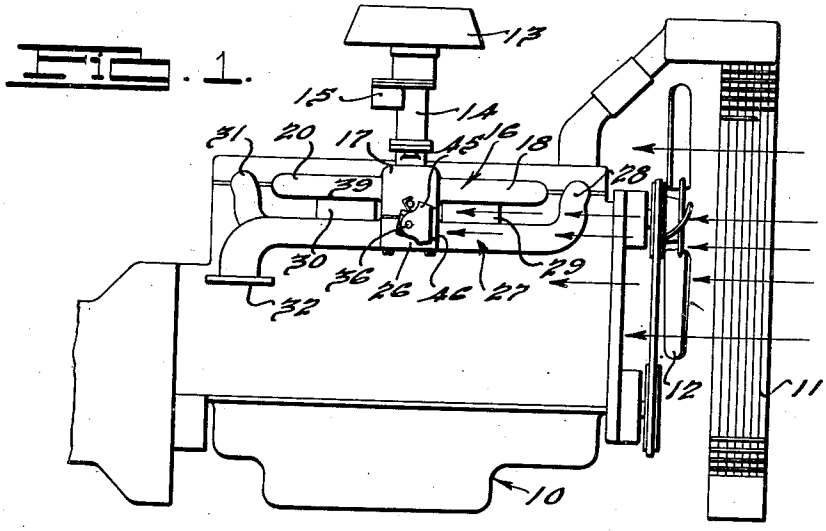
Dec. 24, 1940. L. N. MURPHY 2,226,011

MANIFOLD HEAT CONTROL APPARATUS

Filed March 25, 1939

FIG. 1.



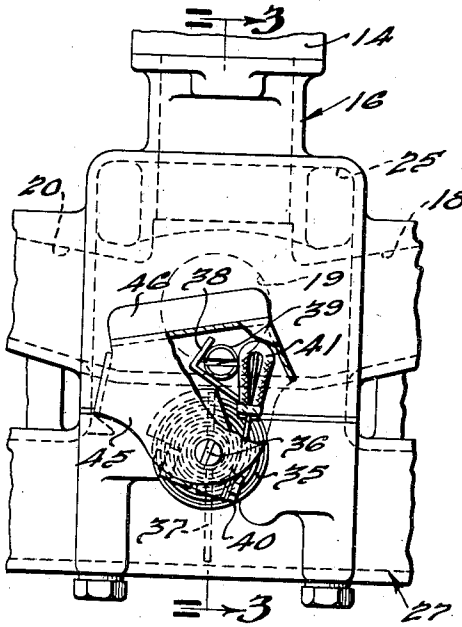


FIG. 2.

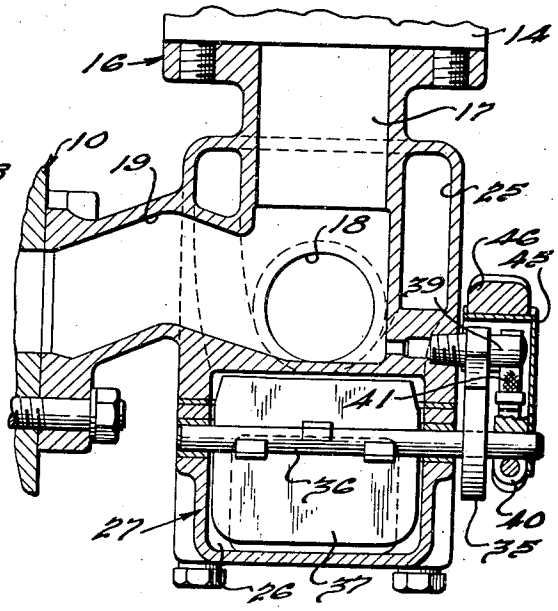


FIG. 3.

INVENTOR

BY Louis N. Murphy.

Haines, Lind, Potter & Haines.

ATTORNEYS

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MANIFOLD HEAT CONTROL APPARATUS

Louis N. Murphy, Highland Park, Mich., assignor to Chrysler Corporation, Highland Park, Mich., a corporation of Delaware

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16 Claims. (Cl. 123—122)

The present invention relates to thermostatic manifold heat control apparatus of particular utility in automotive vehicle engines. A feature of the present invention is that it permits the proper functioning of manifold heat control means regardless of the state of movement of the vehicle in which it is used, which is to say that the present invention compensates for the increased cooling effect induced by rapid movement of the vehicle over the ordinary cooling effect of the air stream from the usual fan associated with the engine when the vehicle is stationary.

Manifold heat control apparatus of the type to which the present invention pertains has been in use for considerable time, the object of such apparatus being to preheat the combustion mixture by the addition of heat thereto from the exhaust gases when the engine is cold, and automatically to reduce the amount of heat imparted thereto by the exhaust gases in proportion to the increasing temperature of the engine until a point is finally reached at which the engine will run most efficiently when the combustion mixture is supplied at ordinary temperatures and, therefore, no heat is imparted to the mixture from the exhaust gases.

The object of the present invention is to increase the effectiveness of manifold heat control apparatus by means which discounts or eliminates the effect of increased movement of the vehicle, or more rapid circulation of cooling air travelling over the surface of the engine and of the manifold heat control apparatus. Conversely, the present invention discounts or eliminates the effect of fan failure, or to put the principal object positively, the present invention is designed to render the control of thermostatic manifold heat control apparatus more directly responsive to changes in temperature of the engine alone and less directly responsive to the effect of the cooling air stream.

A feature of the present invention is that the objects and advantages of the invention are achieved by the use of a simple, inexpensive, and readily assembled addition to the parts of a heat control apparatus now in use, without substantial change or modification of the present parts and the assembly thereof.

Having described the principal objects and advantages of the present invention the same should be more readily understood by reference to the accompanying drawing and the following specification, illustrating and describing a preferred embodiment of the invention, wherein like numerals refer to like parts throughout.

In the drawing Fig. 1 illustrates the present invention applied to a standard internal combustion engine; Fig. 2 is an enlarged view of a thermostatic manifold heat control apparatus having the present invention applied thereto; and Fig. 3 is a vertical section taken along line 3—3 of Fig. 2, looking in the direction of the arrows.

In Fig. 1 the control apparatus is shown in the position it assumes when the engine is hot and the exhaust gases are being eliminated without imparting heat to the combustion mixture; and Figs. 2 and 3 show the manifold heat control apparatus in the position it assumes when the engine is cold and heat is being imparted to the combustion mixture from the gases exhausted from some of the cylinders.

The numeral 10 refers to an internal combustion engine which is provided with the usual radiator 11 and belt-driven fan 12. An air intake is indicated at 13 which is mounted upon the inlet manifold riser 14 which carries the carburetor 15 and in which the combustible mixture of fuel and air is created. The riser 14 is connected to the intake manifold 16 which comprises a distributing chamber 17 from which extend the cylinder intake passages 18, 19 and 20.

A heat exchange chamber 25 surrounds the distributing chamber 17 and the connections thereto of the intake passages 18, 19 and 20. The chamber 25 is open at its lower end and communicates with a chamber 26 provided in the exhaust manifold 27, into which the exhaust gases are admitted from the cylinder exhaust passages 28, 29, 30 and 31, and from which the gases flow into the usual exhaust pipe (not shown) connected to the exhaust manifold at 32. The exhaust gases from the forward cylinders flow through connections 28 and 29 and into the chamber 26 associated with the chamber 25 before being ejected through the exhaust pipe.

When the engine is cold the exhaust gases from the forward cylinders are caused to flow into chamber 25 to impart heat to the incoming combustion mixture in response to the action of the thermostatic control means comprising a coil 35 of bimetal or other thermo-responsive means. The coil 35 is connected at its innermost extremity to a valve shaft 36 upon which is mounted a valve 37 which substantially obstructs the flow of gases through the manifold when in closed position as shown in Figs. 2 and 3, thereby caus-

ing the gas from the forward cylinders to flow upwardly through the connecting passages of chamber **25**, then downwardly into the rear portion of the exhaust manifold. The coil **35** is provided with a hooked outer extremity **38** which engages a limit abutment **39** extending from the outer surface of the chamber **25**. A return limit bracket **40** mounted on the valve shaft **36** retains the thermostatic coil **35** and carries a padded limit arm **41** which also engages the abutment **39** when the engine is cold, thereby preventing the initial tensioning of the coil **35** from causing the valve **37** to return beyond its closed position, which, as shown in Figs. 2 and 3, is substantially vertical. When the engine becomes hot and radiates heat to the air stream contacting the thermostatic coil, the convolutions of the coil tend to unwind or expand, thereby causing shaft **36** to rotate and lessening resistance against turning of the valve **37** by the force of the exhaust gases from the forward cylinders. The lower end of the valve, which is longer than the upper end of the valve and, therefore, has a greater force exerted against it by the exhaust gases, swings towards the rear, thus opening the passageway through the exhaust manifold and tending to shunt the chamber **25**.

It has been found that when the engine is in a stationary position during a very hot day, or if the fan fails during a moderately cool day, a conveniently calibrated thermostatic coil **35** will cause the valve **37** to assume a horizontal or completely open position; but that the effect of rapid movement of air from the fan, augmented by movement of the vehicle, particularly during cold days, will so counteract the radiating effect of the engine as to prevent complete opening of the valve, thereby causing overheating of the combustion mixture and loss of power and efficiency. In order to overcome this effect the present invention contemplates the provision of a shield **45** fixed to the outer surface of the member **40**, or to the end of the shaft **36**, the shield preferably comprising an outer plate, substantially parallel to the outer surface of the chamber **25** in order to reflect heat radiations from the manifold, and a hood portion extending inwardly to partially surround the coil **35**.

When the engine is not running the coil **35** is contracted, thereby holding the valve **37** in vertical position and holding the shield in a position above the coil **35**. As the engine becomes warm coil **35** expands, thereby causing the valve to assume a partially opened position and, to the same extent, causing the shield to rotate toward a position in advance of the coil, thereby preventing the air stream from affecting the coil. The small amount of air which does reach the coil is heated by the engine and expands the coil to a sufficient extent to permit complete opening of the valve **37** when complete opening is desirable.

The shield **45** serves a dual purpose in that it serves as the lever arm for a counterweight **46** which is so arranged as to have its center of mass beyond dead center when the valve is in closed position, as shown in Fig. 2, thereby holding the apparatus against accidental misplacement; and which assists the force of the exhaust gases to open valve **37** as soon as its mass has travelled to the opposite side of dead center. Valve **37** is preferably long enough to strike the upper wall of the manifold passage when in opened position to thereby prevent counterweight **46** from travelling beyond the position shown in Fig. 1.

Having described the details and operations of a preferred embodiment of my invention it should be apparent that I am not limited to the exact form herein disclosed since modifications in arrangement and detail should be apparent to those skilled in the art.

I claim:

1. A thermostatic manifold heat control apparatus for use with an internal combustion engine, comprising an engine temperature responsive means, a manifold bypass valve under control of said means, and a shield associated with said temperature responsive means and comprising an air stream deflector movable to a position in advance of said temperature responsive means when said temperature responsive means expands under the influence of heat imparted thereto by the engine.

2. A thermostatic manifold heat control apparatus for use in connection with an internal combustion engine against which a stream of cooling air is directed during the operation thereof, comprising a thermo-responsive member, and a shield, having an air stream deflecting portion, associated therewith and responsive thereto to move toward a position in advance of said thermo-responsive member in the direction from which the stream of cooling air approaches the engine such as to prevent the cooling air stream from substantially affecting said thermo-responsive member.

3. A thermostatic manifold heat control apparatus for use in connection with an automotive vehicle engine, comprising a thermo-responsive member and a shield, having an air stream deflecting flange, responsive thereto and movable thereby to a position in advance thereof when the engine has become warm.

4. A thermostatic manifold heat control apparatus associated with a heat exchanger to impart heat to the combustion mixture of an internal combustion engine from the exhaust gases of the engine, comprising a valve which in closed position admits exhaust gases into said heat exchanger and which in open position shunts said heat exchanger, a thermo-responsive member responsive to the temperature of the engine to open said valve when the engine is warm, and a shield responsive to said thermo-responsive member and having an overhanging portion movable thereby to a position in advance of said thermo-responsive member as the valve opens and to a position above said thermo-responsive member as the valve closes whereby to permit the air stream substantially to affect said thermo-responsive member only when the engine is cold and the combustion mixture requires preheating for efficient performance of the engine.

5. A thermostatic manifold heat control apparatus for use with an internal combustion engine, comprising an engine temperature responsive means, a manifold bypass valve, movable under control of said means, and an air stream deflecting shield associated with said temperature responsive means and movable by said temperature responsive means coextensively with said manifold bypass valve to a position in advance of said temperature responsive means.

6. A thermostatic manifold heat control apparatus for use with an internal combustion engine, comprising an engine temperature responsive means, a manifold bypass valve movable under control of said means, and a shield associated with said temperature responsive means and mov-

able by said temperature responsive means coextensively with said manifold bypass valve, said shield comprising a flanged portion overhanging said temperature responsive means to deflect ambient air away from said temperature responsive means when placed in advance of said temperature responsive means, said flanged portion being normally above said temperature responsive means and placed in advance of said temperature responsive means when said valve is opened.

7. A thermostatic manifold heat control apparatus for use with an internal combustion engine, comprising an engine temperature responsive means, a manifold bypass valve movable under control of said means, and a shield associated with said temperature responsive means and movable by said temperature responsive means coextensively with said manifold bypass valve, said shield comprising a hood partially surrounding said temperature responsive means and adapted to substantially exclude ambient air from said temperature responsive means when said bypass valve is open.

8. A thermostatic manifold heat control apparatus for use in connection with an internal combustion engine against which a stream of cooling air is directed during the operation thereof, comprising a heat exchanger associated with the intake and exhaust manifolds of the engine, a bypass valve adapted to direct exhaust gases into said heat exchanger when said valve is closed, a thermo-responsive member operating said valve to close the same when the engine is cold and to open said valve when the engine is warm, and a shield associated with said thermo-responsive member comprising a portion partially surrounding said thermo-responsive means and movable thereby to a position such as to substantially exclude the cooling air stream from said thermo-responsive member when said valve is open.

9. A thermostatic manifold heat control apparatus for use in connection with an internal combustion engine against which a stream of cooling air is directed during the operation thereof, comprising a heat exchanger associated with the intake and exhaust manifolds of the engine, a bypass valve adapted to direct exhaust gases into said heat exchanger when said valve is closed, a thermo-responsive member operating said valve to close the same when the engine is cold and to open said valve when the engine is warm, and a shield associated with said thermo-responsive member and movable thereby to a position such as to substantially exclude the cooling air stream from said thermo-responsive member when said valve is open, said shield comprising a hood partially surrounding said thermo-responsive member, said hood terminating closely adjacent the surface of said heat exchanger whereby to permit contact of said thermo-responsive member by a limited stream of air drawn from the surface of said heat exchanger.

10. A thermostatic manifold heat control apparatus for use in connection with an internal combustion engine against which a stream of cooling air is directed during the operation thereof, comprising a heat exchanger associated with the intake and exhaust manifolds of the engine, a bypass valve adapted to direct exhaust gases into said heat exchanger when said valve is closed, a thermo-responsive member operating said valve to close the same when the engine is cold and to open said valve when the engine is warm, and a shield associated with said thermo-responsive member and movable thereby to a position such as to substantially exclude the cooling air stream from said thermo-responsive member when said valve is open, said shield comprising a hood partially surrounding said thermo-responsive member, said hood terminating closely adjacent the surface of said heat exchanger whereby to permit contact of said thermo-responsive member by a limited stream of air drawn from the surface of said heat exchanger.

11. A thermostatic manifold heat control apparatus for use in connection with an automotive vehicle engine comprising a thermo-responsive member, means under control thereof to preheat the combustion mixture when the engine is cold, and a shield responsive to said thermo-responsive member and having a hood portion movable therewith to a position in advance of said thermo-responsive member when the engine is hot whereby to exclude ambient air from the region of said thermo-responsive member.

12. A thermostatic manifold heat control apparatus for use in connection with an automotive vehicle engine, comprising a thermo-responsive member, means under control thereof to preheat the combustion mixture when the engine is cold, and a shield responsive to said thermo-responsive member and movable thereby to a position in advance of said thermo-responsive member when the engine is hot whereby to exclude ambient air from the region of said thermo-responsive member, said shield comprising a hood partially surrounding said thermo-responsive member and a substantially flat plate parallel to a surface of the engine, said thermo-responsive member being mounted between said plate and said surface.

13. A thermostatic manifold heat control apparatus for use in connection with an automotive vehicle engine, comprising a thermo-responsive member, exhaust gas bypass means under control thereof to preheat the combustion mixture when the engine is cold, and a shield responsive to said thermo-responsive member and movable thereby to a position in advance of said thermo-responsive member when the engine is hot whereby to exclude ambient air from the region of said thermo-responsive member, said shield comprising a plate substantially parallel to a surface of said engine and a hood attached to said plate and partially surrounding said thermo-responsive member, said shield being pivotally mounted and having its center of mass near its outer extremity, and being movable from a position beyond vertical dead center to a substantially horizontal position whereby the mass of said shield tends to hold said exhaust gas bypass means in one or the other extreme position.

14. A thermostatic manifold heat control apparatus for association with a heat exchanger for imparting heat to the combustion mixture of an internal combustion engine from the exhaust gases of the engine, comprising a valve in the exhaust manifold which in closed position causes exhaust gases to flow through said heat exchanger and which in open position shunts said heat exchanger, a bimetal actuator responsive to the temperature of the engine to open said valve when the engine becomes warm and to close said valve when the engine becomes cool, and a shield fixed to said valve and movable coextensively therewith comprising means to permit ambient air to strike said bimetal actuator when said valve is closed and substantially to exclude ambient air from the region of said bimetal actuator when said valve is open.

15. A thermostatic manifold heat control apparatus for association with a heat exchanger for imparting heat to the combustion mixture of an

internal combustion engine from the exhaust gases of the engine, comprising a valve in the exhaust manifold which in closed position causes exhaust gases to flow through said heat exchanger and which in open position shunts said heat exchanger, a coiled bimetal actuator fixed to said valve and responsive to the temperature of the engine to open said valve when the engine becomes warm and to close said valve when the engine becomes cool, and a shield fixed to said valve and movable coextensively therewith comprising means to permit ambient air to strike said bimetal actuator when said valve is closed and substantially to exclude ambient air from the region of said bimetal actuator when said valve is open.

16. A thermostatic manifold heat control apparatus for association with a heat exchanger for imparting heat to the combustion mixture of an internal combustion engine from the exhaust gases of the engine, comprising a valve in the exhaust manifold which in closed position causes exhaust gases to flow through said heat exchanger and which in open position shunts said heat exchanger, a coiled bimetal actuator fixed to said valve and responsive to the temperature of the engine to open said valve when the engine becomes warm and to close said valve when the engine becomes cool, and a shield fixed to said valve and movable coextensively therewith comprising means to permit ambient air to strike said bimetal actuator when said valve is closed and substantially to exclude ambient air from the region of said bimetal actuator when said valve is open, said shield having its mass near its outer end and being pivotally movable from a position beyond vertical dead center to a substantially horizontal position whereby the mass of said shield tends to hold said valve in one or the other extreme position.

LOUIS N. MURPHY.