Nov. 16, 1943. A. F. UNDERWOOD 2,334,457

ENGINE COOLING SYSTEM

Filed Dec. 24, 1941

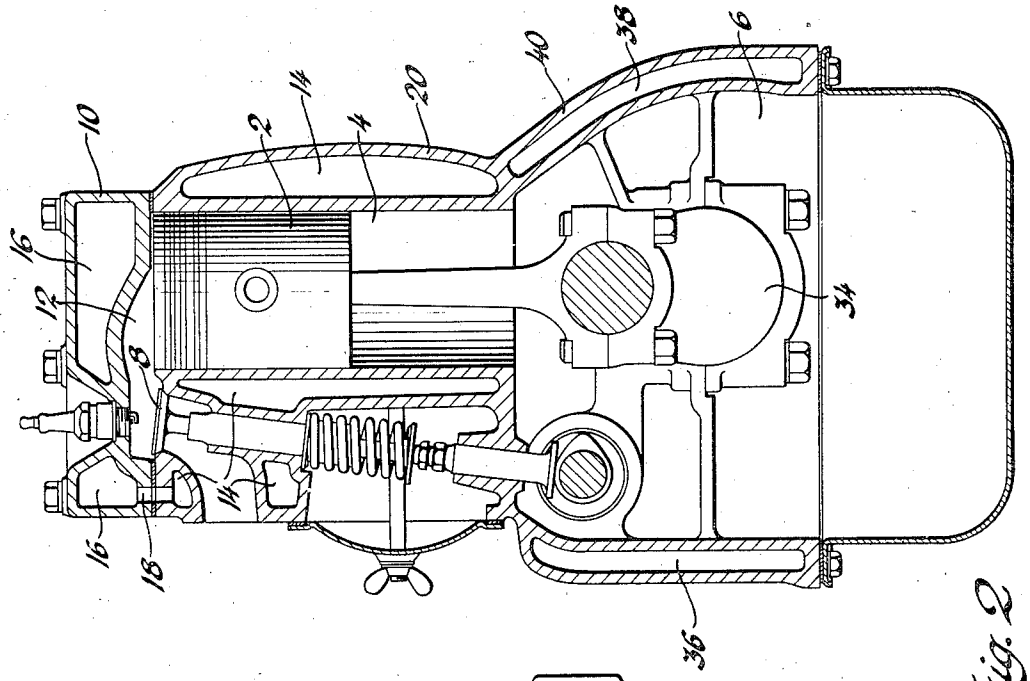

Fig. 2

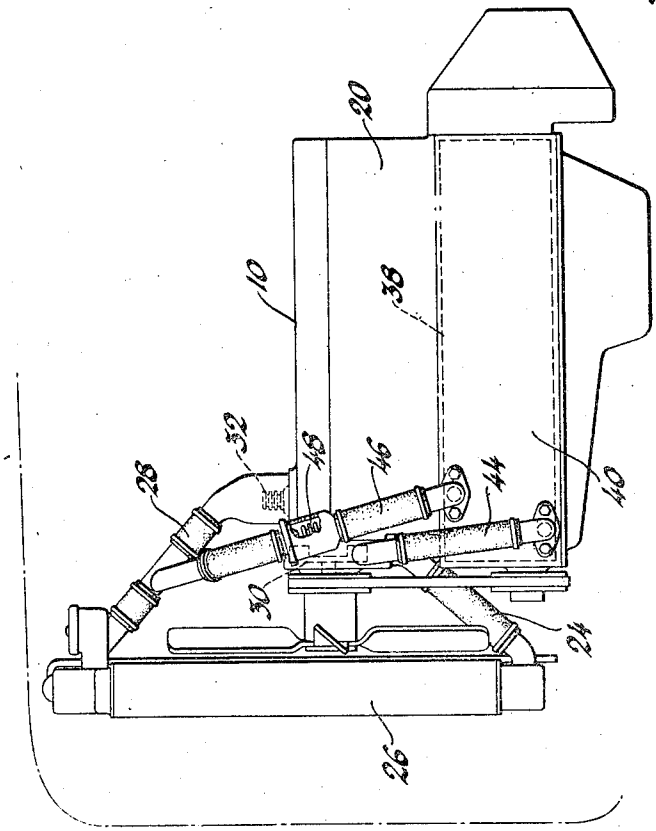

Fig. 1

Inventor
Arthur F. Underwood

By Blackmore, Spencer & Flint
Attorney

Patented Nov. 16, 1943 2,334,457

UNITED STATES PATENT OFFICE

2,334,457

ENGINE COOLING SYSTEM

Arthur F. Underwood, Grosse Pointe, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application December 24, 1941, Serial No. 424,269

4 Claims. (Cl. 123—178)

This invention relates to internal combustion engines and especially to the cooling systems thereof.

The cylinders and combustion chambers comprising the combustion spaces of internal combustion engines are ordinarily provided with cooling chambers forming parts of a single jacket through which coolant is circulated to dissipate waste heat and maintain the parts at a suitable operating temperature. In addition, it is frequently necessary to provide an oil cooler to maintain the engine lubricating oil at a suitable lower working temperature.

It has been found that the inner walls of the crankcase constitute an effective oil cooler enabling the complications of a separate independent oil cooler to be dispensed with, if the temperature of these walls is maintained sufficiently low by the coolant, but a sufficiently low temperature for this purpose is too low a temperature at which to maintain the combustion chambers for satisfactory operation and maximum fuel economy.

The object of the invention is an engine cooling system which will maintain the inner walls of the crankcase at a suitable temperature for cooling the engine lubricating oil, while maintaining the combustion spaces at a higher temperature for satisfactory operation with maximum fuel economy.

The foregoing and other objects of the invention will be apparent as the description proceeds.

According to the invention, the engine has a cooling jacket around the upper walls of the crankcase, separate from the cooling jacket for the combustion spaces, and coolant from a suitable source of supply is independently circulated through the jacket around the upper walls of the crankcase and through the jacket around the combustion spaces.

The drawing shows a construction according to the invention.

In the drawing:

Figure 1 is an elevational view of an internal combustion engine for a motor vehicle, to which the invention has been applied.

Figure 2 is an enlarged sectional view of the engine shown in Figure 1.

The engine has pistons such as 2 in cylinders such as 4, a crankcase 6, valves such as 8, and a cylinder head 10 with combustion chambers such as 12.

The cylinder head 10 with its combustion chambers 12, the pistons 2, the walls of the cylinders 4 and the valves 8 are all exposed to hot gases in the combustion space.

There is a cooling chamber 14 for the cylinders 4 and the valves 8, and a cooling chamber 16 for the cylinder head 10. The cooling chambers 14 and 16 communicate with each other through a plurality of connecting ports such as 18 and constitute a cooling jacket 20 for the combustion spaces.

There is an inlet pipe 24 to the cooling jacket 20 from the lower part of a radiator 26, and an outlet pipe 28 from the upper part of the cooling jacket 20 to the upper part of the radiator. A pump 30 aids and maintains circulation of liquid coolant through the cooling jacket 20 and the radiator 26 to dissipate waste heat from the walls of the combustion spaces, while a thermostatically operated valve 32 in the pipe 28 varies the rate of flow of the coolant through the cooling jacket 20 to maintain the walls of the combustion spaces at the most suitable temperature for maximum efficiency and fuel economy.

Engine lubricating oil escaping from the bearings of the crankshaft 34 and connected parts, and oil falling from the cylinder walls or being picked up from the crankcase 6, is thrown violently against the upper walls thereof by the revolving crankshaft and connected parts. The lubricating oil thrown against the upper walls of the crankcase will be effectively cooled if these walls are cool enough. To enable the upper walls of the crankcase 6 to serve as an oil cooler, they are provided with cooling chambers 36 and 38 which are connected together in any suitable way at one or both ends of the engine and constitute a cooling jacket 40 for the upper walls of the crankcase, separate from the cooling jacket 20 for the combustion spaces.

There is an inlet pipe 44 to the cooling jacket 40 from the pump 30, and an outlet pipe 46 from the upper part of the cooling jacket 40 to the upper part of the radiator through the pipe 28 to which the pipe 46 is connected at a point beyond the thermostatic valve 32. A thermostatically operated valve 48 in the pipe 46 varies the rate of flow of the coolant through the cooling jacket 40 to maintain it at a lower temperature than the cooling jacket 20, and thereby to maintain the upper walls of the crankcase at a lower temperature than the walls of the combustion spaces, to cool the engine lubricating oil to a desirable lower temperature, it being assumed that the radiator is capable of cooling the coolant to a sufficient extent to permit of this.

It will be appreciated that the radiator 26

could be dispensed with when there is an unlimited supply of sufficiently cold water for use as a coolant, and that in the event the radiator **26** does not cool the coolant to a sufficient degree for the cooling jacket **40**, an additional separate radiator and pump could be provided for this purpose.

I claim:

1. In an internal combustion engine having combustion spaces and a crankcase, a cooling jacket around the upper walls of the crankcase, separate from a cooling jacket around the combustion spaces, and means whereby coolant from a suitable source of supply may be independently circulated through the jacket around the upper walls of the crankcase and through the jacket around the combustion spaces to maintain the former at a lower temperature than the latter, thereby making the inner walls of the crankcase effective as an oil cooler while maintaining the combustion spaces at a higher temperature for maximum efficiency.

2. The combination according to claim 1 including a radiator for liquid coolant, pipes connecting the lower part of the radiator to both cooling jackets, and pipes connecting the upper parts of both cooling jackets to the upper part of the radiator.

3. The combination according to claim 1 including a radiator for liquid coolant, inlet and outlet pipes between the radiator and each of the cooling jackets, and a pump to aid and maintain circulation of the coolant through both the cooling jackets and the radiator.

4. The combination according to claim 1 in which each of the cooling jackets has an inlet and an outlet for liquid coolant, and there is a thermostatically operated valve in each of the outlets to control the rate of flow and hence the temperature of the coolant in the respective cooling jackets.

ARTHUR F. UNDERWOOD.