

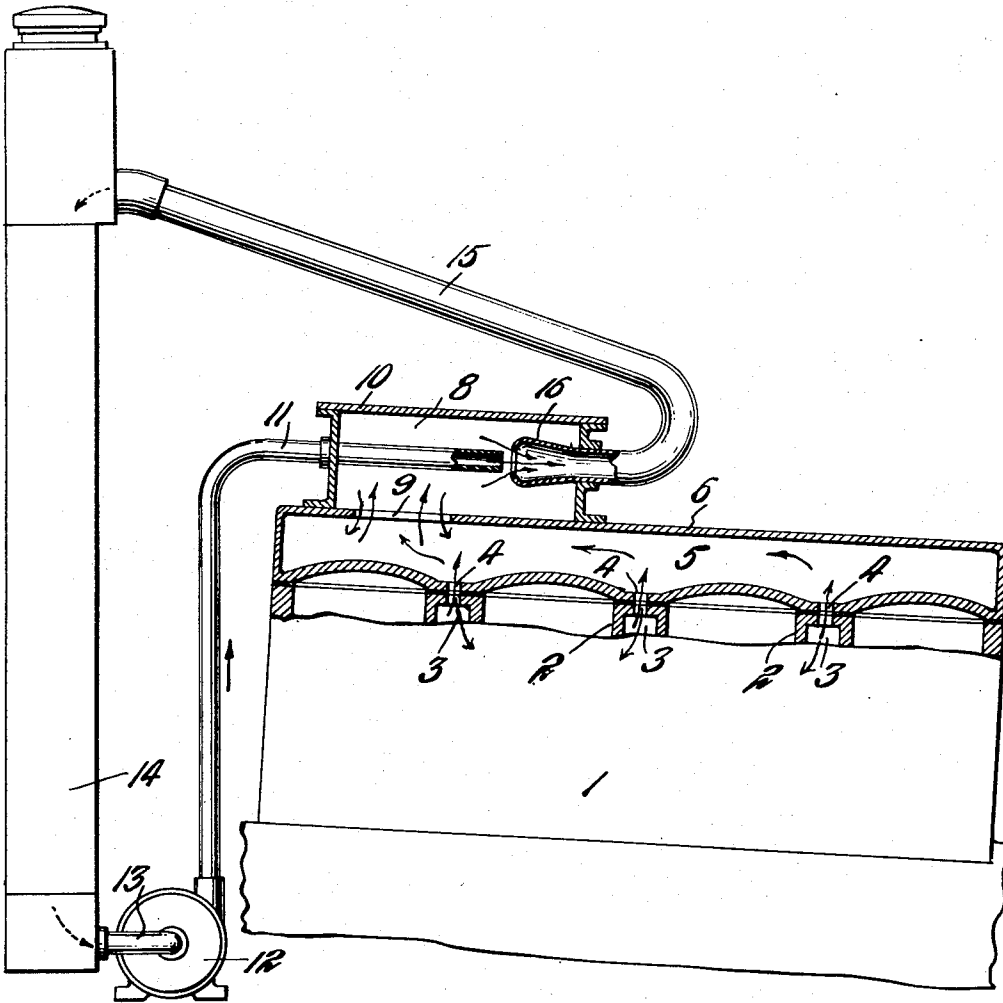
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COOLING SYSTEM FOR INTERNAL-COMBUSTION ENGINES

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COOLING SYSTEM FOR INTERNAL-COMBUSTION ENGINES

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5 Claims. (Cl. 123—174)

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My present invention relates to cooling systems for internal combustion engines and consists in a further development of the systems as disclosed in my prior Patents No. 2,086,439 to No. 2,086,442, dated July 6, 1937.

In the systems as therein disclosed special provision is made in operation to maintain the interior surfaces of the cylinder walls at a relatively high and uniform temperature to obtain higher efficiency in motor operation and other benefits including quickened warming up of the motor under cold weather conditions. These advantages in the systems referred to are accomplished with a cooling fluid cycle or circulation wherein the cylinder jacketing cooling spaces or passages are in a shunting relation to the forced circulatory passages of the cooling cycle. The arrangement therefor of Pat. No. 2,086,439 provides a cooling cycle through a downflow radiator having offtake and return flow connection to the motor head jacketing passage and with restricted communication between the cylinder jacketing and the head passages or jacketing whereby the cylinder jacketing is in a shunting relation to the pump-forced fluid circulation.

An object of the present invention is to further improve the operation of the cooling system of the shunted cylinder jacket principle in a manner to attain better temperature control of both the cylinder and head jacketing by special provision effective to preclude of wide temperature fluctuations in the engine jackets. This is accomplished by the arrangement of a supplemental chamber positioned desirably above and separate from the motor head and preferably with restricted communication to the head jacketing space. The fluid cycle is in series relation to this chamber with an improved arrangement for and positioning of its communication with the chamber relative to the head jacket passage designed materially to improve the operation.

The referred to and other features and advantages of the present improvements will be more fully understood by reference to the accompanying drawing showing a preferred embodiment thereof and wherein the motor is shown in side elevation with portions in vertical, longitudinal section.

The structural embodiment of the features as shown diagrammatically includes the motor block 1 formed with multiple cylinders 2, jacketing spaces or passages 3 communicating by means of openings 4 with the jacketing space 5 of the conventional removable head 6. The openings

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4 are of an area large enough to permit ready escape of steam from the cylinder jacket without sufficient velocity to obstruct the downflow through the same passages of at least enough water to make up for the evaporative loss. The head jacketing or cooling chamber 6 is in communication with a top or mixer chamber 8 through an opening 9. This opening 9 is likewise of an area large enough to permit escape of steam without sufficient velocity to obstruct downflow through the same passages. The top chamber 8 is shown formed by a separately closed housing 10 mounted on and positioned above the motor head. The circulation of the coolant is through the supplemental or top chamber 8 by means of intake pipe 11 from pump 12 connected by intake 13 to the bottom of downflow radiator 14 connected at its upper portion by conduit 15 to the outlet of the condenser chamber 3. The heat exchange or cooling cycle as thus established is by circulation through the top or auxiliary chamber 8 and the radiator 14 for cooling with the head and cylinder jacketing spaces in communication with the cooling fluid circulation in a shunting relation through the openings 4 and 9.

For maintaining the desired higher temperature and more uniform temperature conditions within the cylinder and head jacketing special provision is made to reduce to the minimum localized cooling in their communication with the top or auxiliary chamber 8. The structural arrangement therefor consists as shown in positioning the intake pipe 11 to direct its discharge into the spaced and flared intake end 16 of the outflow pipe 15 in a Venturi relation. As a result thereof under normal conditions of circulation the cooler water is to the maximum degree circulated and confined in the cooling cycle. The outlet or discharge from the top or auxiliary chamber 8 is remote from the head jacket opening 9 and moreover the flared outlet portion 16 is of special form as indicated with an inturned opening wall further contributing to the desired operation. The arrangement determines that heated water surges will pass into the enlarged outlet with the circulating water with return flow requirements of the chamber fulfilled by backflow and at higher temperatures than that of the chamber intake. The temperature gradient between the contents of the auxiliary chamber and that of the head jacket is accordingly reduced to a minimum with reduction in localized chilling or cooling action. The desirable described arrangement accordingly is such

as to localize the area of the cooler water entrance within the auxiliary chamber in a manner whereby the pulsating movement incident to boiling action in any part of the head will not induce wide fluctuations in the temperatures of the water entering the motor head through the aperture 9.

Under operating conditions of light load, it is believed that there is a steady upflow of steam bubbles and corresponding downflow of water into the cylinder jacket through the openings 4 while under conditions of maximum load there seems to be set up a pulsating action or interchange of steam and water through the passages. Experience has shown that there is no danger of overheating as it has been found that violently boiling water will carry away from a unit area of metal surface much more heat than can be carried away by water that is not boiling. Under pressure surge of water within the mixer chamber 8 heated water will be displaced, with the cooler water entering through pipe 11, to enter the discharge pipe 15 from the mixer box and on the reduced pressure surge a substantial portion of the heated water will return to the chamber 8 from the flared intake of pipe 15 thus to maintain to a maximum degree the desired heated water supply of the mixer box chamber 8.

While if desired the arrangement described herein may be occasionally or mainly operated on a boiling and condensing cycle by restricting the passage between the cylinder head jacket and the auxiliary chamber, thus causing the water to boil in the engine jackets and the resulting steam to be condensed in the water and the auxiliary chamber, I have found in actual construction, upon standard makes of automotive engines, that by making the passage between the head jacket and the auxiliary chamber of liberal cross section, the water in the cylinder jackets will come quickly almost, but not quite, to boiling, or about 208 degrees Fah. at sea level, and to about 205 degrees in the cylinder head jacket, under light or heavy load, in the cold of winter or in summer heat; the engine jacket temperatures being almost if not quite independent of the temperature of the water circulated by the pump through the radiator and the auxiliary or "shunt" cooling circuit, and without employment of thermostat valves or radiator covers or shutters as commonly employed with the conventional water cooling system.

This exchange of heat without actual boiling of the water in most of the engine jacket spaces is apparently due to a pulsating pressure noted in the water jackets of all conventional water cooled engines, due to the more or less violent boiling that takes place around the exhaust valves, this pulsating action seeming to increase in direct proportion to the load on the engine. It will be seen, thus, that the engine jackets may be maintained always practically at boiling point, with all the advantages of a steaming and condensing system and without necessity of an expansion tank to take care of water displaced from the engine jackets under conditions of excessive boiling, while avoiding the prejudice which many hold against employment of steam under any conditions.

I claim:

1. An internal combustion engine having water

jacketed cylinders and head and in combination therewith a supplemental chamber mounted on the head and having a direct communication opening therebetween, a cooling circuit including a radiator and connections including a pump for circulating the water through the supplemental chamber, said connections comprising an outlet connection from the supplemental chamber and an inlet connection positioned to discharge into the outlet connection at a point remote from the communication between the supplemental chamber and head jacket.

2. An internal combustion engine having water jacketed cylinders and head and in combination therewith a supplemental chamber member directly communicating with the head jacket, said chamber being in series with a cooling circuit including a radiator and means for circulating the coolant in a cycle through the chamber with the head jacket connected in shunt relation, said circulating means including intake and outlet connections to the supplemental chamber with the inlet connection in close spaced relation and directed into the outlet connection and said outlet being positioned remote from the communication between the chamber and the head jacket.

3. An internal combustion engine having water jacketed cylinders and head and in combination therewith an auxiliary chamber member having an opening communicating with the head jacket and a cooling circuit having a cycle independent of the jacketing and including a radiator and connections from the radiator to the supplemental chamber, said connections including a flared outlet connection from the chamber and an inlet connection thereto closely spaced from and directed into the flared outlet connection to establish water circulation with the jacketing in shunt relation communication therewith.

4. An internal combustion engine and cooling circuit arrangement therefor as claimed in claim 3 wherein the opening communicating between the supplemental chamber and head jacket is positioned remote from the inlet and outlet connections.

5. An internal combustion engine and cooling circuit arrangement therefor as claimed in claim 3 having the condensing chamber member positioned above the head and having the outlet connection to the supplemental chamber formed with a flared end enlargement with an intumed opening wall and positioned remote from the chamber head communicating opening.

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