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THERMOSTATIC VALVE WITH BY-PASS

Filed March 9, 1928

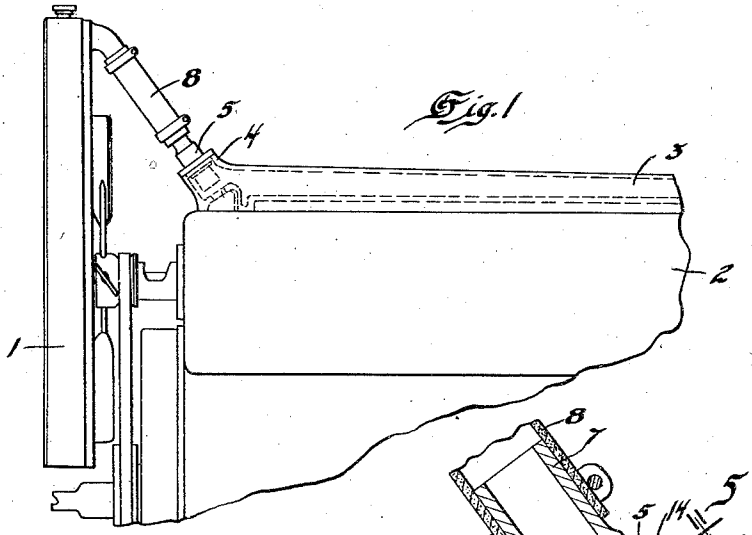


Fig. 1

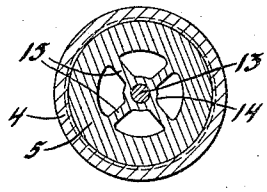


Fig. 5

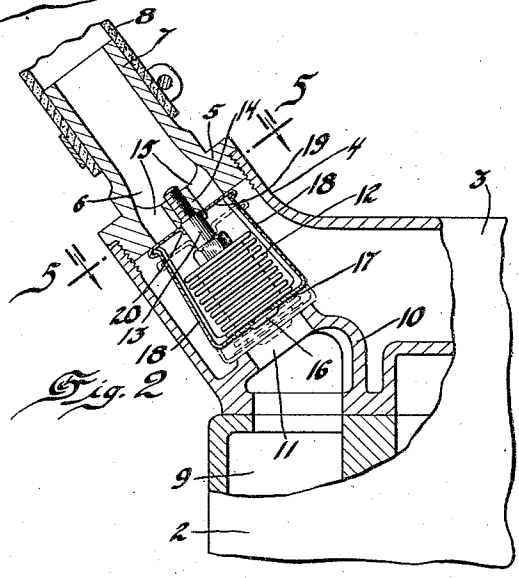


Fig. 2

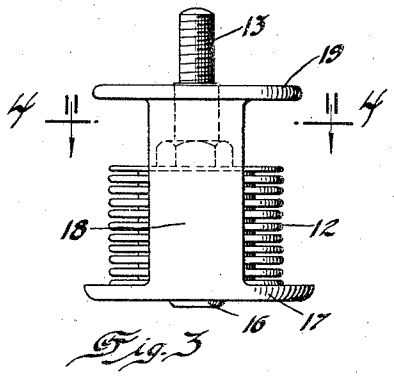


Fig. 3

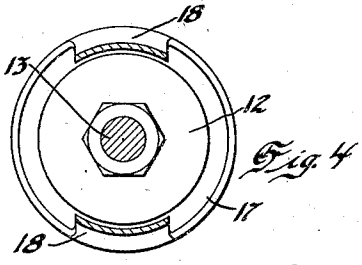


Fig. 4

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UNITED STATES PATENT OFFICE

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THERMOSTATIC VALVE WITH BY-PASS

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This invention relates to internal combustion engines of the water cooled type, and more particularly to an improved arrangement for controlling the circulation of cooling medium therethrough.

One of the objects of the invention is to provide a thermo-sensitive element at the outlet from the engine cylinder, which carries a pair of valves controlling respectively, an outlet leading to a cooling radiator, and a by-pass around the radiator leading directly to the water pump, thereby affording a continuous circulation thru the engine jacket at all times and reducing resistance to the operation of the pump.

The structure forming the subject matter of the invention, is intended to eliminate circulation through the radiator when the engine is first started and the cooling liquid is cold, so that the engine will warm up quickly to an efficient operating temperature. As the engine warms up, the thermo-sensitive element causes the valve over the outlet to the radiator to move away from its seat, and the valve for the by-pass to move toward its seat, allowing circulation through the radiator and restricting the flow through the by-pass, until the liquid reaches a temperature calling for the full circulation through the cooling radiator, when the outlet valve will be entirely open and the by-pass valve held tightly on its seat.

A preferred, but not necessarily the only embodiment of the invention, is illustrated in the accompanying drawing wherein Fig. 1 is a fragmentary side elevation of an engine and radiator associated therewith.

Fig. 2 is a view of the upper and front portion of the engine with parts shown in section.

Fig. 3 is a detail side elevation of the thermostat control unit.

Fig. 4 is a section taken on line 4—4 of Fig. 3 and

Fig. 5 is a section taken on line 5—5 of Fig. 2.

Referring to the drawings, the reference character 1 indicates the usual heat radiating unit forming a part of the circulatory system, the outlet of which is connected with a suitable pump operated from the engine crankshaft, for withdrawing the cooled water, or other cooling medium, from the radiator, and sending it through the engine jacket in the cylinder block 2 and head 3. At the upper front portion of the jacketed cylinder head 3. an upwardly extending tubular portion 4 is provided, into which is screw threaded a plug 5, having an outlet passageway 6 leading from the jacket, and a tubular extension 7, on the outside of which is secured the usual rubber hose connection 8 leading to the inlet of the radiator 1. Under normal operating conditions, the cooling liquid leaves the engine jacket through the passageway 6 and the hose 8. To by-pass or shunt the water around the radiator, the engine block is provided with a passageway 9 leading directly to the pump, and the cylinder head 3 has an integral hollow boss or raised portion 10, extending upwardly into the jacket and having an opening 11 in alignment with the outlet passageway 6.

Interposed between the raised boss 10 and the block 5, is a thermo-sensitive element which controls the liquid flow through the respective passageways 6 and 9 in accordance with temperature conditions. In the present case, this thermo-sensitive element is of the well known bellows type, indicated at 12, and which expands as the temperature rises and contracts as the temperature falls. The upper end of the thermostat bellows 12 is held in a fixed position by a fastening stud or pin 13, having a screw threaded extremity for engagement within the hub 14, carried at the end of the passageway 6 by a number of radially extending webs or arms 15, integral with the plug 5. Secured as by a rivet 16, to the opposite end of the thermostat bellows, is a valve element, which for convenience and economy of manufacture may be stamped from sheet metal, and which comprises a disk or plate 17, having a pair of oppositely disposed arms 18 extending upwardly and carrying at their upper ends, a plate or disk 19 having a central opening therein through which the stud 13 projects, and an annular flange 20 for sliding engagement on the shank of the stud.

When the thermostat bellows is contracted the disk 19 seats against the adjacent face of the plug 5 closing the outlet passageway 6. At such time, all the cooling fluid will enter the opening 11 and flow through the by-pass 9 to the pump, insuring continuous circulation through the engine jacket at all times. Since the flow through the radiator is cut off, there will be no dissipation of heat, whereby the engine will heat up rapidly. As the temperature rises to a point which enables the engine to operate most efficiently, the action of the heat of the thermostat causes the expansion thereof, which carries along the valve element to move the valve disk 19 off its seat and allow some of the heated water to pass to the radiator, and also moves the valve disk 17 toward it seat, so as to restrict the flow through the by-pass. The pump, therefore, draws some of the cooled liquid from the radiator which, in the same manner, warms up as it absorbs the heat of the explosions. When the fluid throughout the entire system reaches the temperature necessitating its complete passage through the radiator to prevent overheating of the engine, the expansion of the bellows will have caused the valve to move to the dotted line position in Fig. 2, at which time the valve disk 17 will be seated tightly against the face of the boss 10 cutting off all circulation through the by-pass and causing all the liquid to flow through the outlet passage 6.

Having thus described our invention we claim:

1. In an internal combustion engine, the combination with a water jacketed cylinder head having an outlet opening therein, and a raised boss integral with the head having an outlet port spaced from and aligned with said outlet opening, of a plug fitted into the outlet opening and provided with a passageway, a thermo-sensitive element carried by said plug and positioned between the plug and said boss, and valve members carried by said element and positioned beyond opposite ends thereof for controlling fluid flow through said passageway and said outlet port respectively.

2. In an internal combustion engine, the combination with a water jacketed cylinder head having a pair of aligned outlet openings therein arranged face to face in spaced relation, of a valve member having portions at opposite ends thereof adapted to seat over said openings, and a thermo-sensitive element interposed between said openings and connected with said valve member for controlling the movement of said end portions to and from their seats in inverse unison relation.

3. In an internal combustion engine, the combination with a water jacket, a pair of aligned outlet passages leading in opposite directions from said jacket, a thermo-sensitive element interposed between said outlet passages and a pair of valves carried by said element beyond the opposite ends thereof controlling the flow from the jacket through the respective outlet passages.

4. In an internal combustion engine, the combination with a water jacketed cylinder head having aligned openings in the top and bottom walls, and of a fluid flow control unit including a plug insertable within one of said openings and having a passage therein in alignment with the other of said openings, a thermo-sensitive element carried by said plug intermediate the passage and the last mentioned opening, and a pair of valves positioned beyond opposite ends of and carried by said element for closing one or the other of the last mentioned openings and the passage in accordance with thermal conditions.

5. In an internal combustion engine, the combination with a water jacketed cylinder head having an opening therein, an integral boss forming a valve seat and having an opening therein leading to an outlet passageway, of a plug fitting into said cylinder head opening, one end of which forms a valve seat for an outlet passageway therethrough in alignment with the first mentioned passageway, a thermo-sensitive element having one end fixed to said plug, a valve member fixed to the opposite end of said element, and movable upon operation thereof, and having one portion adapted to seat against the boss under hot conditions of the engine, and another portion adapted to seat against the plug under cold conditions of the engine.

In testimony whereof we affix our signatures.

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ROBERT WHYTE.