

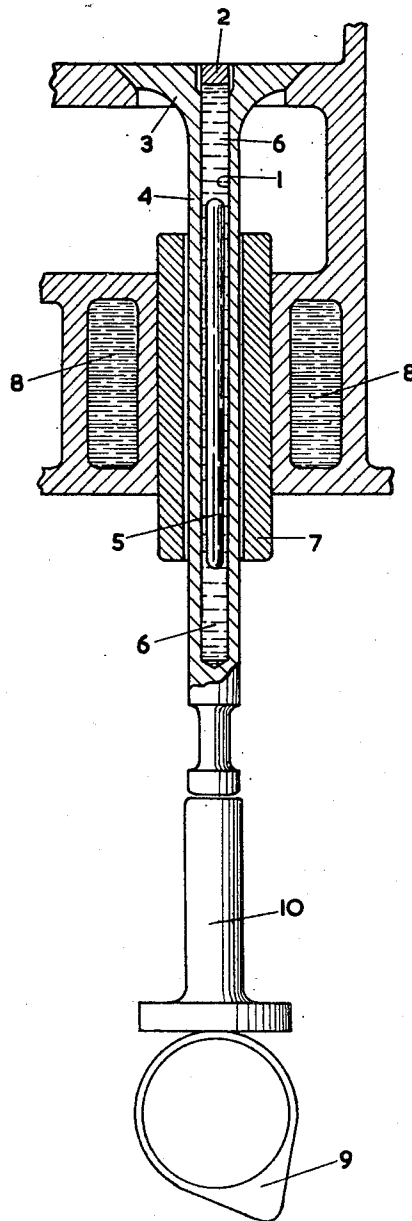
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F. E. LINDSAY

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INTERNAL-COMBUSTION ENGINE POPPET VALVE COOLING

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INVENTOR
FRANK EADES LINDSAY

BY

A. Yates Dowell
ATTORNEY

UNITED STATES PATENT OFFICE

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INTERNAL-COMBUSTION ENGINE
POPPET VALVE COOLINGFrank E. Lindsay, Birmingham, England, as-
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This invention relates to internal combustion engine poppet valves and more particularly to the means employed for cooling such valves.

It has already been proposed to provide poppet valves with a sealed hollow stem containing a cooling liquid or a cooling medium, such as sodium, which is in a fluid or liquid state at operating temperatures. The cooling medium does not fill the valve stem cavity and is displaced from end to end thereof as the valve reciprocates so that it serves to transfer heat from the valve head to the valve stem which may work in a water-cooled guide.

In a poppet valve according to the present invention, a fluid or liquid cooling medium contained within a sealed hollow valve stem is positively displaced from end to end of the valve stem cavity by a displacement member which is free to move therein and which, owing to the inertia effect, lags behind the movement of the valve, a clearance, preferably of considerable length, being afforded between the displacement member and the wall surface of the valve stem cavity for the passage of the displaced cooling medium.

An embodiment of the invention is shown, by way of example, in the accompanying drawings of an internal combustion engine poppet valve and its operating cam and tappet, the valve head and the major portion of its stem being in section to show the internal construction.

Referring to the drawing, the valve is formed with a cavity 1 which is closed at its upper end by a screwed-in sealing plug 2 and extends from the valve head 3 longitudinally through the valve stem 4 almost to the lower or tappet end thereof. A displacement member 5 in the form of a metal rod with rounded ends is housed in the valve stem cavity 1, and this displacement member or rod 5 is shorter than the said cavity 1 and is of such cross-sectional area as to afford a through all-round clearance between it and the wall of the cavity. The remainder of the space within the valve stem is filled with a fluid or liquid cooling medium 6. The valve stem 4 works in the usual tubular guide 7 which is cooled by the surrounding water jacket 8.

As the valve is reciprocated at speed by the cam 9 and tappet 10, the displacement member or rod 5 moves freely in the valve stem cavity 1 but, owing to the inertia effect, lags behind the valve movement and thereby displaces the cooling medium 6 from one end of the cavity 1 to the other and through the clearance in either direction according to the direction of movement of the valve.

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In passing through the narrow clearance between the displacement rod 5 and the cavity wall the cooling medium has considerable relative velocity and this gives very good conditions for heat transfer which is enormously increased by the movement between the cooling medium and the internal surface of the valve stem which dissipates heat to the valve guide 7 and the water in the jacket 8. In a modification employing air cooling, instead of water cooling, the lower end of the valve stem may be formed with fins for dissipating the heat transferred through it from the upper or head end by the displaced cooling medium in the valve stem cavity.

Obviously it is desirable that the displacement member or rod shall be as long as possible, consistent with leaving end clearances sufficient to accommodate the displacement and lag, so that the narrow all-round clearance between such rod and the cavity wall will be of considerable length.

Having fully described my invention, what I claim and desire to secure by Letters Patent is:

1. An internal combustion engine poppet valve having a sealed hollow valve stem containing a fluid medium and a displacement member, said member being solid in transverse cross section at least throughout a portion thereof, and free to move in the valve stem hollow and which, owing to the inertia effect, lags behind the valve movement so as to displace said cooling medium around the periphery of said member as the valve reciprocates.

2. An internal combustion engine poppet valve as claimed in claim 1, wherein there is afforded between the displacement member and the wall surface of the valve stem cavity a clearance of considerable length for the passage of the displaced cooling medium.

3. An internal combustion engine poppet valve as claimed in claim 1, wherein the displacement member is in the form of a rod somewhat shorter than the length of the valve stem hollow and of such cross-sectional area as to afford a through all-round clearance between it and the wall of said cavity to permit the free displacement thereof of the cooling medium from one end of the hollow to the other in either direction according to the direction of movement of the valve.

4. A poppet valve for internal combustion engines comprising an elongated stem having an elongated closed cavity, a fluidizable substance within said cavity, an elongated displacement member relatively movable within said cavity whereby said substance will be caused to pass from one end of said cavity to the other end thereof in contact with the wall thereof, said dis-

placement member being solid in transverse cross section at least throughout a portion thereof and being completely closed at one end thereof.

5. In a poppet valve having an elongated stem with an elongated closed cavity, the improvement comprising an elongated solid displacement member within said cavity, said elongated displacement member being shorter than said cavity and movable longitudinally therein, a fluidizable substance within said cavity surrounding said displacement member.

6. A poppet valve comprising a stem having an elongated closed cavity, a rod of smaller dimensions and said cavity movably mounted in said cavity, a fluidizable substance in said cavity sur-

rounding said rod, said rod being substantially solid whereby the fluidizable substance moves from one end of the cavity to the other end as said rod moves within said cavity, said fluidizable substance serving to transfer heat from one portion of said valve to another portion thereof.

FRANK E. LINDSAY.

REFERENCES CITED

10 The following references are of record in the file of this patent:

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