May 17, 1938. R. SCHLATTER 2,117,367

FUEL INJECTION VALVE

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Fig. 1.

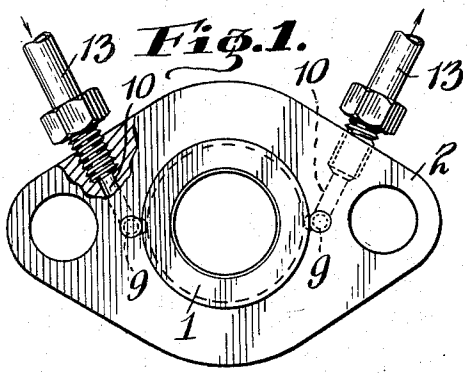


Fig. 3.

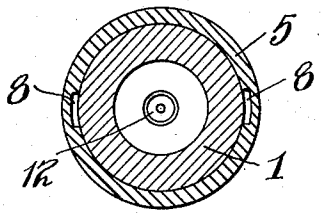
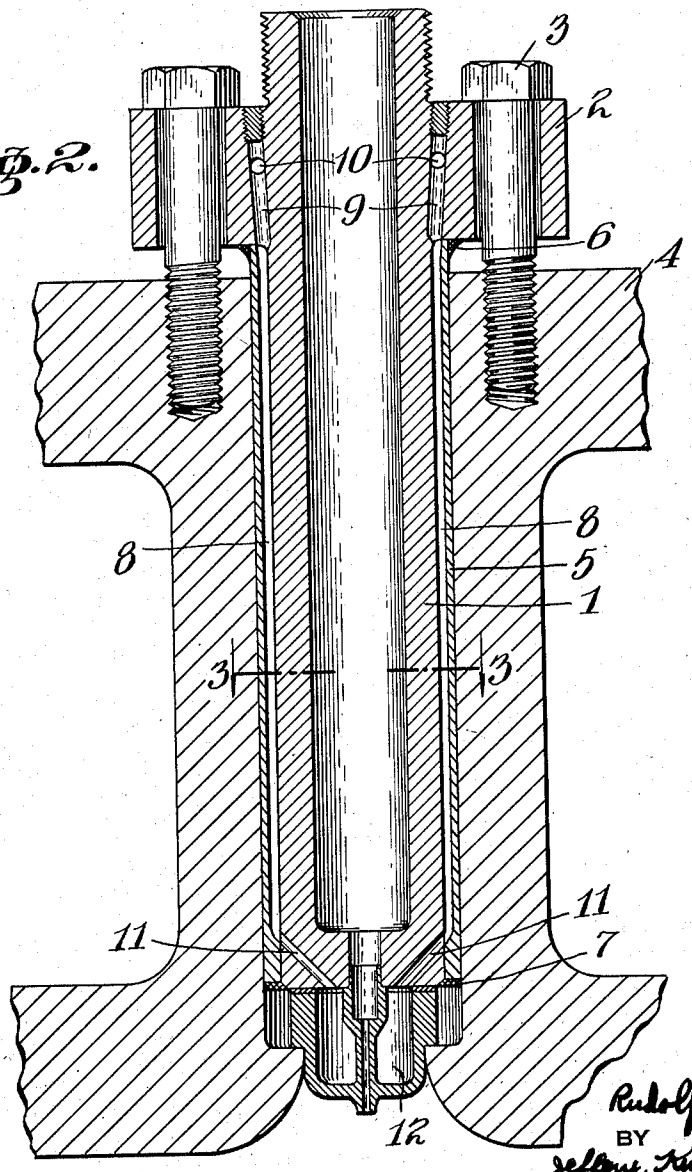


Fig. 2.



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FUEL INJECTION VALVE

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5 Claims. (Cl. 299—107.1)

The invention relates to valve cages for liquid fuel injection valves for oil engines and more particularly water-cooled valves, its object being to provide a water-cooled injection valve incorporating a high margin of safety against failure in a minimum outside diameter so that it can be more conveniently organized and assembled in the cylinder head structure.

Valves of the kind to which this invention relates are called upon to operate under internal pressures in the order of upwards of 10,000 lbs. per square inch and inasmuch as such pressures are pulsating or intermittent, the cage structure is accordingly subject to fatigue, sometimes resulting in failure, in consequence of which it is customary to make them of relatively massive proportions, with heavy wall thicknesses in order that they may safely accommodate the drill holes for conducting cooling water to the water-cooled spray tip. By this invention, such valves can be made of extremely compact dimensions without sacrificing safety against failure of spraying capacity and the new valves are therefore most convenient for assembly in cylinder heads or cylinder walls and particularly on the piston rod side of double-acting engines.

In the accompanying drawing an exemplification of the new valve is shown in plan view in Fig. 1, longitudinal section in Fig. 2, and cross section in Fig. 3.

According to this invention, the valve cage or casing includes a one-piece inner tube marked 1, which is of uniform wall section from end to end, except for its attachment flange 2, which is larger and of such radial extension as will accommodate the holes for the clamp bolts 3 by which the valve is clamped into the socket formed in the cylinder head 4. The dimensions of the tubular wall 1 are determined by the fuel oil pressures which it is expected to handle but its thickness is uniform, circumferentially considered, and from end to end.

Around the tube 1 is shrunk, or push-fitted, a sleeve 5 so as to make a close fit against the underside of the clamp flange 2, to which it is desirably sealed by a welded seam marked 6. The lower end of the sleeve is similarly welded to the lower end of the tube, the seam being marked 7.

The sleeve 5 has longitudinal internal channels 8 of any desired width cut in its interior face, preferably in opposite locations and the clamp flange 2 is drilled with passages 9 and 10 which communicate with these channels on each side. It is to be noted that the drill holes 9 and 10 are substantially outside of the cylindrical contour of the tubular body 1, so that the uniformity of wall thickness, to resist internal pressure, is not impaired by them.

At the lower end of the tube, and registering with the lower ends of the channels 8, respectively, are two obliquely drilled passages 11 forming communications between the sleeve channels 8 and the interior of the spray nozzle or tip 12. The construction of this tip is of no consequence to this invention, so long as it is hollow and contains a passage for cooling water. In the present case, it is indicated as applied or attached to the end of the tube by being clamped between the bottom of the socket in the cylinder head and the end of the tube. Any other form of attachment could obviously be substituted, screw threads being also appropriate. With the parts thus assembled and in position, the clamping pressure exerted by the bolts 3 is exerted upon and transmitted practically entirely by the fuel tube itself and its spray tip, none of it being borne by the sleeve which is thus no thicker than necessary for accommodating the water channels.

When thus assembled and in use, cooling water introduced by one of the connections 13 screwed into the edge of the clamp flange 2 passes down through the ducts 10 and 9, sleeve channels 8, on one side, through the hollow spray tip 12 and out on the other side through the corresponding passages on that side as will be apparent.

The invention is not concerned with the detail of the valve mechanism located within or connected to the tube 1 and this internal construction has not been illustrated on this account. It may be assumed to be the ordinary cam actuated valve plug, sometimes called needle valve, or a pressure operated valve plug, both of which are in common use in injection type engines. It will be understood however, that in any case the fuel oil to be injected into the combustion space of the engine will pass under high pressure into the valve tube 1 and emerge from it through the spray tip by which it is distributed in finely divided form in the compressed air.

Although water is referred to as the cooling medium, any other liquid is to be understood.

Having described my invention, I claim:

1. In an injection valve as described, the combination of a liquid fuel tube having a water-cooled spray tip at its inner end and a clamping flange at its outer end and shaped and adapted to be clamped in a socket in an engine cylinder head so as to press said spray tip against the bottom of said socket and means for cooling said spray tip comprising a sleeve fitted, upon and around said tube and substantially wholly free of the clamping pressure to which said tube and tip

are subjected, and passages formed in said pressure-free sleeve for circulating water through the water space in said tip.

2. An injection valve of the kind described comprising a flanged tube for conducting liquid fuel to the engine, a water-cooled spray tip at the end of said tube for delivering fuel therefrom to the combustion space of the engine, said tube having a central bore and a surrounding wall of uniform thickness, circumferentially considered, from its flange to said tip adapted to withstand maximum injection pressures, a sleeve fitted around said tube of much less thickness than said tube and channelled on its inner face to provide with said tube entrance and egress water passages communicating with the cooling space in said tip, and supply and discharge water connections to the opposite ends of said water passages, all of said parts forming a unit and organized to be clamped in a valve socket in the engine cylinder head and said tube being organized to take substantially all of the clamping strain.

3. In an injection valve constructed in accordance with claim 2, the flange on the liquid fuel tube being provided with ducts leading to said sleeve-formed water passages and said water supply connections being connected directly to said tube flange.

4. In an injection valve constructed in accordance with claim 2, the water-cooled spray tip being separately formed and clamped to said liquid fuel tube and the adjacent end of said tube drilled to form communication between said water passages and said spray tip.

5. An injection valve as described, comprising a fuel tube formed with a clamp flange at its outer end whereby its inner end may be clamped into an engine socket, a sleeve separately made but permanently attached to and around said tube extending from the flange thereof to the inner end thereof and formed with longitudinal water channels, and a separately formed spray tip removably related to said inner end, within the engine socket, and having fuel and water passages respectively connecting with the bore of said tube and the water channels of said sleeve.

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