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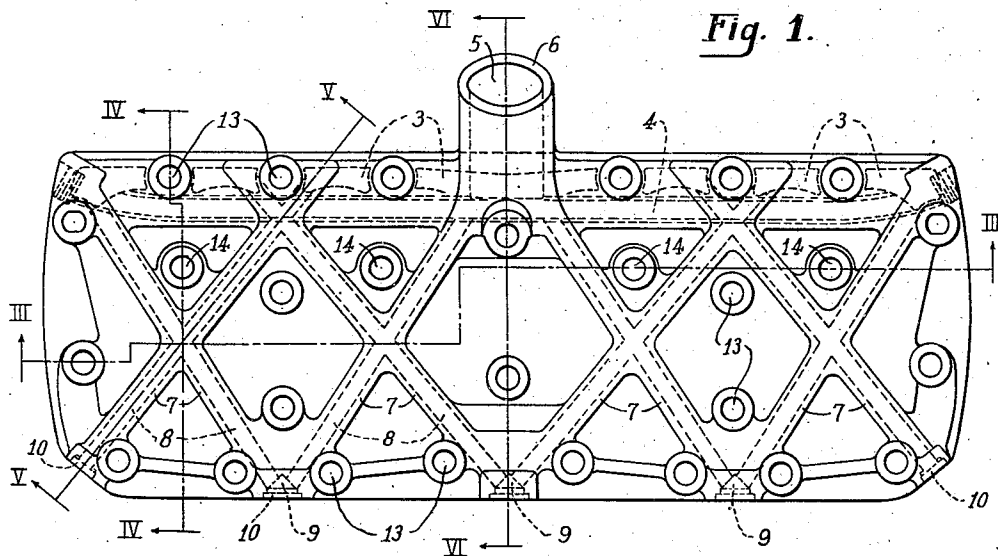
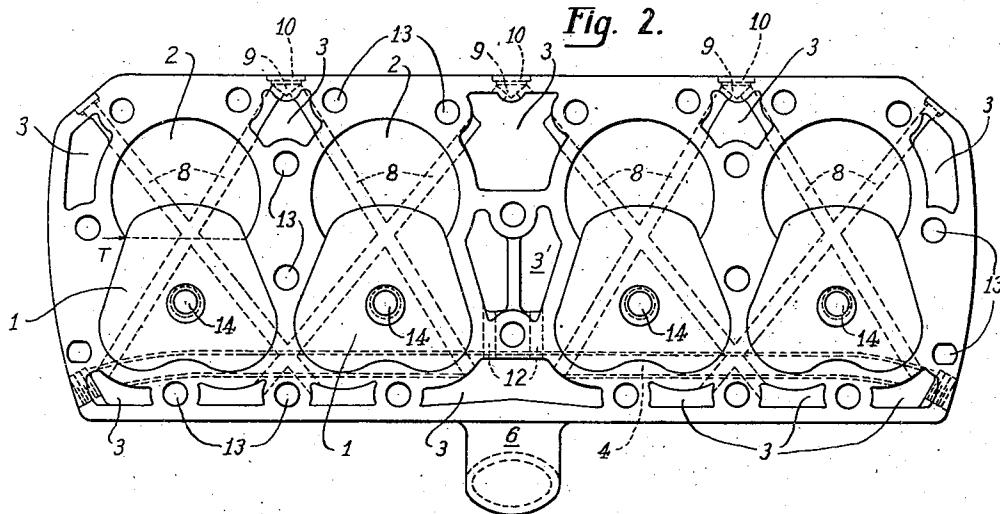
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2,339,972

CYLINDER HEAD

Filed April 15, 1942

2 Sheets-Sheet 1



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Fig. 3.

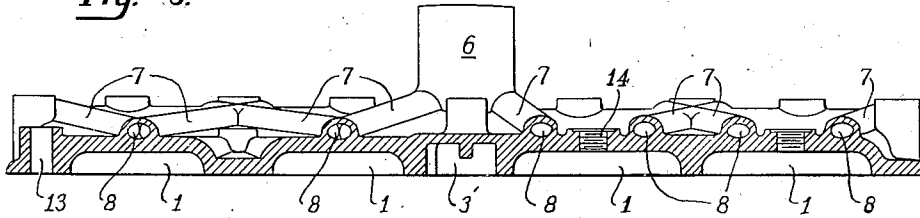


Fig. 4.

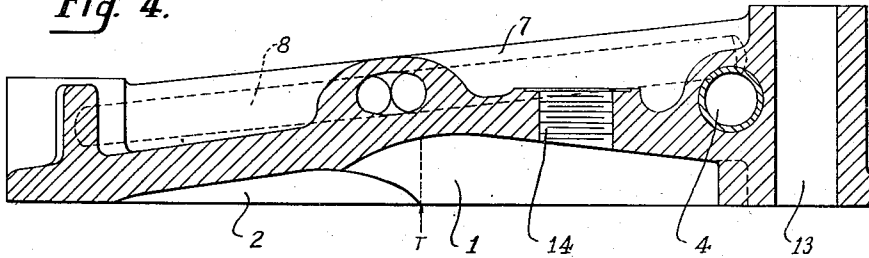


Fig. 5.

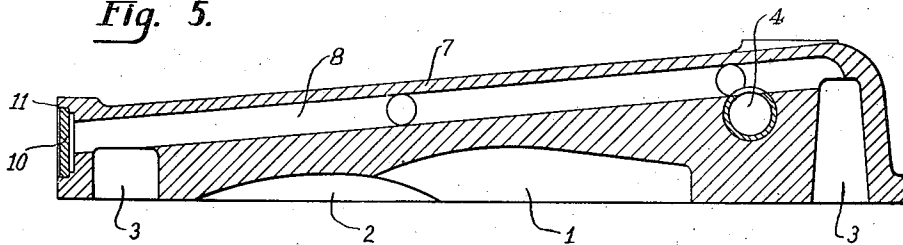
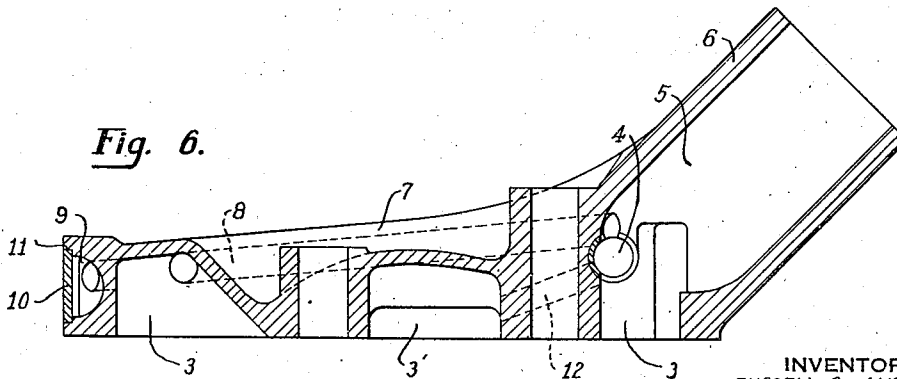


Fig. 6.



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2,339,972

CYLINDER HEAD

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Application April 15, 1942, Serial No. 439,040

3 Claims. (CL 123—173)

This invention relates to cylinder heads for liquid cooled internal combustion engines.

It is an object of this invention to provide a liquid cooled cylinder head which is adapted to dissipate heat from the combustion chambers quickly and efficiently, and which has a novel cooling system therein through which cooling fluid can be circulated.

It is a further object of this invention to provide a light weight cylinder head having on its upper surface reinforcing means with intersecting liquid passages therein connecting liquid chambers on opposite sides of the head and extending across the head and over the combustion chambers.

Other objects of the invention will be apparent from the following specification and claims.

In accordance with the present invention, a cylinder head having a plurality of combustion chambers is provided with intersecting liquid passages extending across the cylinder head and over the combustion chambers and the areas above the cylinders of the cylinder block, it being desirable to have the liquid passages formed within intersecting ridges extending across the top of the cylinder head and forming strengthening members for the head as well as serving as heat-radiating elements. The intersecting liquid passages communicate with passages for cooling fluid in the engine cylinder block, and preferably also communicate with at least one liquid passageway extending longitudinally along the cylinder head. Preferably, the point of intersection of the intersecting liquid passages is over or adjacent the transfer area of the combustion chamber, which is the minimum cross-sectional area of the combustion chamber through which the combustion gases travel in passing from the valve side of the combustion chamber to the cylinder bore, since it is at that area that heat from the gases ordinarily concentrates. Such a cooling system permits fluid from the cylinder block to circulate readily through the cylinder head and to reach areas from which it is especially desirable to extract heat.

In the accompanying drawings of a cylinder head embodying the invention:

Fig. 1 is a plan view of the cylinder head;

Fig. 2 is an inverted plan view of the cylinder head of Fig. 1 showing liquid passages therein;

Fig. 3 is a longitudinal cross section taken on the line III—III of Fig. 1;

Fig. 4 is a transverse cross section taken on the line IV—IV of Fig. 1;

Fig. 5 is a sectional view taken on the line V—V of Fig. 1; and

Fig. 6 is a sectional view taken on the line VI—VI of Fig. 1.

Referring to the drawings, the metal cylinder head has in its under surface a plurality of aligned combustion chambers 1, recesses 2 communicating with and intercepting the combustion chambers 1, and marginal liquid chambers 3 extending upwardly into the cylinder head adjacent the combustion chambers 1 and the recesses 2. The recesses 2 register with the cylinders of the cylinder block (not shown) and are provided to permit the dome-shaped head of pistons in the cylinder head to project into the cylinder head; they may be omitted if the cylinder head is to be used on an engine employing pistons whose heads are flat. The liquid chambers 3 are so situated as to register with liquid passages in the cylinder block and openings in the gasket between the cylinder head and the cylinder block. A liquid passageway 4 extends longitudinally along one side of the cylinder head and intersects suitable chambers 3 located on the same side of the head. One of the chambers 3 which is intersected by the passageway 4 communicates with the aperture 5 in the main outlet 6 which communicates with a radiator (not shown) where heat is dissipated from the cooling fluid. The liquid passageway 4 may be drilled in the cylinder head, or it may be formed during casting of the head. Preferably, as shown, it is in the form of a tube imbedded in the head during the casting operation and subsequently machined away where it intersects the liquid chambers 3.

Extending across the cylinder head are intersecting transverse ribs or ridges 7, which serve as heat-radiating and strengthening elements for the head, there being a pair of such ridges extending over each combustion chamber 1 and recess 2. The ridges 7 house liquid passages 8 which extend between liquid chambers 3 on one side of the cylinder head to liquid chambers 3 or the passageway 4 on the opposite side of the head, the liquid chambers 3 which are joined by each passage 8 being on opposite sides of the longitudinal center line of the combustion chamber 1 and recess 2. The passages 8 in the intersecting ridges 7 likewise intersect at the intersection of the ridges, the intersection being adjacent the transfer area of each combustion chamber, which is indicated by the dotted line T in Figs. 2 and 4.

If the passageway 4 is in the form of a tube within the head, the tube is machined away at

the points where it intercepts the passages 8, thus permitting liquid to flow from the passages 8 into the tube. The passages 8 may be drilled in from one side of the head, or they may be cored out with sand or metal cores in casting the head. Apertures 9, into which the passages 8 open, are provided along one side of the cylinder head and are closed by any suitable plug which does not interfere with the flow of cooling fluid through the passages 8. One suitable method of closing the apertures 9 is by forcing a Welch plug 10 (Figs. 5 and 6) into a seat 11 in the apertures. Likewise, the ends of the longitudinal passageway 3 are closed by suitable plugs.

Intermediate adjacent combustion chambers there may be provided an additional liquid chamber 3'—shown in approximately the center of the head in Fig. 2—which registers with a liquid passage in the cylinder block. The chamber 3' does not communicate directly with any of the transverse passages 8, but communicates with a chamber 3 through one or more openings 12. A suitable number of bolt openings 13 are provided in the head for bolts (not shown) which pass through the head and fasten it to the cylinder block. Likewise, spark plug openings 14 are provided for each combustion chamber.

By means of the cooling system described above, cooling liquid from the cylinder block can rise into the cylinder head through the chambers 3. The liquid entering those chambers 3 which are located along the side of the cylinder which is opposite the trunk passageway 4, passes through the transverse passages 8 and over the combustion chambers, and thence into the passageway 4 from which it is discharged through the outlet 6. Likewise, liquid entering the chambers 3 on the same side of the head as the passageway 4 flows into the passageway 4 and out of the cylinder head through the outlet 6. As shown in the drawings, the passages 8 converge toward, and intersect adjacent to portions of the combustion chamber where heat ordinarily accumulates,—i. e., the transfer area and the area adjacent to the spark plugs—thus concentrating the cooling effect of the circulating liquid at points from which it is especially desirable to extract heat.

Cylinder heads made in accordance with our invention readily lend themselves to common fabricating practices. They can be cast in sand

or permanent molds without resort to expensive coring procedures, or they can be made by forging or pressing operations, in which case the liquid passages 8 and the passageway 4 are drilled in the head. Preferably, the head is made of a suitable aluminum base alloy in order to take advantage of the high heat conductivity of aluminum.

It will be understood that various modifications can be made in the cylinder head and cooling system described above without departing from our invention or the appended claims.

We claim:

1. A cylinder head for an internal combustion engine, said cylinder head comprising a plurality of combustion chambers, at least one liquid passageway extending longitudinally of said head past said combustion chambers, and a plurality of liquid chambers which are adapted to communicate with liquid passages in the cylinder block of the engine, at least one of said combustion chambers having a pair of transverse liquid passages extending diagonally across the cylinder head above it and intersecting over that combustion chamber, said pair of transverse liquid passages connecting a plurality of said liquid chambers with at least one of said longitudinally extending liquid passageways.

2. A cylinder head for an internal combustion engine, said cylinder head comprising a plurality of combustion chambers disposed on its lower face, a plurality of liquid chambers which are adapted to communicate with liquid passages in the cylinder block of the engine, the upper surface of said cylinder head having over each combustion chamber a pair of intersecting ridges, a liquid passage in each of said ridges, said passages of each pair of ridges intersecting and connecting a plurality of said liquid chambers.

3. A cylinder head for an internal combustion engine, said cylinder head comprising a plurality of combustion chambers, a plurality of liquid chambers which are adapted to communicate with liquid passages in the cylinder block of the engine, a transfer area in each of said combustion chambers, and a pair of transverse liquid passages extending over each of said combustion chambers and intersecting adjacent the transfer area thereof, said liquid passages connecting a plurality of said liquid chambers.

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