

Oct. 6, 1942.

F. JARDINE

2,298,213

CYLINDER HEAD

Filed Oct. 1, 1940

3 Sheets-Sheet 1

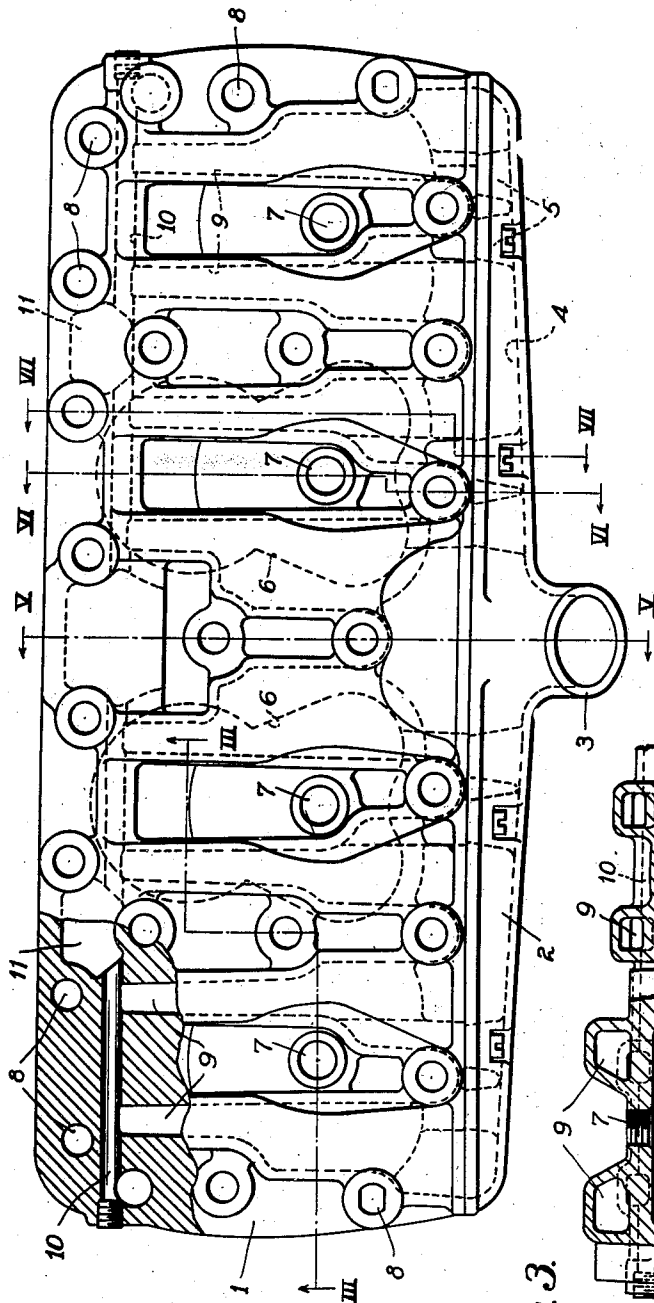


Fig. 1.

Fig. 3.

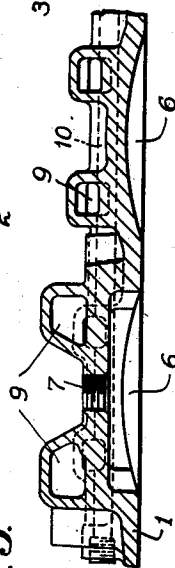
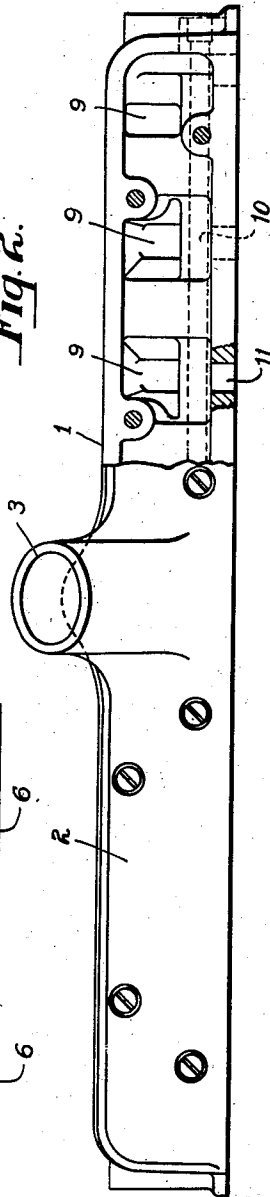


Fig. 2.



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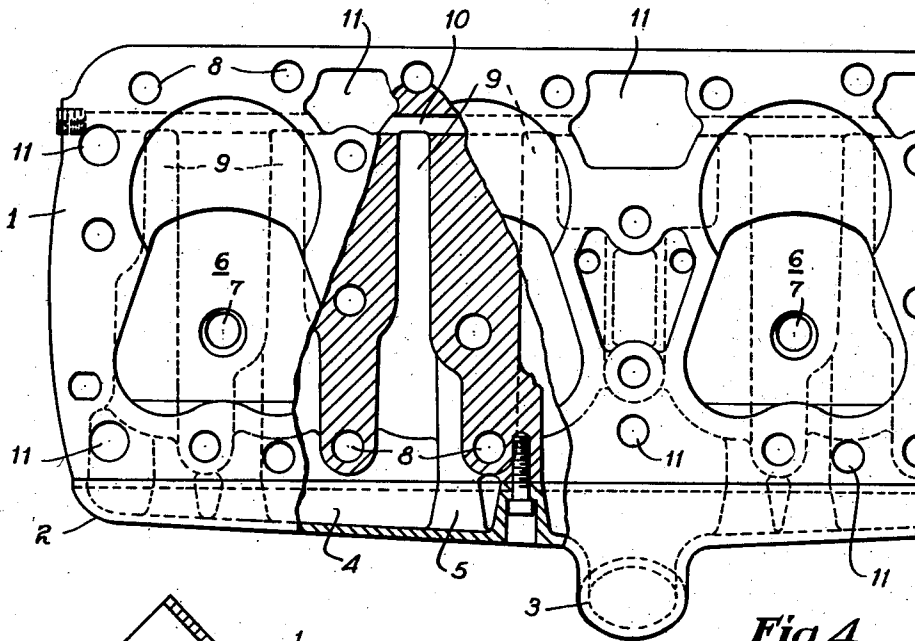
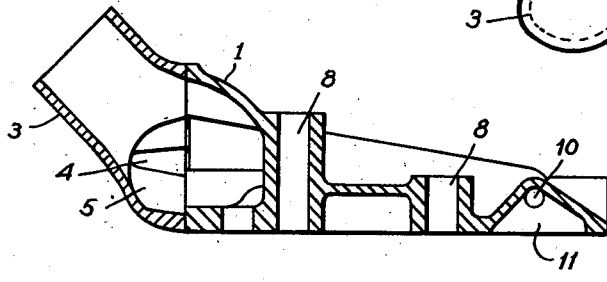


Fig. 5.

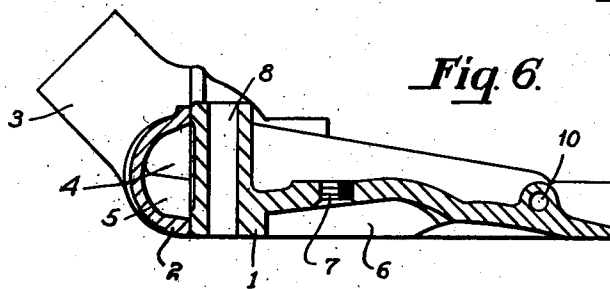


Fig. 6.

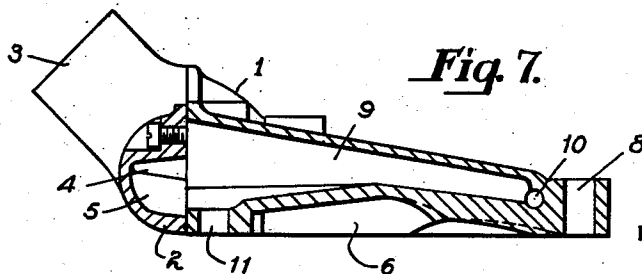


Fig. 7.

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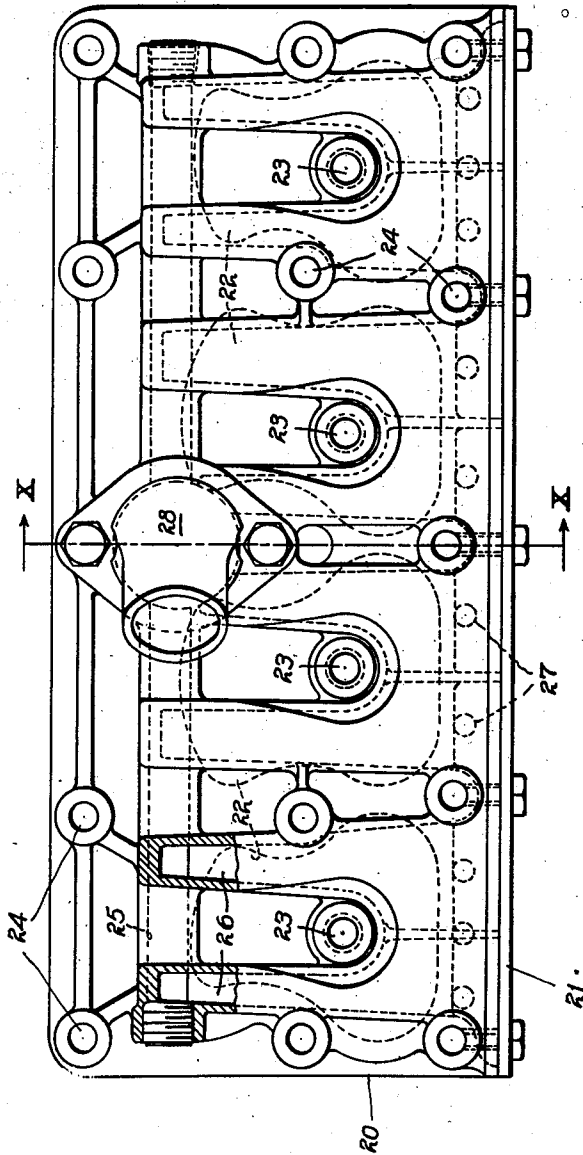


Fig. 8.

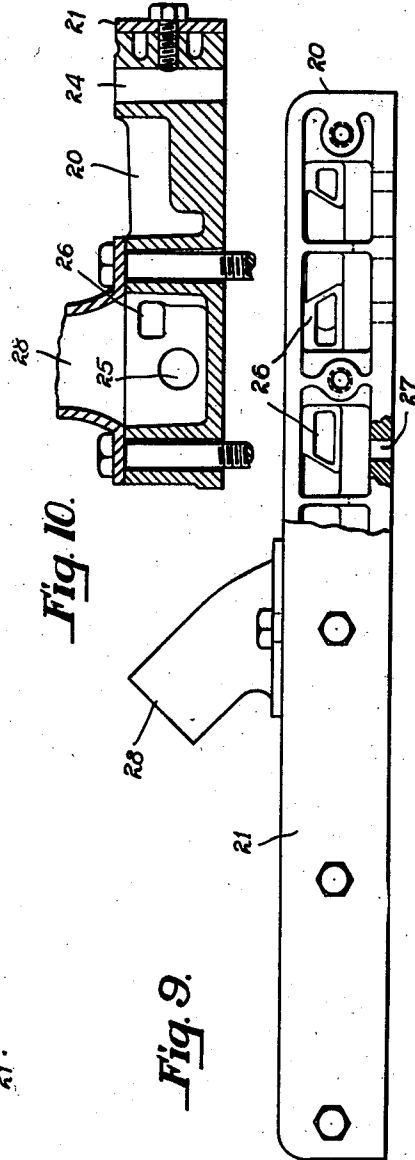


Fig. 10.

Fig. 9.

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2,298,213

CYLINDER HEAD

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Application October 1, 1940, Serial No. 359,214

5 Claims. (Cl. 123—173)

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

It is an object of this invention to provide an internal combustion engine cylinder head which is provided with an efficient cooling system and which can be easily and economically manufactured. It is a further object of this invention to provide a cast, liquid cooled, metal cylinder head for internal combustion engines, which cylinder head is designed to permit fabrication thereof without the use of sand cores. A further object of this invention is to provide a liquid cooled, metal cylinder head for internal combustion engines, the cylinder head consisting of two separately fabricated sections, one of which contains transverse passages through which a cooling fluid can circulate, and which can be cast in a permanent mold without the use of sand cores to produce cooling passages. Still a further object of this invention is to provide a two-piece cylinder head for internal combustion engines, the head having cooling passages therein designed to facilitate production of the head. Other objects of the invention will be apparent from the following description and claims, and from the accompanying drawings, in which:

Fig. 1 is a plan view, partly in section, of a cylinder head constructed in accordance with the invention;

Fig. 2 is a side elevation of the cylinder head shown in Fig. 1, the drawing being partly broken away to show in side elevation a portion of the principal section of the cylinder head;

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

Fig. 4 is an inverted plan view, partly in section, of a portion of the cylinder head shown in Fig. 1;

Fig. 5 is a vertical section taken on the line V—V of Fig. 1;

Fig. 6 is a vertical section taken on the line VI—VI of Fig. 1;

Fig. 7 is a vertical section taken on the line VII—VII of Fig. 1, with the taper of the liquid chamber in the main portion of the cylinder head shown in exaggerated form;

Fig. 8 is a plan view of a modification of the invention;

Fig. 9 is a side elevation of the cylinder head shown in Fig. 8, the drawing being partly broken away to show in side elevation a portion of the head; and

Fig. 10 is a vertical section taken on the line X—X of Fig. 8.

Referring to the embodiment of the invention illustrated in Figs. 1-7 of the drawings, the cylinder head consists of a main section 1 and a manifold 2 which is bolted or otherwise detachably joined to the main section 1 along a plane extending vertically and longitudinally of the cylinder head. The manifold 2 is provided with an outlet 3 which communicates with suitable cooling means (not shown), such as a radiator. Extending longitudinally of the manifold 2 is a fluid passage 4 which opens outwardly throughout its length toward the face of the main section 1 to which the manifold 2 is joined, as shown in Figs. 5-7. The passage in the outlet 3 likewise tapers outwardly toward the main section 1, and is free of any undercut portions, as is the passage 4 also. The tapered bosses 5, which are adapted to receive suitable fastening bolts, extend across the passage 4 and register with bosses in the main section 1 having seats therein for the bolts mentioned.

The main section 1 of the cylinder head is provided with a plurality of combustion chambers 6 and suitable spark plug openings 7, as well as both bolt holes 8 for accommodating bolts which fasten the cylinder head to the cylinder block. Adjacent the combustion chambers are transverse fluid chambers 9 which communicate at their ends remote from the manifold 2 with a longitudinal drilled passage 10, which extends from one end of the main section 1 to the other and is closed at both ends by threaded plugs. The fluid chambers 9 have a draft or taper from their ends remote from the manifold 2 to the face of the main section 1 to which the manifold is joined, and connect the manifold 2 to the drilled passage 10 (see Figs. 3, 5-7). The chambers 9 have no undercut portions or the like, and in view of the fact that they open progressively outwardly throughout their length toward the side face of the section 1, they can be formed, when the section 1 is cast, by employing permanent cores which can be withdrawn from the casting at the meeting plane of the two sections of the head. Likewise, the fluid passage 4 and outlet 3 in the manifold 2 can be formed by using a permanent core or cores when the manifold is cast, since the fluid passage 4 and the outlet 3 have an outward draft or taper toward the main section 1 of the cylinder head and are free from undercuts and the like. It is preferred to cast both sections of the cylinder head in permanent molds, and to make them of a suitable aluminum base alloy because of the heat conducting properties of aluminum and its alloys. The chambers 9 communicate at the meeting

Referring to the embodiment of the invention

plane of the two sections of the head with the fluid passage 4 in the manifold 2, with the result that the passage 4, the chambers 9, and the drilled passage 10 cooperate to form a continuous cooling system in the head through which cooling fluid can circulate freely. In order that the cooling fluid may also circulate in the cylinder block, a plurality of apertures 11 are provided in the main section 1 which communicate with the fluid chambers 9 or the drilled passage 10, and which are so placed as to coincide with liquid passages in the cylinder block. A suitable gasket may be interposed between the main section 1 and the manifold 2.

In the modification illustrated in Figs. 8-10, the cylinder head consists of a main section 20 and a plate 21 bolted to one side of the main section. The section 20 contains the combustion chambers 22, spark plug openings 23, and bolt holes 24 for bolts which fasten the cylinder head to the cylinder block. A drilled passage 25 extends longitudinally of the section 20 from one end thereof to the other and is closed at each end by suitable plugs. The transverse fluid chambers 26 communicate at one end with the drilled passage 25, and have an outward draft or taper throughout their length toward the main section's face to which the plate 21 is attached. They contain no undercut portions, and consequently, in casting the section 20, permanent, metal cores can be used to form those chambers, the cores being withdrawn at the end of the casting operation from the main section's face to which the plate 21 is to be fastened. The apertures 27 furnish communication between water passages in the cylinder block to which the cylinder head is attached and the passage 25 and the fluid chambers 26. A fluid inlet 28 is bolted to the section 20 and communicates with the passage 25 through an opening in the section 20 which intercepts the passage 25, as shown in Fig. 10.

Although in the cylinder heads illustrated in the drawings and described above the two transverse fluid chambers are shown associated with each combustion chamber and extending across the head above the combustion chambers, it will be understood that more or fewer fluid chambers can be used if desired, and that they may be positioned differently in the head without departing from the invention. The number of such chambers used, and their precise position in the cylinder head, will depend on such factors as the amount of heat which it is desired to remove from the cylinder head, the rapidity with which the cooling fluid is circulated in the head, and the size of the fluid chambers. Various other modifications can be made in the invention without departing from the following claims.

I claim:

1. A liquid cooled metal cylinder head for an internal combustion engine, said head comprising a main section containing a plurality of combustion chambers, a plurality of transverse liquid chambers adjacent the walls of said combustion chambers, said liquid chambers having an out-

ward draft throughout their length toward a side face of said main section, a fluid passage in said main section extending longitudinally thereof and connecting said liquid chambers, and means detachably attached to said main section for closing the ends of said liquid chambers.

2. A liquid cooled metal cylinder head for an internal combustion engine, said head comprising a main section containing a plurality of combustion chambers, a plurality of transverse liquid chambers adjacent the walls of said combustion chambers, said liquid chambers having an outward draft throughout their length toward a side face of said main section, a fluid passage in said main section extending longitudinally thereof and connecting said liquid chambers, and a plate detachably attached to said main section and extending longitudinally thereof across the ends of said liquid chambers.

3. A liquid cooled metal cylinder head for an internal combustion engine, said head comprising a main section containing a plurality of combustion chambers, a plurality of transverse liquid chambers adjacent the walls of said combustion chambers, said liquid chambers having an outward draft throughout their length toward a side face of said main section, a fluid passage in said main section extending longitudinally thereof and connecting said liquid chambers, and a manifold detachably attached to said main section and extending longitudinally thereof across the ends of said liquid chambers.

4. A liquid cooled metal cylinder head for an internal combustion engine, said head comprising a main section containing a plurality of combustion chambers, a plurality of transverse liquid chambers adjacent the walls of said combustion chambers, said liquid chambers having an outward draft throughout their length toward a side face of said main section, a fluid passage in said head extending longitudinally thereof and connecting said liquid chambers, a manifold detachably attached to said main section and extending longitudinally thereof across the ends of said liquid chambers, said manifold having a fluid passage therein having an outward draft toward said liquid chambers throughout its length.

5. A liquid cooled metal cylinder head for an internal combustion engine, said head comprising a main section containing a plurality of combustion chambers, a plurality of transverse liquid chambers adjacent the walls of said combustion chambers, said liquid chambers having an outward draft throughout their length toward a side face of said main section, a fluid passage in said main section extending longitudinally thereof and connecting said liquid chambers, and a manifold detachably attached to said main section and extending longitudinally thereof across the ends of said liquid chambers, said manifold being adapted to communicate with means for cooling fluid circulating in said head, and having a fluid passage therein having an outward draft toward said liquid chambers throughout its length.

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