Feb. 1, 1955 F. K. H. NALLINGER 2,700,969

CYLINDER HEAD OF INTERNAL-COMBUSTION ENGINES

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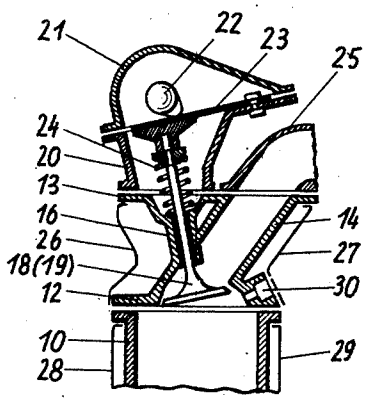


Fig.1.

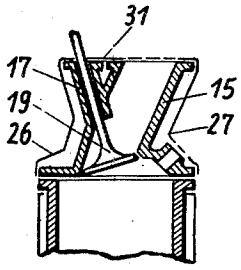


Fig.3.

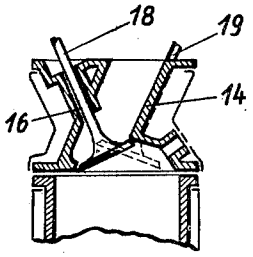


Fig.5.

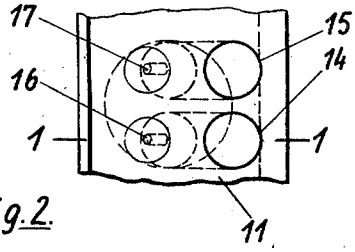


Fig.2.

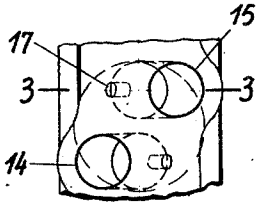


Fig.4.

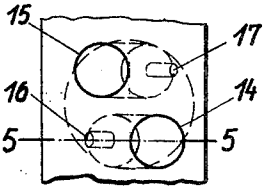


Fig.6.

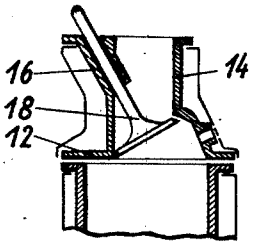


Fig.7.

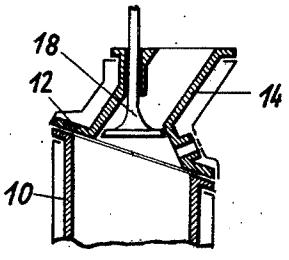


Fig.8.

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CYLINDER HEAD OF INTERNAL-COMBUSTION ENGINES

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The invention relates to a cylinder head of internal combustion engines. The most distinguishing features of the invention are the valve channels or passages in the cylinder head extending from the wall adjacent the cylinder chamber to the opposite wall i. e., with a standing cylinder arrangement from bottom to top. Preferably the valves should be arranged in a slanting direction to the main direction of the channels. The channels can be arranged vertical by or at a slant to the separating plane or gasket joint between cylinder housing and cylinder head and parallel or slantwise to the axis of the cylinder. The valves are also arranged likewise, preferably in a slant to the separating plane or gasket joint or to the axis of the cylinder. Furthermore, the channels and valves may be arranged side by side in a row or alternately, or in such a manner that they incline in different directions so that the inlet and outlet channels and intake and exhaust valves are arranged V-shape towards each other.

Due to the invention herein described and illustrated, it is possible to model the cylinder head in a particularly simple manner and to make one of light weight. The inlet and outlet channels may extend in a straight line or practically in a straight line. Thereby the losses caused by condensation and/or by the loading mixture of the engine can be decreased. Remarkable advantages are obtained when the casting is cast without outer walls, e. g. without the outer cooling-water-jacket. In this case e. g. the outer walls consist of sheet metal and are detachable by fastening them afterwards with the casting by way of removable screws, or are undetachable by way of welding, soldering, casting or the like.

Such a cylinderhead consists mainly of the wall covering the cylinder, eventually the wall opposite to the latter, the walls of the valve channels and the valve guides and thus can be cast in a simple and cheap way. The casting requires only simple cores and the cleaning can be done by hand in a most simple and yet efficient manner. Strains in the casting can be avoided entirely and thus waste of castings reduced to a minimum. While a number of the cast walls, made ordinarily in accordance with the prior art, are about ⅛ to 3/16 of an inch thick, they can be replaced in accordance with the present invention by sheet metals walls having a thickness of about 1/32 of an inch, and, at the same time, the remaining cast walls can be made thinner; the weight in particular will decrease considerably. The drawing shows, by way of example, several different embodiments of the invention.

Figures 1, 3, 5, 7 and 8 illustrate a vertical section through one of the embodiments, whereby, for reasons of distinctiveness the cylinder is shown in an axial section and the cylinder head is shown in sections according to lines of **1—1, 3—3**, and **5—5** of Figs. 2, 4, and 6 respectively, and

Figures 2, 4 and 6 are plan views of the cylinder head according to Figs. 1, 3 and 5, respectively.

In Figs. 1 and 2, **10** is the cylinder, **11** the cylinder head which consists mainly of the lower wall **12**, covering the cylinder chamber, forming the separating plane for the gasket joint between the cylinder housing and the cylinder head, the upper wall **13** located opposite thereto, the inlet and outlet channels **14** and **15** which are substantially rectilinear and are arranged slantwise to the separating joint and to the cylinder axis respectively, and the oppositely inclined guides **16** and **17** for the intake and exhaust valves **18** and **19**. On the cylinder head, there is mounted a valve controlling housing consisting of two parts **20** and **21** with a slantwise arranged separating joint

for the valve control mechanism which housing surrounds the camshaft **22**, an intermediate lever or spring element **23**, and the valve spring **24**, as well as the intake and exhaust pipe **25**, respectively. For the inlet pipe preferably a down-draught-carbureter should be utilized which can be mounted directly above the cylinder head. The outer wall of the cooling-water-jacket is formed by bent sheet metal jackets **26** and **27**, which are arranged on the outside of the cast part of the cylinder head and can be connected by welding, soldering or casting, e. g. with a Schoch type casting spirt system. In a similar manner the cooling-water-jacket of the cylinder can be formed by sheet metal **28** and **29**. Provision has been made for a bore-hole **30**, e. g. for a spark plug or something similar.

The illustrated example according to Figs. 3 and 4 differs essentially from the one shown previously by the feature that an upper wall is missing. Instead an upper cover-lid, made of sheet metal is provided which can be fastened in a manner described hereinabove. Furthermore, as shown in Fig. 4, inlet and outlet channels and intake and exhaust valves respectively, are arranged in V-shape to each other.

A similar arrangement of the channels and valves is shown in the illustration according to Figs. 5 and 6, but in contrast to the previously illustrated example where the valves are set off sidewise out of the central longitudinal plane of the cylinder. Fig. 7 shows an illustrated example with channels **14, 15**, of which only channel **14** is shown in the cross sectional view of the drawing, running parallel with the cylinder axis and perpendicular to the separating plane or to the lower wall **12**, while the valves **18, 19**, of which only valve **18** is shown in the cross sectional view of the drawing, are inclined to one side or to different sides.

Referring to the illustrated example according to Fig. 8, the lower cylinder head wall **12** and the separating plane between cylinder casing and cylinder head respectively incline to the cylinder axis. The valves are parallel to the cylinder axis, but the inlet and outlet channels are arranged at an incline to the cylinder axis whereby they may run perpendicularly to the separating plane. In a given case the valve could run perpendicularly to the separating plane, while the inlet and outlet channels respectively, run parallel to the cylinder axis, or eventually at an angle. Channels and valves can also be set apart, or arranged in V-shape to each other. The valve guides can be formed as part of the cylinder head casting.

In all cases, the valve control housing can be set upon the cylinder head (similar to Fig. 1) or can be, wholly or partially, one piece with the latter. This invention has particular importance by its small and cheap engines but can be applied just the same to larger engines, furthermore to all engines with a carbureter, diesel engines or all kinds of internal combustion engines for all purposes, especially for motor vehicles. The particularities of the various illustrated embodiments can be interchanged with one another according to suitability and in agreement with the workability; e. g. the arrangements according to Figs. 2, 4 and 6 are applicable individually to each and every one of the remaining figures relating to the arrangement of cylinder heads.

What I claim is:

1. In an internal combustion engine having a cylinder block and a cylinder head separate from said cylinder block by a separating joint, said cylinder head consisting of a unitary casting comprising essentially a wall adjacent said cylinder block, another wall opposite to said first-mentioned wall, and walls forming the valve channel, whereby the exterior of said casting is freely accessible from the side thereof, said valve channel extending linearly and at an angle with respect to a line perpendicular to said separating joint from said first-mentioned wall delimiting the cylinder space to said another wall, a valve controlling said valve channel and inclined with respect to said perpendicular line toward the opposite side thereof from said valve channel, lateral sheet-metal covering walls for covering said casting laterally between said first-mentioned wall and said another wall to form cooling-liquid jackets therewith.

2. In an internal combustion engine having a cylinder

block and a cylinder head separate from said cylinder block by a separating joint, said cylinder head consisting of a unitary casting comprising essentially a wall adjacent said cylinder block, another wall opposite to said first-mentioned wall, and walls forming the valve channel, whereby the exterior of said casting is freely accessible from the side thereof, said valve channel extending at an angle with respect to a line perpendicular to said separating joint from said first-mentioned wall delimiting the cylinder space to said another wall, a valve controlling said valve channel and inclined with respect to said perpendicular line toward the opposite side thereof from said valve channel, lateral sheet-metal covering walls for covering said casting laterally between said first-mentioned wall and said another wall to form cooling-liquid jackets therewith.

3. In an internal combustion engine, a cylinder head provided with valve channels and consisting of a unitary casting comprising a wall adjacent the cylinders, a wall on the side opposite the cylinders, and walls forming said valve channels and interconnecting said aforementioned walls, said valve channels having a rectilinear axis, said casting of the cylinder head being devoid of side walls whereby the exterior is freely accessible from the side thereof, and lateral sheet-metal covering walls enclosing said casting laterally between said first-mentioned wall and said second-mentioned wall.

4. In an internal combustion engine, a cylinder head provided with valve channels and consisting of a unitary casting comprising a wall adjacent the cylinders, a wall on the side opposite the cylinders, and walls forming said valve channels and interconnecting said aforementioned walls, said valve channels having a rectilinear axis, said casting of the cylinder head being devoid of side walls whereby the exterior is freely accessible from the side thereof, a supplemental covering sheet-metal wall for said second-mentioned wall, and lateral sheet-metal covering walls enclosing said casting laterally between said first-mentioned and said second-mentioned wall.

5. In an internal combustion engine having a cylinder block and a cylinder head, said cylinder head being formed of a unitary casting comprising essentially a lower wall adjacent said cylinder block, an upper wall opposite said lower wall, walls forming the valve channel and valve guide walls, said valve channel extending rectilinearly from said first-mentioned wall delimiting the cylinder space toward said second-mentioned wall and being inclined with respect to the cylinder axis, and a valve for controlling said valve channel and guided by said valve guide walls, said valve being inclined toward the opposite side of said cylinder axis from said valve channel, said casting being devoid of walls closing off the exterior of said casting laterally between said two first-mentioned walls whereby the exterior of the casting is freely accessible from the side thereof.

6. In an internal combustion engine having a cylinder block and a cylinder head, said cylinder head being formed of a unitary casting comprising essentially a lower wall adjacent said cylinder block, an upper wall opposite said lower wall, walls forming the valve channel and valve guide walls, said valve channel extending rectilinearly from said first-mentioned wall delimiting the cylinder space toward said second-mentioned wall and being inclined with respect to the cylinder axis, a valve for controlling said valve channel and guided by said valve guide walls, said valve being inclined toward the opposite side of said cylinder axis from said valve channel, said casting being devoid of walls closing off the exterior of said casting laterally between said two first-mentioned walls whereby the exterior of said casting is freely accessible from the side thereof, and lateral sheet-metal covering walls for laterally covering said casting between said first-mentioned wall and said second-mentioned wall.

7. In an internal combustion engine according to claim 1, comprising a plurality of valves with both valves inclined in one direction substantially parallel to each other.

8. In an internal combustion engine according to claim 1, comprising at least two valves and a valve channel for each valve, wherein one of said valves and the valve channel co-operating with the other of said valves are inclined in one direction, and the other valve and the valve channel co-operating with said one valve are inclined in the opposite direction.

9. In a multi-cylinder internal combustion engine according to claim 1, comprising at least one intake valve and one exhaust valve for each cylinder, wherein the intake valves are inclined to one side and the exhaust valves to the other side relative to corresponding valve channels.

10. In a multi-cylinder internal combustion engine according to claim 1, comprising a plurality of valves and a valve channel for each valve, wherein the valves are inclined to one side with respect to a plane containing the cylinder axes and the valve channels are inclined to the other side with respect thereto.

11. In a multi-cylinder internal combustion engine according to claim 1, comprising a plurality of valves and a valve channel for each valve, wherein adjacent valve channels are located alternately on different sides of a plane containing the cylinder axes.

12. In an internal combustion engine, the combination according to claim 3, further comprising a valve controlling one of said valve channels, and wherein the axis of said valve extends in the same direction as the cylinder axis and the axis of said one valve channel extends at an incline with respect to the cylinder axis.

13. In an internal combustion engine, the combination according to claim 3, further comprising valves controlling said valve channels, wherein of the axes of said valve channels and of corresponding valves at least one axis extends essentially in the direction of the cylinder axis and the other axis extends at an incline to the same.

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