

May 28, 1946.

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2,401,210

CYLINDER HEAD

Filed May 22, 1942

3 Sheets-Sheet 1

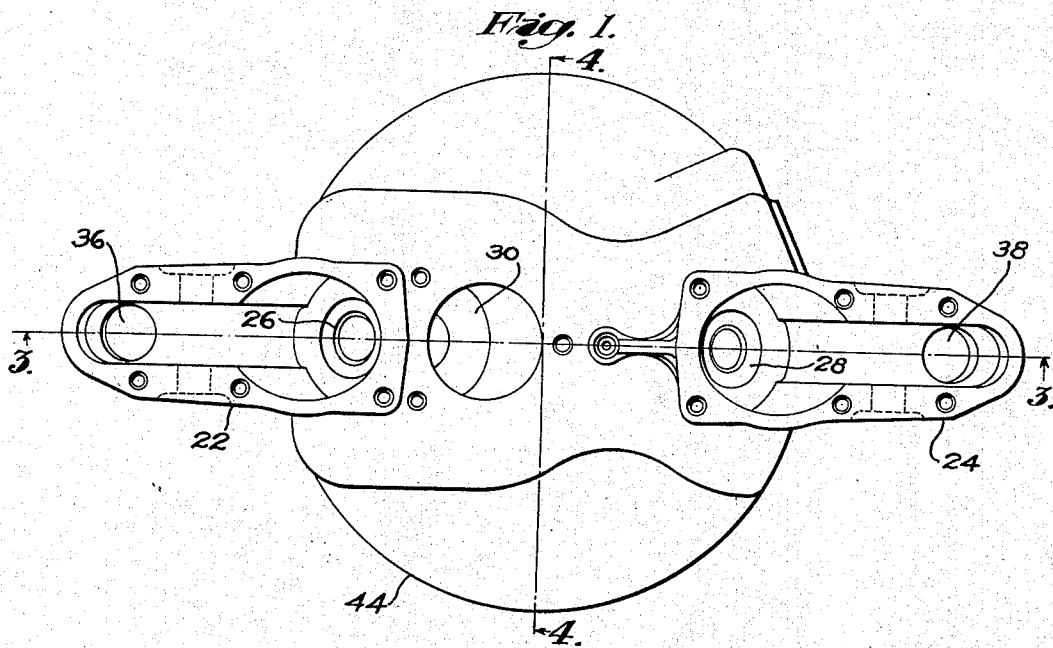
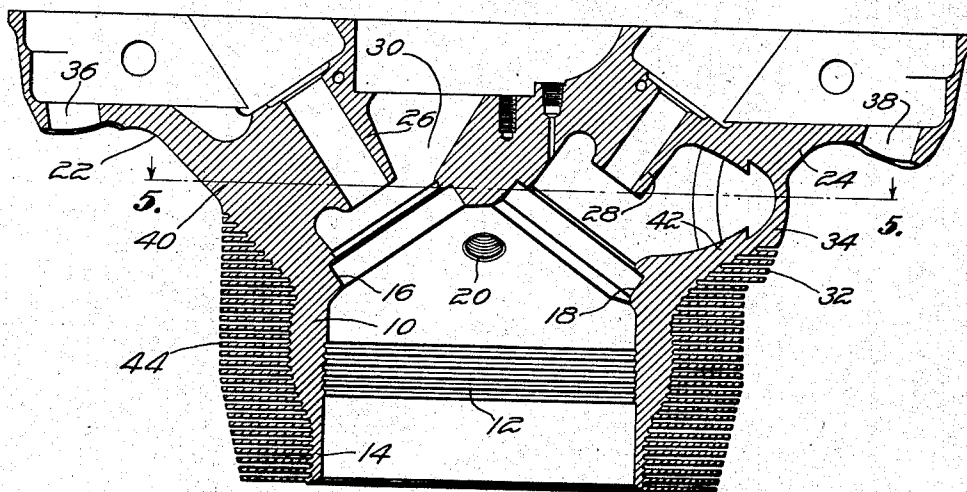


Fig. 3.



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Fig. 5.

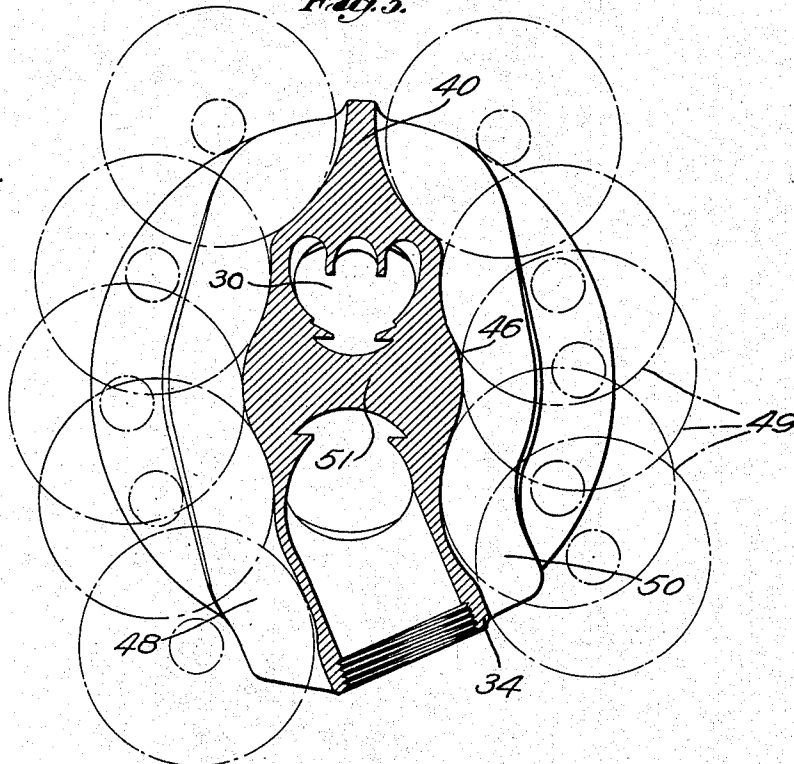
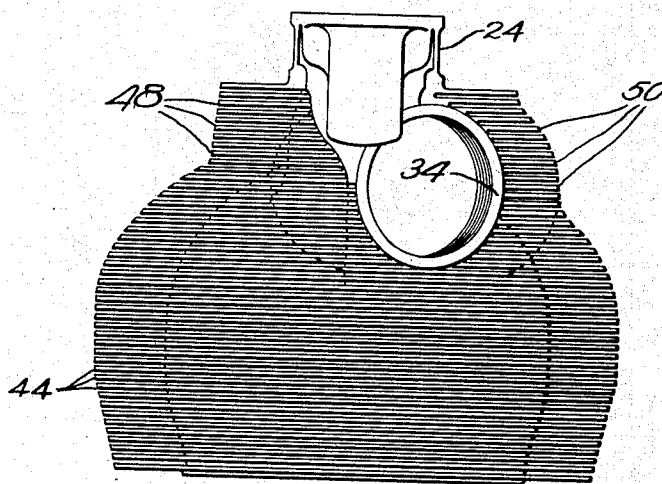


Fig. 2.



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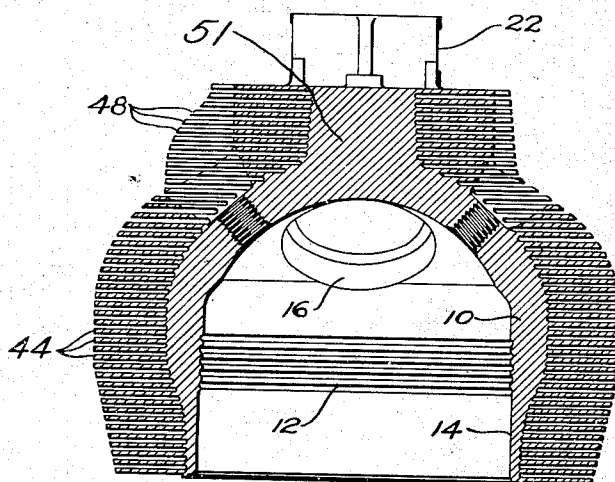
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Fig. 4.



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CYLINDER HEAD

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Application May 22, 1942, Serial No. 444,032

4 Claims. (Cl. 123—171)

This invention relates to improvements in internal-combustion engines and has particular reference to an improved cylinder head for an air-cooled engine.

An object of the invention resides in the provision of an improved engine cylinder head of the character indicated which is easy to manufacture and which can be readily shaped from a forged metal blank.

A further object resides in the provision of an improved engine cylinder head of the character indicated which is particularly strong and durable and at the same time of a relatively light weight; these advantages being accomplished by an improved distribution of the metal of which the cylinder head is formed.

A further object resides in the provision of an improved cylinder head of the character indicated which is symmetrical and reversible so that it can be made to operate in either one of two or more operative positions on an engine crankcase.

Other objects and advantages will be more particularly pointed out hereinafter or will become apparent as the description proceeds.

In the accompanying drawings, in which like reference numerals are used to designate similar parts throughout, there is illustrated a suitable mechanical embodiment for the purpose of disclosing the invention. The drawings, however, are for the purpose of illustration only and are not to be taken as limiting or restricting the invention since it will be apparent to those skilled in the art that various changes in the illustrated embodiment may be resorted to without in any way exceeding the scope of the invention.

In the drawings,

Fig. 1 is a top plan view of an engine cylinder head constructed according to the invention.

Fig. 2 is a side-elevation view of the cylinder head illustrated in Fig. 1.

Fig. 3 is a longitudinal sectional view on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view on the line 4—4 of Fig. 1, and

Fig. 5 is a transverse sectional view on the line 5—5 of Fig. 3.

Referring to the drawings in detail, the cylinder head comprises a body portion 10 provided with internal threads 12 which are adapted to engage with external threads provided on a cylinder barrel, not illustrated, the end of which projects into the body portion of the cylinder head. Below the threads 12 the body portion 10 is extended to provide a skirt portion 14 of progressively thinner section which fits over the outer end of

the cylinder barrel. The absence of any head or flange on this skirt portion eliminates any material concentration of stresses in the barrel at the inner end of the cylinder head and thus increases the safety and durability of the improved construction. Above the threads 12 the body portion 10 converges to form a dome-shaped combustion chamber provided with annular receptacles 16 and 18 for the intake and exhaust valve seats and with internally threaded spark plug apertures, one of which is indicated at 20.

Projecting from the body portion 10 are the extensions 22 and 24 which are made hollow to constitute rocker boxes for the rocker arms of the valve actuating mechanism.

These extensions 22 and 24 provide valve guides 26 and 28 which open into the hollowed-out portion of the integral rocker arm boxes. From the inner end of the valve guide 26 an exhaust port 30 opens through the cylinder head between extensions 22 and 24, and an intake port 32 leads to an annular boss 34 provided in the side of the cylinder head just below and slightly to one side of extension 24. Extensions 22 and 24 are provided in the lower portions thereof with apertures 36 and 38 through which enter the valve push rods. From aperture 36 a reinforcing web 40 extends from the lower portion of the extension 22 to the body portion 10. A similar web 42 extends from the undersurface of extension 24 near aperture 38 to the body portion 10 of the cylinder head but this web is somewhat deformed to pass around the boss 34.

While a construction has been shown in which one of the valve ports extends to the exterior of the head through the top portion of the head, it is to be understood that, if desired, both ports may open through the top of the head, or both may extend to the sides of the head below the respective rocker boxes, in the manner of the port 34, without in any way exceeding the scope of the invention.

The fins on both the circular and non-circular portions of the head may be cut (for example) by providing a forging of proper external shape, by applying a rotary cutter to the forging, and by so controlling the cutter as to form separate fins parallel to the ends of the head or, if preferred, the fin may be cut in the form of a continuous helix. Of course, the cutter is controlled to provide proper predetermined depths to the fins. Discontinuous fins such as those around the upper part of the head may be cut by this same method.

The provision of fins in the upper portion of

the head is particularly illustrated in Fig. 5 in which the elongated core portion 46 is shown provided along each side thereof with continuous fins, as indicated at 48 and 50. This figure shows, in broken lines 49, the path of the cutter while forming fins on the non-circular portion of the head. It will be noted that the core portion 46 provides a relatively thick web 51 between the valve ports. This core portion, together with the integral web 40 extending to the side of the head and the relatively thick walled port 32, provide a bridge of relatively heavy metal extending entirely across the cylinder head thus adding materially to the head strength.

Both the upper and lower ends of the cylinder head are substantially flat, as indicated in Fig. 3, and are parallel to each other. This shape greatly facilitates the machining of the head blank and also results in a considerable reduction in the height from threads 12 to the upper surface of the head. The provision of the exhaust valve port 30 opening through the top of the cylinder head between the rocker boxes 22 and 24 also is an advantage in that the hot exhaust gas is kept entirely away from the finned portion of the cylinder head and there is, therefore, little transfer of heat from the exhaust gases back to the cylinder head.

The improved rocket box and fin arrangement also insures a maximum cooling effect with a minimum pressure loss in the cooling air flow past the cylinder heads since a substantially straight line flow of cooling air across the cylinder and around the valve rocker arm boxes can be obtained.

It is to be understood that the invention is not limited to the specific embodiment herein illustrated and described, but may be used in other ways without departure from its spirit as defined by the following claims:

1. In an aircooled integral cylinder head having a combustion chamber portion, a pair of elongated valve rocker boxes having their longitudinal axes aligned and adapted to be positioned in alignment with the cooling airflow over said head, said boxes extending oppositely and being positioned in spaced relationship along the line of their longitudinal axes, a metal bridge extending across the top of said combustion chamber portion between said boxes and supporting the adjacent ends of said boxes, a fluid passage through said bridge, and a push rod aperture in the outer end of each of said boxes and a valve stem aperture in the inner end of each of said boxes, said rod apertures and said stem apertures being located on a common plane.

2. In an aircooled aircraft engine cylinder head having a dome shaped combustion chamber portion, a flat topped generally rectangular elongated

metal bridge extending diametrically across the top of said combustion chamber portion and having its longitudinal axis adapted to be positioned in alignment with the cooling airflow over said head, a pair of elongated flat topped valve rocker boxes carried by said bridge at opposite sides of the top thereof, said boxes extending outwardly in opposed relationship from said bridge and having their longitudinal axes aligned and extending in the direction of the longitudinal axis of said bridge, a web connecting the under side of one of said boxes with said combustion chamber at one side thereof, and a fluid passage extending underneath the other of said rocker boxes and having a wall constituting a web connecting said rocker box with the other side of said combustion chamber.

3. A one-piece forged cylinder head for radial aircraft engines comprising, a dome shaped combustion chamber portion having intake and exhaust valve ports symmetrically disposed on opposite sides thereof, valve supporting portions projecting outwardly at opposite sides of said dome portion and having valve stem receiving bores therein disposed at acute angles with respect to the longitudinal axis of the cylinder, a valve rocker box extending laterally, in a direction normal to said longitudinal cylinder axis and at an angle with respect to the axis of the corresponding valve stem bore, from each of said valve supporting portions adjacent the top of said valve stem bores, said rocker boxes being relatively long in a direction normal to said longitudinal cylinder axis and relatively short in the direction of said longitudinal cylinder axis, a fluid passage having an opening in the top of said head between said rocker boxes, and a push rod aperture in the bottom wall of each of said boxes.

4. In an aircooled integral cylinder head having a combustion chamber portion, a pair of elongated valve rocker boxes having their longitudinal axes aligned and adapted to be positioned in alignment with the cooling airflow over said head, said boxes extending oppositely and being positioned in spaced relationship along the line of their longitudinal axes, a metal bridge extending across the top of said combustion chamber portion between said boxes and supporting the adjacent ends of said boxes, a push rod aperture in the outer end of each of said boxes and a valve stem aperture in the inner end of each of said boxes, and spaced parallel cooling fins substantially completely covering said combustion chamber portion and said bridge, said fins forming cooling air passages adapted to receive a cooling airstream flowing in the direction of the longitudinal axes of said rocker boxes.

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