Feb. 5, 1952 K. RABE 2,584,289

CYLINDER HEAD

Filed May 4, 1949 2 SHEETS—SHEET 1

Fig. 1

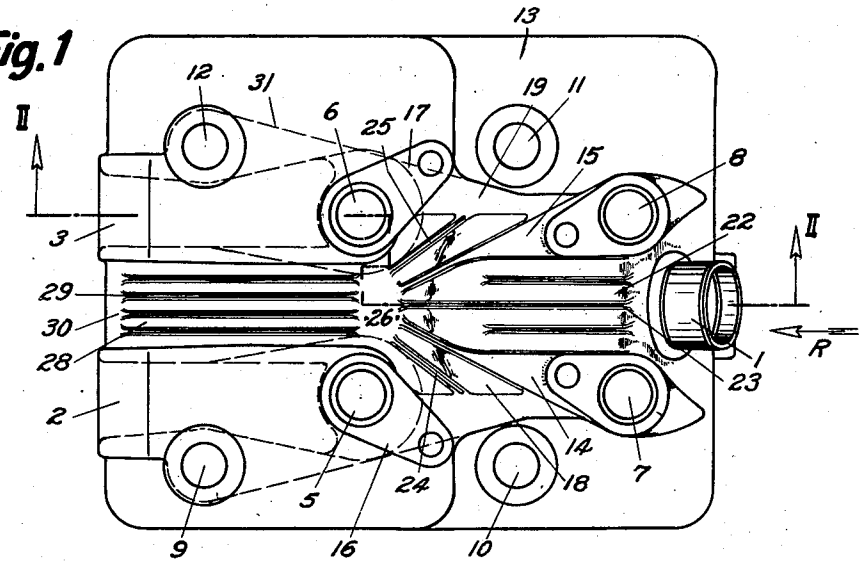
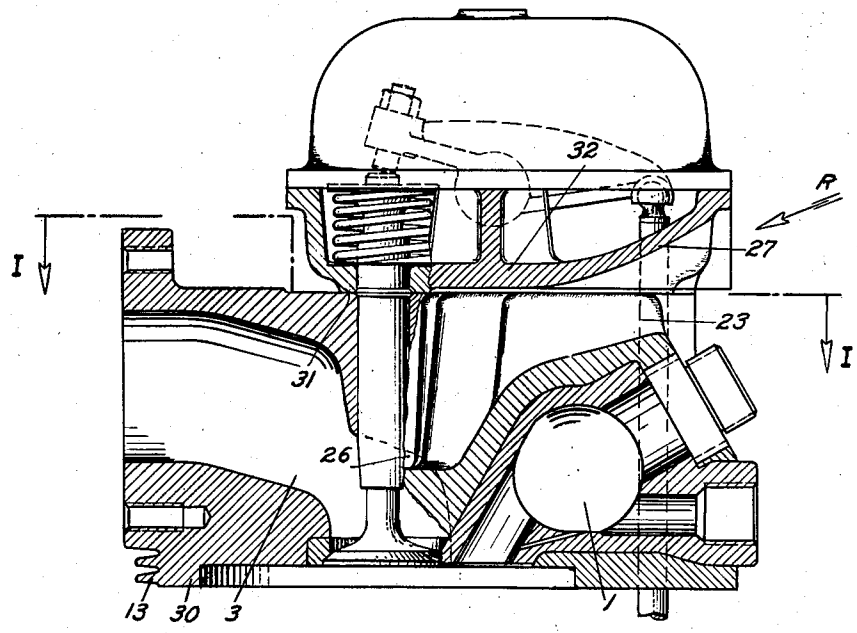


Fig. 2



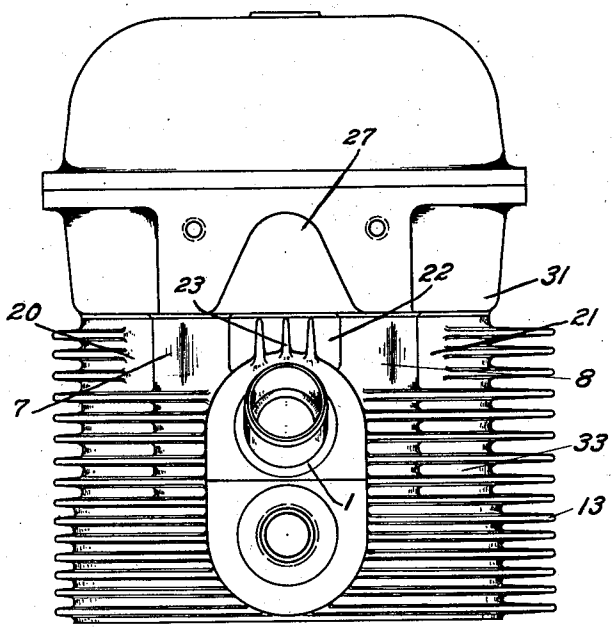
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Fig.3



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CYLINDER HEAD

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11 Claims. (Cl. 123—41.69)

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This invention relates to a novel cylinder head for use in air-cooled, internal combustion engines provided with a precombustion or turbulence chamber, and more particularly to a cylinder head for use in power driven vehicles.

With internal combustion engines of the usual type, it is extremely difficult to cool more adequately and locally the thermally highly stressed parts of the cylinder head, such for instance as the combustion chamber and the outlet valve together with the outlet manifold, since the air stream becomes so highly heated by one of these constructional parts, which it first encounters, that for the other parts of the cylinder head only hot air with little cooling action is available.

In order to overcome this difficulty, it has been sought to provide a novel and special arrangement or ribs or fins on the chamber to obtain a maximum of uniform cooling of all constructional parts. For example, the combustion chamber was fitted with cooling ribs or fins surrounding it in the manner of an upright collar, which, while it facilitated cooling of the combustion chamber, rendered the cooling of the outlet valve and of the other cylinder head parts difficult. Also, the subdivision of the space through which air was swept by means of vertical and horizontal cooling ribs did not provide the desired remedy, especially since the number of cooling ribs or fins provided remains limited, owing to the small amount of space available.

According to the present invention hereinafter described, difficulties, aforementioned, are overcome through the expedient, that the chamber is arranged in the direction of the current of air as it arrives at the chamber and that the stream of air is divided by the chamber and by intermediate walls into middle and lateral partial streams of air, of which the middle partial stream of air and portions of the lateral partial streams of air unite again in an equalizing chamber behind the chamber, the intermediate walls lying vertically at both sides of the chamber and forming the middle air passage. By the use of such chamber, the air flowing through the middle air channel becomes highly heated, but is so far cooled by the partial streams of air also sweeping into the equalizing chamber through the lateral channels, which streams of air suffer practically no increase in temperature, that the reunited streams of air have considerable cooling effect. In order to obtain better heat conduction from the upper part of the chamber, the middle air channel is subdivided by means of vertical ribs extending from the chamber. Individual upper lateral air channels opening into the equalizing chamber are formed by one of the intermediate walls and a valve push rod opening. There are omitted the horizontal cooling ribs surrounding the cylinder head in the direction of

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the air passage as far as behind the place of entry of the upper lateral streams of air, whereby these partial streams of air will reach the equalizing chamber by a short cut. This not only enables the cooling air to be branched-off into the lateral channels, but the air streaming into the lateral air channels suffers practically no change in temperature and in pressure. In the lateral air channels there are also provided vertical ribs which not only serve the purpose of cooling, but also of guiding the air into the equalizing chamber. Behind the equalizing chamber, which brings about a temperature and pressure equalization of the re-united partial streams of air, vertical ribs are provided between the inlet and outlet guides. Through the arrangement and ribless construction of the equalizing chamber it becomes possible to bring about a good cooling of the rear part of the cylinder head with respect to the direction of the arriving stream of air, more particularly a good cooling of the outlet valve and of the outlet guide.

Furthermore, if the lateral walls of the main body of the cylinder head extend obliquely to the outside with respect to the direction of the arriving stream of air, the result will be channels tapering in the nozzle-like manner, whereby the air will be pressed towards the cylinder head and partly into the lateral channels, causing the cooling action in the equalizing chamber to be increased, thus permitting an entirely satisfactory cooling of the two sides of the cylinder head to take place. Preferably, for further improving the heat conduction, the horizontal cooling ribs surrounding the cylinder head are of greater length at the outlet side than at the inlet side, whereby a better cooling of the outlet side and consequently a uniform cooling of the relatively cool inlet side and the hot outlet side results.

With the above and other features in view, it is an object of my invention to provide a cylinder head for the chamber of power driven vehicles, which head is of such construction that it is adapted to divide the oncoming current of air into middle and lateral streams for cooling the chamber, and permit said streams to unite again at an area behind the chamber.

A preferred embodiment of the invention is illustrated by way of example as applied to the cylinder head with a precombustion chamber of an internal combustion engine in the accompanying drawings, in which:

Fig. 1 is a plan view of the cylinder head along line I—I of Fig. 2, the upper part being removed;

Fig. 2 is a section on line II—II of Fig. 1, and

Fig. 3 is a front view of the cylinder head.

The cylinder head shown in the drawings has a precombustion chamber 1, openings or ducts 2 for the intake, openings or ducts 3 for the exhaust of gases, and guides or openings for

operating the valves. The valve rod guides or openings 5 and 6 and push rod openings 7 and 8 are to be seen in Fig. 1. The cylinder head also has bores 9, 10, 11 and 12 through which the clamping bolts pass, by means of which the head is fixed to the cylinder in any suitable manner.

Over the greater part of its periphery, the cylinder head is encircled by horizontally arranged cooling ribs or fins 13. According to the number of cylinders of the internal combustion engine in each case, a series of cylinder heads is arranged next to one another, all of which are surrounded by a sheet metal air guide.

The air flows in the direction of the arrow R against the cylinder head. The combustion chamber which may be a turbulence chamber, ante-chamber or the like is oppositely disposed to the direction of the arriving or oncoming stream of air, so that the stream of cooling air impinges directly on it. The push rod openings 7 and 8 for the valve operating rods, are disposed on both sides of the combustion chamber in such a manner and extended inwardly with respect to the cylinder head as to form intermediate dividing, upwardly extending walls 14 and 15, by which the stream of air is divided into a central partial stream of air and two lateral ones. In addition, the valve rod openings are extended to form walls 16 and 17, so that the walls 14 and 16 form a lateral channel 18 and the walls 15 and 17 form a lateral channel 19. The access of the air to these channels is facilitated by the horizontal ribs 13 being omitted at these places, as indicated at 20 and 21 in Fig. 3.

In the central air channel 22, there are arranged, starting from the combustion chamber, vertical ribs 23 for cooling the combustion chamber, and in the lateral channel 18 vertical ribs 24 and in the lateral channel 19 vertical ribs 25. The vertical ribs 23 are fixed in the upper part of the combustion chamber, whilst the ribs 24 and 25 extend upwards from the main body 30. The cooling ribs 23, 24 and 25 terminate before the narrowest place between the walls 14 and 15, whereby an equalizing chamber 26 is formed. At the top, the channels are shut off by a wall 27 of the cylinder head, which extends obliquely in accordance with the best air conduction and may also be provided with cooling ribs supplementing the ribs 23 or 24 or 25.

The conducting means for the intake ducts 2 and the exhaust ducts 3 form in continuation of the equalizing chamber 26 a chamber 28 for the stream of air coming from the said chamber. In this space vertical ribs 29 are provided, which extend from the main body 30 upwards. The upper closure of the chamber is formed in part by a wall 31, as shown in Fig. 2, the rest of the chamber being covered in by a sheet metal enclosure, not shown.

In the upper part 32 of the cylinder head there are mounted rocking levers for connecting the valve actuating members, as shown. The upper part 33 of the side walls of the main body 30 of the cylinder head extends from the front to the rear in an obliquely outward manner, as shown in Figs. 1 and 3. As the cylinder head illustrated herein adjoins the next one in the power unit of the vehicle, it will be noted that the side walls of such head also extend obliquely outwards. The last cylinder head of a multi-cylinder internal combustion engine or the single cylinder head of a one cylinder internal combustion engine is provided with a sheet metal jacket for guiding the air around the cylinder and the

heads, with the result that there are formed between the individual cylinder heads or at the last or single cylinder head, channels which taper forward and backward in the manner of nozzles, whereby the air is forced against the cylinder head and whereby better cooling is effected. The main object of this nozzle-like tapering is, however, to force more cooling air against the adjacent lateral channels 18 and 19, in order that in the equalizing chamber 26, the greatest possible temperature drop of the air streaming out of the central channel 22 will result by mixing it with the cool air coming from the lateral channels. Also with the object of obtaining uniform cooling of the head, the horizontal ribs 13 are made longer at the outlet side of the cylinder head than at the inlet side, as will be seen from Figs. 1 and 3.

From the foregoing taken in connection with the accompanying drawings, it will be noted that the stream of cooling air flowing in the direction of the arrow R toward the cylinder head is divided by the various intermediate walls into a plurality of partial streams of air. A partial stream of air flows and cools the combustion chamber 1 and arrives highly heated in the equalizing chamber 26. At the same time partial air streams come through the lateral channels 18 and 19 into the equalizing chamber 26 which owing to the omission of the ribs 13 and due to the fact that they cool relatively, not too highly, the heated parts of the main body 30 of the cylinder head by a short cut, suffer only a slight increase in temperature and hardly any pressure drop. As the three air channels converge in the manner of nozzles at an angle to one another, a good intermixing of the air and a consequent temperature equalization results. Through the nozzle-like extending side walls 33 of the main body of the cylinder head, a relatively large quantity of cooling air is forced into the equalizing chamber. These three partial air streams intermix in the ribless space, greatly reduce the temperature of the central partial air stream and form a cooling air stream which flows through the chamber 28 and brings about an effective cooling of the rest of the cylinder head, including the outlet part of the latter. Furthermore, partial air streams flow along past the side walls of the cylinder head and complete the cooling effect.

As already stated, the invention is suitable for all kinds of internal combustion engines, whether they are constructed with an ante-chamber, turbulence chamber or other kinds of fuel jet igniting chambers. It is to be noted that the invention is also suitable for cylinder heads of internal combustion engines having no precombustion chambers, since a division of the air stream and a bringing together again of the major part thereof in an equalizing chamber is also of advantage in the case of internal combustion engines having no precombustion chamber.

While a preferred embodiment of the invention has been particularly described and shown herein, it is to be noted that changes as to form, use and arrangement of parts may be made without departing from the spirit and scope of the claims herein.

I claim:

1. In a cooling system for a cylinder head in an internal combustion engine, the combination comprising a central channel in the front of the head for the passage of a cooling fluid thereinto, an oblique channel on either side of said central

channel, said channels leading into a central equalizing chamber in communication with all of said channels and an exit chamber extending from said equalizing chamber.

2. In a cooling system for a cylinder in an internal combustion engine, a cylinder head having a pre-combustion chamber, a plurality of intermediate vertical walls adjacent the pre-combustion chamber forming central and lateral ducts therein for dividing an on-rushing stream of cooling fluid into a central and opposed oblique stream, vertically extending cooling means in said central and lateral ducts, a central chamber in said cylinder on which said ducts converge, and a posterior chamber extending from the central chamber, disposed intermediate the intake and exhaust sections of the cylinder.

3. A cooling system in a cylinder head having a pre-combustion chamber comprising a main air inlet channel having vertically disposed ribs set in the direction of the oncoming current of cooling fluid, conduit means adapted to divide said current into a central and opposed lateral conducting means, said conduits having vertical cooling means while the lateral conducting means are provided with horizontally extending cooling means, and a central equalizing chamber leading to the rear of the cylinder head in connection with the central and lateral conducting means.

4. A cylinder head for internal combustion engines having a pre-combustion chamber, a plurality of horizontally disposed ribs around the head, a plurality of vertically disposed ribs around the pre-combustion chamber forming a central and obliquely disposed lateral channel for the passage of a cooling fluid therethrough, a central equalizing chamber in said head in communication with said channels, said channels tapering and converging into said central chamber, and a rear chamber in said head extending from the central chamber having vertical ribs on the top thereof and horizontal ribs on the sides thereof, said rear chamber being disposed intermediate the intake and exhaust ports in the head.

5. In a cooling system for cylinders of internal combustion engines, the combination comprising a cylinder head, a pre-combustion chamber in the forward portion of said cylinder head, a plurality of vertical walls on either side of said pre-combustion chamber forming a middle, and an oblique, tapering lateral channel, a central equalizing chamber provided with vertical ribs extending from the precombustion chamber, in connection with said middle and converging lateral channels, said lateral channels being nozzle-like at their end merging with the central chamber, and a posterior chamber extending from the central chamber, disposed intermediate the intake and exhaust ports in the cylinder head adapted to receive cooling fluid in the latter portion of the head to cool the same.

6. In a cooling system for the cylinder of an internal combustion engine, the combination comprising a cylinder head adapted to be cooled by a fluid passing through and around it, having a pre-combustion chamber in connection with the cylinder head and against which an air stream passes, said pre-combustion chamber having vertical cooling ribs above the same for cooling the combustion chamber, a pair of lateral channels disposed adjacent the chamber each having spliced vertical ribs extending upwardly from the main body of the cylinder, an equalizing chamber in communication with the lateral channels provided with cooling ribs supplementing the ribs above indicated, and another chamber continuing from the equalizing chamber disposed intermediate the exhaust and intake portions of the cylinder having a series of vertical ribs thereon and horizontal ribs therearound.

7. In a cooling system for a cylinder head in an internal combustion engine, the combination comprising a cylinder head having a main body, a plurality of openings therein for push rods in the forepart of said main body, a valve seat area in the bottom of said body for accommodating a valve head, a pre-combustion chamber extending from the forepart of the body adapted to communicate with the cylinder of the engine, an intake and an exhaust port in the rear portion of said main body, a series of horizontally disposed ribs surrounding the vertical wall of said body, a fluid conducting main channel extending from the fore to the central part of said head, a plurality of vertical ribs lateral to the main channel forming a plurality of separate channels to divert some of the fluid from the main channel, a centrally disposed chamber in said head merging with the lateral and main channels for equalizing the temperature and pressure of the converging fluid streams entering thereinto, and an extending channel in the rear of said head in connection with the central chamber having a plurality of spaced vertical ribs extending therefrom.

8. A cylinder head as claimed in claim 7, characterized by the feature, that the central air channel is divided by vertical ribs starting from the precombustion chamber.

9. A cylinder head as claimed in claim 7, characterized by the feature, that the horizontal cooling ribs enclosing the lateral cylinder head are omitted in the direction of the flow of air as far as the place at which the upper lateral streams of air enter, whereby these partial streams of air flow into the equalizing chamber along a short path.

10. A cylinder head as claimed in claim 7, characterized by the feature, that behind the equalizing chamber which is adapted to effect equalization of temperature and pressure of the converging partial air streams, vertical ribs are provided between the inlet and outlet guiding means.

11. A cylinder head as claimed in claim 7, characterized by the feature, that the lateral walls of the main body of the cylinder head extend obliquely outwards with respect to the direction of the arriving air, so that nozzle-like tapering channels are formed, whereby the air is forced against the cylinder head and in part into the lateral channels.

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