

May 23, 1933.

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1,910,558

INTERNAL COMBUSTION ENGINE

Filed May 12, 1930

2 Sheets-Sheet 1

FIG. 2.

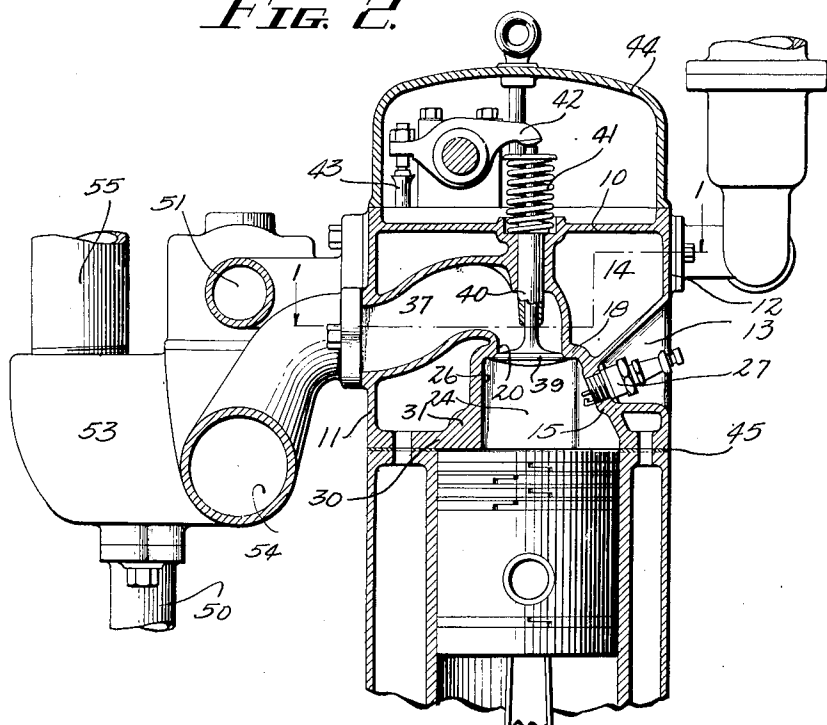
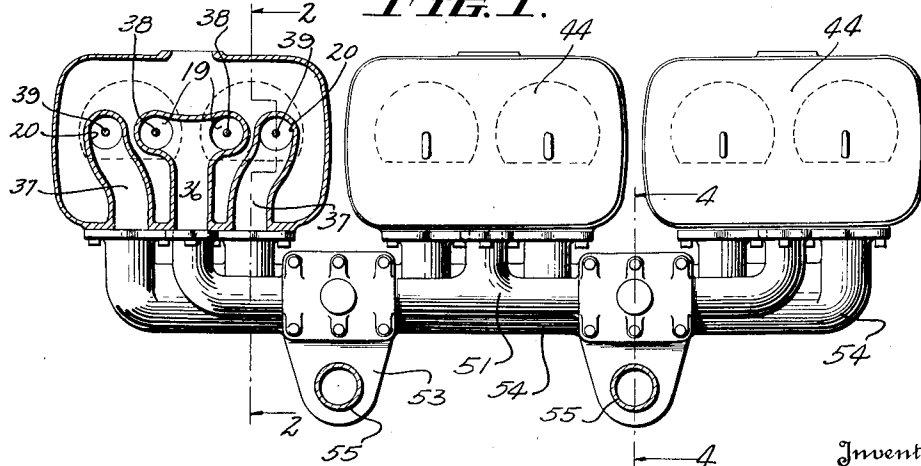


FIG. 1.



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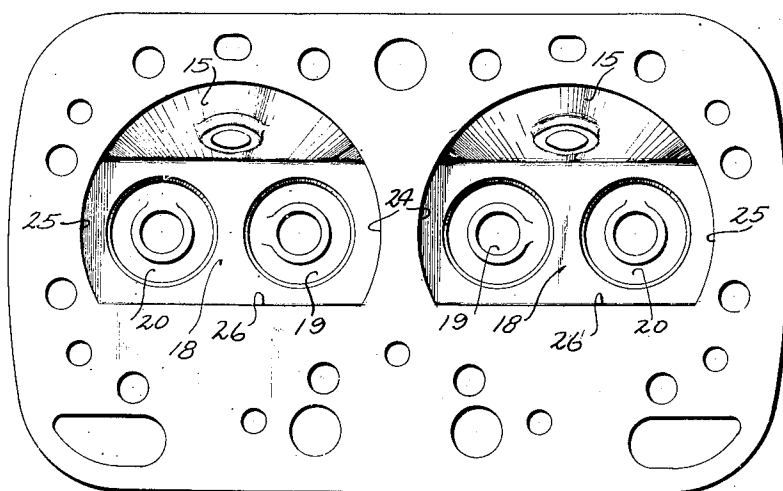
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FIG. 3.



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INTERNAL COMBUSTION ENGINE

Application filed May 12, 1930. Serial No. 451,540.

My invention relates to improvements in cylinder heads for internal combustion engines.

Primary objects of my invention are to obtain improved firing efficiency, to avoid excessive heating of the valves and valve seats, and utilize low grade fuels.

Other objects are to provide ports and valves of maximum size permissible by the area of the top of an ignition chamber by designing the chamber in such a manner that the spark plugs may be otherwise located; to provide accessible spark plugs in recesses formed in the outer wall of a water jacketed ignition chamber, with walls which extend across the water receiving jacket cavity and connect with the inner wall of the ignition chamber around the spark plug aperture; to provide unitary removable cylinder head assemblies, preferably in duplex units, for convenient handling and convenient access to all interior parts, including the valves and valve seats; to increase the efficiency of the cooling system, insofar as it relates to cylinder heads.

In the drawings:

Figure 1 is a plan view of a six cylinder internal combustion engine embodying my invention, with a portion of one duplex cylinder head unit shown in horizontal section drawn generally to line 1—1 of Figure 2.

Figure 2 is a sectional view drawn generally to line 2—2 of Figure 1.

Figure 3 is an enlarged bottom plan view of one of the duplex cylinder heads.

Like parts are identified by the same reference characters throughout the several views.

In the drawings, my invention is illustrated as applied to an internal combustion engine of the twin cylinder type, each pair of cylinders being cast as a unit and provided with a unitary head. My improved cylinder head unit has a generally rectangular top wall 10; a manifold receiving side wall 11 and an opposing side wall 12 which has recesses 13, the walls of which extend across the water jacket cavity 14 and connect with ignition chamber walls 15, the lower margins of which correspond in curvature

and coincide with arcuate portions of the upper ends of the cylinders. These walls 15 are conically tapered and each is connected at its upper margin with a flat rectangular top 18, (Fig. 3), in which the inlet and exhaust ports 19 and 20 are located. These walls 15 and 18, taken with arcuate end walls 24 and 25 and a straight upright wall 26, form an ignition chamber which constitutes an extension of the cylinder compression chamber.

The wall 15 of each ignition chamber has an aperture at the base of the recess 13 in which a spark plug 27 is screwed. Combustion is, therefore, initiated underneath the overhanging portion of the conically tapering wall 15 and at a substantial distance from the inlet and exhaust ports in the direction of the cylinder. The expanding gases tend to be deflected by the wall 15 obliquely downwardly and across the central portion of the ignition chamber.

The wall 26 is inset from the side of the cylinder opposite that occupied by the wall 15 and its base constitutes a chord of the arc formed by the lower margins of the walls 15, 24 and 25. The angle formed by this wall with the base portion 30 of the head is filled by a comparatively thick body of metal 31 integral with the vertical wall 26 and the horizontal base portion 30.

The ports 19 and 20 are connected with the manifolds across the water jacket cavity 14 of the head by passages 36 and 37, the single central passage 36 being connected to the two inlet ports 19 as shown in Figure 1. In accordance with ordinary practice, the inlet valves 38 and the exhaust valves 39 have stems extending upwardly through the top wall 10 of the cylinder head and are provided with guides 40, (Fig. 2). The seating springs 41, rocker levers 42, and the upper ends of the valve tappets 43 are housed by a cap 44.

Ignition will, of course, occur while the piston is still moving upwardly near the limit of its compression stroke. The conically tapered wall 15 will tend to direct the burning and expanding gases downwardly but the upwardly moving piston tends to

drive the gases upwardly. The ignition chamber is of such size that nearly all of the compressed gases may be forced into the ignition chamber, the compression chamber of the cylinder being reduced to substantially the thickness of the gasket 45 interposed between the head and the cylinder wall. The comparatively thin layer of compressed gas underneath the portion 30 of the head base will be comparatively cool and will probably not be ignited until after the piston has reached the limit of its upward movement or after commencement of the expansion stroke. This slight extension of the igniting interval assists very materially in preventing detonation.

It will be observed that the inlet and exhaust valves are at a substantial distance from the cylinder and the surrounding water jacket cavity is large in proportion to the area of the upper end of the chamber. The period of valve and valve seat exposure to the intense heat of the burning gases is shortened by reason of the rapid cooling of the walls; and also by the fact that ignition occurs at a material distance below the top plate, and expansion is necessarily downward.

The water jacket cavity 14 completely encircles the spark plug recesses to prevent the plugs from being over-heated and it also extends over the top plate 18 of the ignition chamber on all sides of the inlet and exhaust passages 36 and 37, thus effectually cooling the valves and valve seats,—this being particularly true because the valves and valve seats are less exposed to heat than those employed in ordinary valve in the head engines. When the inlet valve opens, portions of the incoming charge are directed across the ignition points of the spark plug and when the exhaust valve opens, the out rush of the products of combustion is in part also across the spark plug points, thus tending to keep them clean.

In the drawings I have illustrated an intake manifold 51 provided with an inlet duct 50, a heater jacket 53 with which the exhaust manifold 54 communicates, and from which an exhaust pipe 55 extends. These parts are more fully disclosed in a divisional application and, as they are not claimed herein, further illustration and description herein is deemed unnecessary.

While I have described the wall 15 of the ignition chamber as being conically tapered, it will be understood that its inner surface does not conform to that of a true cone but becomes progressively flattened in curvature or developed and merged into a straight line along the connected margin of the top plate 18, as is clearly shown in Figure 3. This departure from a true conical surface has little, if any, functional significance and is largely incidental to the formation of the

casting, of which the head is composed. Also, it will be understood that the conical surface is incidental to the provision of an oblique wall underneath which ignition may take place and which may be curved along its lower margin in conformity with the curvature of the engine cylinder.

I claim:

1. A cylinder head for internal combustion engines provided with an ignition chamber having valved inlet and outlet ports in its top wall and also having an oblique side wall provided with a spark plug aperture, said side wall having a substantially straight top marginal portion extending along the inlet and outlet ports at one side thereof, and having a curved bottom margin substantially coincident with the upper end of the cylinder bore.

2. A cylinder head for internal combustion engines provided with an ignition chamber having valved inlet and outlet ports in its top wall and also having an oblique side wall provided with a spark plug aperture, said oblique side wall having an interior surface conforming generally to that of a cone in its lower portion and progressively flattening in curvature as it approaches the top wall.

3. An internal combustion engine head provided with an ignition chamber eccentric to a cylinder to which the head is adapted to be applied, and having an upwardly and inwardly inclined wall on one side adapted to partially overhang the cylinder and provided with a spark plug aperture, the opposing side of the head being inset and having a flat bottom adapted to cover the upper end of a cylinder to which the head is applied, and also having a vertical wall extending from the inner margin of said inset flat bottom portion at the opposite side of the cylinder axis from that occupied by the inclined wall, the top of said ignition chamber having a generally rectangular form.

4. An internal combustion engine head provided with a water jacketed ignition cavity having one wall provided with igniting means and inclined upwardly, inwardly, and progressively flattened toward an oblique plane, said wall being adapted to constitute an upward extension of one side portion of an engine cylinder and said head also having a substantially horizontal bottom wall adapted to cap the opposite side portion of the cylinder, the ignition cavity also having a horizontal top wall provided with valved inlet and exhaust ports.

5. An internal combustion engine head provided with a water jacketed ignition cavity having one upwardly extending wall arcuate along its lower margin adapted to constitute an upward extension of one segment of an engine cylinder, the head also having a

- substantially horizontal bottom wall adapted to cap the remaining segment of the engine cylinder, said cavity having a flat top wall provided with valved inlet and exhaust ports, ignition means centrally connected with the arcuate wall portion of the ignition cavity, said head having a water jacket cavity extending about the ignition cavity walls.
6. The combination with an internal combustion engine cylinder, of a cylinder head provided with an ignition chamber eccentric to the cylinder bore and having an upwardly and inwardly inclined wall on one side provided with a spark plug aperture, the lower margin of said wall being curved in correspondence with the curvature of the upper end of the cylinder and the other margin having a straight line connection with the top of the chamber, the intermediate portions being progressively flattened from bottom to top in the curvature of its horizontal sections.
7. The combination with an internal combustion engine cylinder, of a cylinder head provided with an ignition chamber eccentric to the cylinder bore, said chamber being water jacketed and provided with valved inlet and exhaust ports in its top and a spark plug at the side having the longer radius from the projected axis of the cylinder bore the opposite side of the head being inset and adapted to partially cap such bore.
8. An internal combustion head having an ignition cavity, one wall of which has a conically curved lower portion and a progressively flattened upper portion.
9. An internal combustion cylinder head having a compression ignition cavity provided with a generally rectangular and substantially flat top portion corresponding generally in its longer diameter to the diameter of the cylinder for which the head is designed, said cavity having one flat vertical side wall and an opposing oblique side wall progressively conforming downwardly to the curvature of the upper end of the cylinder and adapted to register at its lower margin with the upper margin of the cylinder, the bottom of the head associated with the vertical wall being relatively thick and adapted to cap a portion of the cylinder, and the oblique wall being provided with igniting means in its central portion.
10. An internal combustion head having an ignition cavity, the top portion of which is of a generally rectangular form with arcuate ends conforming generally in curvature to the curvature of the bore of the cylinder to which the head is to be applied and the side margins of said top occupying secant planes projected from the cylinder bore at substantially equal distances from the central axis of the bore, said cavity having one wall substantially coincident with one of the secant planes and another wall oblique thereto and progressively curving in its lower portion to an arc which includes the end portions, the top wall of said cavity being ported and provided with inlet and exhaust valves, the oblique wall being provided with ignition means and the bottom wall along the base of the vertical side wall being thickened for heat storing purposes.
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