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CYLINDER AND PISTON CONSTRUCTION

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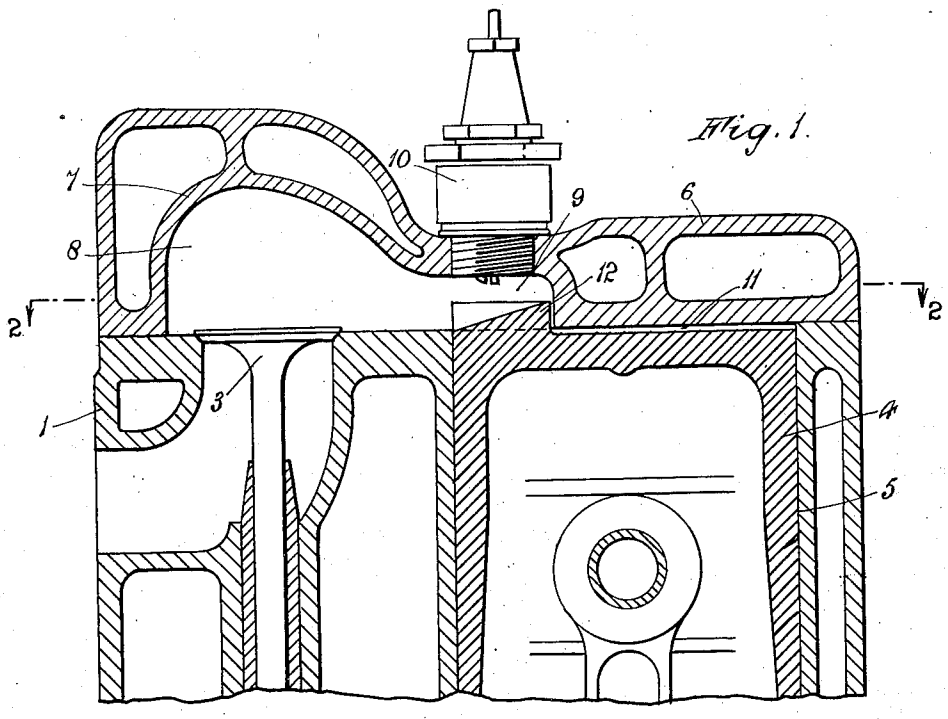


Fig. 1.

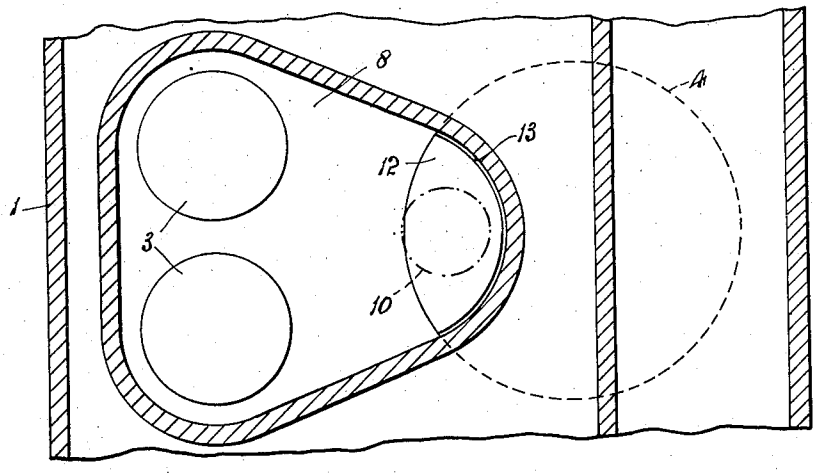


Fig. 2.

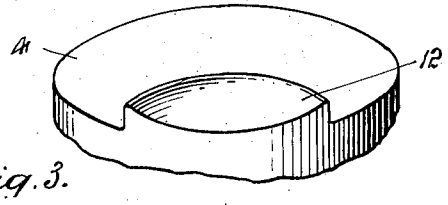


Fig. 3.

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CYLINDER AND PISTON CONSTRUCTION

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8 Claims. (Cl. 123—191)

This invention relates to the cylinder head and piston construction of internal combustion engines, having for its object to provide for the initial pressure of the ignited charge on a portion of the surface of the top of the piston and the valving of the major portion of the space above the piston in a manner which will temporarily or momentarily delay access of the expanding charge to whole area of the piston top until the said piston has descended in the cylinder to a predetermined degree.

The invention has as a further object to effect the accomplishment of such valving by means of an overlapping of part of the piston head with part of the combustion chamber wall whereby a major portion of the top of the piston is cut off from communication with the main portion of the combustion chamber while the piston is negotiating the upper portion of its stroke.

A still further object is to provide a combustion chamber proper extending mainly over the cylinder block structure and partially over the piston, said chamber being characterized by walls converging toward the piston with the spark plug or firing means located at the resulting restricted portion of the chamber above or proximate to the piston. The invention contemplates the provision of a generally triangular configuration of the combustion chamber, the apex of which extends over a portion of the piston with the firing means located in such apex, and the roof of the chamber of considerably greater height remote from the piston than above the piston.

A further object is to provide for valving between the said combustion chamber and the space above the major portion of the piston by a stepped arrangement between the piston top and the wall of the combustion chamber defining the limits of the encroachment of the said chamber over the piston.

Still further objects and advantages other than those already stated, or resulting from the construction or operation of the invention as it may be carried into effect, will become apparent to those skilled in this art as the said invention is hereinafter further disclosed.

In carrying the said invention into effect, I may provide the novel construction and arrangement of parts hereinafter described, by way of example, having reference to the embodiment shown in the accompanying drawing, wherein:

Figure 1 is a fragmentary sectional elevation of an internal combustion engine cylinder with the improved cylinder head and piston applied thereto;

Figure 2 is a transverse section of the same taken on a plane indicated by the line 2—2 of Figure 1; and

Figure 3 is a fragmentary perspective view of the head of the piston.

Similar characters of reference indicate similar parts in the several figures of the drawing.

The engine cylinder block 1 is shown as being provided with the usual valves 3 seated in the body thereof and the piston 4 working in the cylinder 5 in the conventional manner. 6 is the cylinder head the inner domed wall 7 of which provides the combustion chamber 8 which is located mainly over that part of the body carrying the valves 3 and extends partially over the top of the piston at 9.

The said combustion chamber is of a generally triangular form in plan its side walls converging to an apex exemplified by the portion 9 of the said chamber, the roof of the chamber being domed to provide a considerably greater height above the valves 3 than above the piston, whereby the said roof slopes downwardly toward the portion of the chamber 9 above the piston, as shown in Figure 1.

It is preferred to locate the spark plug 10 in the apex 9 of the chamber, whereby ignition will take place at the point of greatest restriction and the flame of combustion will be propagated rearwardly and progressively therefrom to the larger volume of the charge in the space above the valves and a desirable burning action of the charge effected.

The clearance 11, extending over a large portion of the top of the piston and beneath the cylinder head, is cut off from communication with the combustion chamber 8 while the piston is at or proximate to its upper dead center position by a stepped valving relationship between the cylinder head and the piston, which in the illustrated example is effected by a projection 12 extending upwardly from the top of the said piston into the apex of the chamber 8 and shaped to closely approach the side walls of that portion of the said chamber, as at 13, in such manner that, while frictional contact is avoided and the gaseous charge may pass through the spacing 13 to the clearance 11 above the piston, combustion may not be propagated through said space.

The projection 12 arises from the top of the piston 4 as a projection of a comparatively short arc of the periphery thereof, and its other wall, as viewed in plan, is formed on an arc having its center outside the contour of the piston top. As viewed in section, taken at the middle of the

projected arc, the projection tapers upwardly from the middle of said projected arc from substantially zero height to its maximum height.

The above described formation of the projection 12 provides for a comparatively large volume of gases immediately above the projection, and combustion of these gases provides power on the piston top as soon as combustion occurs. In addition to the above advantage, the described formation of the projection 12 avoids exposing a large side area of the piston to the ignited gases, which would burn the lubricant from the side of the piston and increase side thrust. The side thrust is undesirable in that it results in uneven wear of the cylinder, and causes "piston slap".

It is to be noted, upon reference to Fig. 2, that the wall of the combustion chamber 8 and the wall of the projection 12 which coact at 13 are both shaped arcuately, with the center of the arc residing outside the contour of the top of the piston 4. The spark plug 10 resides within the contour of the top of the piston 10 and, therefore, flame propogation initiating at the spark plug and radiating therefrom in directions contacting the wall 13 of the combustion chamber is deflected thereby into the main portion of the combustion chamber. Turbulence created by combustion is not localized within the area defined by the two arcuate edges of the projection 12 as viewed in plan, but due to deflection by the curved wall of the combustion chamber is effective throughout the entire combustion chamber. This turbulence creating effect is further augmented by the inclined surface of the projection 12 being disposed directly beneath the spark plug so that at the time of ignition it tends to force the ignited gases into the main portion of the combustion chamber.

At the time the edge of the projection 12 enters the combustion chamber, it tends to displace gases from the portion 9 of the combustion chamber which overlies the piston into the main portion thereof. The gases so displaced tend to travel in diverging directions due to the curve 13, so that if said gases are ignited, flame propogation in the main portion thereof is augmented by the diverging movement of the gases.

Under actual working conditions the formation of thin deposits of carbon or oil residues on the contiguous surfaces of the projection 12 and the side wall of the combustion chamber may practically close this space 13 against flow of the charge therethrough when the piston is in the said upper position.

The arrangement of the valves in the manner described with respect to the main portion of the space above the piston, permits a pressure to build up in the combustion chamber 8 while the piston is negotiating the top of its stroke, which pressure initially is applied to the area of the projection 12 of the piston and is eventually released to the entire area of the piston when the said piston has descended in its stroke to a point where the said projection passes beyond the lower limits of the contiguous side wall of the combustion chamber, as will be readily understood, the pressure being so applied to the complete area of the piston when the crank shaft of the engine is moved to a favorable extent beyond its dead center position.

The apex 9 of the combustion chamber and the area of the top of the projection 12 acts to restrict the flow of gases to the spacing 11 as this spacing increases in size.

As the opening to the clearance 11 above the piston is thus effected, the expanding gases from the chamber 8 stream in a highly turbulent manner into this space and this, following the rearward propagation of the flame of combustion in the chamber 8, as already described, produces a form of cumbustion in the chamber as a whole including the clearance 11 which is very desirable as to thermal efficiency and produces a pressure curve characterized by its greater enclosed area.

This invention may be developed within the scope of the following claims without departing from the essential features of the said invention and it is desired that the specification and drawing be read as being merely illustrative and not in a limiting sense, except as necessitated by the prior art.

What I claim is:

1. A piston having a flat top and a projection arising therefrom as a projection of an arc of the periphery thereof, said projection being of substantially zero height at the middle of said arc and tapering upwardly therefrom.

2. A piston having a flat top and a projection arising therefrom in extension of a comparatively short arc of the periphery, said extension being substantially of zero height at the center of said arc and increasing toward the other wall thereof, said other wall in plan view being formed on an arc having its center outside the contour of said top.

3. A piston having a flat top and a projection arising therefrom in extension of a comparatively short arc of the periphery, said extension being substantially of zero height at the center of said arc and increasing toward the other wall thereof, said other wall in plan view being formed on an arc having its center outside the contour of said top, the width of said projection along any diameter of said top being substantially less than the radius of said top.

4. The combination of a piston, a combustion chamber extending partially above said piston and means curtaining a portion of said chamber from above the remainder of the piston during a part of the travel of said piston comprising a comparatively short projection arising from the top of said piston spanning an arc of the periphery thereof and a wall depending from the roof of said combustion chamber with one surface thereof paralleling an upright surface of said projection, said surface and said upright surface vertically overlapping as said piston approaches its uppermost position, said surface and said upright surface being sufficiently close during overlapping as to substantially preclude the flow of gases therepast whereby the fuel charge is confined to said combustion chamber after ignition thereof and until the piston has travelled a fraction of its working stroke.

5. The combination of a piston having a flat top and a projection arising therefrom with the outer wall thereof being in extension of an arc of the periphery of said top, said projection having substantially zero height at the center of said arc and tapering upwardly therefrom to a rear wall portion, a cylinder head above said piston having a combustion chamber having a depressed portion immediately above said piston shaped in counterpart of the flat portion of said top and said rear wall portion, said rear wall and the corresponding portion of said depressed combustion chamber portion overlapping vertically as said piston approaches upper dead center position and having a clearance therebetween of smallest practical extent whereby to act as a

cut-off for flame propagation therebetween immediately subsequent to ignition of the fuel charge in said combustion chamber.

6. The combination of a piston having a flat top and a projection arising therefrom with the outer wall thereof being in extension of an arc of the periphery of said top, said projection having substantially zero height at the center of said arc and tapering upwardly therefrom to a rear wall portion, a cylinder head above said piston having a combustion chamber having a depressed portion immediately above said piston shaped in counterpart of the flat portion of said top and said rear wall portion, said rear wall and the corresponding portion of said depressed combustion chamber portion overlapping vertically as said piston approaches upper dead center position and having a clearance therebetween of smallest practical extent whereby to act as a cut-off for flame propagation therebetween immediately subsequent to ignition of the fuel charge in said combustion chamber, said depressed portion arising substantially above said rear wall portion when said piston is in uppermost position whereby a substantial volume of fuel charge may be contained immediately above said projection, and a spark plug immediately above said projection.

7. An internal combustion engine having a cylinder and a piston operating therein, a cylinder head, said head having a portion overlying a major portion of the area of said cylinder and having only a working clearance with the piston at the limit of its compression stroke whereby all gases are substantially completely expelled from said portion of the cylinder, a combustion chamber in said head and overlying a minor portion of the area of said cylinder for receiving the gases expelled from said cylinder, and a comparatively short projection on the piston co-acting with the wall of said combustion chamber for substantially preventing the flow of gases from the combustion chamber and the first mentioned portion of the cylinder during a fraction of the working stroke of the piston.

8. An internal combustion engine having a cylinder and a piston operating therein, a cylinder head, said head having a combustion chamber overlying a minor portion of the top of said cylinder, and a projection arising from the top of said piston and having a wall adapted to co-act with the wall of said chamber to separate the combustion chamber from all of said cylinder except said minor portion above the piston, said projection tapering to zero height in a direction away from said co-acting walls.

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