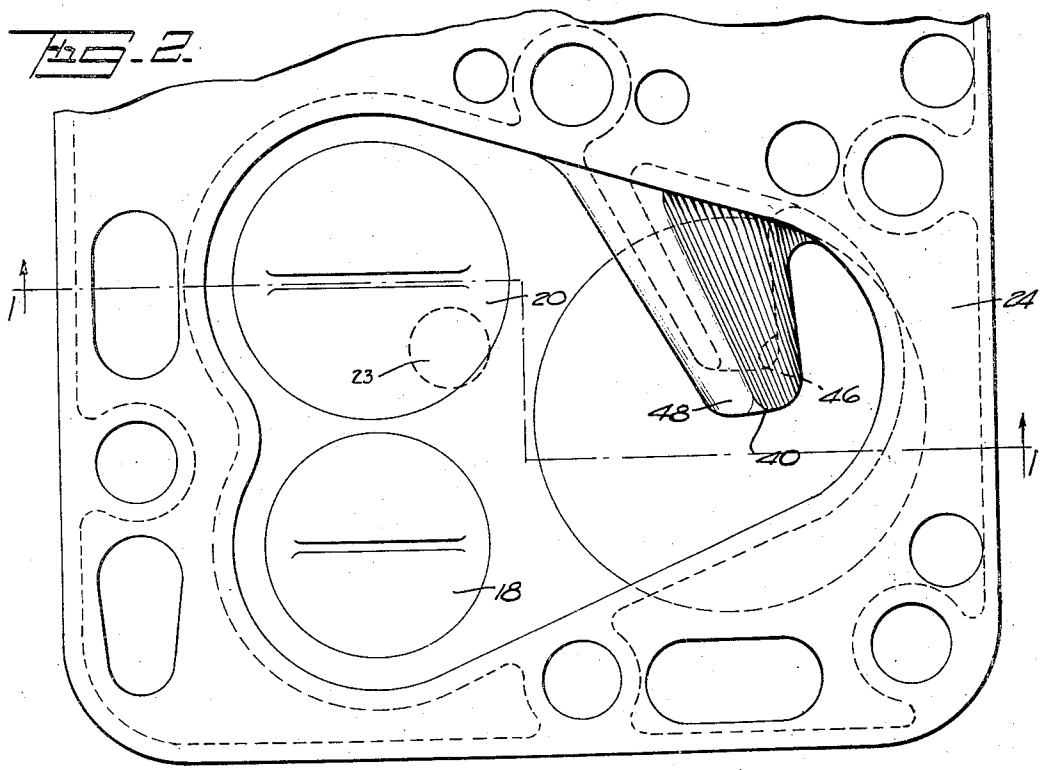
June 12, 1928. 1,673,776

A. MOORE

WATER COOLED INTERIOR AGITATOR FOR INTERNAL COMBUSTION ENGINES

Filed Jan. 28, 1927

Fig. 2.



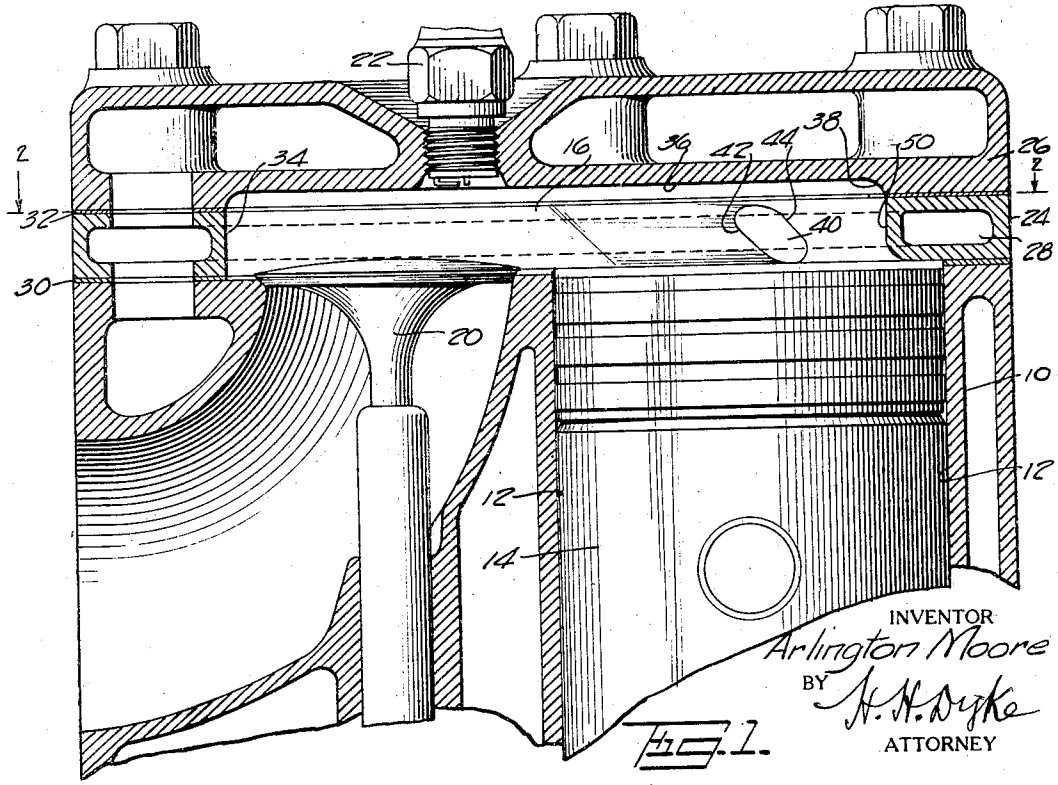


Fig. 1.

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UNITED STATES PATENT OFFICE.

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WATER-COOLED INTERIOR AGITATOR FOR INTERNAL-COMBUSTION ENGINES.

Application filed January 28, 1927. Serial No. 164,350.

My invention relates to internal combustion engines, and particularly to a water cooled interior agitator for internal combustion engines.

One of the objects of the invention consists in the subdivision of the cylinder head into parts, and providing one of these parts with inwardly extending agitating means.

Another object consists in the provision of means for obtaining efficient cooling of the agitating means. Other objects will appear in connection with the following description of an embodiment of my invention.

In my application Serial No. 159,838, filed January 8, 1927, I described and claimed interior agitator members forming part of a relatively thin metallic plate member interposed between the cylinder block and the removable cylinder head of an internal combustion engine.

In the present case, an interposed member is made use of as before for supporting the agitating means, but this time said interposed member is made relatively thick and preferably consists of a substantially flat casting, which is recessed in its interior for circulation of cooling fluid, and the interior agitating means projecting therefrom and supported thereby are similarly recessed and cooled for at least a portion of their length.

This additional recessed casting substantially takes the place of that part of the removable cylinder head containing the sidewalls of the combustion chamber, substantially the ceiling wall only of the combustion chamber being formed in the cylinder head itself.

In the accompanying drawings showing an embodiment of the invention in an L-head, four-cycle internal combustion engine for consuming volatile liquid fuel, Fig. 1 is a vertical sectional view of such an internal combustion engine equipped with agitator means in accordance with my invention, the section being taken on line 1—1, Fig. 2, and Fig. 2 is a plan view with the cylinder head removed.

The engine shown for purposes of illustration is of the L-head type, and comprises the cylinder block 10 containing cylinder bores 12, pistons 14, combustion chamber 16, exhaust and intake valves 18 and 20, and spark plug 22.

A casting 24 is interposed between the cylinder head 26 and the cylinder block 10. This casting is made comparatively thick in order that it may be cored out as indicated at 28 for circulation of cooling water.

With the provision of the thick plate 24 there is, of course, a duplication of the usual head gasket, as indicated at 30, 32.

The plate 24 is provided with bolt holes and water passages like the gaskets, so that it may be bolted in place, and the cooling water may circulate freely through the connected recesses in the cylinder block 10, the cylinder head 26 and the interposed cast plate member 24.

The combustion chamber space consists largely of the openings 34 provided in the plate 24, so that the plate 24 provides all or the larger part of the sidewall surfaces of the combustion chamber, and the under side of the cylinder head 26 constitutes the ceiling wall 36 of the combustion chamber, though cylinder head 26 may be recessed to some extent, as at 38, to provide a part of the combustion chamber space.

While several agitator vanes or blades may be provided, one big vane is preferably used in order to facilitate coring out a recess therein for the cooling water. In the form shown, a single large vane 40 is illustrated. Said vane 40 projects laterally into the space over the cylinder bore 12, and preferably to about the middle thereof, and has inclined front and back walls 42, 44, and the cored out recess 46 in communication with the engine water jackets. The cooling water recess 46 preferably extends only part way out to the extreme end portion 48 of the vane 40, so that this part 48 of vane 40 is adapted to become heated during combustion and to give up heat to the incoming charge.

While the vane or vanes may be used alone with the space over the cylinder bore otherwise freely open, I prefer to extend a portion of plate 24 over the cylinder bore 12 substantially opposite the vane 40, as indicated at 50. The overhanging portion 50 is preferably substantially arcuate in form and leaves only a slight clearance over the piston head when the piston is at top center position.

With such arrangement, the ejection of

gases from between the piston 14 and the overhanging portion 50 of the plate 24 upon the compression stroke supplements the agitational effect of the vane 40 and produces a severe agitational movement of the gases during compression, and upon their being ignited in such state of agitation, flame travel is effectually speeded up. The agitation and speeding up of flame travel so obtained is greatest at high engine speed and decreases with lower engine speed and as the effect so obtained is much the same as that obtained by advancing and retarding the spark at high and low speeds respectively, the fixed ignition timing may advantageously be used, if desired.

The spark plug 22 is preferably located in the opening 23 over the intake valve 20 and adjacent to the vane 40, so that the agitational movement produced by vane 40 is substantially a maximum at the point where the gases are ignited.

The arrangement shown and described is well adapted for producing efficient scavenging action, as the exhaust gases are directed over the intake valve 20 and pass freely to their outlet through the exhaust gas valve port.

The vane 40 and plate extension 50 are well adapted to break up pressure waves produced during combustion and to thereby prevent or reduce detonation.

With the walls of the combustion chamber formed in three parts, namely one part in the cylinder block 10, another part in the cylinder head 26, and still another part in the interposed plate member 24, each part has its own rate of yielding slightly to the forces productive of detonation and of recovery therefrom, so that vibrational effects produced in the combustion chamber under conditions productive of detonation are subdivided and dampened as compared with the usual construction with the ordinary two-part combustion chamber.

It will be seen that substantially any desired clearance space and compression ratio can be obtained with the construction shown, by variation in the thickness of the member 24, and that where a high compression ratio is desired, and it is not practical to further reduce the thickness of member 24 because of valve clearances and the like, a very considerable reduction can be obtained in the volume of the combustion chamber by making the water-cooled vane 40, as well as the water-cooled overhanging at 50, of generous size. By providing the vanes in a separate plate the casting of the vanes is simplified, and the member containing the vanes can be readily removed to give access to the pistons. A thick vane, such as shown, is, of course, very stiff and strong and highly resistant to any tendency toward vibration.

It will be understood that the illustrated embodiment of the invention is for the purpose of affording an understanding of the invention and not for limitation thereof and the scope of the invention is defined in my claims.

The subject matter of the invention disclosed herein but not claimed is disclosed and claimed in part in my copending application Serial No. 155,919, filed December 20, 1926, and in part of my copending application Serial No. 159,838, filed January 8, 1927.

I claim:

1. An internal combustion engine comprising a hollow member communicating with the water-containing spaces of the engine and extending over the cylinder bore; said member being transversely inclined and serving to impart a cyclonic agitational movement to the fuel charge.

2. In an internal combustion engine, a cylinder block, a cylinder head, a hollow member interposed therebetween communicating with the water-containing spaces of the engine, and a hollow projection communicating with said member and extending inwardly therefrom for agitating the fuel charge.

3. In an internal combustion engine, a cylinder block, an apertured water-cooled member thereon having the major part of the combustion chamber spaces formed therein, a part of the inner edge portion of said member projecting inwardly over the edge of the cylinder bore for a portion of the circumference thereof into the space over the cylinder bore, and a cylinder head on said member.

4. In an internal combustion engine, a cylinder block, a cylinder head, and an interposed relatively thick plate having a combustion chamber space therein and a part of the edge portion thereof projecting into the space over the cylinder bore along a portion of the edge thereof.

5. In a water-cooled internal combustion engine, a cylinder block and a cylinder head and a member interposed therebetween, all having recesses for circulation of cooling water, said member having water-cooled interior agitation means projecting into the space over the cylinder bore at one side thereof, and a part of said interposed member overhanging the cylinder bore in the cylinder block opposite said agitation means.

6. In an internal combustion engine, a cylinder block, a cylinder head and a member interposed therebetween, all having communicating recesses for cooling fluid, an agitator vane with inclined sides extending inwardly from the interposed member to about the middle of the cylinder bore, a cooling fluid recess provided in the vane and in communication with the cooling fluid re-

cess in said member, and the extreme end part of said vane being substantially solid and adapted to absorb heat during combustion and to give up heat to the incoming gases of the succeeding cycle.

7. In an internal combustion engine, a cylinder having a combustion chamber at the end thereof, a piston therein; a part of the wall portion of said combustion chamber projecting over a part of the edge of said cylinder in close relation thereto, and constricting the mouth of the cylinder bore to provide an eccentric opening between the same and the combustion chamber contiguous to the remaining part of the edge of said cylinder, and a projecting portion on the part of the wall of said combustion chamber opposite said first named part thereof lying in the path of the fuel charge passing through said constricted opening for controlling the condition of the charge upon the actuation of the piston.

8. In an internal combustion engine, a cylinder having a combustion chamber at the end thereof extending laterally thereof, a piston in said cylinder, intake and exhaust valves in the laterally extending portion of said combustion chamber; a part of the wall of said combustion chamber projecting over the part of the edge of said cylinder remote from said valves in close relation to said cylinder edge and constricting the mouth of the bore thereof to provide an eccentric opening between the same and said combustion chamber at the side thereof adjacent to said valves, and a projecting portion on the wall of said combustion chamber towards said valves disposed adjacent to said opening and in the path of the fuel charge passing therethrough for controlling the condition of the same upon the actuation of the piston.

9. In an internal combustion engine, a cylinder having a combustion chamber at the end thereof extending laterally thereof, a piston in said cylinder, intake and exhaust valves in the laterally extending portion of said combustion chamber; a part of the wall portion of said combustion chamber projecting over the part of the edge of said cylinder remote from said valves in close relation to said cylinder edge, and constricting the mouth thereof to provide an eccentric opening between the bore thereof and said combustion chamber at the side thereof adjacent to said valves, and means on the walls of said combustion chamber towards said valves adjacent to said opening cooperating with said piston and the projecting part of said combustion chamber for producing an agitational movement of the fuel charge.

10. In an internal combustion engine, a cylinder having a combustion chamber at the end thereof; a part of the wall portion of said combustion chamber projecting over a part of the edge of said cylinder in close relation thereto and providing an eccentric opening adjacent to the remaining part of the edge of said cylinder between the bore thereof and said combustion chamber, and an agitator vane in the combustion chamber extending transversely of said eccentric opening.

11. In an internal combustion engine, a cylinder having a combustion chamber at the end thereof; a part of the wall portion of said combustion chamber projecting over a part of the edge of said cylinder in close relation thereto and providing an eccentric opening contiguous to the remaining part of the edge of said cylinder between the bore thereof and said combustion chamber, intake and exhaust valves in said combustion chamber, and an inclined member projecting from the wall of said combustion chamber intermediate said valves and said opening.

12. In an internal combustion engine, a cylinder having a combustion chamber at the end thereof extending laterally thereof; a part of the wall portion of said combustion chamber projecting over the part of the edge of said cylinder remote from the laterally extending portion of said combustion chamber in close relation to said edge, and providing an eccentric opening between the bore of said cylinder and said combustion chamber towards the laterally extending part thereof, intake and exhaust valves in the laterally extending part of said combustion chamber, and an inclined vane extending from the wall of said combustion chamber and over said eccentric opening, and disposed between the projecting wall portion of said combustion chamber and said valves.

13. In an internal combustion engine, a cylinder block, a relatively flat cylinder head, and a relatively flat member interposed therebetween having an opening therein alined with the cylinder bore and extending laterally beyond the same, and forming with said cylinder head a combustion chamber; said parts having recesses for the circulation of water therein; and said member having a portion thereof projecting over the part of the edge of the cylinder bore remote from the laterally extending portion of the combustion chamber to provide an eccentric opening between said cylinder bore and said combustion chamber towards the laterally extending portion thereof, intake and exhaust valves in the laterally extending portion of said combustion chamber, and an inclined hollow vane projecting from said member and over said eccentric opening intermediate the projecting portion of said member and said valves, and communicating with the interior of said member.

14. In an internal combustion engine, an inclined hollow member communicating with the water-containing spaces of the engine

and extending over the cylinder bore; the end portion of said member having thicker walls than the base portion thereof.

15. In an internal combustion engine, a relatively large inclined hollow vane within the combustion chamber communicating with the water-containing spaces of the engine, and extending from adjacent to the edge of the cylinder bore towards the center thereof; the extreme end part of said vane being substantially solid and adapted to absorb heat during combustion and to give up heat to the incoming gases of the succeeding cycle.

In testimony whereof, I have signed my name hereto.

ARLINGTON MOORE.