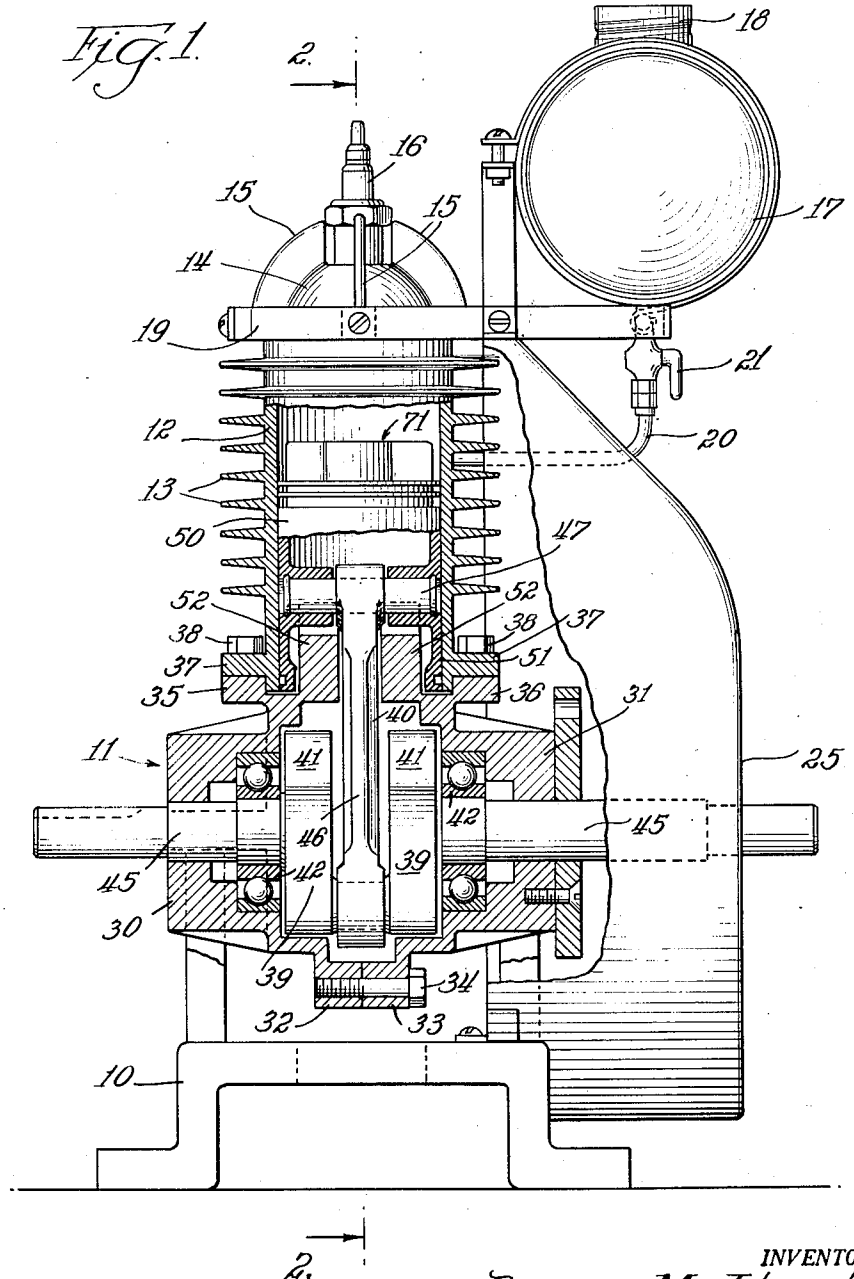
July 4, 1950 B. M. IKERT 2,513,563

TWO-CYCLE GASOLINE ENGINE

Filed July 5, 1947 3 Sheets-Sheet 1

Fig. 1.



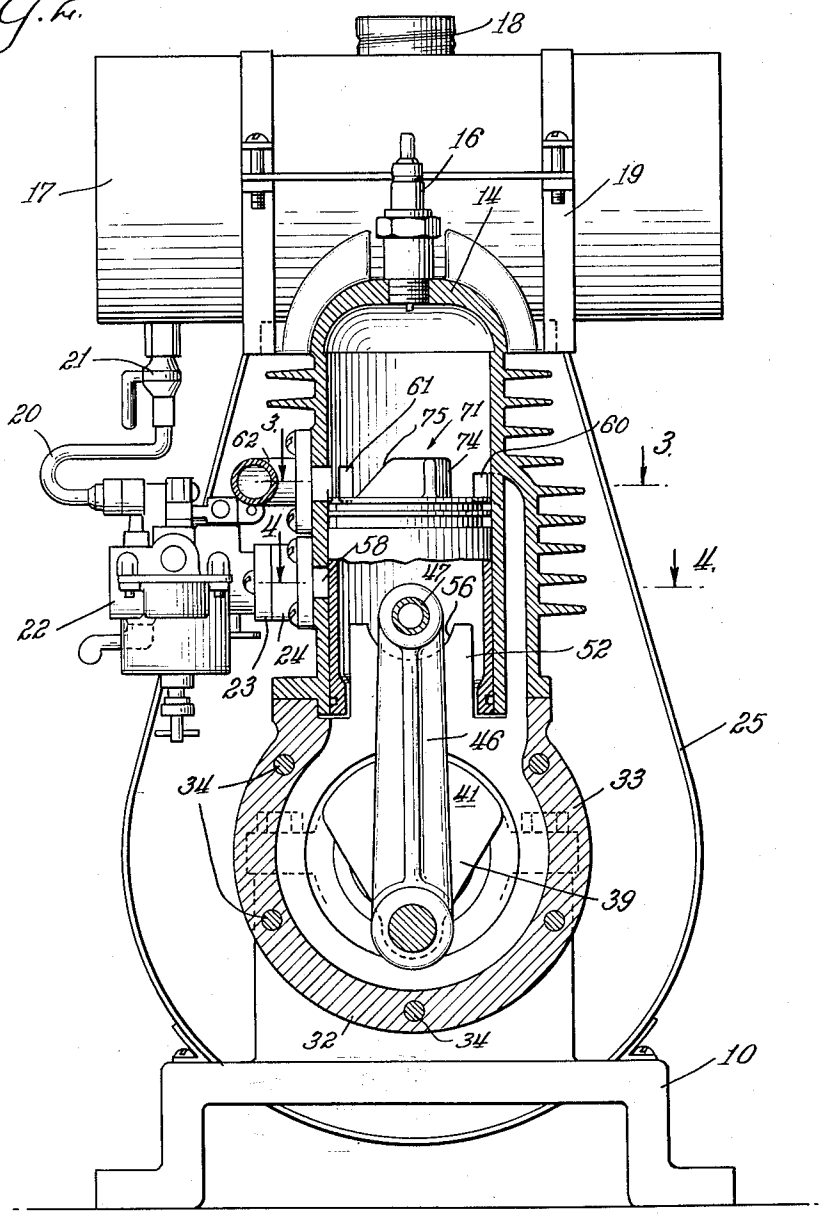
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Filed July 5, 1947 3 Sheets-Sheet 2

Fig. 2.



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Filed July 5, 1947 3 Sheets-Sheet 3

Fig. 3.

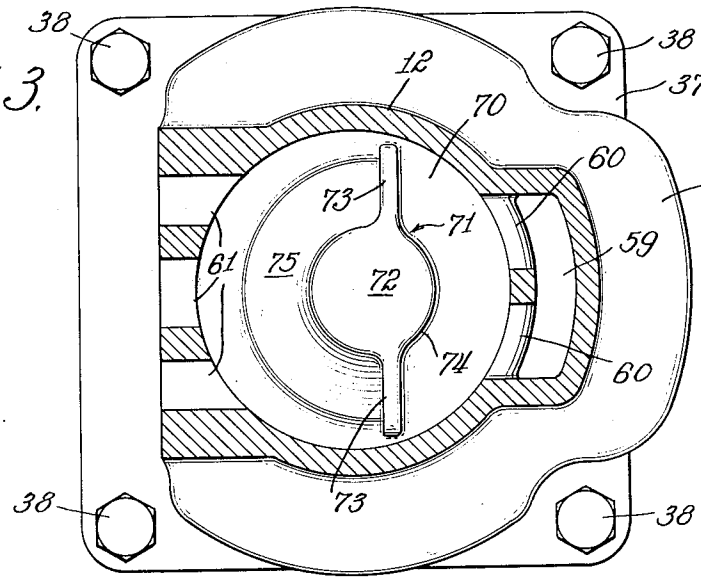
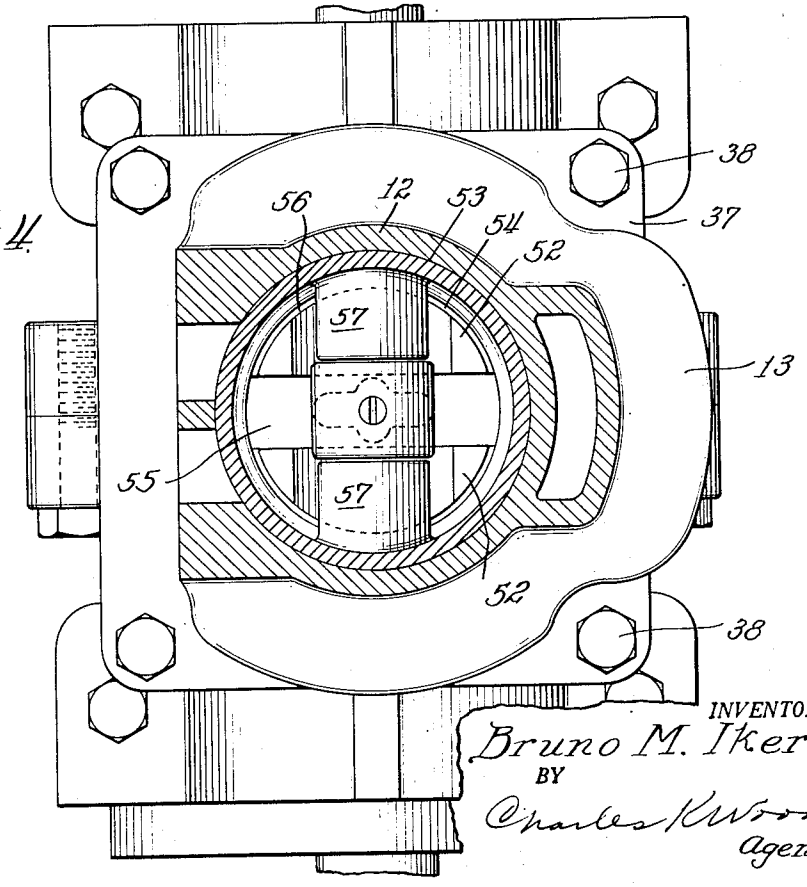


Fig. 4.



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TWO-CYCLE GASOLINE ENGINE

Bruno M. Ikert, Chicago, Ill.

Application July 5, 1947, Serial No. 759,014

4 Claims. (Cl. 123—73)

1

This invention pertains to new and useful improvements in two cycle gasoline engines.

The chief and general object of this invention is to provide a two cycle engine of increased efficiency and of simple, low cost construction.

Another purpose of the invention is the provision in a two-cycle gasoline engine of structural improvements in the crank case for increasing the explosive power of the gasoline mixture by enhancing the volatility thereof in that means are provided in said crank case for heating the fuel and causing its entrance into the firing chamber under pressure and a high degree of turbulence.

Yet another object of the invention is to provide a two cycle engine having a piston, the outer top surface of which is so shaped as to take full advantage of the explosion of the gas, to more effectively inhibit mixture of unexploded fuel and the exhaust gases, and to permit exhaust gases, and to permit exhaust of the burned gases immediately once full advantage has been taken of the force of their explosion.

How the above objects and advantages and still others incident to the invention are accomplished is set forth in the detailed description which follows and shown on the somewhat diagrammatic drawings in which:

Fig. 1 is a cross sectional side view of a typical engine looking in the direction at which the crankshaft extends transversely of the engine structure;

Fig. 2 is a cross-sectional view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional plan view taken substantially along the line 3—3 of Fig. 2; and

Fig. 4 is a cross-sectional plan view taken substantially along the line 4—4 of Fig. 2.

In terms of broad, general inclusion the two-cycle engine in the single-cylinder form shown on the drawings, comprises the combination of a supporting base, a cylinder block and cylinder head, fuel supply and vaporizing means, firing means, cooling means, a crankshaft, connecting rod, wrist pin and appropriate bearing therefor and all of which are substantially conventional, with a novel crankcase which closely encompasses the crank portion of the crankshaft, heat conveying, fuel turbulent, shoulder portions associated with the crankcase which extend a distance into the path of the piston and adjacent to which the fuel vaporizing means may discharge into the crankcase, a fuel conveying passageway between the crankcase and the cylinder, and a novel piston, the head of which integrally carries a baffle so constructed as to guide the incoming unexploded fuel upwardly and to guide the exploded fuel downwardly in the retracted position of the piston.

2

Referring now to the drawings, reference numeral 10 indicates the base or support for the engine, bolted to which in manner best shown in Fig. 2, is the crankcase indicated generally by reference numeral 11. Extending upwardly from crankcase 11 and conventionally bolted to it is a cylinder block 12 having on its exterior a plurality of spaced outwardly extending and generally circumferential heat dissipating fins 13. Closing the outer end of cylinder block 12 is the cylinder head 14 which has on its exterior a plurality of heat dissipating fins 15 and which has a centrally located threaded hole therein to receive the conventional spark plug 16.

The exteriorly visible engine fuel supply means comprises a fuel tank 17 having a filler opening closed by screw cap 18, the former being held by appropriate supports 19. A fuel line 20 having in its length a shut-off valve 21 is in communication between tank 17 and a conventional carburetor 22. The outlet throat 23 of carburetor 22 communicates with an attaching flange 24 bolted to cylinder block 12 and this flange communicates with fuel inlet port more fully described hereinafter.

At one side of the engine is a hood or housing 25 which is adapted to act as a guiding scoop for heat dissipating air blast past the fins 13, 15 provided by a crankshaft-attached fan or combined flywheel and fan which is enclosed in this housing. The hereinbefore described fan or flywheel and fan is conventional hence is not shown on the drawings.

Crankcase 11, in a single cylinder engine such as herein shown, is comprised of two generally similar opposed castings 30, 31 having integral opposed matching semicircular vertical connecting flanges 32, 33, said castings held in proper relative positions by machine screws 34, which extend through these flanges. The upper portions of castings 31, 32 are provided with outwardly extending horizontal flanges 35, 36, respectively, which abut the lower surfaces of a corresponding flange 37 on the lower end of cylinder block 12, being attached thereto by machine screws 38.

Interiorly, each crankcase-forming casting 30, 31 is hollowed out in a series of concentric annular steps to provide space for the rotation of the crankshaft crank 39 and its integral counterbalances 41, 41 and to accommodate a pair

of spaced crank shaft supporting roller bearings 42, 42. As best seen in Fig. 1, castings 30, 31 are each also bored for tight fitted outward passage therethrough of the extremities of crankshaft 45. Crank 39 has conventionally mounted on it one end of a connecting rod 46, the other end of the latter being conventionally mounted on wrist pin 47 mounted on piston 50. Rearwardly of wrist pin 47 piston 50 has a depending hollowed out skirt 51 the lower annular extremity of which, in most retracted position of the piston, travels about to the open lower end of cylinder block 12.

Still referring to Fig. 1, each crankcase forming casting 30, 31 has formed integral with it a solid shoulder 52 which, as shown in Fig. 4, is of generally semi-cylindrical form and, as shown in Fig. 1, is of such length and so positioned as to extend a substantial distance into depending piston skirt 51 in the most retracted position of piston 50.

In the assembled condition of the engine, shoulders 52, 52 are laterally spaced a distance from the inner cylinder block wall 53 to admit piston skirt 51 between their semi-cylindrical outer surfaces and cylinder wall 53, a small space 54 being left between the outer shoulder surfaces and the interior surface of skirt 51. Also, as shown in Fig. 4, a transversely extending opening 55 is provided between shoulders 52, 52 for passage therebetween of connecting rod 40, and each shoulder preferably has its upper end arcuately dished out as at 56 to permit close positioning of the shoulders to the piston wrist pin carrying trunnions 57, 57.

As best shown in Fig. 2, the wall of cylinder block 12 has an opening 58 therein in communication with carburetor throat 24 and this opening is positioned immediately above the upper peripheries of shoulders 52, 52 so that the volatilized fuel discharged by the carburetor 22 will be discharged thereby in close contact with the shoulders. The position of opening 58 with respect to piston 50 is such that in most extended position of such piston the opening is in open communication with the space above shoulders 52, 52 to admit the fuel mixture into crankcase 11.

As will be obvious from Figs. 1 and 2, the integral relationship of shoulders 52, 52 with the assembled crankcase 11 and the connected relation of the crankcase with cylinder block 12, coupled with the close proximity thereto of piston 50, permits such shoulders to become quite heated by transference of heat from such closely associated parts during engine operation.

As shown in Fig. 2, preferably in diametrically opposed relation to opening 58 is a fuel passageway 59 between crankcase 11 and cylinder block 12. This passageway is unrestricted at its juncture with the crankcase, but at its upper and cylinder connecting end is divided into a pair of spaced fuel inlet ports 60, 60. Preferably opposite to inlet ports 60, 60 are a plurality of exhaust outlet ports each indicated by reference numeral 61 which extend through the wall of cylinder block 12 and communicate with an exhaust outlet pipe 62.

As best shown in Fig. 2, it will be noted that the upper portions of outlet openings indicated by reference numerals 61 are arranged in a higher horizontal plane than the upper portions of fuel inlet openings 60, 60 for reasons to be brought out later herein.

As shown in Figs. 2 and 3, the upper surface of piston 50 is in part horizontally planar as at

70 and inwardly of this planar area 70 is a gas directing baffle indicated generally by reference numeral 71. Baffle 71 is non-concentric with respect to the lateral periphery of piston 50 but extends in this relation transversely of the piston head at its other end to have at its one side the fuel inlet ports 60, 60 and the exhaust outlet ports 61, 61.

Generally medially of baffle 71 is a horizontally planar portion 72 of circular plan view appearance which is in vertical register with the firing points of spark plug 16. Extending outwardly from planar baffle position 72 transversely of the engine fuel inlet and exhaust outlet ports are opposed wings 73, 73. Baffle 71 and wings 73, 73 present to the fuel inlet ports an abruptly vertical and medially horizontally outwardly curved surface indicated by reference numeral 74. Opposite vertically abrupt surface 74, baffle 71 is formed into a downwardly inclined semi-circular surface 75 which merges with the planar piston head surface 70 immediately in front of the exhaust outlet ports.

Two cycle engines, when in operation, at certain times invariably have in their crankcases a partially vacuous condition which permits their crankcases to form part of the fuel intake system. In the case of the instant invention it will be apparent that during the upstroke of piston 50 the piston will pass and wholly close off cylinder fuel inlet ports 60, 60 and the exhaust ports indicated by reference numerals 61. This piston upstroke will generally cause the gaseous content of the crankcase to be reduced to less than outside atmospheric pressure so that when piston skirt 51 passes fuel intake port 58 a charge of carburetor-vaporized or atomized fuel will be drawn into crankcase 11.

As previously stated, the incoming charge enters the crankcase immediately above shoulders 52, 52. Since the shoulders extend substantially into piston skirt 51, downstroke of piston 50 will force the vaporized charge against the shoulders 52, 52 and in resisting compression the vapor will seek an outlet which it will find in the openings 54 and 55 arranged between and around such shoulders.

The downward stroke of piston 50 also tends somewhat to compress the fuel vapor and since inlet port 58 will then be closed by the piston wall the gasified fuel in seeking an outlet will pass up fuel passageway 59 to pass, when the piston is sufficiently retracted into the cylinder through ports 60, 60. The vertically abrupt face of 74 of baffle 71 will cause the fuel to be directed vertically and particularly in and around the firing points of spark plug 16.

On the upstroke of piston 40 the fuel charge is compressed whereupon, in proper usual relation to the downstroke of the piston the spark-providing electrical system (conventional, and not shown) causes the sparkplug to jump a firing spark across its terminals, exploding the fuel.

It will be obvious that the maximum force of the explosion is directed against planar baffle surface 72. The piston is thus precipitately forced downward until the upper end of exhaust ports 61 are exposed, whereupon the high velocity exploded gas follows the downwardly sloping contour of baffle surface 75 being substantially disposed of before the upper portion of fuel inlets 60 are exposed by the retracting piston and a new firing charge injected.

From the foregoing it will be obvious that the compressive, agitating force of the reciprocating

piston and connecting rod in their close proximity to shoulders 52, 52 will exert tremendous turbulence to the carburetor-vaporized fuel discharged adjacent the shoulders. It will also be obvious that once the engine has been a while in operation heat transfer from the cylinder walls will take place causing the shoulders to become quite hot and the restricted areas of passage for the vaporized fuel will cause the fuel to absorb a quantity of this desirable heat. Thus it may be accurately said that a highly desirable fuel turbulence and heat absorption takes place with corresponding increase in fuel volume and explosiveness.

It is characteristic of two cycle engines that at one position of the piston (see Fig. 1) both inlet and exhaust ports are simultaneously open and this necessary condition is one of the factors making the achievement of high efficiency in such engines a very considerable problem.

The form of piston head baffle 71 is a far step in the direction of increased efficiency in that the vertically abrupt but medially outwardly curved face 74 thereof causes the incoming fuel mixture to be principally directed away from the outgoing exhaust gases and in the direction of cylinder head 14. The horizontal planar top surface 72, being located vertically directly below the terminals of the sparkplug 16 received the brunt of the exploded charge and more efficiently passes on this energy for translation into rotary motion in the crankshaft. The downwardly slanted baffle area 75 permits more efficient self propelled disposal of the exhaust gases.

While the invention has been shown and described with considerable particularity it is realized that modifications thereof may be made, hence it is desired that the detailed disclosure be taken as illustrative rather than in a limiting sense.

I claim:

1. In a two-cycle engine having a cylinder, a crankshaft and a connecting rod carried thereby, a crankcase having therein a space for rotation of said crankshaft and connecting rod, said crankcase comprising two similar portions fixed in opposed relation to one another, each portion having on it a heat-exchange shoulder extending into said cylinder.

2. In a two-cycle engine, the combination of a connected cylinder block and crankcase, a piston, connecting rod and crankshaft interconnected with one another within said cylinder block and crankcase, a shoulder portion within said crankcase, said shoulder portion extending substantially into the rearwardmost portion of said piston in the retracted position thereof, carburetor means discharging into said crankcase adjacent said shoulder portion, fuel conduit means between said crankcase and the interior of said cylinder block forwardly of said piston, said piston having a fore-end baffle comprising a planar area and

at each side thereof outwardly directed wings, and laterally of said wings, an abrupt surface on one side and a downwardly sloped surface on the other side.

3. In a two-cycle gas engine, a piston having a head comprising two generally annular planar surfaces generally parallel to one another at different elevations, said upper planar surface being disposed generally medially of said lower planar surface and of less area than the latter, opposed aligned wings extending outwardly from each side of said upper planar surface and connected with said lower planar surface and extending across the latter at one side of a line denoting its diameter, said wings joining said lower planar surface at substantially right angles at one side and at the side opposite that of its right angled relation to said lower planar surface said wings merging with an angularly downwardly directed surface of generally semi-annular configuration in plan view which extends downwardly from said upper planar surface and merges with said lower planar surface adjacent the edge thereof.

4. In a two-cycle engine the combination comprising a block having a piston-receiving cylinder formed therein and a crankcase, an integrated piston, connecting rod and crankshaft operative within said cylinder and said crankcase, said crankcase comprising two similar portions fixed in opposed relation to one another and each of said crankcase portions having a shoulder thereon, said shoulders extending into the rearward part of said piston in the retracted position thereof, carburetor means discharging into said crankcase adjacent said shoulders and at one side of said block, said block having a fuel passageway formed therein at a side opposite the discharge port of said carburetor means and communicating between the interior of said crankcase and said cylinder forwardly of said piston, the fuel discharged by said carburetor means passing around said crankshaft in its path of travel and being thrown into extreme turbulence by the movement of said crankshaft.

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