OPPOSED PISTON ENGINE, FOUR CYCLE

Fig. 2

Fig. 3

Fig. 4

Fig. 5

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This invention relates to internal combustion engines and the primary object of the invention is to construct a four-cycle combustion engine without the use of poppet or sleeve valves.

A further object of the invention is the reducing of considerable vibration due to the elimination of said valves as commonly used in internal combustion engines.

A still further object of the invention is the obtaining of a greater period of operation of the engine without reconditioning due to the burning, corroding or carbonization of the valves.

These and other incidental objects will be apparent in the drawings, specification and claims.

Referring to the drawings:

Figure 1 is a fragmentary end sectional view of my new and improved internal combustion engine.

Figure 2 is a diagrammatical lay taken of the motor whose crank shaft has revolved 180 degrees from that shown in Figure 1 at the end of the power stroke.

Figure 3 is a diagrammatical view where the crank shaft has revolved a further 180 degrees completing the exhaust stroke of the engine.

Figure 4 shows the crank shaft has travelled still another 180 degrees having completed the intake stroke of the piston.

Figure 5 is a side view of the engine, parts broken away illustrating the method of timing the auxiliary crank shaft and pistons with the main crank shaft and piston of the engine.

In the drawings:

My new and improved internal combustion engine is comprised of a cylinder block having the usual crank shaft 2 journalled therein in the well known manner. Primary pistons 3 work within the cylinders 4 and are connected to the crank shaft in the usual manner by the connecting rod 5, which is pivotally mounted to the piston pin at 6 and to the crank pin 7 of the main crank shaft.

With my new and improved combustion engine I have added a secondary crank shaft which is journalled in suitable bearings 9 within the crank case 10 formed on the upper ends of the cylinders 4. A secondary piston 11 is connected to the said crank shaft by the connecting rods 12 in the usual manner. A fuel intake port 13 is located on one side of the cylinders 4 and communicates with the said cylinders, it operation being controlled by the secondary pistons 11, which will later be described.

A fuel manifold 14 communicates with the ports 13 and with a source of supply not here shown.

Exhaust ports 15 also communicate with the cylinders 4 and are open and closed by the secondary piston 11. These ports have an exhaust manifold 16. The usual ignition plug 17 is provided and communicates with the combustion chamber 18. I will now describe the operation of my new and improved combustion engine. The secondary crank shaft 8 travels half the speed of the main crank shaft 2 and is driven from the crank shaft 2 through the drive chain 19 from the sprocket 20 to the sprocket 21, which is keyed to the secondary crank shaft 8.

Referring to Figure 1, the engine is shown on compression and a compressed charge of fuel is contained within the combustion chamber 18 ready to be ignited by the plug 17. Figure 2 diagrammatically illustrates the end of the power stroke. The lower end 22 of the piston 11 taking the place of the usual cylinder head. The rings 23 providing a seal between the intake port 13 and the combustion chamber 18. As the primary piston 3 travels downwardly on power stroke the secondary piston 11 travels upwardly but at half the speed of that of the primary piston. The piston 11 also transmits power through the chain 19 on the crank shaft 2. This action has a counterbalancing effect on the motor and reduces vibration.

When the crank shaft 2 has travelled 180 degrees as indicated in Figure 2, it will start up on its upper stroke which will exhaust the burned gases through the exhaust port 15, the piston 11 still maintaining a seal between the intake port 13 and the combustion chamber 18, referring to Figure 3. When the piston 3 travels down another 180 degrees, as indicated in Figure 4, the piston 11 will have travelled downward to the bottom of its stroke, which brings the intake port 13 into communication with the combustion chamber through the recess 30 of the piston 11 and the socket 51 of the cylinder forming with the recess a by-pass and drawing in a charge of fuel into the combustion chamber, the piston 3 will then start upward again to the position shown in Figure 1 compressing this charge of fuel at which time it will be fired, repeating the cycle of operation.

I do not wish to be limited to the exact mechanical structure as other mechanical equivalents may be substituted still coming within the scope of my claims.

That which is claimed, as new, is:

1. An internal combustion engine comprising a cylinder, primary and secondary pistons reciprocating therein, a power crank shaft connected to
the primary pistons, a secondary crank shaft connected to the secondary pistons, said secondary crank shaft being geared to the said primary crank shaft, said secondary crank shaft adapted to rotate one-half the speed of the primary crank shaft, an intake port communicating with a by-pass located on the side of the secondary piston, said by-pass communicating with a by-pass located in the cylinder wall and communicating with a combustion chamber of the engine.

2. An internal combustion engine comprising a cylinder, a power crank shaft, a power piston connected to said crank shaft and contacting said cylinder, an inlet port and an exhaust port in said cylinder, a second crank shaft connected to said power shaft, a second piston contacting said cylinder and connected to said second shaft for movement to various positions, means residing in the relative location of said ports and causing said second piston in a first position to close said inlet port and open said exhaust port, by-pass means, including a recess formed in the periphery of said cylinder and a recess formed in said second piston, causing said second piston to open said inlet port and close said exhaust port, and means residing in the length of said second piston and causing same in a third position to close both ports.

3. An internal combustion engine according to claim 2, wherein a socket is formed in the wall of the recess in the cylinder, and a spark plug is fitted in said socket.

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