Sept. 5, 1933. S. B. SMITH 1,925,285

TWO-CYCLE ENGINE

Filed Nov. 28, 1930

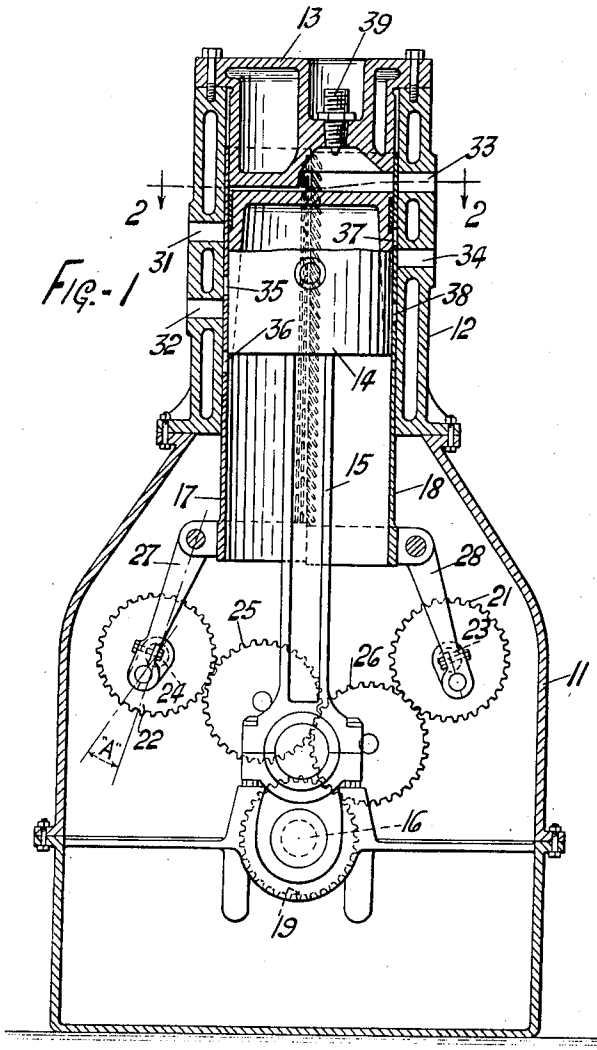


FIG. 1

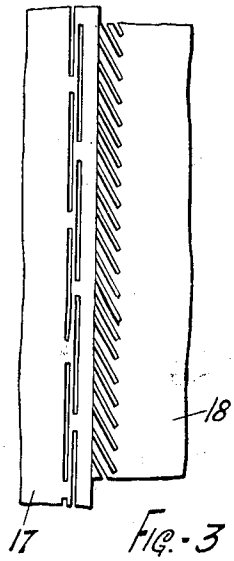


FIG. 3

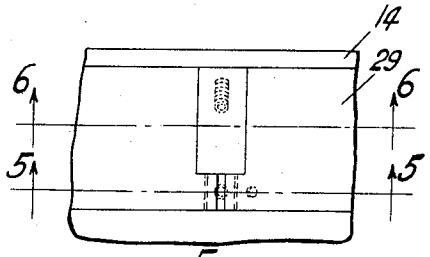


FIG. 4

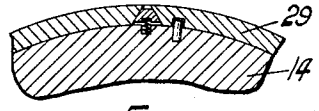


FIG. 5

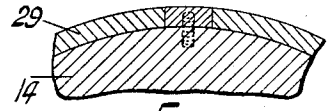


FIG. 6

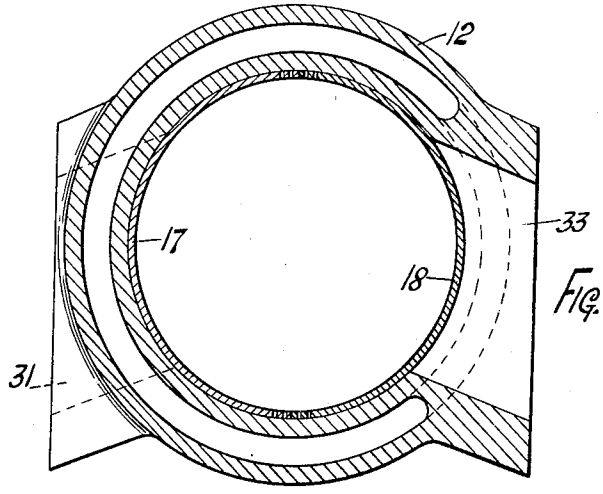


FIG. 2

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TWO-CYCLE ENGINE

Samuel B. Smith, Rocky River, Ohio

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Serial No. 498,553

6 Claims. (Cl. 123—65)

This invention relates to two cycle engines, particularly of the compression ignition type employing sleeve valves either of the split type shown or tubular type.

The general object of the invention is to provide an improved, relatively inexpensive, simple, efficient engine of the compression ignition type working on the two stroke cycle.

One of the primary objects of the invention is to construct and design an engine of this type in which large port areas are provided for the admission of fresh air and exhaust of products of combustion. As a result the efficiency of the engine is greatly increased over engines of the type heretofore designed and more rapid and effectual scavenging and charging is obtained.

A further object of the invention is to improve the scavenging of the engine by giving the air as it enters the intake ports a whirling action which gives a spiral movement through the chamber aiding in the effectual operation of the engine.

The foregoing and other objects of the invention are achieved by the apparatus illustrated in the accompanying drawing and described below, it being understood that the invention is not limited to the exact form thereof shown and described.

In the drawing:

Figure 1 is a vertical sectional view thru an embodiment of the invention;

Figure 2 is an enlarged plan view taken on line 2—2 of Figure 1;

Figure 3 is a side elevation of a portion of the contacting edges of the split sleeve valve incorporated in the inventive combination;

Figure 4 is a partial side elevation of the piston sealing ring showing the filler blocks between the ends thereof;

Figure 5 is a sectional view taken on the line 5—5 of Figure 4; and

Figure 6 is a sectional view taken on line 6—6 of Figure 4.

Referring to the drawing the numeral 11 indicates a suitable crank case upon which is mounted a cylinder block 12, topped by a head 13. The block 12 and head 13 may be suitably chambered, as shown, for the passage of cooling means. Slidably mounted in the block 12 is a piston 14, which is adapted to be reciprocated by any suitable means which may include a connecting rod 15 and crank shaft 16.

Between the piston 14 and the walls of the block 12, and in sliding contact therewith, are the diametrically split slide valves 17 and 18, which are in turn reciprocated by any suitable means, so that their movement is synchronized with the movement of the piston 14. To this end a gear 19 mounted on the crank shaft 16, drives gears 21 and 22 mounted on auxiliary crank shafts 23 and 24, by way of idler gears 25 and 26. Links 27 and 28 connect the sleeves 17 and 18 with the crank-shafts 23 and 24. The arrangement of the gears is such that there will be one up and down movement of each of the slides 17 and 18 to one up and down movement of the piston. As illustrated in Figure 1, the crank 23 of the slide valve 18 is at dead center and the crank 24 of the slide valve 17 is ahead of the angle "A", for a purpose hereafter explained.

The contacting edges of the slide valves 17 and 18 are slotted as shown in Figure 3, in order to prevent pressure leakage past the piston 14. This construction forms no part per se of the present invention, and is completely described in my copending application Serial No. 480,698 filed September 9, 1930, on which Patent No. 1,881,330 dated October 4, 1932, was granted.

As indicated in Figures 4, 5 and 6, the piston 14 is provided with a wide sealing ring 29, which is completely described in my copending application, Serial No. 479,519, filed September 3, 1930, and which forms no part per se in the present invention.

The cylinder block 12 is formed with two exhaust ports 31 and 32, and two diametrically opposite intake ports 33 and 34, having a connection with a source of air under pressure. From Figure 1 it will be seen that the intake ports 33 and 34 are placed to the top of the combustion chamber, and in such a position that the port 33 is substantially in line with the top of the chamber and the port 34 is substantially in the middle of the chamber. It will also be seen that the exhaust ports 31 and 32 are placed to the bottom of the combustion chamber, and in such a position that the port 32 is substantially just off the bottom, and the port 31 is approximately two-thirds of the way up the chamber. These inlet and outlet ports are arranged at an angle or incline with respect to the cylinder, as shown in Figure 2, the object of this arrangement being to give the air a whirling or spiral movement through the cylinder. As the air is moved in the downward spiral path it effectively clears the cylinder of the products of combustion.

The sleeve valves 17 and 18 are provided with suitable ports 35, 36, 37 and 38, which are adapted to cooperate with ports 31, 32, 33 and 34 respectively. In the form of the invention illustrated, the distance between the sleeve ports

is equal to the distance between the ports in the block 12.

The numeral 39 indicates an injector thru which the fuel is injected into the combustion chamber, as will be understood.

In the operation of the device, assuming the parts to be in the position shown in Figure 1, and assuming the explosion has just taken place, the piston will begin to move downward. The sleeves 17 and 18 will be moving upward with the sleeve 17 slightly ahead of the sleeve 18, as occasioned by the angle "A". The piston 14 is soon below ports 31 and 33, so that as soon as the port 35 is aligned with port 31, the chamber will begin to be exhausted. This will occur after the crank shaft 16 has rotated approximately 90°. The angle "A" is such that the port 37 will not be aligned with the intake port 33 until the crank shaft has rotated approximately 15° more so that the burnt gases will be partially exhausted before the intake is opened. As the ports 37 and 33 become aligned, the charge of fresh air will partially scavenge the chamber, and as the piston 14 continues to fall, the aligned intake ports 38 and 34 and aligned exhaust ports 36 and 32 will be uncovered, so that the chamber is given a final scavenging by pure air. It will be understood that the fresh air is supplied under pressure to the engine thru the agency of a supercharger or other means.

The piston 14 will reach the bottom of its travel when the crank shaft 16 has turned 180° and will start on its upward travel. The exhaust ports will close when the crank shaft 16 has turned approximately 215° and the intake ports will close after approximately 15° further rotation thereof. The fresh pure air will then be compressed during the remainder of the stroke, and the fuel will be injected thru the nozzle 39 when the piston 14 is near the top of its stroke, and will immediately explode due to the compression heat of the air, as is understood in the art. The process will then be repeated.

While the invention has been disclosed as using two exhaust ports and two intake ports, it will be apparent that the invention contemplates more or less than two intake and exhaust ports functioning in a similar manner to that described. Again, the principles of the invention are broadly applicable to two cycle engines of any type. It will also be seen that the invention is not necessarily limited to split sleeve valve engines, nor to the exact means for reciprocating the sleeve valves.

In conformity with the patent statutes, a specific embodiment only of the invention has been shown and described, it being understood that the scope of the invention is not limited thereto, but is defined by the appended claims.

What is claimed is:

1. A two cycle engine of the compression ignition type comprising a cylinder, a piston mounted for reciprocation in said cylinder, a pair of split sleeve valves mounted for reciprocation between the piston and the cylinder, said cylinder having a plurality of longitudinally spaced intake ports, one of said sleeve valves having a plurality of ports adapted to cooperate with said first named ports when the sleeve valve is in its uppermost position, said cylinder having a plurality of longitudinally spaced exhaust ports, the other of said sleeve valves having a plurality of ports adapted to cooperate with the cylinder exhaust ports in the uppermost position of the sleeve valve, means synchronizing the reciprocations of the piston and sleeve valves whereby the firing chamber is initially and partially scavenged, and thereafter more completely scavenged with pure air.

2. A two cycle engine of the compression ignition type comprising a cylinder, a piston mounted for reciprocation in said cylinder, a pair of split sleeve valves mounted for reciprocation between the piston and the cylinder, said cylinder having a plurality of longitudinally spaced intake ports, one of said sleeve valves having a plurality of ports adapted to cooperate with said first named ports, said cylinder having a plurality of longitudinally spaced exhaust ports, the other of said sleeve valves having a plurality of ports adapted to cooperate with the cylinder exhaust ports, means synchronizing the reciprocations of the piston and sleeve valves whereby the firing chamber is initially and partially scavenged and thereafter more completely scavenged with pure air.

3. In combination a cylinder, a piston reciprocating therein, said cylinder having longitudinally spaced intake and longitudinally spaced exhaust ports therein, a split ported sleeve valve to control said intake and exhaust ports, means for sealing the contacting edges of the split sleeve valve, means to move the split sleeve valve in synchronism with the piston so that one of the exhaust ports will open slightly in advance of the opening of one of the intake ports, which ports will initially exhaust and scavenge, and thereafter all the exhaust and intake ports will open to completely exhaust and scavenge the cylinder.

4. In combination a cylinder, a piston reciprocating therein, said cylinder having longitudinally spaced intake and longitudinally spaced exhaust ports therein, a split ported sleeve valve to control said intake and exhaust ports, means to move the split sleeve valve in synchronism with the piston so that one of the exhaust ports will open slightly in advance of the opening of one of the intake ports, which ports will initially exhaust and scavenge, and thereafter all the exhaust and intake ports will open to completely exhaust and scavenge the cylinder.

5. In combination a cylinder, a piston reciprocating therein, said cylinder having intake and exhaust ports therein, a split ported sleeve valve to control said intake and exhaust ports, means to move the split sleeve valve in synchronism with the piston so that one of the exhaust ports will open slightly in advance of the opening of one of the intake ports, which ports will initially exhaust and scavenge, and thereafter all the exhaust and intake ports will open to completely exhaust and scavenge the cylinder.

6. In combination a cylinder, a piston reciprocating therein, an air intake port at one limit of the piston travel, an exhaust port near the opposite limit of piston travel, an intake port and an exhaust port near the middle of the piston travel, a pair of ported sleeve valves reciprocable between the cylinder and piston, means for reciprocating said sleeve valves so that in the expanding stroke of the piston the middle exhaust port will open substantially when it is uncovered by the piston and the intake ports will open immediately thereafter, said other exhaust port being open when uncovered by the further downward movement of the piston.

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