C. C. KEYSER.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED DEC. 22, 1911.

1,035,600.

Patented Aug. 13, 1912.

2 SHEETS—SHEET 1.

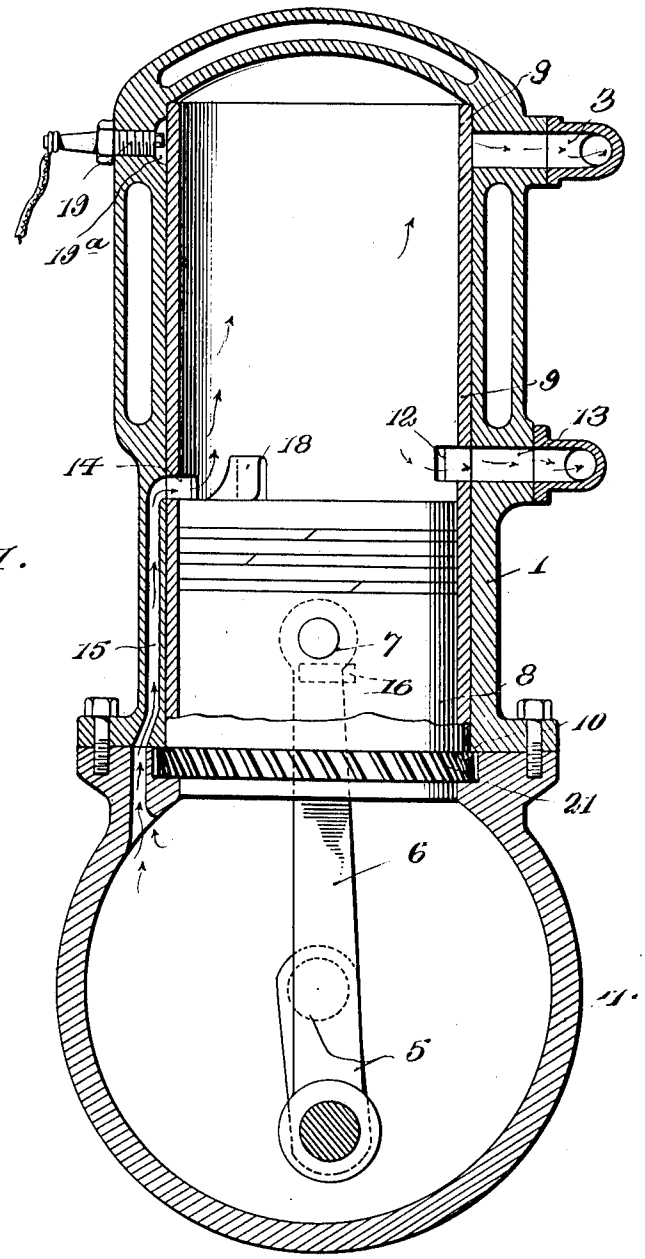

Fig. 1.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

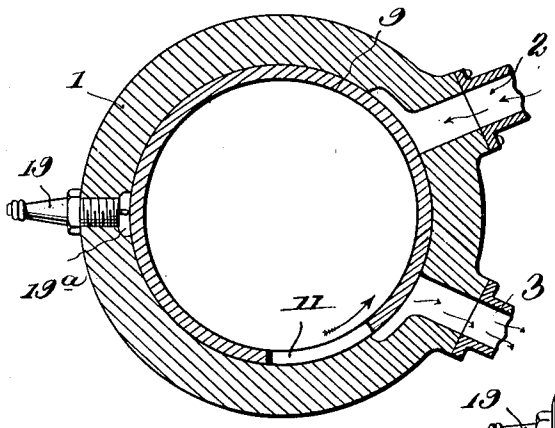


Fig. 3.

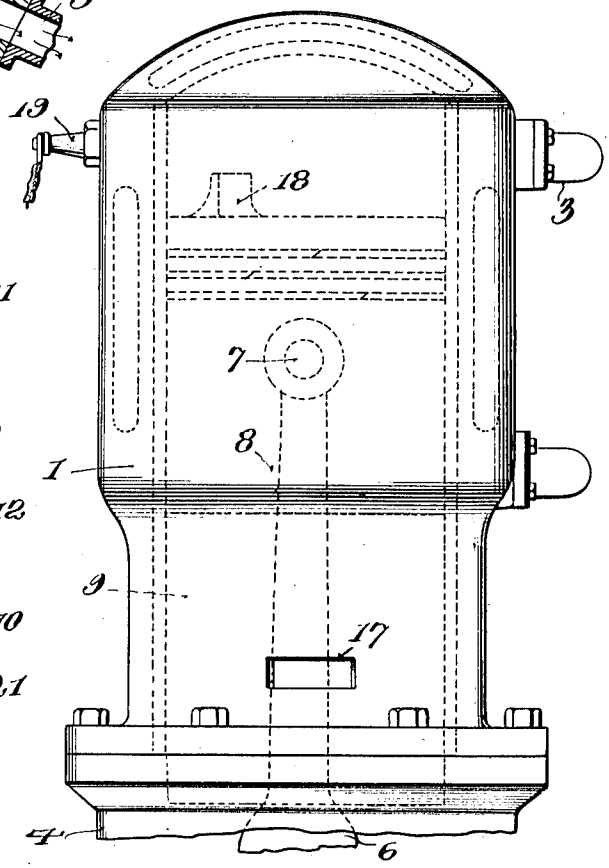
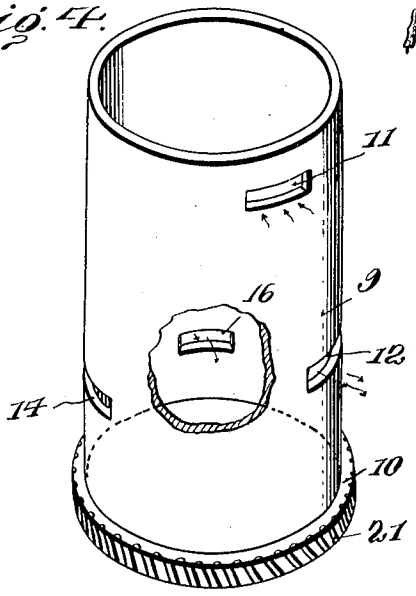


Fig. 4.



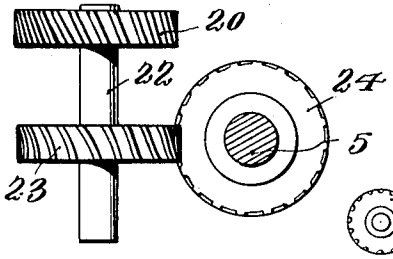
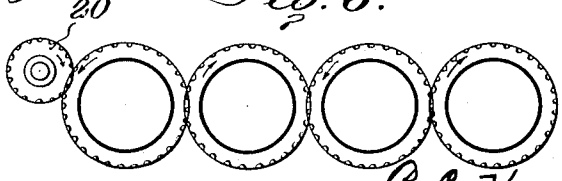


Fig. 5.

Fig. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

CHARLES C. KEYSER, OF PENSACOLA, FLORIDA.

INTERNAL-COMBUSTION ENGINE.

1,035,600. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed December 22, 1911. Serial No. 667,310.

To all whom it may concern:

Be it known that I, CHARLES C. KEYSER, a citizen of the United States, residing at Pensacola, in the county of Escambia, State of Florida, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a description, reference being had to the accompanying drawing and to the letters and figures of reference marked thereon.

The invention relates to new and useful improvements in internal combustion engines, and more particularly to the valve mechanism therefor.

An object of the invention is to provide a construction of rotating cylinder valve wherein the air may be compressed in the crank casing and passed into the cylinder to scavenge the same, and to cool the cylinder.

A further object of the invention is to provide a valve of the above character, which also controls the intake of air into the crank casing.

A still further object of the invention is to provide a valve of the above character, with an intake opening adjacent its upper end, and an auxiliary exhaust or relief port adjacent the end of the inner stroke of the piston, the main exhaust port being formed adjacent the intake.

These and other objects will in part be obvious, and will in part be hereinafter more fully described.

In the drawings which show by way of illustration one embodiment of the invention; Figure 1 is a sectional view through an engine having my improved valve applied thereto; Fig. 2 is a transverse sectional view adjacent the outer end of the cylinder, and through the intake and main exhaust ports; Fig. 3 is a view similar to Fig. 1, showing the intake port which allows air to enter the crank casing; Fig. 4 is a perspective view of the cylinder valve removed from the engine; Fig. 5 shows a driving mechanism for turning the cylinder valve from the crank shaft; Fig. 6 is a view more or less diagrammatic, showing the manner of controlling the cylinder valves in a four cylinder engine.

The cylinder body or casing 1, which will be hereinafter referred to as the casing, may be provided with a suitable water jacket and with an intake port 2, and an exhaust port 3. The intake and exhaust ports 2 and 3, are located adjacent the upper end of the cylinder, and adjacent the upper end of the stroke of the piston. Attached to the cylinder is a crank casing 4, which may be of any desired inclosed construction. Located within the crank casing, is a crank shaft 5, to which the connecting rod 6 is connected.

The connecting rod 6 at its upper end, is pivoted at 7 to a piston head 8. Within the cylinder casing is a cylinder valve 9. This valve extends the full length of the stroke of the piston, and is bored so as to receive the piston head. The piston head is of the usual construction, and has a sliding fit with the inner bore of the cylinder valve. This cylinder valve is held against endwise movement by a flange 10, which is housed between the casing 1 and the crank casing 4, as clearly shown in Fig. 1. Each end of the cylinder valve is open and the upper end is closed by the cylinder casing proper. The lower end of the cylinder valve communicates with the crank casing. The cylinder valve is provided with a transverse slot 11 adjacent its upper end, which slot is approximately one-eighth of the circumference of the valve, although it is obvious that the length of this slot may be varied to suit the desired conditions.

The cylinder valve is rotated as will be hereinafter more fully described. During the rotation of the valve, the slot 11 in the valve will be brought first into register with the intake port 2, which allows a charge to be taken into the cylinder, and upon the continued rotation of the cylinder valve, said slot will be brought into register with the exhaust port 3, to allow a discharge of the burnt gases, and also to let out the air used to scavenge the cylinder.

The cylinder valve is provided with a second slot 12 which is adapted to register with an auxiliary exhaust port 13 formed in the cylinder casing. This slot 12 and the auxiliary exhaust port, are located just above the extreme inner stroke of the piston head, and said slot will be brought into register with the auxiliary exhaust port at the proper time, to relieve the expanding gases in the cylinder. In order to scavenge the cylinder, the valve is provided with a slot 14, which is brought into register as the valve turns with a port 15 leading to the crank casing. The valve is also formed with a slot 16, which at times registers with the intake port 17 formed in the cylinder casing, and allows air to

be drawn into the crank casing. The air drawn into the crank casing will be compressed by the inward movement of the piston, and forced through the port 15 and slot 14, into the cylinder in advance of the piston head. A deflecting ledge 18 may be provided on the piston head for deflecting the air as it enters the cylinder to cause a more complete scavenging of the cylinder.

The spark plug 19 as herein illustrated, is inserted in the side of the casing forming the cylinder. A pocket 19[a] is formed in the casing at the inner end of the spark plug and said pocket is located at a short distance below the upper end of the cylinder valve, so that said pocket is normally closed by the valve, and it is only when the valve is rotated so as to bring the slot 11 into register with the pocket 19[a], that the spark plug is brought into contact with the gases in the cylinder. At other times, the spark plug is housed behind the cylinder valve. This prevents the cold air or gas passing through the cylinder during the scavenging of the same, from coming in contact with the insulation of the spark plug and causing a cracking of the same. Furthermore, the housing of the spark plug prevents oil from getting thereon, and forming carbon which, is liable to short-circuit the spark plug. Then again, the spark plug is protected from the lubricating oil. It will be obvious however, that from certain aspects of the invention, the spark plug may be placed in the end of the cylinder as is common in this type of engine.

In Fig. 5, I have shown a train of mechanism for operating a helical spur gear 20, which is adapted to engage a helical spur gear 21 formed in the flange 10 of the cylinder valve. The spur gear 20 is secured to a short shaft 22 carrying a spiral gear 23 which meshes with a spiral gear 24 on the crank shaft 5.

In Fig. 6 of the drawings, I have shown the gears on the flanges of the cylinder valves as intermeshing, so that one cylinder valve will turn the cylinder valve in the next adjacent cylinder. The helical spur gear 20 may be made of half the circumference of the helical spur gear on the end of the cylinder valve, and thus said valves will be rotated once for every two rotations of the crank shaft.

From the above construction it will be apparent that I have provided a single cylinder valve, which during its rotation, controls the intake and the main exhaust port, the auxiliary exhaust port for giving an initial release to the expanding gases, the air intake for the crank casing, the air port for allowing the compressed gases in the crank casing to pass through the cylinder to scavenge the same, and also to control the spark plug, whereby the same is covered except at times when it is desired to fire the compressed gases. The burnt gases have an initial escape when the piston is nearly at the bottom of the power stroke, and when the piston moves still farther down or inward, the port 15 on the opposite side of the valve will be uncovered and a charge of air from the crank casing forced into the cylinder, and deflected to the top of the cylinder by the deflector plate 18 on the outer face of the head of the piston. This release of the burnt gases and the introduction of the air, is practically the same as in the ordinary two-cycle engine. My engine however, is designed as a four-cycle engine, and the purpose of the auxiliary exhaust port is to give an initial release to the expanding gases, thereby reducing the noise incident to the exhaust through the main exhaust port, and to further aid in scavenging the cylinder.

It will be understood that the valve rotates continuously all the time the motor is running and by the time the piston has finished its inward stroke, the main exhaust port is opened, and as the piston rises, said exhaust port continues to uncover until a full opening is accomplished, and then begins to close, so that when the piston reaches the outer end of its stroke, the intake valve begins to open to allow the cylinder to be filled with the gas from the carbureter.

When the piston reaches the inner end of the suction stroke, the ports in the bottom of the cylinder valve are closed and the suction stroke is completed with the same effect as if the cylinder had no ports at the bottom. Then, as the piston rises again on the compression stroke, the intake port is closed, and the gases are compressed ready for igniting on the power stroke of the piston. On the compression stroke of the piston, the cylinder valve uncovers the air port 17, and allows air to be drawn into the crank casing at atmospheric pressure. This registering of the port 16 in the cylinder valve with the air port 17, is of course, so timed as to occur when the piston is at the upper end of the cylinder completing its pressure stroke. This air in the crank casing on the power stroke of the piston, will be compressed and as the cylindrical valve rotates, the port will be closed and the air held under compression ready for admission through the port 15 to scavenge and cool the cylinder. Inasmuch as the cylindrical valve rotates once for every two rotations of the crank, air is admitted to the crank casing at each alternate revolution of the crank shaft. If the scavenging of the cylinder is not desired, ports 16, 17, and 14, and 15 may be omitted in the valve and cylinder casing.

It will be noted that minor changes in the details of construction, and the arrangement of parts may be made, without departing

from the spirit of the invention as set forth in the appended claims.

Having thus particularly described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. An internal combustion engine including in combination, a cylinder casing, a crank casing connected thereto, said crank casing being inclosed whereby air may be compressed by the inward movement of the piston, said cylinder casing having an inlet port and an exhaust port adjacent its outer end, a cylinder valve fitting in said casing and having a single slot adapted to register first with one port and then the other, a piston head reciprocating in said cylinder valve, a crank shaft, a connecting rod connecting the crank shaft to the piston head, means operated by the crank shaft for rotating the cylinder valve, an intake port in the cylinder valve adjacent the extreme inner end of the stroke of the piston head, and an air port connecting said intake port with the crank casing, whereby air compressed in the crank casing may be admitted to the cylinder.

2. An internal combustion engine including in combination, a cylinder casing, having an inlet port and an exhaust port, a cylinder valve fitting said casing and having a slot adapted to be brought into register with first one port and then the other, a piston head sliding in said cylinder valve, a crank shaft connected with the piston head, means operated by the crank shaft for rotating the cylinder valve, an auxiliary exhaust port near the inner end of the stroke of the piston, said cylinder valve having a slot adapted to register with said auxiliary port, a crank casing connected to the cylinder casing, said crank casing being inclosed, an air intake port for the crank casing controlled by the rotation of the cylinder valve, an air port connecting the crank casing to the cylinder at a point adjacent the extreme inner stroke of the piston head, said air port being controlled by the cylinder valve.

In testimony whereof I affix my signature, in presence of two witnesses.

CHARLES C. KEYSER.

Witnesses:
LEE DANIELL,
F. H. SHEPARD.