C. V. HERBERT.

INTERNAL COMBUSTION ENGINE.

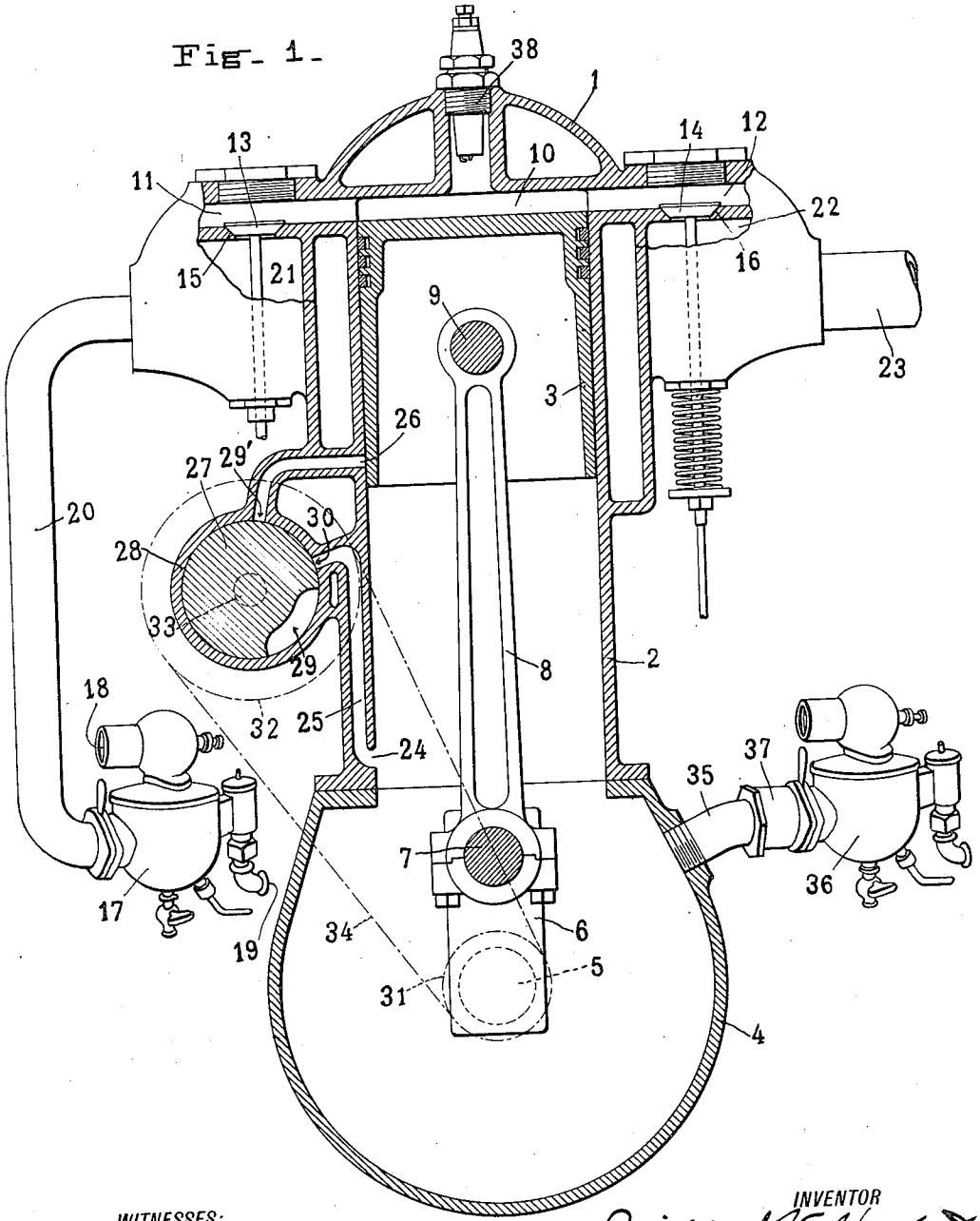
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1,219,458.

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2 SHEETS—SHEET 1.

Fig. 1.



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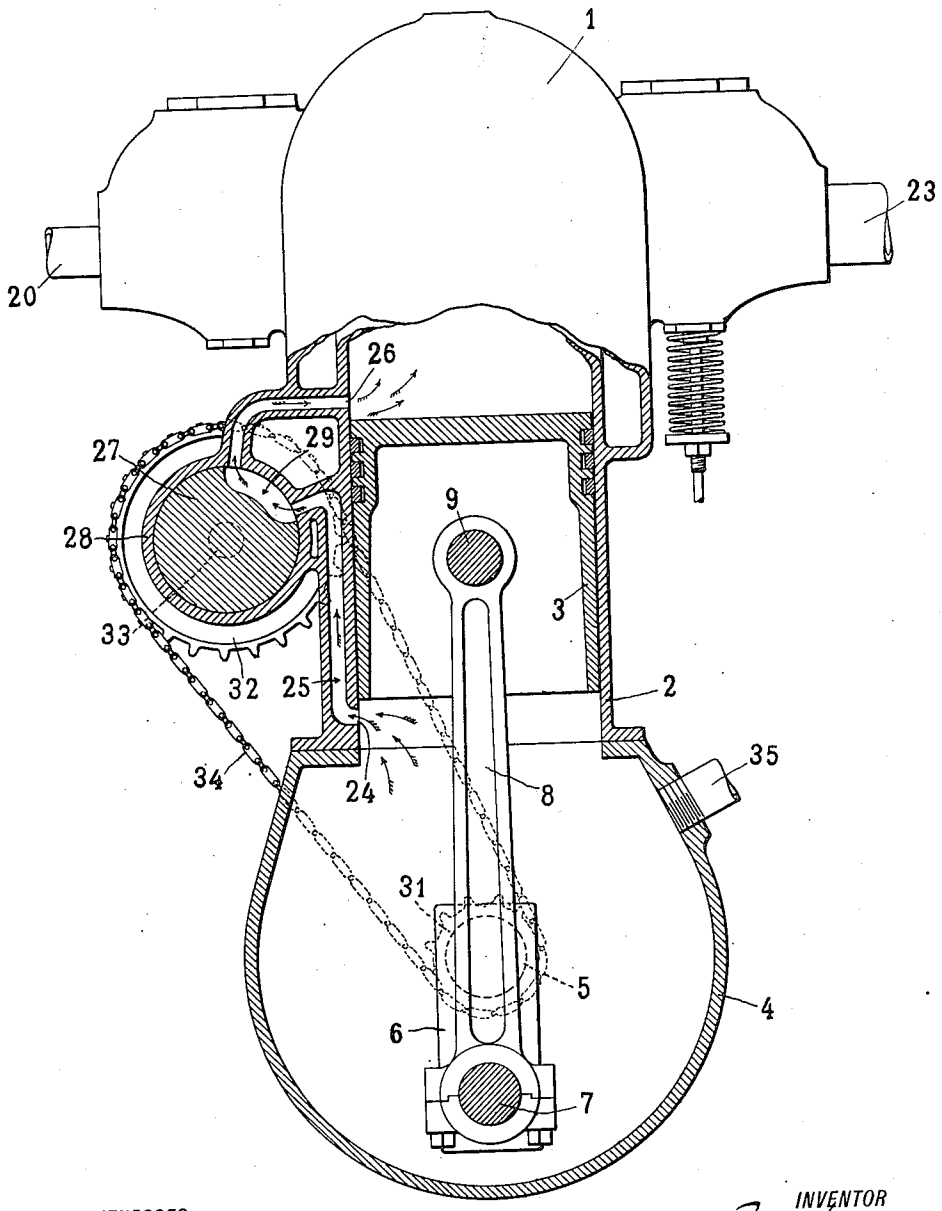
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2 SHEETS—SHEET 2.

Fig. 2.



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CLIFFORD V. HERBERT, OF NEW YORK, N. Y.

INTERNAL-COMBUSTION ENGINE.

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To all whom it may concern:

Be it known that I, CLIFFORD V. HERBERT, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines, and one of the objects thereof is to provide an engine of this type of increased efficiency. Another object is to provide in an internal combustion engine, means whereby a greater amount of explosive mixture will be discharged into the cylinder before each explosion than it has been possible to discharge therein in engines of this type as hitherto constructed. Another object is to provide means whereby the piston of an internal combustion engine on strokes other than its compression strokes, will operate to compress an explosive mixture which will thereafter be discharged into the explosion chamber before a compression stroke of the piston.

Another object is to provide improved means for discharging an explosive mixture under pressure into the explosive chamber of an internal combustion engine prior to the compression stroke of the piston.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangements of parts, which will be pointed out hereinafter, and the scope of the protection contemplated will be indicated in the appended claims.

In the accompanying drawings wherein I have illustrated an improved form of embodiment of invention,

Figure 1 is a vertical sectional view taken through the engine, certain of the parts being shown in elevation, and

Fig. 2 is a view similar to Fig. 1 showing certain parts in a different position.

Similar reference characters refer to similar parts in both figures of the drawings.

Referring now to these drawings wherein I have illustrated a single cylinder of a four cycle engine, the numeral 1 indicates generally a casing, having the usual water jacketing, wherein is provided the cylinder 2 and the piston 3. The lower portion of the casing comprises a closed crank casing 4, and journaled in the side walls of this casing, in suitable journal bearings (not shown) is crank shaft 5. The crank 6 is mounted upon the shaft 5 and is provided with a crank pin 7 upon which is journaled one end of the piston rod 8; the opposite end of which is journaled upon the pin 9 extending transversely of the piston 3. The explosive chamber 10 of the cylinder 2, it will be noted, is separated from the closed crank casing 4 by the piston 3.

The numerals 11 and 12 indicate respectively gas intake and exhaust ports which are controlled by the puppet valves 13 and 14 respectively, which rest upon suitable seats 15 and 16, as is usual in gas engine construction, the means for operating these valves being omitted since it forms no part of my present invention.

Numeral 17 denotes a common form of carbureter which receives air and the liquid fuel through the ports 18 and 19 respectively, and 20 denotes a pipe carrying the carbureted mixture into the intake valve chamber 21; whence the mixture passes through the port 11 into the explosive chamber 10. The exhaust passes out through the port 12 and into the exhaust valve chamber 22 and is discharged through the exhaust pipe 23. As is usual in four cycle engines, the valves 13 and 14 operate in alternation, each operating at every fourth stroke of the piston 3.

Leading from a point 24 near the lower end of the cylinder 2, which point 24 is just below the lowest point reached by the piston 3, is a by-pass 25, said by-pass again entering the cylinder 2 at the point 26 just above the lowest point reached by the upper end of the piston 3 at the end of its downward stroke. This by-pass is controlled by a rotary valve 27 mounted in a casing 28, said valve having a cut-a-way portion 29 of sufficient width to include the ports 29′ and 30 of the by-pass 25. It will be noted that when the cut-a-way portion 29 of the valve 27 does not include both of the parts 29′ and 30 of the by-pass 25, the latter is closed.

The rotary motion of the valve 27 is imparted, in the present instance, from the crank shaft 5, the driving connection including a sprocket 31 mounted upon the crank shaft, a sprocket 32 on the shaft 33 of the valve 27, and a chain 34, which is carried upon said sprockets. The sprocket 32 is intended to have a circumference double that

of the sprocket 31 so that the valve 27 will rotate at one-half the angular velocity of that of the crank shaft 5.

Leading into the crank casing 4 is a pipe 35 which is adapted to conduct a carbureted mixture into said casing, from the carbureter 36, similar to that shown at 17 and interposed between the pipe 35 and the carbureter 36, is a check valve 37 which opens inward toward the crank casing, which valve is adapted to automatically close under back pressure, as will be readily understood. The details of construction of this check valve are not shown therein.

It will be noted that the piston 3 closes the by-pass 25 at the point 26, at all times save when it reaches its lowermost point.

Having thus described this illustrative embodiment of my invention, the operation thereof may now be understood.

It will be noted that the piston 3, when operated, will, through suction, cause an explosive mixture to be drawn into both the explosive chamber 10 and the crank casing 4, the check valve 37 preventing any escape of the explosive mixture from the crank casing 4, and the valve 13 operating to prevent the escape of explosive mixture in the explosion chamber 10.

Assuming the parts to be in the position shown in Fig. 1 with the piston 3 at its uppermost position on the up-stroke following an explosion, the operation is as follows:—

Upon the downward stroke of the piston 3, the valve 13 will be opened permitting the piston to draw a carbureted mixture into the explosion chamber 10, and the descent of the piston will also operate to compress the carbureted mixture in the crank casing 4. The valve 27, as will be noted in Fig. 1, is in a position whereby the by-pass 25 is closed. When the piston reaches the limit of its downward movement, as shown in Fig. 2, the valve 27 will have moved to the position shown in this last mentioned figure, whereby the by-pass 25 will be open, allowing the compressed carbureted mixture in the closed crank casing 4 to pass into the explosion chamber 10, the piston having opened the by-pass at the point 26, such carbureted mixture being added to the carbureted mixture which has previously been drawn in said explosive chamber by the descent of the piston. Thus there will be added to the mixture in the explosion chamber 10 such quantity of the mixture in the crank casing 4 as will be sufficient to equalize the pressures in these two chambers. During the upward stroke of the piston 3, the carbureted mixture in the explosive chamber 10 is further compressed, the valve 27 having been moved to close the by-pass 25. The upward stroke of the piston also reduces the pressure of the mixture in the crank casing 4 below atmospheric pressure, whereby a further quantity of carbureted mixture will be drawn into the closed crank casing 4. The sparking device 38 is now operated, producing the explosion whereby the piston is forced downward, and upon the next upward stroke of the piston the products of combustion are forced through the exhaust port 12. The parts will then be in position as shown in Fig. 1. These cycles of operation will then be repeated so that upon every second downward stroke of the piston there will be added to the carbureted mixture in the explosion chamber 10 a portion of the compressed carbureted mixture in the crank casing 4, resulting in the presence of explosive mixture under pressure in the explosion chamber 10 before the initial movement of the compression stroke of the piston.

It is intended in practice to introduce lubricating oil with the carbureted mixture in the crank casing. This will be accomplished by adding the lubricant to the liquid fuel before it is introduced into the carbureter 36.

It will accordingly be seen that in the present construction, there will be a greater quantity of carbureted mixture in the explosion chamber 10 than it has been possible to discharge thereinto in engines of this type as hitherto constructed, thereby increasing the operative efficiency of the engine for a given size cylinder, and it follows that the horse-power of the engine will be correspondingly increased without increasing the size of the engine.

While the ports 11 and 26 are each shown and described as being adapted for the passage of a carbureted mixture into the compression chamber, it, however, is evident that one of these ports may be used for injecting only a quantity of pure air, if desired. In this instance, the gaseous mixture injected through the other port would preferably be of a relatively higher value so as to properly proportion the value of the combined mixture in the combustion chamber.

Wherever, therefore, in this description and claims, the term "fuel port" is employed, it is intended to mean a port of entrance for either one or both of the main constituents which go to make up a proper mixture for the combustion chamber.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described

and all statements of the scope of the invention, which as a matter of language, might be said to fall therebetween.

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

1. In an internal combustion engine the combination with a cylinder, a piston movable in said cylinder, a crank shaft, a combustion chamber at one side of said piston, a compression chamber at the other side of said piston, a valve controlled fuel supply port at all times communicating with said combustion chamber, and a fuel supply passage extending from said compression chamber to said combustion chamber closed by said piston except when said piston is in one extreme of its movement, of means interposed in the length of said fuel supply passage for preventing passage of fuel therethrough into said combustion chamber upon some of the movements of said piston into its mentioned extreme position comprising a cylindrical casing having a pair of openings therethrough spaced apart one communicating directly with said combustion chamber and the other communicating directly with said compression chamber, a constantly rotating member within said casing having a wall surface closing the mentioned openings through said casing during a portion of the rotation of said member, and having a part of the wall surface thereof cut away to establish communication between the openings in the walls of said casing during another portion of the rotation of said member, and means for rotating said member.

2. An internal combustion engine, comprising a cylinder having a combustion chamber therein, and having an inlet port opening through the wall of the combustion chamber, a piston movable in said cylinder to draw a quantity of fuel into the combustion chamber through said inlet port by the outward movement of the piston, a compression chamber at the outer side of said piston, within which a second quantity of fuel will be compressed by said outward movement of the piston, a second inlet port opening through the wall of the combustion chamber, means forming a passage between said compression chamber and said second inlet port, said second inlet port opening into said combustion chamber in such a position as to be kept covered by the piston except when the piston is in its outermost position, and means whereby said passage is maintained closed at all times except upon alternate movements of the piston into said outermost position.

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

CLIFFORD V. HERBERT.

Witnesses:
NATHALIE THOMPSON,
HELEN HENRY.