Aug. 17, 1926. 1,596,069

F. C. SKILES

INTERNAL COMBUSTION MOTOR

Filed March 19, 1921 2 Sheets-Sheet 1

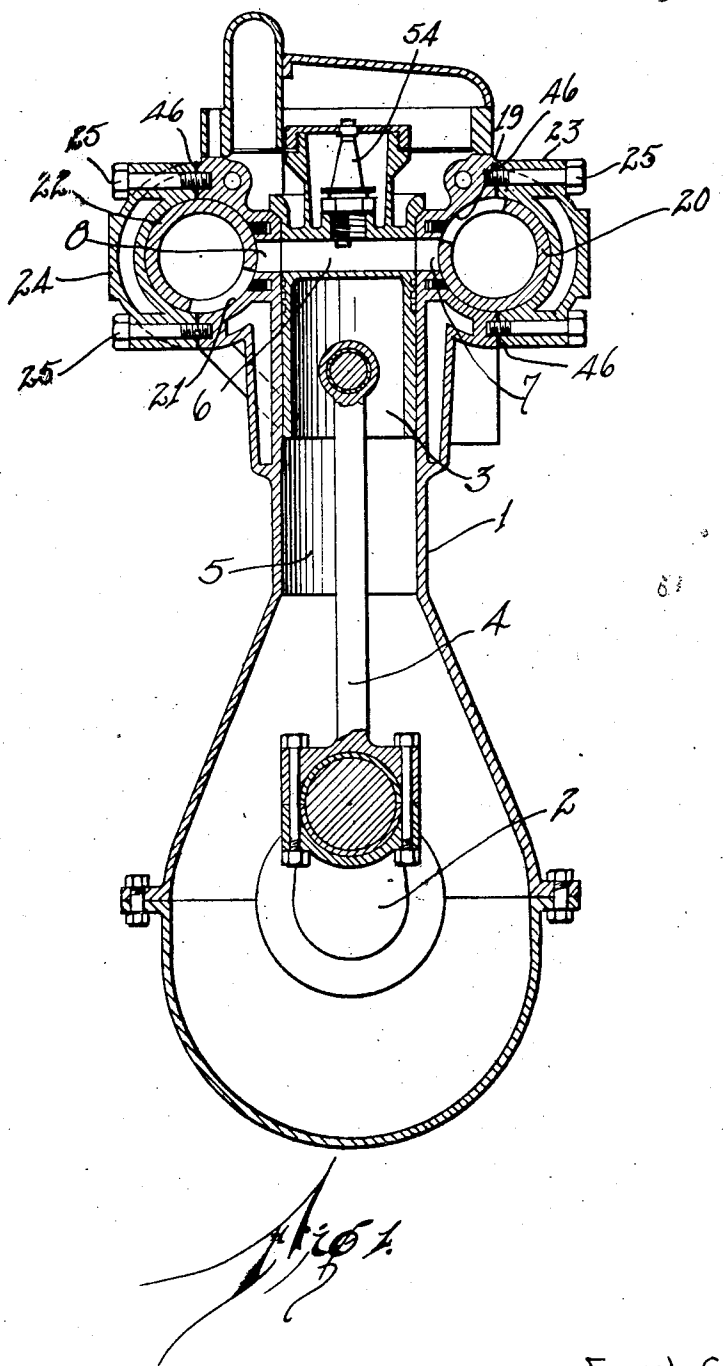

Fig. 1.

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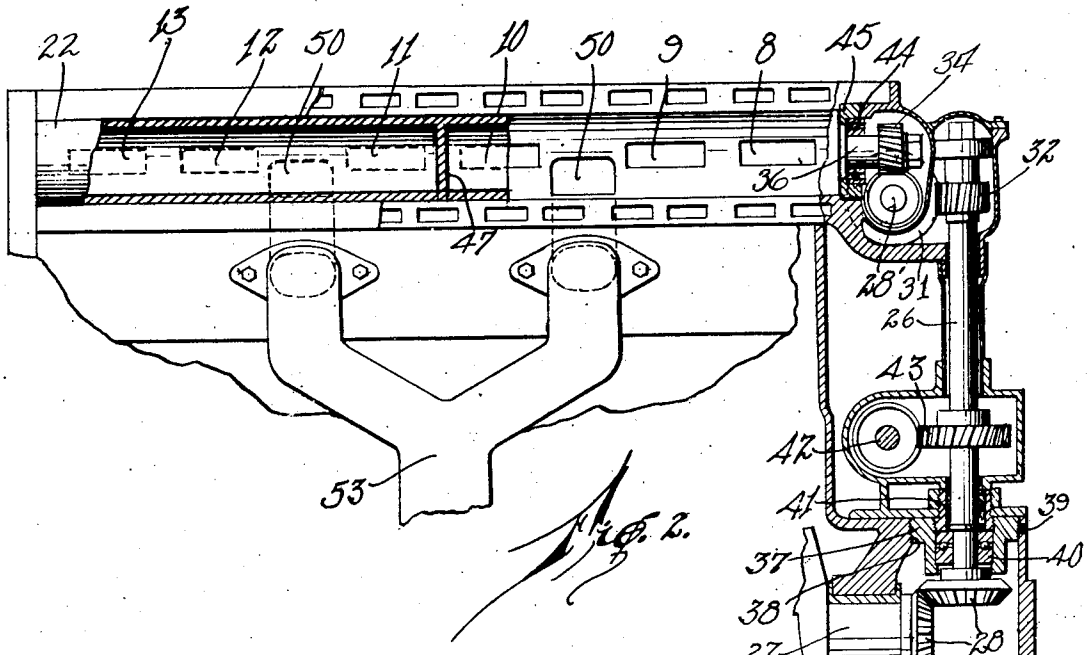

Fig. 2.

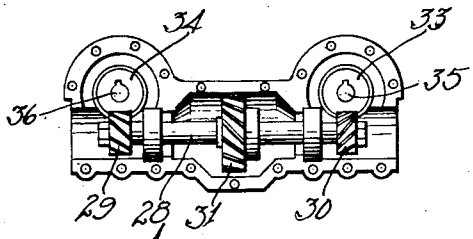

Fig. 3.

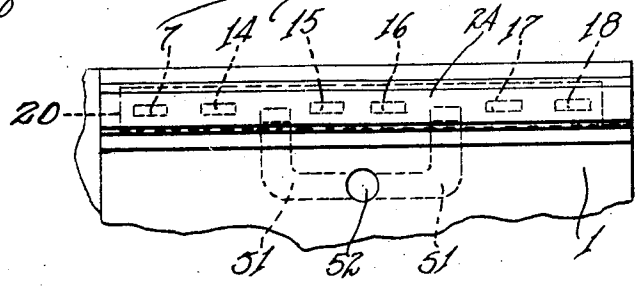

Fig. 4.

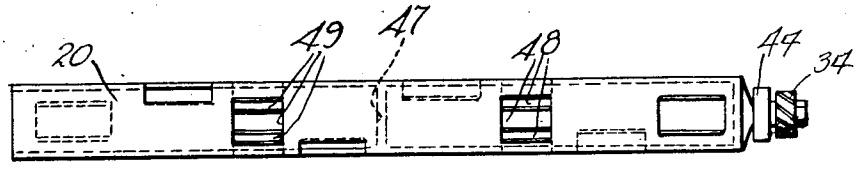

Fig. 5.

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Patented Aug. 17, 1926. 1,596,069

UNITED STATES PATENT OFFICE.

FRANK C. SKILES, OF CHICAGO, ILLINOIS.

INTERNAL-COMBUSTION MOTOR.

Application filed March 19, 1921. Serial No. 453,633.

My invention relates to improvements in internal combustion engines, and it consists in the combinations, constructions, and arrangements herein described and claimed.

An object of my invention is to provide an internal combustion engine which makes use of a single rotary intake valve for all of the cylinders, and which makes use of a rotary exhaust valve for all of the cylinders, these valves having a partition therein which assures a uniform feed and exhaust to the cylinders.

A further object of my invention is to provide a device of the type described which has a novel gear mechanism for operating the valves.

A further object of my invention is to provide a device of the type described which is relatively simple in construction, durable, and efficient for the purpose intended.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claim.

My invention is illustrated in the accompanying drawings forming part of this application, in which—

Figure 1 is a transverse section through the motor,

Figure 2 is a side elevation of the device, portions thereof being shown in section,

Figure 3 is a detail view of a portion of the valve gear mechanism,

Figure 4 is a diagrammatic view of the intake side of the engine, and

Figure 5 is a side elevation of one of the valves.

In carrying out my invention I provide an engine which consists of an engine block 1, a crank shaft 2, pistons 3, and connecting rods 4. In the drawings I have shown the engine as comprising six cylinders. The cylinders 5 have a head 6 from which an intake passageway 7 and an exhaust passageway 8 lead. In Figure 2 I have shown the six exhaust ports 8 to 13 inclusive, and in Figure 4 I have shown six intake ports, 7, and 14 to 18 inclusive.

The engine block is provided with a semi-cylindrical valve seat 19 which is adapted to receive the intake valve 20. In like manner, the block 1 is provided with a semi-cylindrical valve seat 21 that is adapted to receive the exhaust valve 22. Caps 23 and 24 cover the exposed portions of the valves 20 and 22 respectively. The caps are secured to the engine block by any means, such as by bolts 25.

The mechanism for connecting the valves with the crank shaft is clearly shown in Figures 2 and 3. A vertical shaft 26 is connected to a crank shaft 27 by miter gears 28′, the gears giving a one to one ratio between the shaft 26 and the crank shaft 27. A horizontal stub shaft 28 is provided with helical gears 29 and 30, and with a large helical gear 31 that is in mesh with a helical gear 32 on the shaft 26. The gears 31 and 32 are of such size as to cause the shaft 28 to rotate through one revolution during each two revolutions of the shaft 26. The valves 20 and 22 are provided with helical gears 33 and 34 that are mounted upon integral pins 35 and 36 that are carried by valves. The ratio between the gears 29 and 34 and 30 and 33 is one to one.

The construction of the gearing mechanism permits the valves to be moved longitudinally and permits the shaft 26 to be moved vertically when necessary to take up wear. It will be noted that the shaft 26 is mounted in a housing. The shaft is carried by a bushing 37 that is threaded into a bore 38 to the desired distance, so as to cause the miter gears 28 to mesh. A set screw 39 locks the bushing in place. The bushing carries a duplex ball bearing 40. A stuffing box 41 is provided above the ball bearing 40. It will be noted that the shaft 26 is also connected to a stub shaft 42 by means of helical gears 43. The shaft 42 operates a water pump and magneto (not shown).

A radial thrust bearing 44 is mounted on each of the pins 35 and 36, and bears against a collar 45. The collars 45 limit the movement of the valves 20 and 22 toward the front of the engine. Shims 46 are disposed between the caps 23 and 24 and the edge of the block 1 so as to provide a novel means for taking up wear. The shims are very thin, and when any wear is desired to be taken up, one or more shims are removed, whereupon the cap will fit more closely to the valve.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. Each of the valves 20 and 22 is provided with six openings, these openings registering with the intake and exhaust ports of the cylin-

ders at the required moments. The rotary valve port openings are made of areas large enough to insure efficient operation. The exhaust ports are larger than the intake ports. The exhaust ports may be made as wide as 87 degrees, and a port connection between one of the exhaust ports of the valve and the exhaust port of the engine may persist over 200 degrees of the crank shaft motion. The firing order of the cylinders, counting from front to rear, and representing the first by the number 1, the second by the number 2, etc., is as follows: 1, 5, 3, 6, 2, 4. The openings in the valves and the port openings in the cylinders are arranged so as to have the communications between the valves and the cylinders overlap. For example, the intake cylinder 1 closes just after the intake of the cylinder 5 opens. The ports in the cylinders are as large as the diameters of the cylinders will permit. The openings in the valves are the same length, but the openings in the valves extend through a greater number of degrees than do the openings in the cylinder block. The communication between the valve and the cylinder is "full open" during the greater part of the movement between the opened and closed position. This permits a great volume of gas to pass into the cylinder in a relatively short time. Furthermore, it provide a very quick shut off at the proper moment. The engine is constructed so as to have a long gas intake for each cylinder, the intake being open from a point when the piston is at the top of its stroke to a point when the piston is just past the bottom of its stroke or low dead center. The exhaust ports are open from the time the piston is at a point just before bottom dead center to a point when the piston is at the top of the stroke. The cranks are disposed 120 degrees apart, and the ports in the valves are disposed 60 degrees apart, since the valves rotate at one-half the speed of the crank shaft.

The partitions 47 are disposed in the centers of the valves, and divide the valves into two compartments, three of the ports communicating with one of the compartments, and three of the ports communicating with the other compartment. In addition to the six ports, each valve is provided with a plurality of openings 48 that are disposed on one side of the partition 47, and a plurality of openings 49 that are disposed on the other side of the partition 47. The openings ars such as to always place the two compartments of the valve in communication with the exhaust passageways 50 (see Figure 2), or with the intake passageways 51 (see Figure 4). Both the valves 20 and 22 are identical, with the exception that the ports in the valve 22 are slightly larger than the ports of the valve 20, and that the valve 22 is an exhaust valve. It will be noted that the intake passageways are cast in the engine block 1 and branch from an opening 52. This construction warms the gas as it passes into the intake valve. The carburetor, (not shown) is placed in communication with the opening 52.

When the engine is started, the crank shaft 27 rotates the valves 20 and 22 toward each other by means of the shaft 26. The ports in the intake valve register with the intake ports of the engine at the right time, the ports of the intake valve being large enough to permit the intake ports of the engine to remain "full open" the greater part of the time the ports are open. In like manner, the ports in the exhaust valve remain "full open" and readily permit the exhaust gas to flow from the cylinders into the passageways 50 and exhaust pipe 53.

Assume that the piston in the cylinder 1 is on its intake stroke. The gas from the carburetor, (not shown) will flow through the branch of the intake passageway 51 that communicates with the compartment in the intake valve 20 that is in communication with the cylinder 1. As heretofore stated, the intake port 7 in the cylinder 1 is "full open" for the greater part of its intake stroke, so as to permit all of the gas that is needed to pass from the valve into the cylinder. Just before the port in communication with the port 7 passes out of alignment with the port 7, the port in the other compartment of the intake valve which communicates with the port 17 of the cylinder 5 will be in alignment with the port 17. If it were not for the partition 47, all of the gas in the entire valve would tend to pass into the cylinder 5, as soon as there is communication between the cylinder 5 and the valve. It might also happen that the suction in the cylinder 5 would be sufficient to draw a portion of the gas from the cylinder that had already entered from the cylinder 1 before the valve closed communication to the cylinder 1. The partition prevents this. The gas flowing from the front part of the valve to the cylinder 5 would have to go through the passageway 51 before it could pass into the cylinder. This passageway is relatively long, and the port to the cylinder 1 would be closed before the gas would have time to take this course. In like manner, the exhaust side of the engine is provided with an exhaust valve, and has a partition therein (see Figure 2). This partition prevents the gases entering the valve at one end thereof and the gases entering the valve at the other end thereof from striking each other at the place now occupied by the partition 47. The partition causes the gases to flow through the passageways 50. The uniform flow of gas into the cylinders and

out of the cylinders is assured from the provision of the partitions 47 in both valves.

The engine is provided with standard spark plugs 54, and with an ignition circuit, (not shown). The engine is also provided with a water jacket and with an oiling system. Since the novel type of valve and valve actuating mechanism forms the subject of this application, it is not necessary to describe or show the specific water cooling means and oiling means.

It will be noted from Figure 2 that the valves 20 and 22 and the shaft 26 may be moved so as to take up wear. In case wear occurs between the gears 28, the bushing 37 is rotated so as to lower the shaft 26 to the desired position, where it is again locked in place by means of the set screw 39. It will be noted that a downward movement of the shaft 26 will not interfere with the timing mechanism, since this downward movement merely moves the gear 32 with respect to the gear 31, but not a sufficient distance to cause the gear 32 to be moved out of engagement with the gear 31. The wear between the gears 28 is very slight and therefore a very slight downward movement of the shaft 26 is sufficient to take up this wear.

The valves 20 and 22 are so connected to the shaft 28 as to cause the valves to tend to move toward the gears 34 when they are rotated. The collars 45 receive the entire thrust of the valves and the valves will always bear against the collars even though they become slightly worn. When the valves are slightly worn they will cause the gears 33 and 34 to move slightly with respect to the gears 30 and 29. This however will not interfere with the timing mechanism of the engine.

In Figure 2 I have also shown how the moving parts between the valves and the crank shaft 27 are entirely enclosed by a housing. When the engine is in operation, the oil is fed to the valves by a force feed oil system (not shown) and the oil will flow from the valves through the bearings 44, the gears 33 to 36 inclusive, then the gears 31 and 32, down along the shaft 26, through the bearing 40, and then to gears 28. In this way all of the moving parts are kept bathed in oil.

I claim:—

In an internal combustion engine, a valve casing adapted to receive a cylindrical valve, a helical gear carried by said valve, a driving shaft extending at right angles to the longitudinal axis of said valve and said gear, a helical gear carried by said driving shaft and being in mesh with said first named gear, the teeth in said gears being inclined so as to cause said valve to move toward said driving shaft, and a thrust bearing adapted to bear against the end of said valve, said valve being adapted to move toward said thrust bearing as the end of said valve is worn, whereby the wear upon said valve is automatically taken up during the operation of the device.

In witness whereof I have hereunto signed my name this 14th day of March, 1921.

FRANK C. SKILES.