March 27, 1928. 1,664,056

J. ASTROM

INTERNAL COMBUSTION ENGINE

Filed March 23, 1923

Fig. 1.

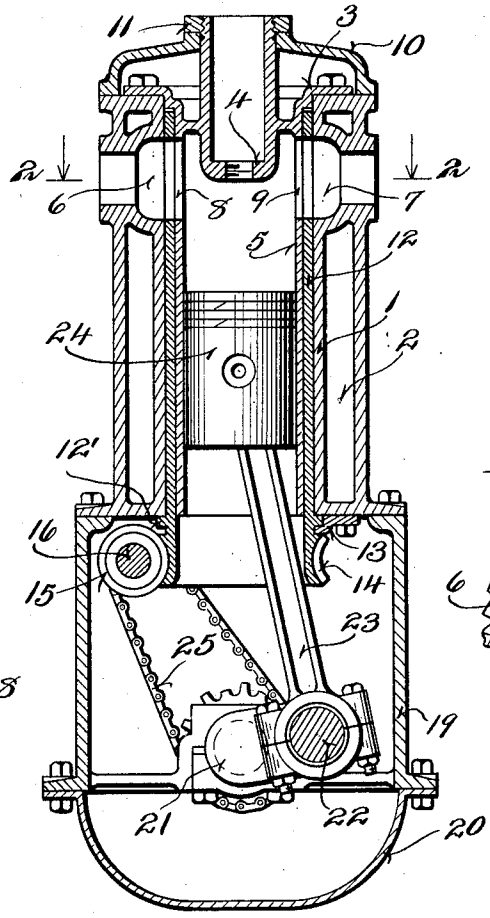


Fig. 3.

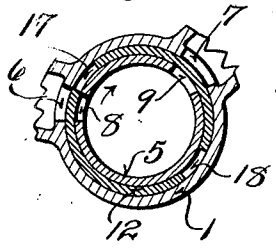


Fig. 4.

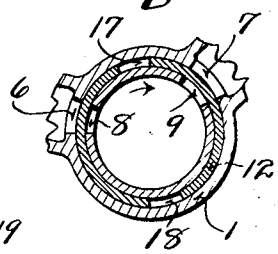


Fig. 2.

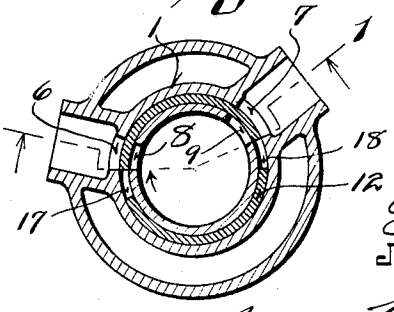
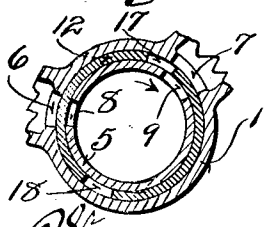


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN ASTROM, OF FORT WAYNE, INDIANA.

INTERNAL-COMBUSTION ENGINE.

Application filed March 23, 1923. Serial No. 627,052.

This invention relates to internal combustion engines and is particularly directed to an internal combustion engine of the type disclosed in my co-pending application for internal combustion engines, filed March 23, 1923, Serial Number 627,051.

Objects of this invention are to provide an internal combustion engine in which there are neither reciprocating valves nor reciprocating mechanism for operating such valves, to provide an engine which will not vibrate at certain critical speeds as the general types of engines do, which is free from wire drawing at the inlet and exhaust ports, and which has a positively actuated valve which quickly opens the inlet or exhaust ports.

Further objects are to provide an internal combustion engine with a rotary sleeve valve, to provide a stationary sleeve within which the piston reciprocates, and to provide a rotary sleeve valve which aids in a substantially uniform distribution of heat and which may be readily lubricated.

An embodiment of the invention is shown in the accompanying drawing, in which:

Figure 1 is a vertical sectional elevation through the engine, such figure corresponding roughly to a section on the line 1—1 of Figure 2.

Figure 2 is a sectional view on the line 2—2 of Figure 1, showing the parts in the position they occupy at the beginning of the suction stroke.

Figures 3, 4 and 5 are fragmentary views, corresponding to Figure 2, showing the relative position of the parts at the end of the suction stroke, at the completion of the compression stroke, and at the end of the explosion or working stroke, respectively.

The engine comprises a cylinder 1, suitably water-jacketed, as indicated at 2, and provided with a cylinder head 3. This cylinder head has a depressed portion 4, adapted to accommodate the spark plug, and is provided with a downwardly extending stationary sleeve 5, which is concentric with the cylinder 1 and is spaced therefrom. The cylinder is provided with an inlet port 6 and with an outlet port 7, offset from a diametrically opposed relative location, as indicated in Figure 2.

It is to be noted that the outlet port or exhaust port 7 is of slightly greater area than the inlet port 6, as may be seen from Figure 2, and that both ports consist of elongated rectangular apertures with their longer dimensions vertical.

The stationary sleeve 5 is provided with similar inlet and exhaust ports 8 and 9, respectively, which are aligned with, and correspond to, the inlet and exhaust ports of the cylinder. The upper portion of the cylinder is capped by means of a hood 10 to complete the water-jacketing of the cylinder head, such hood being held in place conveniently by means of a threaded ring 11 screwed to an extension of the cylinder head.

Between the cylinder 1 and the stationary sleeve 5, a revoluble sleeve 12 is mounted and, it will be seen from Figure 1, projects below the lower end of the cylinder and is provided with a radially projecting flange 12′. Any convenient means may be provided for retaining the sleeve in position. For instance, the bracket 13 overlapping the flange 12′ and secured to the lower end of the cylinder may be employed. The projecting portion of the sleeve is provided with worm wheel teeth 14, which mesh with a worm 15 mounted upon a transverse worm shaft 16. The rotary sleeve 12 is provided with diametrically opposed ports 17 and 18, adapted to successively align with the inlet and exhaust ports.

A crank case 19 is secured to the lower end of the cylinder and is provided with an oil pan 20 in the usual manner. A crank shaft 21 is carried in suitable bearings formed in the crank case and is provided with a crank 22 coupled by means of a pitman 23 with the piston 24, such piston being mounted for reciprocation within the stationary sleeve 5. The crank shaft and worm shaft are provided with any suitable means for transmitting rotary motion from the crank shaft to the worm shaft. For instance, the silent chain 25 may be employed and may cooperate with suitable sprocket wheels mounted upon the two shafts.

In the form shown, it is intended that the rotary sleeve 12 shall rotate once for every four revolutions of the crank shaft 21, and accordingly two ports, 17 and 18, are formed in the sleeve. It is obvious that other gear ratios may be employed with corresponding changes in the number and location of ports in the rotary sleeve.

The operation of the apparatus is as follows: The parts, in the position they oc-

cupy at the beginning of the suction stroke, are illustrated in Figure 2, and it will be seen from such figure that the inlet ports 6 and 8 are about to be opened by the aligning of the port 17 in the rotary sleeve. As the piston begins to descend, these inlet ports are opened wider and wider, and at the completion of the suction stroke the ports are closed, as indicated in Figure 3. The compression stroke begins, and as the piston ascends the port 17 in the rotary sleeve moves further from the inlet ports and finally arrives at the position illustrated in Figure 4 at the completion of the compression stroke. The charge within the cylinder is now exploded and the piston descended upon its working stroke. During this stroke, and during the major portion of the compression stroke, it will be seen that the port 17 is spaced a material distance from the inlet and exhaust ports, thereby effecting a secure sealing. As the piston nears the end of its working stroke, the port 17 approaches the exhaust ports 7 and 9, and at the completion of the working stroke occupy the position illustrated in Figure 5. It will be seen that just prior to the completion of the working stroke, that the exhaust ports are open and the discharge of gases begins. As the piston ascends, the exhaust ports are open to their full extent, and when it arrives at the upper limit of the exhaust stroke, the ports occupy the position illustrated in Figure 2, except for the fact that the ports 17 and 18 have interchanged positions.

It will be seen that the valve sleeve rotates with a uniform motion and continuously in the same direction, and that although the piston may excute a dwell, as dead-center is being passed, the valve sleeve nevertheless has its full speed, and consequently the valves are quickly opened or closed, thereby avoiding wire drawing.

It is further to be noted that any desired lubricating system may be employed and that the rotating valve sleeve will readily distribute the lubricant evenly around the cylinder walls and the outer surface of the stationary sleeve. Also, the heat distribution is improved, as the heat transmitted to the rotary sleeve is distributed in a substantially uniform manner to the cylinder walls.

Although one form of the invention has been described in considerable detail, it is to be understood that the invention may take various forms and is, therefore, to be limited only as set forth in the appended claim.

I claim:

An internal combustion engine comprising a cylinder having inlet and exhaust ports, a rotary sleeve mounted within said cylinder and having ports cooperating with said first mentioned ports to control the flow of gases, a stationary sleeve mounted within said rotary sleeve and having ports aligning with said first mentioned ports, a piston mounted for reciprocation within said stationary sleeve, a crank shaft operatively coupled with said piston, mechanism for communicating motion from said crank shaft to said sleeve, a cylinder head integral with said stationary sleeve and consisting of an outer flange bolted to the end of the cylinder and an inner web of annular formation extending inwardly from said sleeve, a small cylinder carried by said inwardly extending web and projecting downwardly below said web into said cylinder and having a bottom apertured and threaded for the reception of a spark plug, said small cylinder extending upwardly above said web and having an open upper end.

In testimony that I claim the foregoing I have hereunto set my hand at Fort Wayne, in the county of Allen, and State of Indiana.

JOHN ASTROM.