E. E. McCOLLUM.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JAN. 15, 1917.

1,305,728.

Patented June 3, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

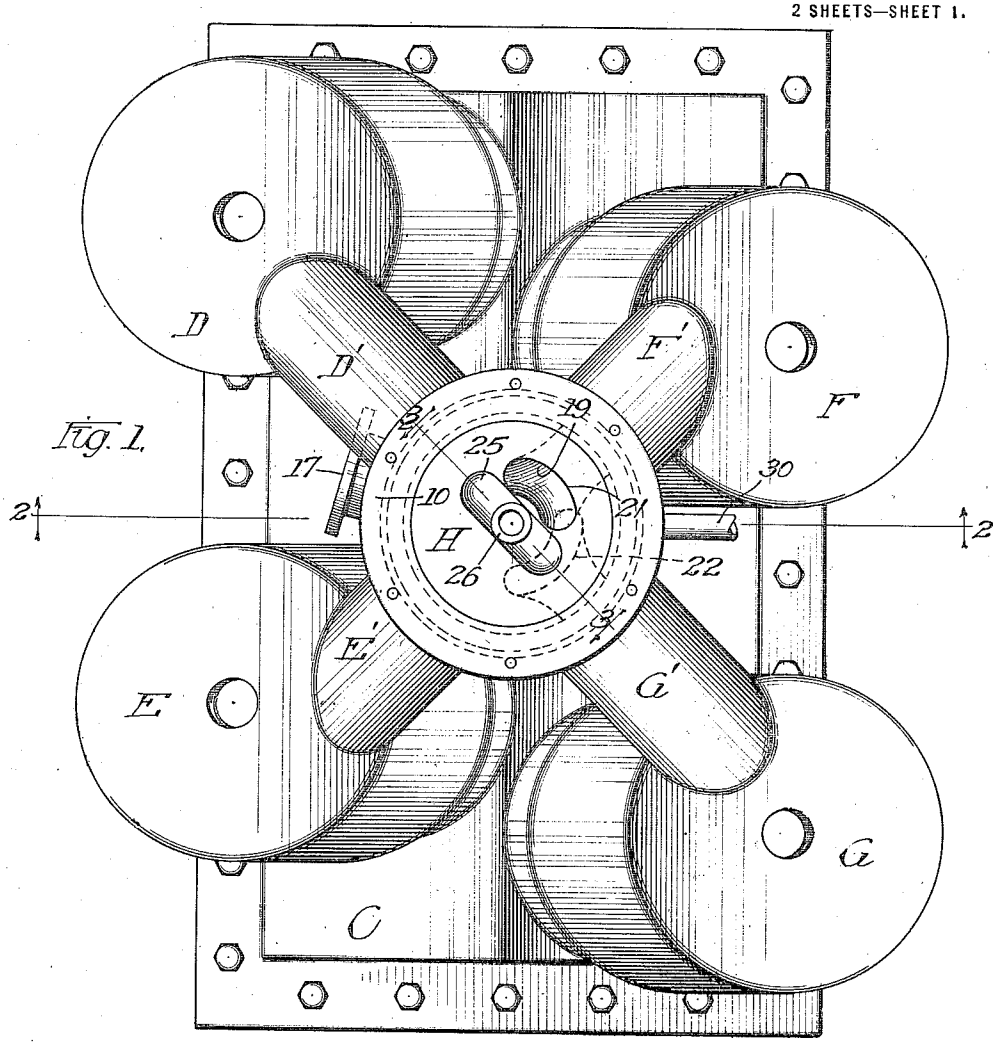
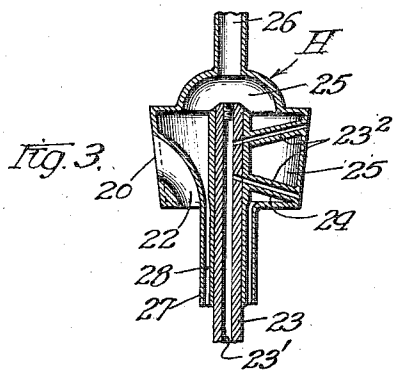


Fig. 3.



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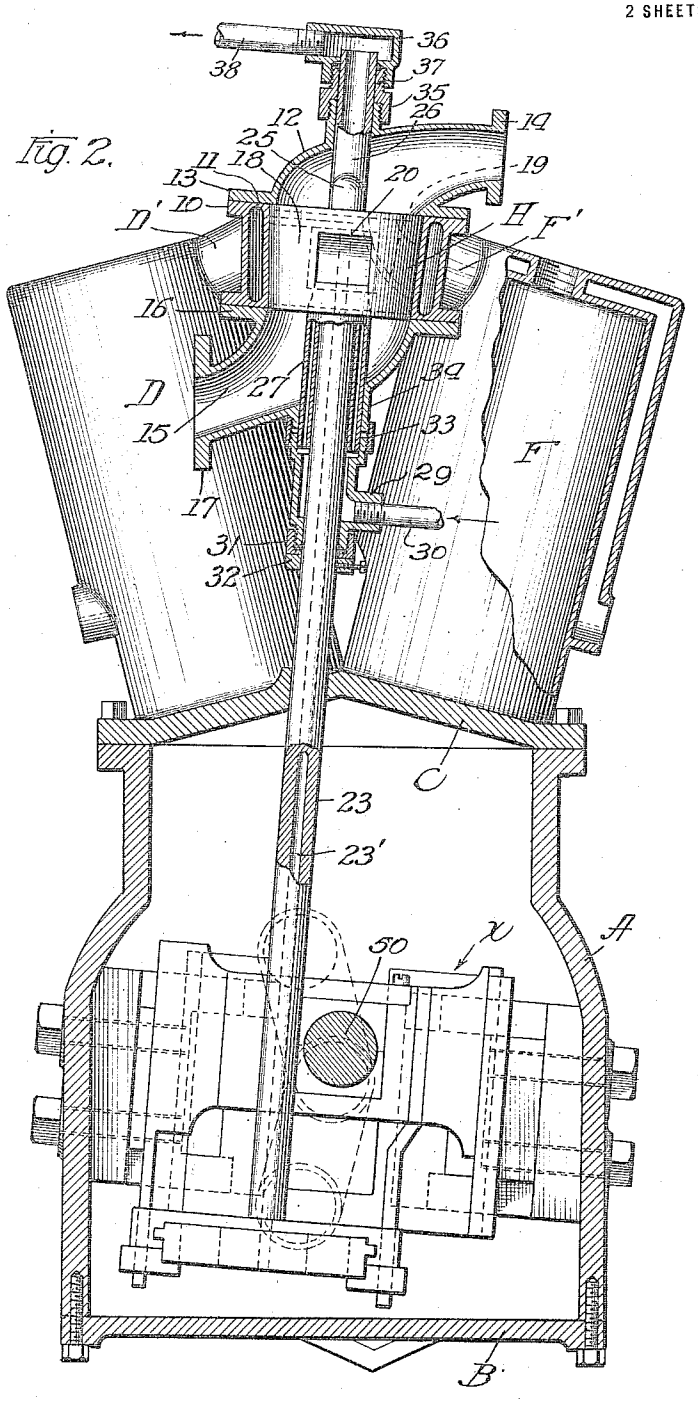
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2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

EARL E. McCOLLUM, OF DOWNERS GROVE, ILLINOIS.

INTERNAL-COMBUSTION ENGINE.

1,305,728. Specification of Letters Patent. Patented June 3, 1919.

Application filed January 15, 1917. Serial No. 142,334.

To all whom it may concern:

Be it known that I, EARL E. McCOLLUM, a citizen of the United States, residing at Downers Grove, in the county of Dupage and State of Illinois, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specificaion.

This invention relates to improvements in internal combustion engines.

One of the objects of my invention is to arrange or position the cylinders in a multi-cylinder gas engine, whereby a single rotary valve may be utilized to control both inlet and exhaust passages of all the cylinders.

Another object of my invention is to provide a rotary valve or such construction as to permit its being utilized to control both the inlet and exhaust passages for a plurality of cylinders.

A still further object of my invention is to so correlate the valves, cylinders and ports of an internal combustion engine as to insure efficient operation in an engine of simple and sturdy construction.

Still other and further objects will become apparent to those skilled in the art from a consideration of the following description and drawing, wherein:—

Figure 1 is a plan view of my improved engine and valve, with the valve cover removed.

Fig. 2 is a vertical transverse sectional view on the line 2—2 of Fig. 1, and

Fig. 3 is a vertical sectional view on the line 3—3 of Fig. 1 showing the valve detached and on a reduced scale.

In general the engine comprises a crank case A with bottom closure wall B and a top closure wall C, upon which are cast the four cylinders D, E, F and G. The cylinders are divided into two pairs D and E, extending upwardlly and outwardly at an angle from one side of a vertical plane passed through the crank shaft and F and G projecting from the other side. The included angle made within the two pairs of cylinders is approximately 30 degrees so that each cylinder is inclined 15 degrees to the vertical. The two sets are positioned in staggered relation so as to locate them all as near as possible to a central rotary valve H. By means of this peculiar location of the cylinders it is possible to bring them all into close relationship to the valve H which is so designed as to serve as inlet and exhaust controlling valves for each of the four cylinders.

The valve H is positioned approximately centrally with respect to the crank casing and is so arranged that four ducts D^1, E^1, F^1, and G^1 connect the four cylinders with the valve casing, each duct serving as both inlet and exhaust passages.

A preferred form of rotary valve is illustrated in Figs. 1, 2 and 3, with an annular casing 10 provided with a cooling water passage 11 to which suitable connection is made. The upper lid or cap of the casing comprises a dome shaped chamber 12 having an annular flange 13 for coaction with the upper flange on the annular casing 10 to which it is secured. This upper dome shaped cover 12 serves as a passage way for the exhaust gases which are taken away through the flanged head 14. The lower end of the casing is covered by a similar chambered cap 15 with annular flange 16 for attachment to the flange at the lower end of the annular valve casing. This chamber serves as an inlet duct for the combustible mixture which is taken into the casing through the flanged opening 17, to which the carbureter is attached.

The valve itself comprises a taper drum 18, having two ports 19 and 20, opening to its periphery, the one extending upwardly, as at 21, to serve as an exhaust port, and the other extending downwardly, as at 22, to serve as an inlet port. The valve H rotating within its annular casing 10, has its downwardly extending inlet port 22, at all times opening to the intake duct 15, whereas its upwardly extending exhaust port 21 at all times communicates with the upper cap or exhaust duct 12. Inlet and exhaust ports are positioned approximately 90 degrees apart around the periphery of the valve, and the valve traveling in a clockwise direction, looking at Fig. 1, obviously serves the cylinders in the following order—D, F, G and E,—or to give their numerical order from the front, 1, 2, 4 and 3.

The valve is rotated by a substantially vertically extending shaft 23, which projects upwardly through the crank case cover C, its lower end extending downwardly to its driving mechanism, and its upper end projecting through the lower wall of the intake passage, and fastened within the centrally positioned tubular hub. The shaft 23 may be hollowed as indicated at 23′ to carry oil

from the crank case to the rubbing surfaces of the valve, suitable ducts 23^2 being provided within the valve for its distribution and a pump of any suitable type may be connected to the lower end of the shaft. The valve is substantially hollow to provide a cooling water passage, its upper end having a hollow dome 25 communicating with the vertically extending axially positioned pipe 26 through which the cooling water is carried away from the valve. The lower end of the valve extends downwardly in the form of a hub 27, which is drilled out, providing a plurality of water channels 28, which communicate at their lower ends with the interior of a bored out casting 29, into which leads a cooling water carrying pipe 30. The lower end of the casting 29 is provided with a packing 31 which is held in position on the rotating shaft 23 by means of a collar 32, secured to the shaft by means of a set screw. The upper end of the casting 29 is also provided with a water tight packing 33, the packing nut of which is threaded upon the downwardly extending nipple 34 of the inlet passage 15. The upwardly extending pipe 26 projects through a nipple 35 formed on the upper wall of the exhaust passage 12, and connects at its upper end with a cap 36 with which it makes water tight connection through the medium of the packing 37. A discharge pipe 38 leads into the cap 36, carries off the cooling water from the valve and returns it to the circulating system.

Proper rotation of the valve is obtained by means of a valve driving gearing, operating upon the same principle as that illustrated and described in my copending application Serial No. 19,285 filed April 5th, 1915 and entitled "Valve gearing mechanism". In this earlier filed application, above referred to, mechanism is shown for driving a rotary valve with the movement of the valve at a rate approximately proportional to the cosine of the crank angle. By this means I am enabled to drive my rotary valve so that the ports are quickly opened and closed, the valve slowing up between the opening and closing movement, so as to permit a substantial dwell to permit the gases to have free course through the passageways.

In the present application I have indicated a valve driving mechanism inclosed within the crank case of the engine and driven from an eccentric 50 on the crank shaft. This valve driving mechanism is illustrated and described in detail in my copending application Serial No. 116,769 filed August 25th, 1916 and entitled Internal combustion engines, of which application the present is a division.

The movement of this valve driving mechanism indicated in general by the letter X, receives its movement from the eccentric 50 and rotates the valve driving shaft 23 at a variable speed, as above described.

Whereas I have illustrated and described a single embodiment of my invention it will be obvious that various changes and modifications may be made therein without departing from the spirit and scope of the following claims.

Having described my invention, what I claim is:—

1. In an internal combustion engine, the combination of a single rotary valve mounted on a substantially vertical axis and having an inlet and exhaust port therein, a plurality of cylinders, a crank casing upon which said cylinders are mounted, and a substantially vertical shaft extending from said crank casing upwardly to said valve for rotating the same, said substantially vertical shaft having an opening therein for conducting lubricants from the crank casing to the valve, said valve having ducts in communication with said opening in the vertical shaft, said ducts leading to the periphery of the valve.

2. In an internal combustion engine, the combination with a single rotary water jacketed valve; a plurality of cylinders served by said valve; a crank casing upon which the cylinders are mounted; a substantially vertical hollow shaft extending from the casing upwardly into said valve, through which oil may be passed from the crank casing to lubricate the valve; a conduit surrounding said shaft through which to conduct cooling water to said jacket and an outlet for said jacket at the top of the valve.

In testimony whereof I hereunto set my hand.

EARL E. McCOLLUM.