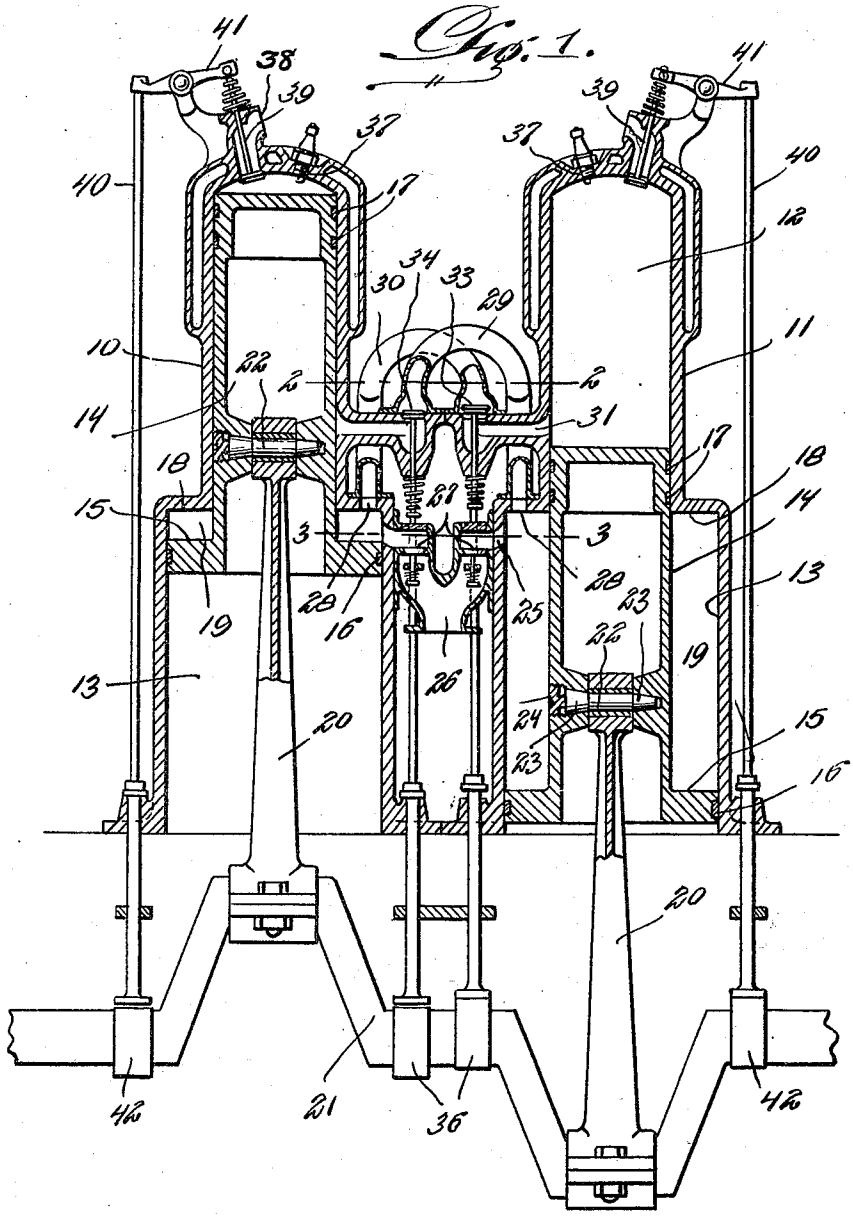
Oct. 28, 1924. 1,513,190

M. R. SMITH ET AL

ENGINE

Filed June 20, 1921 2 Sheets-Sheet 1

Fig. 1.



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2 Sheets-Sheet 2

Fig. 2.

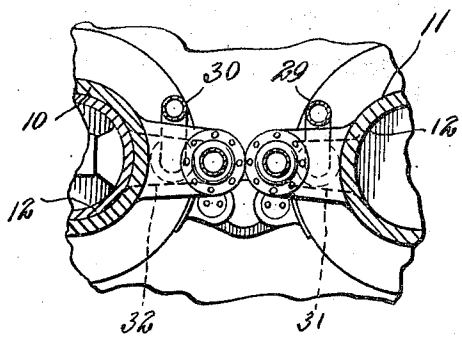


Fig. 3.

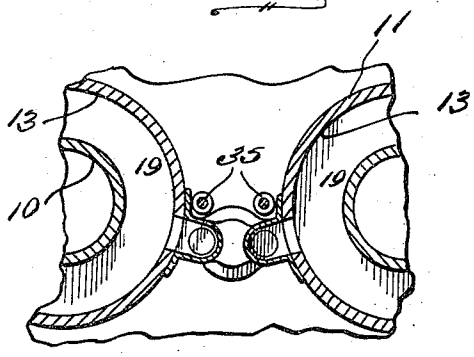
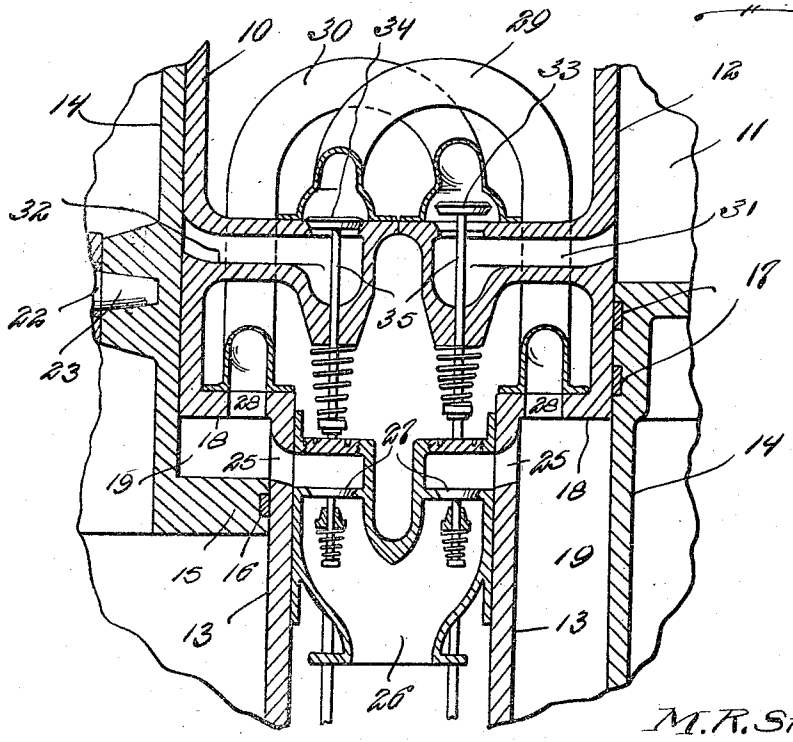


Fig. 4.



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UNITED STATES PATENT OFFICE.

MILLARD R. SMITH AND ALBERT L. CRAIG, OF STANHOPE, IOWA.

ENGINE.

Application filed June 30, 1921. Serial No. 479,009.

To all whom it may concern:

Be it known that we, MILLARD R. SMITH and ALBERT L. CRAIG, citizens of the United States, residing at Stanhope, in the county of Hamilton and State of Iowa, have invented new and useful Improvements in Engines, of which the following is a specification.

This invention relates to internal combustion engines, wherein the cylinders are arranged in pairs, and wherein one cylinder depends upon the other for the suction and compression of the explosive mixture, before the latter is conveyed from one cylinder into the combustion chamber of the other cylinder.

Another object of the invention resides in providing a construction wherein the explosive mixture is compressed twice before ignition, thereby providing for a more perfect combustion.

Another object of the invention resides in providing an engine wherein the cams for operating the valves are mounted direct upon the cam shaft of the engine, in which position they are subjected to proper lubrication.

More specifically stated, the invention comprehends an engine of the above mentioned character wherein each cylinder has a relatively large and a relatively small bore, with a piston operating within the smaller bore and of a length greater than the length of said bore, the lower end of the piston being provided with a flange tightly engaging the wall of the large bore of the cylinder, and defining an intake and compression chamber, wherein the explosive mixture is initially compressed before it is conveyed into the combustion chamber of the adjacent cylinder.

In carrying out the invention, we provide an intake and compression chamber in the manner above stated, of sufficient dimensions to fill the combustion chamber of the adjacent cylinder, so that all the burnt gases are completely expelled from the combustion chamber which adds to the efficiency of the motor generally.

The nature and advantages of the invention will be better understood when the following detailed description is read in connection with the accompanying drawings, the invention residing in the construction, combination, and arrangement of parts as claimed.

In the drawings forming part of this application, like numerals of reference indicate similar parts in the several views and wherein:

Figure 1 is a vertical sectional view through the engine constructed in accordance with the invention.

Figure 2 is a sectional view taken on line 2—2 of Figure 1.

Figure 3 is a similar view taken on line 3—3 of Figure 1.

Figure 4 is an enlarged fragmentary view, showing the relative arrangement of the intake and manifolds for the respective cylinders.

Referring to the drawings in detail, a pair of cylinders are indicated at 10 and 11 respectively, and each cylinder is formed to provide a small bore 12 and a large bore 13. A piston 14 operates within the small bore 12 of each cylinder, and this piston is slightly longer than the bore 12, projecting within the large bore 13 and having an annular flange 15 which tightly engages the wall of said large bore 13. The flange is equipped with a packing ring 16 as is also the piston 14 adjacent the upper end thereof, these packing rings being indicated at 17. In providing the large and small bores for each cylinder, a shoulder 18 is provided parallel with the flange 15, thus forming a space between the flange and shoulder 18 of each cylinder defining an intake and compression chamber 19. A pitman 20 is connected with each piston and with the crank shaft indicated at 21. The pitman is connected with the piston by means of a wrist pin 22, the latter being tapered at both ends as at 23 for the purpose of taking up wear as the occasion requires. This pin is inserted from one side of the piston but does not project from the opposite side, the pin being held in position by means of a plug 24 which is threaded into the opening in the piston through which the pin is passed. The pin may be adjusted from time to time by turning the plug 24 to compensate for wear, and to prevent leakage into the crank case of the engine.

Each cylinder has an intake passage 25, while both of the passages have a common inlet opening 26. Arranged in each passage 25 is a valve 27 which controls communication between the inlet opening 26 and the inlet and compression chambers 19 of the respective cylinders. The shoulder 18 of

each cylinder has an opening 28 which establishes communication between the intake and compression chamber 19 of the particular cylinder and the intake manifold thereof. The intake manifold for the cylinder 10 is indicated at 29, while the intake manifold of the cylinder 11 is indicated at 30. The intake manifold 29 from the cylinder 10 opens into a horizontally disposed port 31 of the cylinder 11, while the intake manifold 30 from the latter mentioned cylinder opens into a similar port 32 of the cylinder 10. These ports 31 and 32 open directly into their respective cylinders, so as to establish communication between the latter and their intake manifolds. A valve 33 controls communication between the intake manifold 29 and the port 31, while a similar valve 34 controls communication between the intake manifold 30 and the port 32. Both of these valves include stems 35, and are opened and closed alternately through the instrumentality of cams 36 carried by the crank shaft 21.

The upper end of each cylinder is provided with an opening 37 for the reception of a suitable spark plug, and with an exhaust opening 38. The exhaust opening is normally closed by means of a valve 39 which is operated by the wellknown push rod 40 rocker arm 41 and a cam 42 fixed upon the crank shaft 21.

Upon reference to Figure 1, it will be noted that the piston 14 of the cylinder 10 has about completed its compression stroke and about to fire, while the piston 14 in the cylinder 11 is moving along its power stroke and sucking a charge of explosive mixture through the intake port 25 into the chamber 19. This charge of fuel is trapped in the chamber 19 between the flange 15 and the shoulder 18, and when the piston in the cylinder 11 moves to the position occupied by the piston and cylinder 10, the fuel just referred to is compressed in the chamber 19 before it is conveyed through the intake manifold 29 into the combustion chamber of the cylinder 10. In the position of the parts illustrated in Figure 1, the combustion chamber 12 of the cylinder 11 is filled with the explosive mixture conveyed from the intake and compression chamber of the cylinder 10 to the position occupied in Figure 1. Consequently, the fuel is compressed twice before firing, initially in the compression chamber 19 of one cylinder, and then in the combustion chamber of the adjacent cylinder, thus providing for a more perfect combustion. By reason of the construction illustrated and described, it will be obvious that the fuel is initially introduced into the intake and compression chamber 19 of the respective cylinders surrounding the wall of the pistons, when the latter are moving along their power stroke, and consequently the fuel is heated in the chamber 19 absorbing the heat from the piston and the wall of the cylinder, which not only makes for a more combustible mixture, but which also tends to maintain the piston and cylinder at a more proper working temperature. It is to be further noted that the cams for operating the valves are all carried by the crank shaft and are disposed to be properly lubricated by the splash system generally used in internal combustion engines.

While it is believed that from the foregoing description the nature and advantages of the invention will be readily apparent, we desire to have it understood that we do not limit ourselves to what is herein shown and described, and that such changes may be resorted to when desired as fall within the scope of what is claimed.

What we claim is:

In an internal combustion engine, a pair of vertically arranged cylinders arranged in spaced relation and each having a large bore and a small bore, a piston operating in the cylinder, an annular head carried by the lower end of each piston and operating within the large bores, valve controlled means for admitting fuel to the large bores, the latter bores being also provided with outlet openings, a pair of laterally extending castings carried by the upper ends of the cylinders and extended toward each other in transverse horizontal alinement, the castings being provided with valve seats in their upper faces and further provided with longitudinal passageways which communicate with the small bores of the cylinders, goose necks communicating with the outlets of the large bores and having their upper ends overlying the valve seat and communicating with the passageways in the castings, and reciprocable valves supported by the castings and movable within the adjacent ends of the goose necks and adapted to seat upon said seat.

In testimony whereof we affix our signatures.

MILLARD R. SMITH.
ALBERT L. CRAIG.