J. H. BATCHELOR & H. H. SMITH.

INTERNAL COMBUSTION ENGINE.

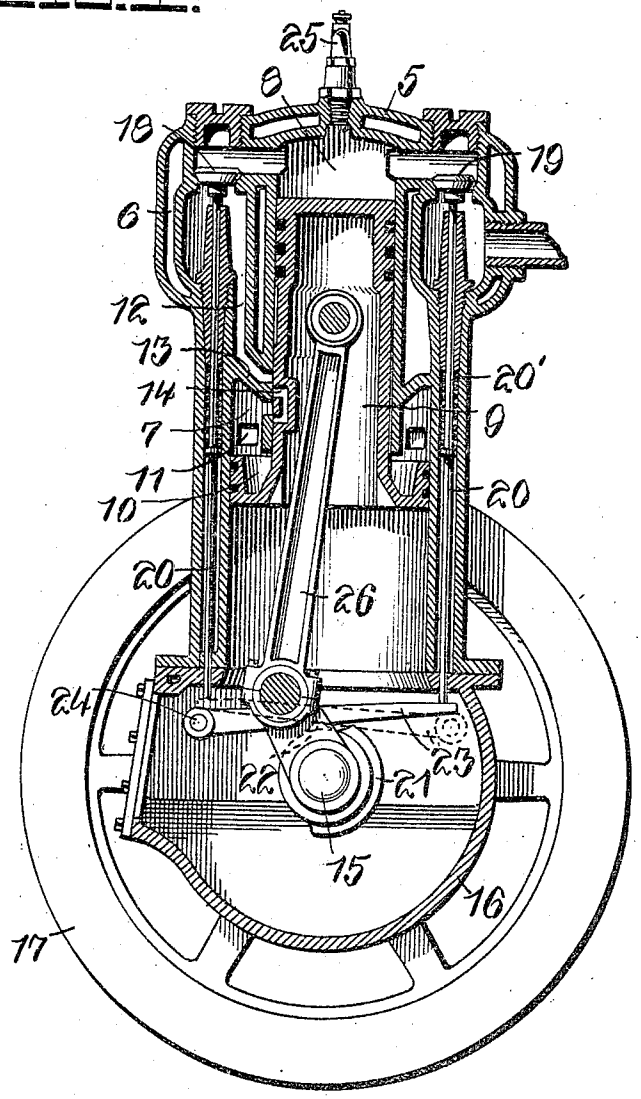
APPLICATION FILED APR. 16, 1910.

987,848.

Patented Mar. 28, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



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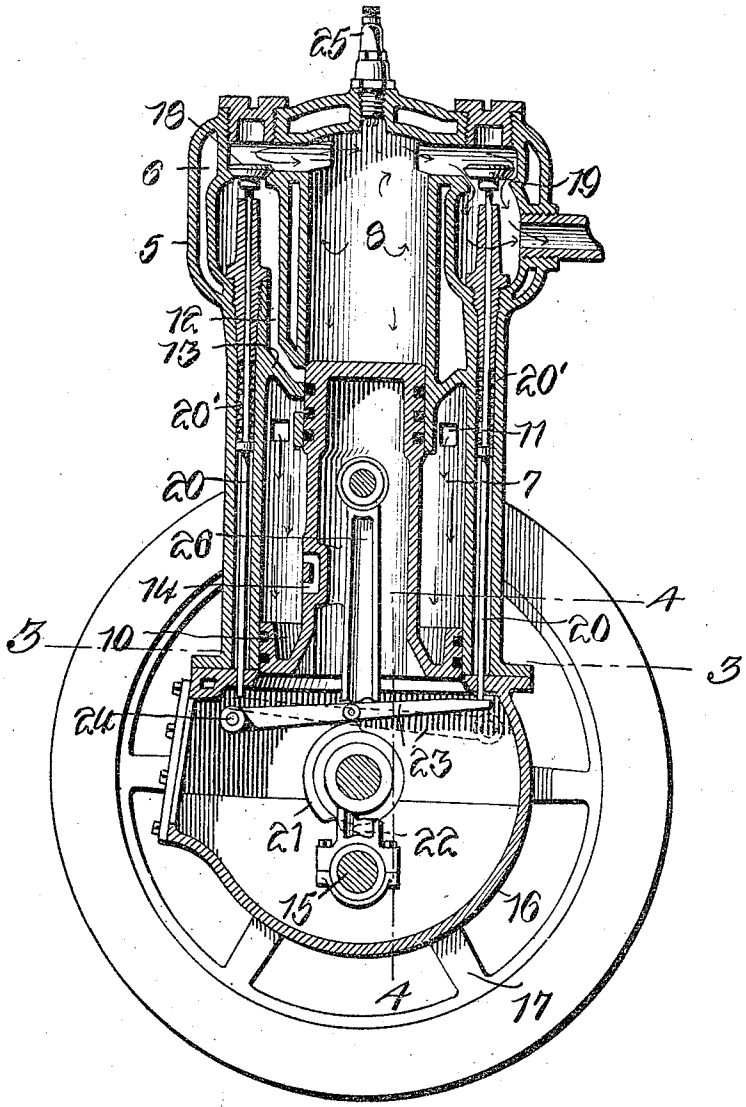
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

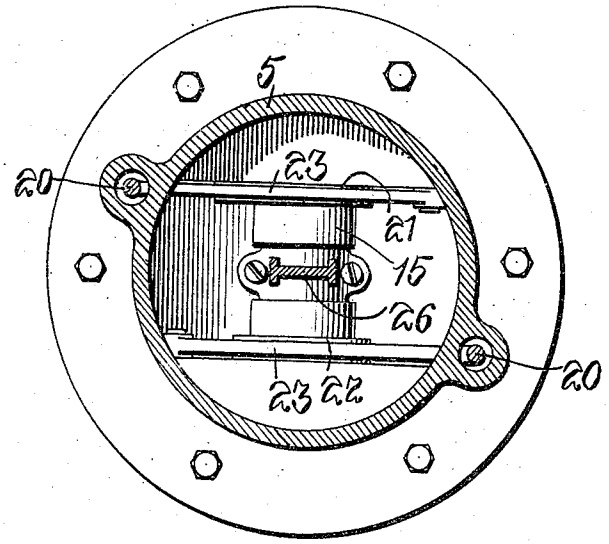
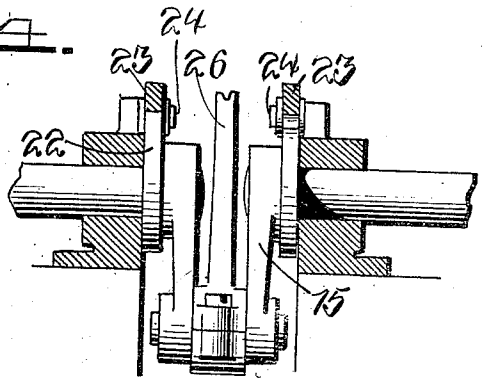


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMIE HUNTER BATCHELOR AND HERBERT H. SMITH, OF DOTHAN, ALABAMA.

INTERNAL-COMBUSTION ENGINE.

987,848. Specification of Letters Patent. Patented Mar. 28, 1911.

Application filed April 16, 1910. Serial No. 555,782.

To all whom it may concern:

Be it known that we, JAMIE H. BATCHELOR and HERBERT H. SMITH, citizens of the United States, residing at Dothan, in the county of Houston and State of Alabama, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to improvements in internal combustion engines and more particularly to an engine of this character of the double piston type.

The invention has for its object to provide an engine of the above character of comparatively simple construction and of great efficiency in operation.

A further object of the invention is to provide an engine of very novel construction whereby the explosion cylinder will be thoroughly scavenged upon the compression stroke of the piston, means being arranged in the crank case and actuated by cams of different sizes on the crank shaft to open the exhaust valve in the explosion chamber and a valve normally closing communication between the compression and explosion chamber, for different periods of time.

With these and other objects in view, the invention consists of the novel features of construction, combination and arrangement of parts hereinafter fully described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section through one of the engine cylinders showing the position of the parts at one point of the stroke of the piston; Fig. 2 is a similar view showing the position of the parts when the piston is at the lowest point of its stroke; Fig. 3 is an enlarged section taken on the line 3—3 of Fig. 2; and Fig. 4 is a section taken on the line 4—4 of Fig. 2.

Referring more particularly to the drawings 5 indicates the engine cylinder casing which is formed with the usual water jacket 6. The cylinder is formed with a compression chamber 7 and an explosion chamber 8. In these chambers a piston 9 is adapted to reciprocate. The lower compression chamber 7 is of considerably greater diameter than the explosion chamber 8 and the lower end of the piston 9 is provided with an enlarged head 10 for engagement with the wall of the compression chamber. A plurality of inlet ports 11 are formed in the cylinder and communicate with the compression chamber 7. These ports are preferably provided at the upper end of the compression chamber so that the explosive mixture is drawn into said chamber as the piston starts upon its down stroke. Suitable check valves, (not shown) are arranged in the supply pipes communicating with the inlet ports 11 whereby back pressure of the gases in said pipes is prevented upon the compression stroke of the piston. The chambers 7 and 8 are connected by a passage 12 which is preferably formed as shown in Fig. 1 of the drawings so that the gases will be caused to follow a circuitous route from the compression chamber to the explosion chamber, the lower end of said passage being inclined inwardly and divided by a wall 13. With the two sections of the passage 12 provided by this wall, the U-shaped channel 14 formed in the body of the piston 9 is adapted to register whereby the gases which have been compressed by the piston upon its up stroke are discharged through said passage into the explosion chamber.

The usual crank shaft 15 is provided which extends through the crank casing 16 secured to the lower end of the cylinder casing. Upon this crank shaft the fly wheel 17 is secured. An inlet and an exhaust valve 18 and 19 respectively control the admission and exhaust of the gases to and from the explosion chamber 8. Each of these valves is formed with a stem 20 which is vertically disposed between the outer cylinder wall and the walls of the chambers 7 and 8. These valves are normally held upon their seats by means of the springs 20′ arranged thereon and are adapted to be automatically actuated to admit the gases to the explosion chamber from the compression chamber and to exhaust the burned gases after the explosion has taken place. The operation of the valves is effected by means of the cams 21 and 22 carried by the crank shaft 15. As clearly shown in Fig. 4 these cams are disposed upon each side of the crank portion of the shaft and are adapted to engage with the pivoted arms 23, said arms being pivoted upon opposite sides of the center of the crank shaft on studs 24 fixed in the side of the crank casing. The arms 23 extend beneath and engage with

the valve stems 20 and upon the rotation of the crank shaft, are actuated by the cams 21 and 22 to open the inlet and exhaust valves at the proper point in the reciprocation of the piston. As shown in Fig. 1 the cam 22 is on the point of engaging with one of the arms to lift the valve 18, the channel 14 being disposed slightly below the sections of the passage 12. Upon the continued movement of the crank shaft, the cam 22 will raise the pivoted arm 23 and thus unseat the valve 18 admitting the gases which have been compressed in the chamber 7 into the upper explosion chamber 8. When this occurs the crank shaft is about 20° from a dead center on the upward stroke, and the cam is only adapted to maintain the valve 18 in open position to the extent of about 5 degrees of movement of the crank shaft at the completion of the up stroke of the piston, said valve closing when the channel 14 is moved past the sections of the passage 12, on the down stroke of the piston.

The usual connecting rod 26 of course connects the crank shaft to the piston and a spark plug 25 is also arranged in the head of the cylinder and as the gases are compressed therein causes the same to explode, such explosion taking place after the crank shaft has passed its dead center and driving the piston downwardly in the compression chamber. Upon the downward stroke of the piston, gas is drawn into the compression chamber through the inlet ports 11 and at a point about 10° from the center of the crank upon the downward stroke, the cam 21 engages with the other of the arms 23 and unseats the exhaust valve 19. This cam is of considerably greater extent than the cam 22 and thus the valve 19 is opened until the crank shaft is moved to a point about 30° from its dead center on the upward stroke, the upward movement of the piston in the compression chamber serving to scavenge or force from the compression chamber through the exhaust the burned gases which may remain therein from the previous explosion. After the exhaust valve closes the inlet valve is opened as above set forth and the cycle repeated. Thus it will be seen that while the gases are being compressed in the lower chamber 7 the explosion chamber is being freed of the remains of the former charge or as it is commonly stated the explosion chamber is automatically scavenged.

From the above it will be seen that we have provided an internal combustion engine of comparatively simple construction whereby both valves are opened and closed with each revolution of the crank shaft and the gases admitted and exhausted from the piston cylinder by the movement of the piston therein. By such construction a very high degree of efficiency is obtained in the operation of engines of this type. The simplicity and durability of the construction of the engine and the means provided whereby the valves are positively operated, precludes any possibility of an overcharge whereby the efficiency of the various elements might be endangered.

It will be understood that while we have particularly described and shown the preferred embodiment of our invention, the same is also susceptible of many minor modifications without departing from the essential features or sacrificing any of the advantages thereof.

Having thus described the invention what is claimed is:—

1. In an internal combustion engine, the combination with a water jacketed cylinder and a crank case secured thereto, said cylinder having an explosion chamber and a compression chamber formed therein, and a passage affording communication between said chambers at times, of a piston adapted for reciprocation in said chambers, said compression chamber having a plurality of inlet ports communicating therewith, an exhaust for the explosion chamber, a spring controlled vertically movable valve normally closing the communicating passage between the chambers, a spring controlled valve normally closing the exhaust of the explosion chamber, a crank shaft and a connecting rod connecting said shaft to the piston, oppositely disposed arms pivoted to the crank case upon opposite sides of the center of the crank shaft, and means carried by the crank shaft adapted to engage said arms for different periods of time, said arms being adapted to hold said valves open through certain portions of the travel of the piston, substantially as and for the purpose set forth.

2. In an internal combustion engine, the combination with a water jacketed cylinder and a crank case secured thereto, said cylinder having an explosion chamber and a compression chamber therein, and a passage affording communication between said chambers at times, a plurality of inlet ports communicating with the compression chamber, an exhaust for the explosion chamber, of a piston adapted to reciprocate in said chambers, a valve normally closing the communicating passage between the chambers, a valve normally closing the exhaust of the explosion chamber, the stems of said valves being movably disposed in the cylinder wall, a crank shaft and a connecting rod connecting said shaft to the piston, oppositely extending pivoted arms arranged in the crank case, said arms having their free ends engaged with the lower ends of the valve stems, and cams arranged on the crank shaft upon opposite sides of the crank adapted to engage said arms at certain points in the movement

of the piston to raise the same and open the valves, said cams being of such form that the exhaust valve is held in open position during the greater portion of the compression stroke of the piston while the other of said valves is opened for a comparatively shorter period of time, substantially as and for the purpose specified.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

JAMIE HUNTER BATCHELOR.
HERBERT H. SMITH.

Witnesses:
D. B. THRASHER,
E. M. STEELE.