

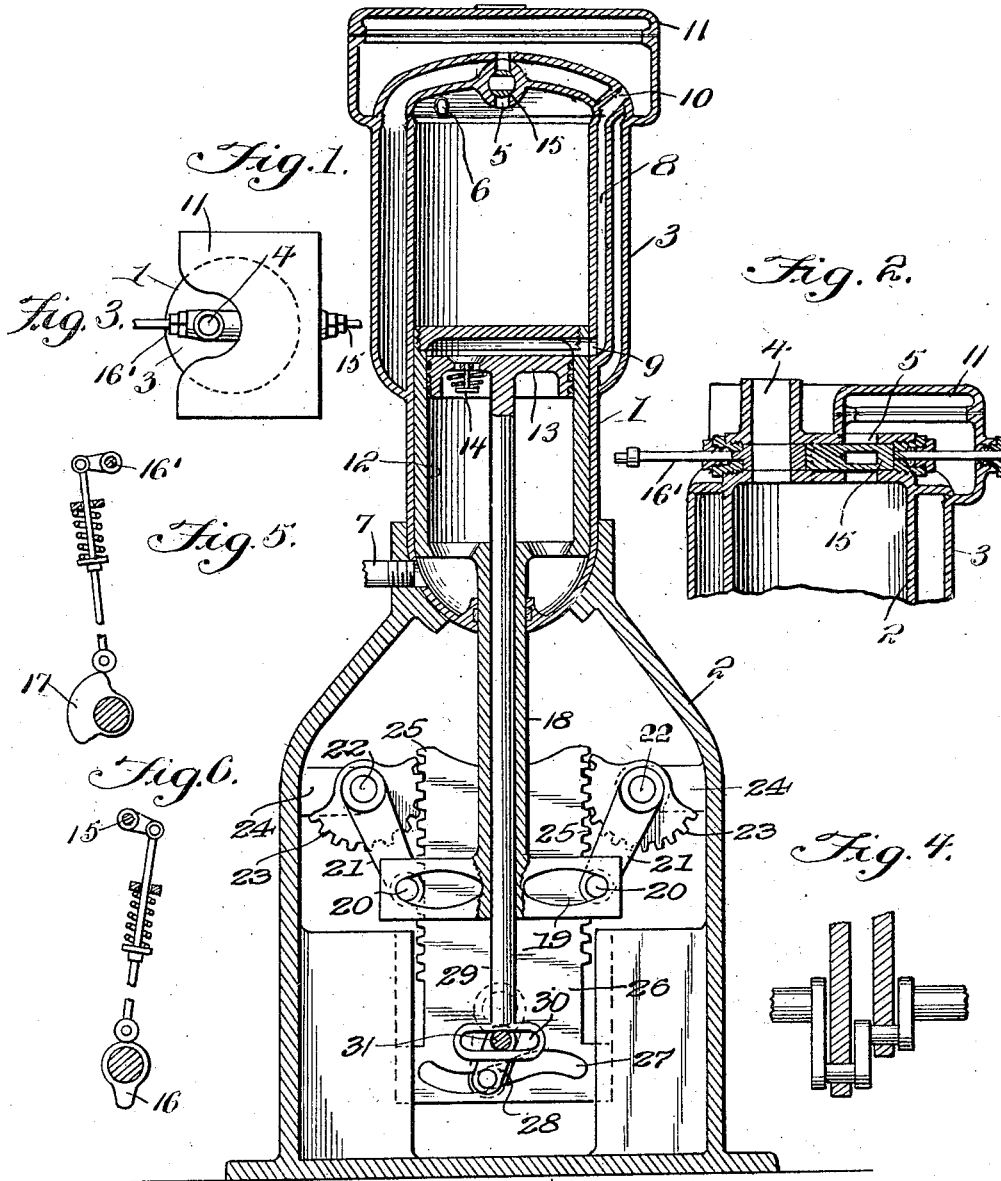
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A. L. POWELL

ENGINE

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## UNITED STATES PATENT OFFICE.

ALVAH L. POWELL, OF MILES CITY, MONTANA, ASSIGNOR, BY MESNE ASSIGNMENTS,  
TO A. L. POWELL POWER COMPANY, INCORPORATED, A CORPORATION OF MONTANA.

## ENGINE.

Application filed December 10, 1919, Serial No. 343,953. Renewed February 11, 1924.

*To all whom it may concern:*

Be it known that I, ALVAH L. POWELL, a citizen of the United States, residing at Miles City, county of Custer, State of Montana, have invented a certain new and useful Improvement in Engines, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

This invention pertains to certain new and useful improvements relating to internal combustion engines, and deals particularly with that type illustrated in my copending application Serial No. 343,954 filed of even date herewith.

The principal object of the present invention resides in the preservation of a storage chamber arranged above the head of the cylinder into which a precompressed charge of air is delivered and stored prior to its admission at the proper moment into the combustion chamber of the engine.

The type of engine illustrated in the attached drawings operates substantially along these same principles as those employed in my copending application 343,954 only differing therefrom in the employment of the storage chamber and the discharging position of the compressed gas within the hollow piston head. In former case the charge was delivered to the combustion chamber while the parts were in firing position whereas, in the present case this charge is delivered to the storage chamber while the piston and its component parts are at their lowermost point of travel.

In the attached drawings I have illustrated the preferred embodiment of my invention but certain changes or variations therefrom may be resorted to without sacrificing any of the principles involved therein, and I wish it therefore understood that the scope of protection contemplated in the present case should only be limited by the construction set forth in the claims.

In the drawings Fig. 1 illustrates a transverse sectional view of the engine with the parts in position at an extreme downward or working stroke, Fig. 2 is a fragmentary view in section of the head of the cylinder showing the type of valve employed in the present case. Fig. 3 is a top plan of the

cylinder showing the peculiar shape of the storage chamber to permit the by-pass of the outlet passage, Fig. 4 is a detailed view of the crank shaft showing series of stepped portions arranged therein. Fig. 5 is a detailed view illustrating the exhaust cam and Fig. 6 is a detailed view of the inlet cam.

Referring more in detail to the drawings wherein similar letters of reference indicate corresponding parts throughout the several views numeral 1 indicates the engine cylinder which is rigidly secured to or integrally cast with a base portion 2 within which is housed lower mechanism of the engine. The cylinder 1 is provided with the usual water jacket 3 outlet passage 4, and inlet passage 5, and spark plug 6. Any suitable form of fuel conduit leading from the carburetor is attached to the lower portion of the cylinder as indicated at 7. The cylinder 1 is provided with a vertical passage 8 which at its lower end communicates with an opening 9 arranged within the wall of its cylinder and at its upper end with an outlet passage 10. This outlet passage 10 communicates with a storage chamber 11 which may be cast integrally with the head of the cylinder. It will be noticed from the showing of Fig. 2 that the inlet passage 5 is arranged within this storage chamber 11. As in a copending case within the cylinder 1 is arranged a reciprocating hollow piston head 12 within which is mounted a reciprocating piston 13. Both of these elements actuate in the same manner as that described in my former case, that is to say, both the hollow piston head 12 and the piston 13 reciprocate in the same general direction at the same time but at relatively different speeds. In the present case I provide the piston head 13 with a check valve 14 which permits the gaseous charge within the lower portion within the cylinder 1 to be drawn into the hollow piston head during the up stroke thereof. This charge is precompressed during the down stroke and when the parts arrive at the position illustrated in Fig. 1, this charge is delivered into the storage chamber 12. In order to control the inlet of the precompressed gaseous charge from the storage chamber to the combustion chamber of the engine I provide a rotatable valve 15 which is momentarily opened through the action of suitable levers

operated upon by the cam 16 arranged on the crank shaft of the engine. The exhaust valve designated 16' is actuated, through suitable connected links, by the cam 17 likewise secured to the engine shaft. The actuating surface of the cam 17 is of sufficient area to hold the exhaust valve 16' in its opened position during a complete upstroke of the engine. Some of the principles embodied in this application are suggested in my co-pending application 142,664.

A complete operation of the engine is as follows; Assuming the parts to be in the position illustrated in Fig. 1 the precompressed charge between the upper wall of the hollow piston head and the piston 13 has been delivered through the longitudinal passage into the storage chamber 12. The upward motion of the piston members will cause a second charge to be drawn into the increased space that will present itself during the upstroke and at the limit thereof will be checked between the piston head 13 and the upper wall of the hollow piston 12. This charge will be compressed during the downstroke of said parts. When the piston is at its upper limit of travel the inlet valve 15 is momentarily opened to permit a charge from the storage chamber to pass into the combustion chamber. After the closure of the inlet valve 15 this charge is exploded thereby forcing the piston in a downward direction.

What I claim is:

1. In an engine of the class described comprising a power cylinder having an opening through the side wall thereof, a reciprocating hollow piston within the cylinder having a passage through the side wall thereof, a member arranged for movement within the hollow piston and adapted to precompress a charge therein and deliver the same through the passage in the piston and the opening in the cylinder at the limit of the outstroke of the piston, a storage chamber, a conduit for leading the precompressed charge from the cylinder to the storage chamber and a communication from the storage chamber to the head of the cylinder.

2. In an engine of the class described comprising a power cylinder having an opening through the side wall thereof, a

reciprocating hollow piston within the cylinder having a passage through the side wall thereof, a reciprocating member within the hollow piston and adapted to precompress a charge therein and deliver the same through the passage in the piston and the opening in the cylinder at the limit of the outstroke of the piston, a storage chamber, a conduit for leading the precompressed charge from the cylinder to the storage chamber and a communication from the storage chamber to the head of the cylinder.

3. In an engine of the class described comprising a power cylinder having an opening through the side wall thereof, a reciprocating hollow piston within the cylinder having a passage through the side wall thereof, a member arranged for movement within the hollow piston and adapted to precompress a charge therein and deliver the same through the passage in the piston and the opening in the cylinder at the limit of the outstroke of the piston, a storage chamber, a conduit for leading the precompressed charge from the cylinder to the storage chamber, a communication from the storage chamber to the head of the cylinder and means for moving the hollow piston and the said member at different rates of movement.

4. In an engine of the class described comprising a power cylinder having an opening through the side wall thereof, a reciprocating hollow piston within the cylinder having a passage through the side wall thereof, a member arranged for movement within the hollow piston and adapted to precompress a charge therein and deliver the same through the passage in the piston and the opening in the cylinder at the limit of the outstroke of the piston, a storage chamber, a conduit for leading the precompressed charge from the cylinder to the storage chamber, a communication from the storage chamber to the head of the cylinder and means for moving the hollow piston and the said member at different rates of movement in the same direction.

In testimony whereof I hereunto affix my signature, this 10th day of December, 1919.

ALVAH L. POWELL.