Nov. 18, 1924. 1,516,457

A. L. POWELL

ENGINE

Filed Dec. 10, 1919

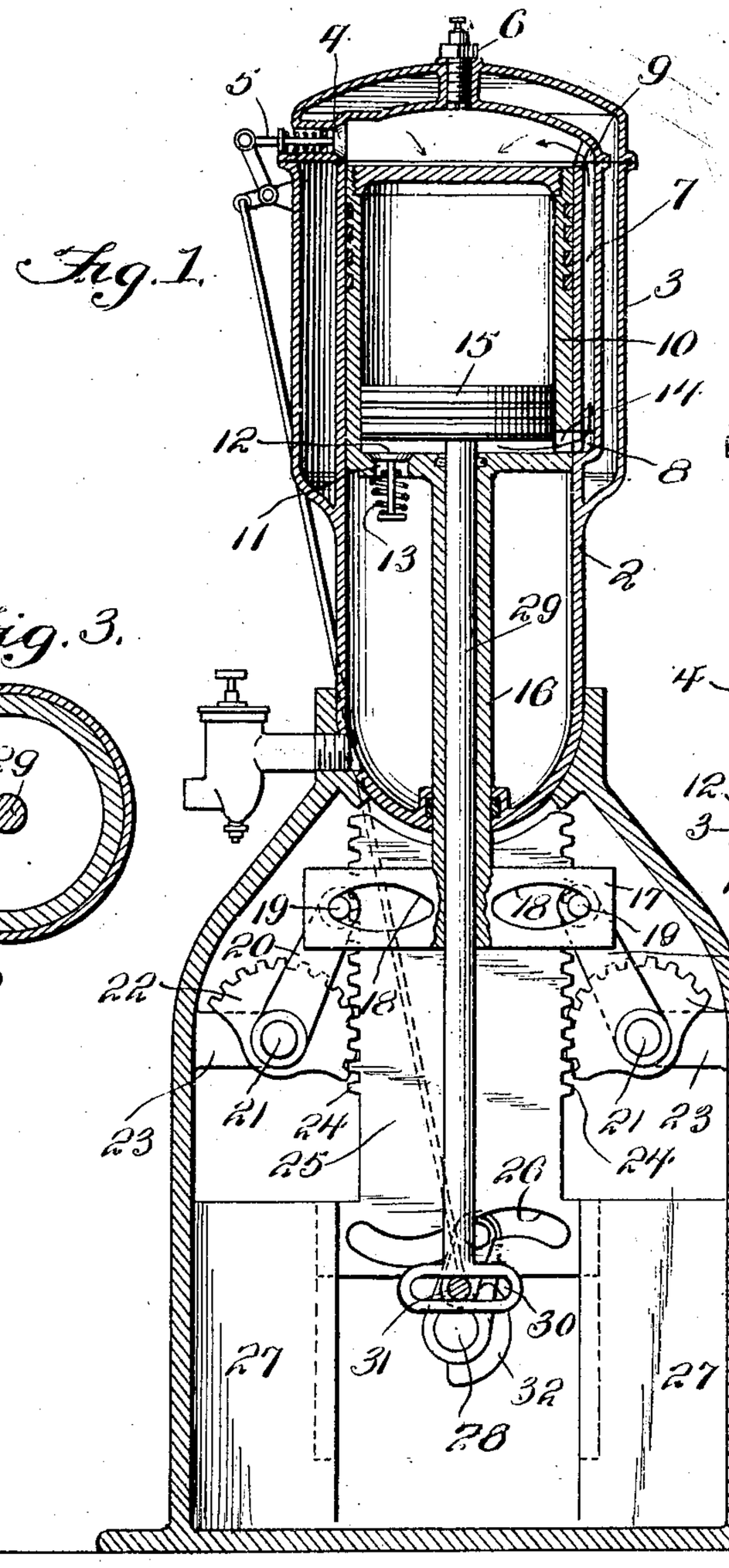

Fig. 1.

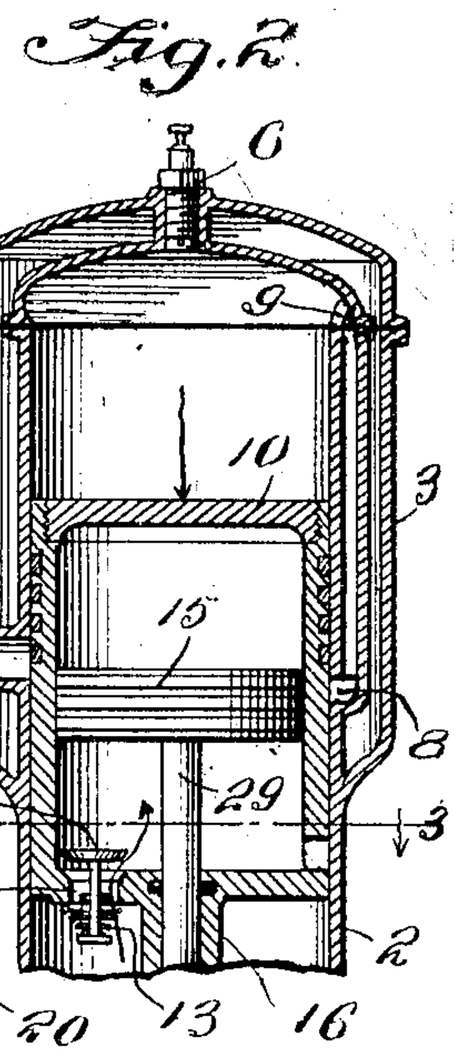

Fig. 2.

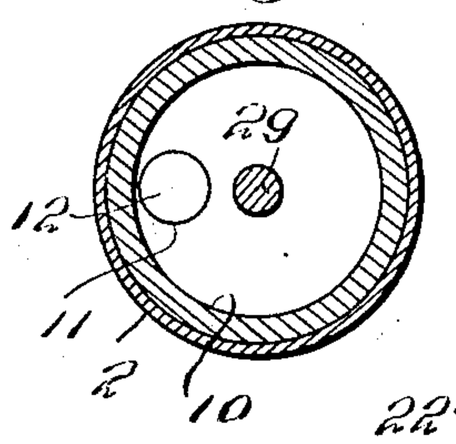

Fig. 3.

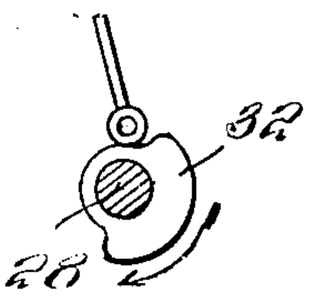

Fig. 4.

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UNITED STATES PATENT OFFICE.

ALVAH L. POWELL, OF ROUNDUP, MONTANA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE A. L. POWELL POWER COMPANY, INC., OF ROUNDUP, MONTANA, A CORPORATION OF MONTANA.

ENGINE.

Application filed December 10, 1919. Serial No. 343,954.

To all whom it may concern:

Be it known that I, ALVAH L. POWELL, a citizen of the United States, residing at Roundup, county of Musselshell, 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 relates to certain new and useful improvements dealing with internal combustion engines, and in the present instance is associated with that type known in the art as two cycle engines and shown in my co-pending application Serial No. 343,953 filed of even date herewith.

The principal object of the present invention resides in the efficient manner of transporting the power stroke of the piston to the crank shaft of the engine by interposing between the said elements a means whereby a more powerful stroke is ultimately delivered to the crank shaft.

Another object of the present invention resides in the novel manner of delivering to the working cylinder a pre-compressed charge. This charge is admitted into the working cylinder only at the proper instant when the piston is in position to be forced downward due to the ignition of the charge.

Still another aim of the present invention is the manner in which the charge is precompressed within a reciprocating chamber in which is mounted the compression piston. The relative movements of the chamber and piston is such that the charge is transferred from the rear end of the crank case into the lower portion of the reciprocating cylinder. This charge is checked within this chamber and owing to the approach of the compression piston towards the rear end of the hollow piston compresses the charge which is allowed at its proper moment to escape through side passages and ultimately delivered to the explosion chamber of the engine.

With these and other objects in view, it will be apparent to those skilled in the art, after reading the following specifications in connection with the attached drawings, that certain deviations or changes may be resorted to without sacrificing any of the spirit of the invention and the scope of protection contemplated will appear from the claims.

In the drawings Fig. 1 is a sectional view of the complete engine, showing the parts in the position which they will assume at firing point, Fig. 2 is a fragmentary view in section showing the position of the parts within the engine cylinder at a half way point in the down or working stroke, Fig. 3 is a cross section taken on line 3—3 of Fig. 2 and Fig. 4 is a detailed view of the exhaust valve operation can.

Referring more in detail to the drawings wherein similar letters of reference indicate like parts throughout the several views 1 designates the crank case of the engine which, as shown in the drawings is of substantially rectangular formation, but I wish it understood that it may assume any other form to meet the desired requirements. Numeral 2 indicates a cylinder which may be cast integrally with the base or fastened thereto in any approved manner. This cylinder is provided with the usual water jacket, 3, exhaust passages, 4, exhaust valve, 5, and spark plug 6. A cylinder 2 is also provided with a longitudinal by pass 7 the lower end of which has an inlet opening 8, while the upper end is ported as at 9.

Mounted within the cylinder 2 for reciprocating motion is a hollow piston 10 provided with an inlet opening 11 controlled by a check valve 12. This check valve is normally held to its seat by an expansion spring as indicated at 13. The side wall of the cylinder 10 is also provided with an outlet passage 14 which is adapted to register with the inlet 8 of the by pass 7 when the piston is at its end of its upper stroke.

Within the hollow piston 10 there is mounted a piston 15 which in the present instance is adapted to reciprocate in the same general direction as the hollow piston 10 at a relatively different speed thereto. This variance of the movement of the piston 15 and the hollow piston 10 first causes the gaseous charge to be drawn within the hollow piston during the down stroke thereof and precompressed therein during the up

stroke. This precompressed charge is then delivered at the proper moment into the head of the combustion chamber where it is fired or exploded to force the piston through another cycle of its operation.

This variance of movement is accomplished by the following mechanical connections. The hollow piston 10 has integrally secured thereto a longtiudinal bored member 16, the lower end of which carries a cross arm 17 provided with two elliptical openings 18 into which pins 19 mounted on arms 20 are adapted to actuate. These arms 20 are rigidly mounted on stub shafts 21 which carry segmental gears 22, the shafts being journaled in suitable supports 23 rigidly secured to the side walls of the case 1. The geared surface of the wheels 22 are adapted to mesh with the teeth 24 arranged on the edges of a reciprocating rack bar 25, the lower end of which is provided with a compound slot 26. The bar or member is maintained in its vertical position by a guided bracket 27 rigidly secured in position within the base 1.

Longitudinally journaled within the base 1 is a crank shaft 28, having a crank which is adapted to slide within the compound slot 26 within the member 25 and thereby to be actuated by the said member.

The piston member 15 is provided with a rod 29 which passes through the longitudinal bored member 16 of the hollow piston 10 and is provided at its lower end with an elongated opening 30. This opening 30 is adapted to receive an intermediate stepped portion 31 of the crank shaft 28.

The crank shaft 28 is also provided with a cam indicated at 32 which is adapted to actuate through suitable link mechanism the exhaust valve 4 and hold the same open throughout the full exhaust period or up stroke of the engine. A suitable carbureter as indicated is attached to the cylinder 2 adjacent its lower end.

A complete operation of the engine is as follows: Assuming the parts to be in the position as indicated in Fig. 1 the precompressed charge that has been delivered to the explosion chamber is fired and the piston commences its down stroke. The travel of the hollow piston being at a slightly greater rate of speed than that of the piston 15 causes the gaseous charge within the base of the cylinder to be transferred into said hollow piston between the rear wall thereof, and the near walls of the piston 15. The check valve permits this gaseous charge to flow into the hollow piston 10. At the extreme down movement of the parts the piston 15 will be positioned against the head or upper end of the hollow piston 10 and a full charge of gas trapped therein. This gaseous charge will be compressed within the hollow piston and ultimately delivered to the combustion chamber when the parts arrive at the position indicated in Fig. 1.

By providing the peculiarly shaped slots 18 and 26 as shown in the drawings it will be seen that the pins 19 and also the crank of the shaft 28 are always acting against a curved surface either in the outward or inward movements of the piston and its driven parts. In other words the engagement between the slots and the pins and crank shaft is not merely a pin and slot connection wherein the frictional engagement is always at right angles to the movement of the piston. The curve or arc of the slot produces an engaging surface for the pins or crank which is only at right angles to the movement of the piston at the middle of its inward or outward position or at the strongest point of its movement.

What I desire to secure by Letters Patent is:

1. A two cycle engine comprising a power cylinder having a longitudinal passage in the wall thereof communicating at one end with the interior of the cylinder and at its opposite end with the head of the cylinder, a supply connected to the lower portion of said cylinder, a reciprocating hollow piston arranged within the cylinder and provided with a port adapted for registration with the longitudinal passage when in one position, a valved passage in the hollow piston for controlling communication into said piston from the base of the cylinder, and relatively movable means within the hollow piston for compressing a charge therein prior to the registration of the port within the hollow piston with the longitudinal passage.

2. In a two cycle engine comprising a power cylinder, a reciprocating hollow piston therein, a piston arranged for relative reciprocation within the hollow piston and adapted to precompress a charge therein and means for delivering the precompressed charge to the head of the cylinder at the limit of the up stroke of the hollow piston.

3. In a two cycle engine comprising a power cylinder, a reciprocating hollow piston therein, a member arranged for relative movement within the hollow piston and adapted to precompress a charge therein, and a means for delivering the precompressed charge to the head of the cylinder at the limit of the up stroke of the hollow piston.

4. In a two cycle engine comprising a power cylinder, a reciprocating hollow piston therein, a member arranged for relative movement within the hollow piston and adapted to draw a charge therein on the down stroke of the hollow piston and to precompress the charge on the up stroke of the hollow piston and means for delivering the

precompressed charge to the head of the cylinder.

5. In a two cycle engine comprising a power cylinder, a reciprocating hollow piston therein, a member arranged for relative movement within the hollow piston and adapted to draw a charge therein on the down stroke of the hollow piston and to precompress the charge on the up stroke of the hollow piston and means for delivering the precompressed charge to the head of the cylinder at the limit of the up stroke of the hollow piston.

6. In an engine of the class described comprising a power cylinder a reciprocating hollow piston therein, a member arranged for relative movement within the hollow piston and adapted to precompress a charge therein, means for delivering the precompressed charge to the head of the cylinder at the limit of the up stroke of the hollow piston and means for moving the hollow piston and the member therein at relatively different speeds.

7. In an engine of the class described comprising a power cylinder, a reciprocating hollow piston therein, a member arranged for relative movement within the hollow piston and adapted to precompress a charge therein, means for delivering the precompressed charge to the head of the cylinder at the limit of the up stroke of the hollow piston and means for moving the hollow piston and the member therein in the same direction and at relatively different speeds.

8. In an internal combustion engine, a power cylinder, a reciprocating hollow piston therein, a second piston slidable within the hollow piston, said hollow piston being closed at both ends and having an intake valve in its lower end, the space between the second piston and the lower end of the hollow piston forming a chamber wherein explosive gases are compressed, and means whereby said compressed gases are delivered to the explosion chamber located between the hollow piston and the head of the power cylinder.

9. In an explosive engine, a power cylinder, a hollow piston slidable therein and closed at both ends, the lower end of said hollow piston having a valve therein, a fuel supply chamber in the lower portion of said cylinder and beneath the hollow piston, a second piston slidable within the hollow piston, an explosive chamber above the hollow piston, said valve serving as a means whereby the gaseous fuel may pass from the fuel supply chamber into a compression chamber formed between the second cylinder and the bottom of the hollow piston, means whereby the fuel in the compression chamber is compressed, means for delivering the precompressed charge to the head of the cylinder and above the hollow piston at the limit of the upstroke of the hollow piston.

10. In an explosive engine, comprising a power cylinder, a reciprocating hollow piston therein, the space between the head of said power cylinder and the upper part of said reciprocating hollow piston forming an explosive chamber, a member arranged for relative movement within the hollow piston and adapted to draw a charge therein on the downstroke of the hollow piston, and to precompress the charge on the upstroke of the hollow piston, and means for delivering the precompressed charge to the explosive chamber when the gases have been compressed to their maximum capacity.

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

ALVAH L. POWELL.