

UNITED STATES PATENT OFFICE.

ALVAH L. POWELL, OF MILES CITY, MONTANA, ASSIGNOR TO THE A. L. POWELL POWER CO., OF MILES CITY, MONTANA, A CORPORATION.

INTERNAL-COMBUSTION ENGINE.

Application filed December 24, 1920. Serial No. 433,034.

To all whom it may concern:

Be it known that I, ALVAH L. POWELL, a citizen of the United States, residing at Miles City, in the county of Custer and State of Montana, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in internal combustion engines in which I provide means for automatic mechanical ignition, and for effecting the ignition at a point in the stroke most favorable to power development. This application accompanies another filed simultaneously, and bearing the Serial Number 433,033. The machine herein described follows the lines of construction shown in my other application but embraces variations that I desire to cover.

In the annexed drawings

Fig. 1 is an elevation, in section, of a two cycle engine equipped with my improvement.

Fig. 2 is a section taken on the line 2—2.

Fig. 3 is a diagram of the power stroke.

Fig. 4 shows the cam and gearing necessary when the improvement is used on a four cycle engine.

In Fig. 1, the cylinder A of a two cycle gas engine has a piston C⁶, conventionally fitted to piston rod and crank to transmit power to a shaft, C⁷. Proper inlet and outlet, operable, valves are shown at A⁷, A⁸. On the upper side of cylinder A there is a cylindrical chamber in which is fitted a slidable piston, A². This piston has, at one end, an automatic inlet check valve K. A² terminates in a tongue to which is fitted an arm of a bell crank, D³, the latter pivoted to any convenient point in the engine frame. Piston A² is hollow, and in the cylindrical space so formed there is a second piston K¹. This is stationary on a pin, K², that is held in position by a plate K³ on the opposite side of cylinder A. It is evident from the construction, that a reciprocatory movement of the piston A² will result in compression being effected within it during a forward movement; that is, a movement towards the cylinder A, but on reversal a vacuum will be formed and air will be drawn in through the valve K. Inlet grooves of a proper length to assure access of air are shown at K⁴. On compression stroke of piston A² the compressed air is

forced through an opening shown at K⁵, by which the said air passes into an annular space, K⁶, in which it is retained during part of the stroke of A² by the wall of the latter and the ball K⁷. This ball serves as a check valve under the conditions about to be described. On one side of the ball K⁷ a sheet of wire gauze is preferably placed (K⁸) to act as a flame screen.

Let it be assumed that piston C⁶ is at up-stroke, on compression. A cam, D on power shaft is just engaging the bent end of rod D¹, that is suitably attached to the bell crank D². It will be observed that the face of the cam, that is, the length of said face equals the length of the arc *a—b*. As the crank rides over the space *c—d* the vertical movement of piston is small, but during this interval the cam D will be operating the bell crank D³ which, in turn, will cause the secondary piston A² to move inward towards center line of piston C⁶. The stationary piston K¹ will act as a compressing member within piston A² and the contained air will be compressed, passing through hole K⁵ while the latter is moving over annular space K⁶. The position of piston C⁶ will cause it to act as a cut-off to the passage occupied by the ball K⁷, and the compressed air in said passage will be retained. As piston C⁶ starts out on power stroke, but before ignition, compression tends to fall, but piston A² advances simultaneously, compensating for the loss due to movement of C⁶. As C⁶ uncovers the hole at M of passage K the compressed air in the annular space will push aside the ball K⁷ and enter the main combustion chamber. This will be effected at a point of crank movement indicated by *d*. The relative space and movement being proportioned for high compression of the annular charge its ingress to the main cylinder will be at ignition temperature. The air and gas in said main chamber will, therefore, be fired, piston C⁶ moving downward, transmitting movement to the crank on the arc *d—e* (Fig. 3). The arc *d—e* is the ideal line of movement for the crank pin and on traversing it maximum power will be transmitted to the shaft C⁷.

I also show an electric ignition plug at M¹. This can be used in an engine using lower compression, although applicable to the high compression type as well.

In this case the pin K² would be removed,

a plug being introduced in end of piston K¹, and the cover K³ put back in position as shown in K³. Compression within A² will no longer take place under these conditions, but the pressure compensating action of A² with reference to the movement of C⁶ would remain the same.

I do not limit myself to the exact construction herein shown. What I believe is new and ask to have protected by Letters Patent, is

Claim.

In a gas engine, the combination of power means, secondary compression means for maintaining compression, mechanical means

for effecting ignition comprising a cam to operate and time said ignition means, cam rod and bell crank to transmit said cam movement to a secondary piston operated by said crank rod, a valve in said secondary piston, a minor piston within said secondary piston, a chamber to hold highly compressed air, a valve in said chamber, means for releasing said secondary compressed air into main cylinder for ignition purposes, and means for transmitting primary piston power to a crank shaft, substantially as described.

In testimony whereof I affix my signature.
ALVAH L. POWELL.