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METHOD OF EXHAUSTING THE CYLINDERS OF INTERNAL COMBUSTION ENGINES

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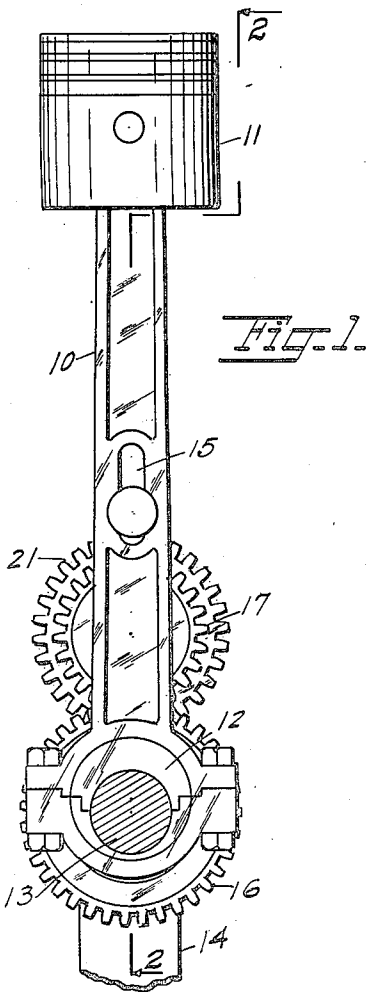


Fig. 1.

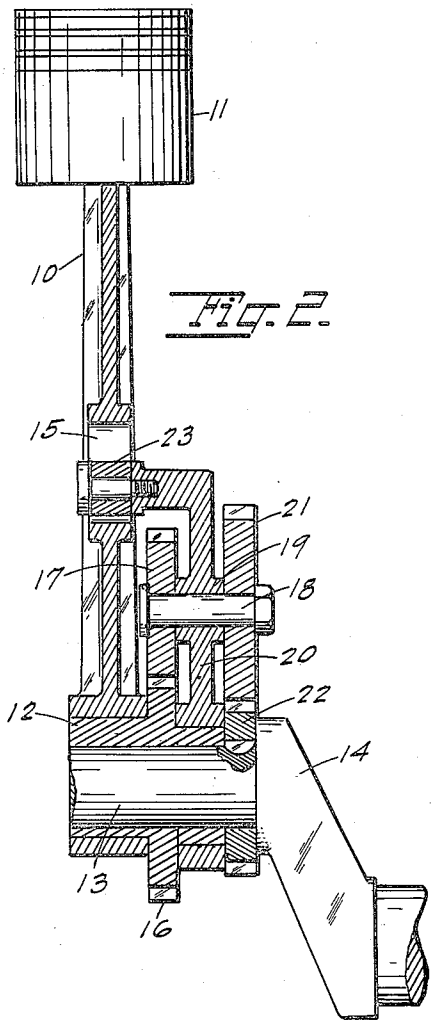


Fig. 2.

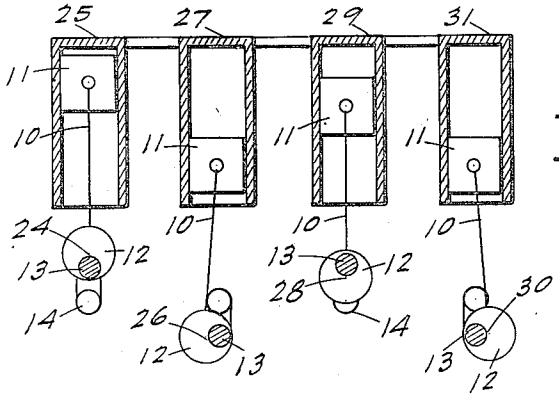


Fig. 3.

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METHOD OF EXHAUSTING THE CYLINDERS OF INTERNAL COMBUSTION ENGINES

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8 Claims. (Cl. 74—44)

This invention, a method of exhausting the cylinders of internal combustion engines, relates to the manner in which an engine piston is operatively connected to the crankpin of a crankshaft for varying the travel of the piston in the respective strokes of a cycle of operation of the engine.

The objects of the invention are as follows;

First; to provide a method of engine operation which will permit using a leaner gasoline mixture due to a more thorough expulsion of the products of combustion from the engine.

Second; to provide a method as outlined which will reduce unit bearing pressures and speeds on the main connecting rod bearing.

Third; to provide a method as outlined which will cause cooler operation of the engine due to substantially complete expulsion of exhaust gases.

Fourth; to provide a method as outlined which will increase the power of the engine at high speeds due to efficient expulsion of gas permitting a more complete intake charge of combustible gas.

Fifth; to provide a method as outlined which will eliminate back firing in the intake manifold.

Other objects and advantages of the invention will become apparent as the following description is read on the drawing forming a part of this application, and in which similar reference characters are used to designate similar parts throughout the several views, of which;

Fig. 1 is a front elevation of the invention with the crank shown in section.

Fig. 2 is a section taken on line 2—2 of Fig. 1.

Fig. 3 is a view diagrammatically illustrating the operation of the invention through a four-stroke cycle in four cylinders.

The invention consists of a connecting rod 10 having one end operatively connected to a piston 11, and its other end rotatably mounted on an eccentric 12, this eccentric 12 being rotatable on a crankpin 13 of a crankshaft 14.

A slide bearing 15 is formed intermediate the length of the connecting rod 10.

Integral with, or affixed to the eccentric 12 is a gear 16, which is concentric to the crankpin 13, and meshes with a pinion 17 which is fixed on one end of a shaft 18, this shaft 18 being rotatable in a bearing 19 in the gear-carrying connecting rod 20.

Another gear 21 is fixed on the other end of the shaft 18 and meshes with a pinion 22 which is fixed on, or integral with the crankpin 13.

The upper end of the gear-carrying connecting rod 20 is provided with a slide member 23 which operates in the slide bearing or slot 15.

The operation of the invention is as follows;

Pinion 22 rotates with the crankpin 13 and drives gear 21, which gear 21 through shaft 18, drives pinion 17, pinion 17 in turn driving gear 16, the ratio through the gear train being 2:1. Therefore for each revolution of the crank, the eccentric 12 makes one-half revolution on the crank, and for each stroke of the crank the eccentric is advanced one-quarter revolution, the slide 23 and slide bearing 15 permitting reciprocal movement between the two connecting rods 10 and 20.

Referring to Fig. 3, the eccentric 12 is at the top center indicated at 24, and piston 11 has traveled almost to the head of the first cylinder 25, this being the last, or exhaust stroke of a cycle.

In the first, or intake stroke, the eccentric 12 has been rotated to position 26, moving the piston 11 to the lowest position in cylinder 27.

In the second or compression stroke, the eccentric 12 has been advanced to position 28 or its lowest position relative to the crankpin, and the piston consequently only moves up to the position shown in cylinder 29, which is the correct position for proper compression of the charge.

In the third or firing stroke, the eccentric has been advanced to position 30 while the piston has traveled down to the position shown in cylinder 31.

The fourth stroke, as previously described, now carries the piston almost to the head of the cylinder, almost completely exhausting the products of combustion.

Thus, in the exhaust stroke, the piston travels up a distance equal to the stroke of the eccentric higher than it does in the compression stroke.

Thus, the compression ratio may be made of any desired value, and the eccentric may be designed to move the piston closer to the cylinder head for the exhaust stroke to more thoroughly expel the exhaust gases.

It will be understood that variations in construction and arrangement of parts, which variations are consistent with the appended claims, may be resorted to, without detracting from the spirit or scope of the invention, or sacrificing any of the advantages thereof.

I claim:

1. In a crank connection; a crank pin having an eccentric rotatable thereon; a main connecting rod operating on said eccentric; an auxiliary connecting rod operating concentrically on said crankpin and slidably connected to said main connecting rod; and an operative connection be-

tween said crankpin, said auxiliary connecting rod, and said eccentric rotating said eccentric at one half the speed of said crankpin and in the same direction.

2. In a crank connection including a crankpin and an eccentric rotatable on the crankpin; a connecting rod operating on said eccentric; an auxiliary connecting rod operating concentrically on said crankpin and having a sliding connection to said connecting rod; and means operatively connecting said crankpin and said eccentric through said auxiliary connecting rod driving said eccentric at one half the speed of rotation of said crankpin.

3. In an internal combustion engine having a piston, a crankshaft having a crankpin, and a main connecting rod connected to said piston; means operatively connecting said main connecting rod and said crankpin equalizing the down strokes and varying the upstrokes of said piston through a four-stroke cycle and consisting of; an auxiliary connecting rod having a sliding connection with said main connecting rod and operating concentrically to said crank pin; an eccentric rotatable on said crankpin and forming the bearing for said main connecting rod; and an operative connection between said crankpin and said eccentric and controlled by said auxiliary connecting rod rotating said eccentric at one half the speed of rotation of said crankshaft and in the same direction.

4. In an internal combustion engine having a piston, and a crankshaft having a crankpin; a main connecting rod connecting said piston to said crankshaft through means equalizing the downstrokes and varying the upstrokes of said piston through a four-stroke cycle; said means comprising, an auxiliary connecting rod having a sliding connection with said main connecting rod and having a concentric bearing on said crankpin; an eccentric rotatable on said crankpin and forming the bearing for said main connecting rod; an operative connection between said crankpin and said eccentric and controlled by said auxiliary connecting rod rotating said eccentric in lagging relation, at one half the speed of rotation of said crankpin and in the same direction, and consisting of a train of four external spur gears driving from said crankpin to said eccentric through a ratio of two to one.

5. An operative connection between a crankshaft having a crankpin, and a reciprocating member; an eccentric rotatable on said crankpin; a main connecting rod having a bearing on said eccentric; an auxiliary connecting rod having a concentric bearing on said crankpin and having a sliding connection with said main connecting rod; an operative connection between said crankpin and said eccentric and controlled through said auxiliary connecting rod rotating said eccentric on said crank pin at a reduced speed relative to the speed of rotation of said crankpin and in the same direction.

6. In a variable stroke connection between a crankshaft having a crankpin with an eccentric rotatable thereon, and a reciprocating member; a main connecting rod operating on said eccentric; an auxiliary connecting rod concentrically operating on said crankpin and having a sliding connection with said main connecting rod; and a speed reducing connection between said crankpin and said eccentric driving said eccentric in the same direction of rotation as the crank pin and at one half the speed.

7. In a variable-stroke connection between a crank pin and an eccentric rotatable thereon; a main connecting rod having a bearing on said eccentric; a driven gear fixed on said eccentric; a drive gear fixed on said crankpin; an auxiliary connecting rod concentrically operating on said crankpin and having a sliding connection to said main connecting rod; a shaft rotatably mounted through said auxiliary connecting rod and a gear fixed on each end of said shaft and respectively meshing with said drive and driven gears.

8. A variable stroke connection comprising a crankshaft having a crankpin; an eccentric rotatable on said crankpin; a driven gear fixed on said eccentric; a bearing hub integral with said eccentric and concentric to said crankpin; a connecting rod having a bearing rotatable on said eccentric and having a slide bearing intermediate its length; an auxiliary connecting rod having a bearing rotatable on said hub and having a slide member operating in said slide bearing and having a shaft bearing formed intermediate its length; a shaft rotatable in said shaft bearing; a drive gear fixed on said crankpin; and a pair of gears fixed on said shaft and respectively meshing with said drive gear and said driven gear.

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