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W. MOREY, Jr.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED NOV. 2, 1906.

Fig. 1,

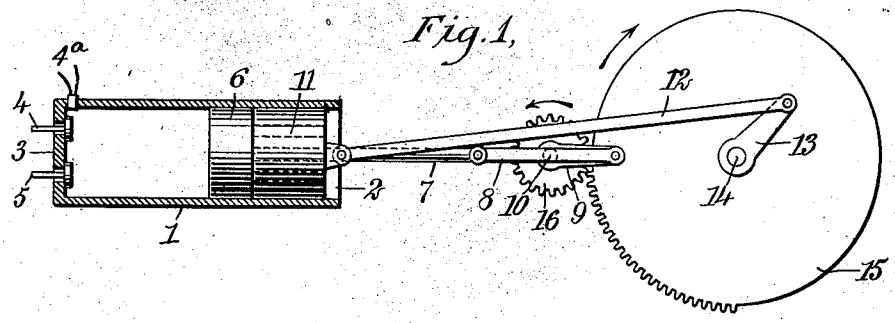


Fig. 2,

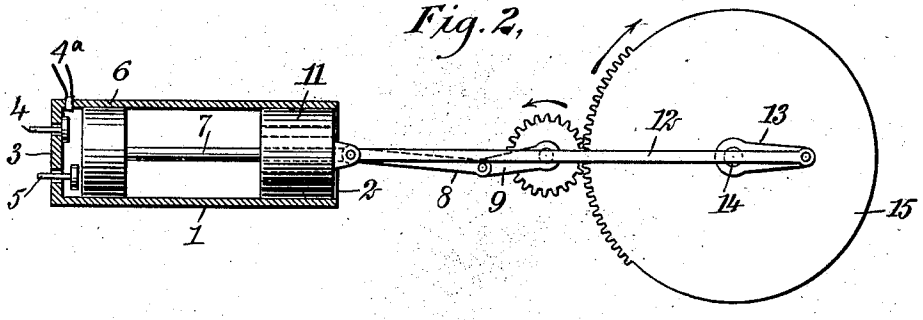


Fig. 3,

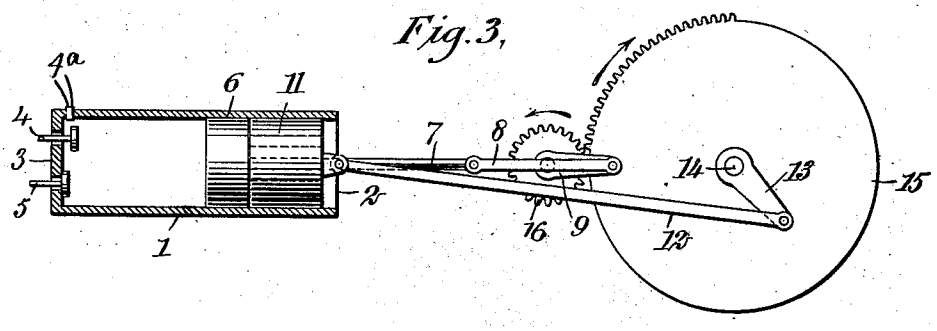
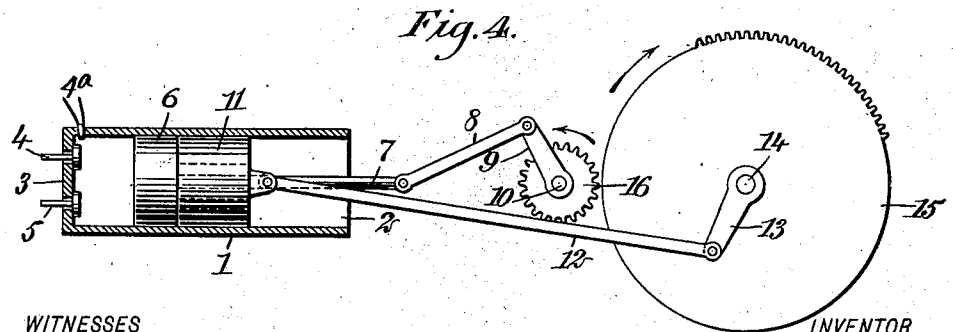


Fig. 4.



WITNESSES

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INTERNAL-COMBUSTION ENGINE.

No. 857,410. Specification of Letters Patent. Patented June 18, 1907.

Application filed November 2, 1906. Serial No. 341,725.

To all whom it may concern:

Be it known that I, WILLIAM MOREY, Jr., a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Internal-Combustion Engine, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in internal combustion engines, and more particularly to a new type of engine having all of the advantages of the four-cycle engine, including the complete scavenging, and at the same time having all of the advantages of the two-cycle engine, namely, an impulse for every revolution of the drive shaft.

My improved engine comprises a cylinder having two pistons therein and means for so connecting them that they travel together during the compression and the power strokes, while at the end of the power stroke the pistons rapidly separate and come together again to completely clear the cylinder of the exhaust and refill the cylinder with a fresh charge. To accomplish this, the pistons are so geared that one of them travels through each stroke in substantially the same time as through every other stroke while the other piston travels through two out of every four strokes at a very much faster rate than through the remaining two. Thus, one of the pistons acts alone as a scavenging and cylinder-filling piston, while the two pistons together act as the compression piston and receive the impulse after the explosion.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, in which

Figure 1 is a side elevation of an engine embodying my invention, and shown somewhat diagrammatically, the parts being in the position they occupy when at the end of the power stroke; Fig. 2 is a view similar to Fig. 1, but showing the parts in the position they occupy at the end of the scavenging stroke; Fig. 3 is a view similar to Fig. 1, but showing the parts in the position they occupy at the beginning of the compression stroke; and Fig. 4 is a view similar to Fig. 1, but showing the parts in the position they occupy toward the end of the compression stroke.

In my improved engine I employ a cylinder 1 of any suitable form or construction, which is provided with any suitable means for cooling the outside of the cylinder, as, for instance, a jacket or radiating flanges, but as these constitute no portion of my invention, they are not shown. The cylinder is provided with an open end 2 and a closed end 3, having an inlet valve 4 and an exhaust valve 5 operated in any suitable manner, as, for instance, by being connected to the drive shaft by gearing of well known construction. Within the cylinder is a solid piston 6 at the inner end of a piston rod 7, which piston rod is connected by a connecting rod 8 to a crank 9 carried on a shaft 10.

Within the cylinder and between the piston 6 and the open end 2, is provided a second piston 11 having a passage therethrough for the piston rod 7, and having perforations shown in dotted lines, whereby atmospheric air may freely pass to and fro through the piston. This piston has a connecting rod 12 pivotally secured thereto, and this connecting rod is attached to the crank 13 on the main drive shaft 14. The shafts 10 and 14 are arranged in alinement with the piston rod 7, and each shaft is provided with a wheel, which wheels are in engagement during only a portion of each revolution of the main drive shaft. The wheel 15 on the main drive shaft is of exactly four times the diameter of the wheel 16 on the shaft 10, and the wheel 15 is provided with means whereby it will only engage with the wheel 16 during one-quarter of each revolution of the former. This means may be of any suitable character, but as is shown in the drawings, the desired result is accomplished by providing the wheel 16 with gear teeth throughout its circumference, and providing the wheel 15 with gear teeth throughout only a quarter of its circumference, whereby the wheels may intermesh, or may rotate independently of each other without intermeshing.

In the operation of my improved engine, the charge after having been admitted to the cylinder and ignited in any suitable manner, causes the piston 6 to be forced outward to the position shown in Fig. 1. The outward movement of this piston causes the simultaneous outward movement of the piston 11, as the two are in contact, and the gear wheels 15 and 16 do not intermesh. During this outward stroke the two pistons travel at exactly the same rate, the piston 11 merely being pushed ahead of the piston 6, but as it is

pushed outward the power generated is delivered to the main drive shaft 14. As the two pistons travel at the same rate, the two wheels 15 and 16 also rotate at the same rate, but due to the difference in circumference the speed of any given point on the circumference of the wheel 15 would be four times that of the speed of a given point on the circumference of the wheel 16. As the pistons reach the position shown in Fig. 1, the exhaust valve 5 is opened by means of any suitable mechanism, not shown, and the teeth on the wheel 15 intermesh with the teeth on the wheel 16. This causes the circumferences of the two wheels to travel at the same rate, and, therefore, causes the wheel 16 to rotate at four times the speed of the wheel 15. As the wheel 16 is now positively rotated and receives its power from the wheel 15 rather than from the piston 6, it causes this piston to travel to the opposite end of the cylinder, while the piston 11 travels only a very short distance. The parts thus almost instantaneously reach the positions indicated in Fig. 2, and the exhaust charge is completely ejected from the cylinder. As the piston 6 is still traveling at its greatly increased speed, it is almost instantly again withdrawn to the position shown in Fig. 3, the inlet valve 4 having opened and the exhaust valve 5 closed, and the cylinder becomes filled with the explosive charge. This scavenging of the cylinder and the refilling of it by a fresh charge has thus been accomplished by the piston 6, while the piston 11 is moved outward only a very short distance to the end of its outward stroke and returned again only a very short distance on its compression stroke. As the piston 6 completes the intake stroke and reaches the position shown in Fig. 3, the teeth of the wheel 15 become disengaged from the teeth of the wheel 16 and the piston 6 is liberated and permitted to move at a speed dependent upon the speed of the piston 11. The compression stroke now begins, the parts being operated by the action of the fly wheel in a well known manner. During this part of the cycle the power derived from the fly-wheel is applied entirely to the piston 11, but as the piston 6 is free to move and is merely pushed along ahead of the piston 11, the gases are compressed until ignited, and the force of the explosion moves the parts again to the position indicated in Fig. 1.

It will thus be noted that the pistons 6 and 11 travel together during the compression and power strokes, one of said pistons being merely pushed ahead of the other, while for a very short interval at the end of the power stroke, the piston 6 is caused to move at four times its normal speed toward the opposite end of the cylinder to eject the exhaust gases and draw in a fresh charge. As the piston 6 returns again to engagement with the piston 11, its gear wheel becomes freed from the gear wheel of the piston 11, and the pistons may again move together at the same speed. The piston 6 of my improved engine thus performs the strokes of the piston of a four-cycle engine, but two of the strokes, namely, the scavenging and the intake strokes, in which very little power is required, are performed at four times the speed of the other two strokes, namely, the compression stroke and the power stroke, in which a large amount of power is required or generated. As the scavenging and the refilling of the cylinder occurs during the interval at the end of the power stroke and the beginning of the compression stroke of the piston 11, every stroke of the latter is one either requiring or generating power, and an impulse is given to the drive shaft 14 at every single revolution of the latter. Thus the engine is a two-cycle engine, although the piston 6 performs all of the strokes of the piston of a four-cycle engine and gives to my improved engine all of the advantages of the latter.

Various changes may be made in the construction of the mechanism for causing the two pistons to travel in the directions and at the speeds above described, as in practice mechanism may be developed which will accomplish these objects equally as well as the mechanism above described. It is only essential that the two pistons travel together during two strokes of one of them, while that one travels at a greatly increased speed to perform its remaining two strokes, whereby a four-cycle engine is produced in which an impulse is given to the drive shaft at every revolution of the latter.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In an internal combustion engine, a cylinder, a piston within said cylinder and having a uniform length of stroke, and means whereby said piston performs two of its strokes at a speed greater than that at which it performs the remaining two strokes.

2. In an internal combustion engine, a cylinder having a piston therein acting upon the four-cycle principle and having a uniform length of stroke, and means whereby the scavenging and intake strokes are performed at a much greater speed than the compression and power strokes.

3. In an internal combustion engine, a cylinder having a piston therein acting upon the four-cycle principle, and means whereby two of its strokes are performed in less time than either of the other two strokes.

4. In an internal combustion engine, a cylinder, two pistons therein, and means whereby the pistons travel in the same direction at the same rate during two strokes of one of the pistons and at different rates during the remaining two strokes of said piston.

5. In an internal combustion engine, a cylinder, two pistons therein, one of said pistons operating upon the four-cycle principle, and means whereby the two pistons travel in the same direction during the compression and power strokes of said piston and in opposite directions during the scavenging and intake strokes.

6. In an internal combustion engine, a cylinder, two pistons therein, one of said pistons traveling upon the two-cycle principle and the othere upon the four-cycle principle, and means whereby the pistons travel in the same direction at the same rate during two strokes of the last mentioned piston.

7. An internal combustion engine, having an open-ended cylinder provided with inlet and outlet valves adjacent one end thereof, and two pistons therein, one of said pistons traveling upon the four-cycle principle and the other piston located between the first mentioned piston and the open end of the cylinder, and traveling upon the two-cycle principle.

8. An internal combustion engine, having a cylinder one end thereof being open and the opposite end thereof being provided with inlet and exhaust valves, and two pistons within said cylinder, one of said pistons traveling upon the four-cycle principle and the other of said pistons being provided with perforations throughout its length, and located intermediate the first mentioned piston and the open end of the cylinder.

9. An internal combustion engine, having an open ended cylinder, a piston located therein and operating upon the four-cycle principle, and a second piston between said first mentioned piston and the open end of the cylinder, and having passages whereby the space between the two pistons may communicate with the atmosphere at all times.

10. An internal combustion engine, having an open ended cylinder, a piston operating therein upon the four-cycle principle, and a second piston between said first mentioned piston and the open end of the cylinder and operating upon the two-cycle principle, said last mentioned piston being provided with perforations whereby the space between said pistons may communicate at all times with the atmosphere.

11. In an internal combustion engine, a cylinder having a piston therein operating upon the four-cycle principle, a second piston therein and operating upon the two-cycle principle, said last mentioned piston being provided with passages whereby the space between said pistons may communicate at all times with the atmosphere, and means whereby the two pistons travel in contact with each other during two of the strokes of the first mentioned piston, and travel independent of each other during the remaining two strokes.

12. In an internal combustion engine, a cylinder having an open end, a piston located therein and acting upon the two-cycle principle, and means traveling with said piston during the greater part of the compression and the power strokes and adapted to travel longitudinally of the cylinder during the final portion of the power stroke and the beginning of the compression stroke to remove the exhaust gas and take in a fresh charge.

13. In an internal combustion engine, a cylinder, a piston located therein and acting upon the two-cycle principle, and a second piston traveling therewith during the main portion of each stroke and adapted to travel independently thereof to eject the exhaust gases and take in a fresh charge while the first mentioned piston is completing its power stroke and beginning its compression stroke.

14. In an internal combustion engine, a cylinder, a piston located therein and acting upon the two-cycle principle, a second piston in contact with the first mentioned piston during the latter portion of the compression stroke and the first portion of the power stroke, and means whereby the second piston travels at a greatly increased speed to eject the exhaust gases and take in a fresh charge while the first mentioned piston is completing its power stroke and beginning its compression stroke.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM MOREY, JR.

Witnesses:
JNO. M. RITTER,
CLAIR W. FAIRBANK.