July 19, 1927. 1,636,612

L. H. NOAH

INTERNAL COMBUSTION ENGINE

Filed April 24, 1926 2 Sheets-Sheet 1

Fig. 1.

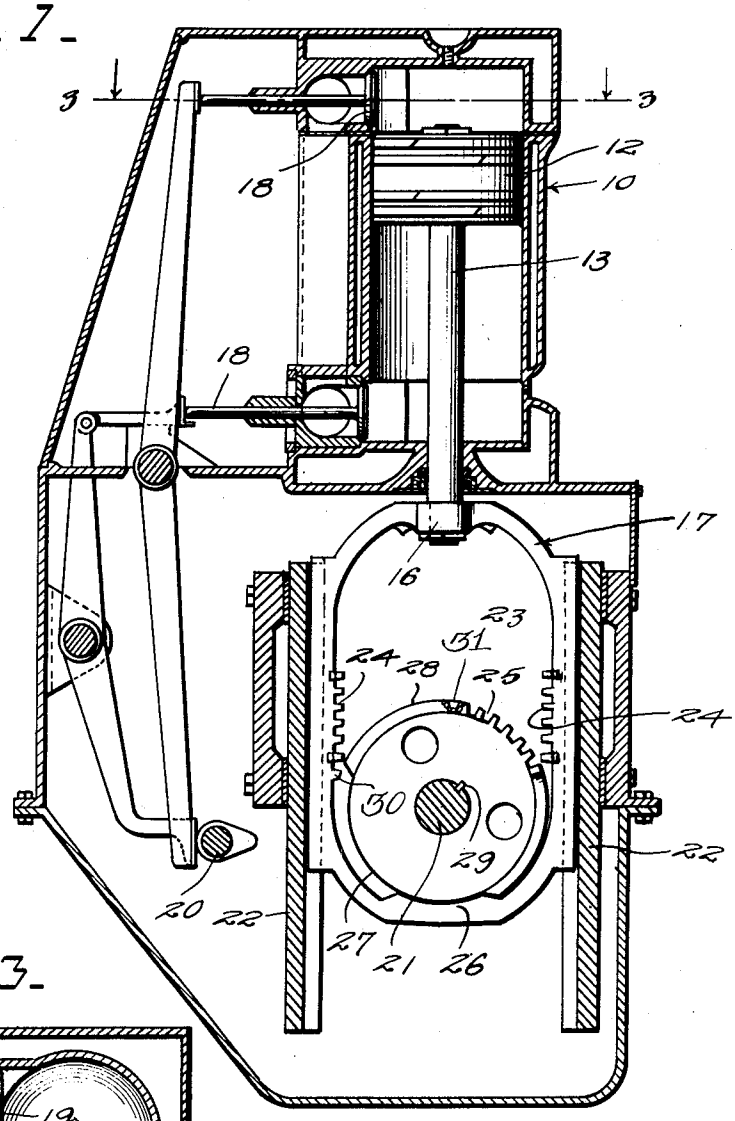

Fig. 3.

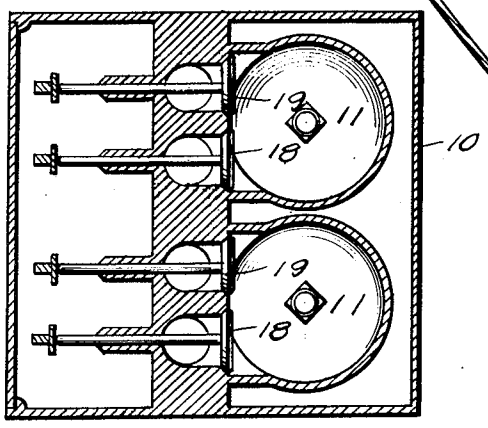

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Fig. 2.

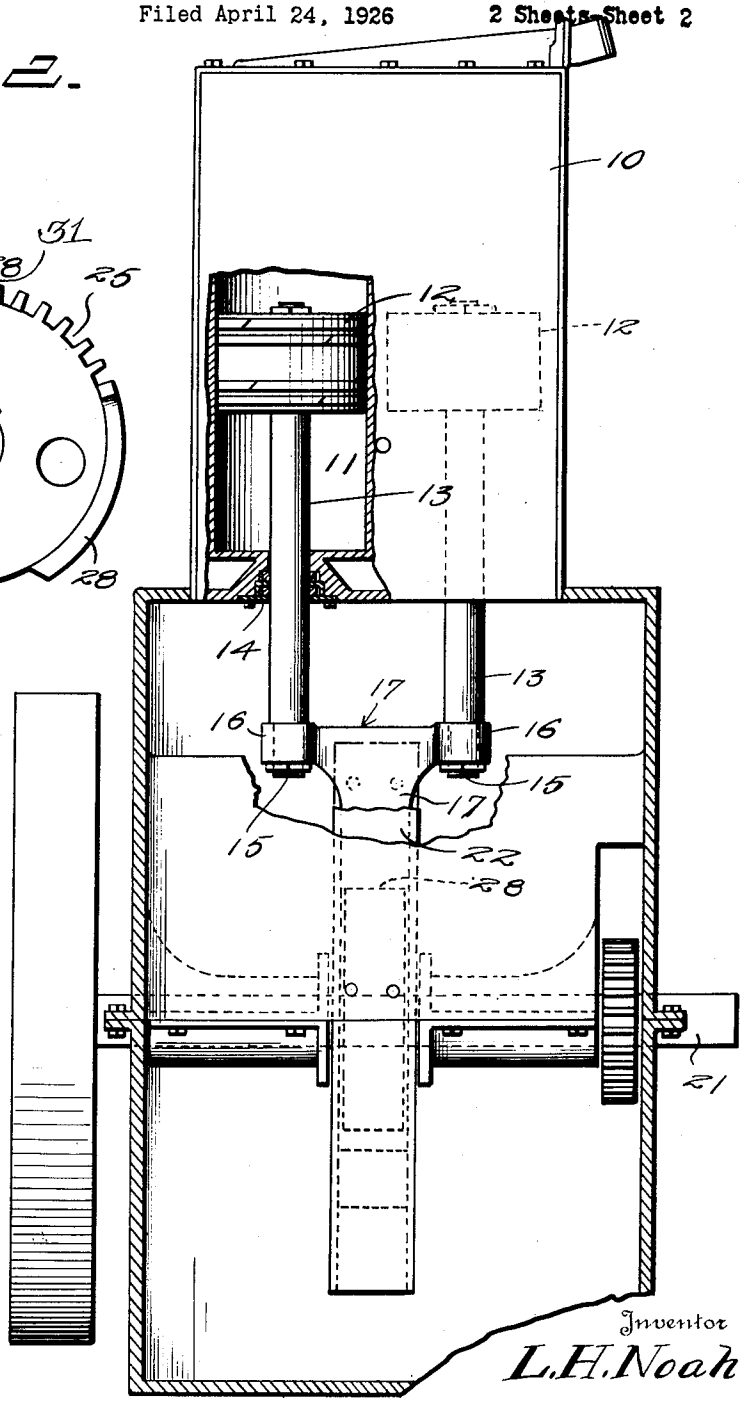
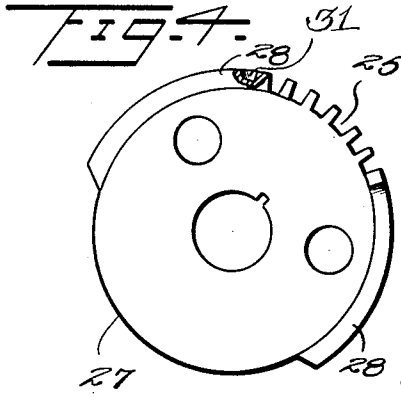


Fig. 4.



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Patented July 19, 1927. 1,636,612

UNITED STATES PATENT OFFICE.

LEROY H. NOAH, OF PALCO, KANSAS.

INTERNAL-COMBUSTION ENGINE.

Application filed April 24, 1926. Serial No. 104,414.

This invention relates to internal combustion engines and more particularly to a means connecting the reciprocating pistons of internal combustion engines to the power or crank shafts thereof.

A further object of the invention is to provide an improved four cycle motor in which distributed losses, due to the usual angular strains applied by the ordinary crank connections, are eliminated and the accompanying friction likewise eliminated.

A further and more specific object of the invention is to provide an internal combustion engine, the pistons of which are connected with a yoke to reciprocate this yoke in a straight line together with means for converting this straight line movement of the piston into a rotary movement of such character that all side strain is eliminated.

These and other objects I attain by the construction shown in the accompanying drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention and wherein:—

Figure 1 is a vertical sectional view through an engine constructed in accordance with my invention;

Figure 2 is a view partially in section and partially in elevation made at right angles to the view shown in Figure 1;

Figure 3 is a section on the line 3—3 of Figure 1;

Figure 4 is an enlarged side elevation of the control member.

Referring now more particularly to the drawings, the numeral 10 generally designates a cylinder block including a pair of cylinders 11 arranged side to side. Operating within each cylinder is a piston 12 having a rod 13. The lower or crank case ends of the rods 13 extend through packing boxes 14 and are rigidly connected, as at 15, to ears 16 projecting from opposite sides of a yoke 17. Opposite ends of the cylinders 11 are each provided with intake and exhaust valves 18 and 19 suitably controlled from a cam shaft 20 driven from the crank shaft 21, the axis of which is perpendicular to the axes of the rods 13. The pistons are maintained by the yoke 17 in corresponding positions in their cylinders and the valve arrangement is such that as one end of one cylinder is exhausting, the corresponding end of the other cylinder is compressing, so that a cushioning of the yoke 13 occurs at each end of the stroke thereof, this cushion being alternately split at the corresponding ends of corresponding strokes by the cylinders.

The yoke 17 is mounted in suitable guides 22 carried by the base of the cylinders and has formed therein a substantially oval opening 23 through which the crank shaft 21 is directed. The longer axis of this opening is in the same plane as the axes of the rods 13 and the longer walls of the opening are provided upon opposed faces thereof with short rack sections 24 adapted to alternately engage with the teeth 25 of an interrupted gear. The shorter walls of the opening have inwardly projecting curved abutment blocks 26 adapted for coaction with an untoothed portion 27 of the disk upon which the interrupted gear is formed. This portion of the disk has its wall curved upon the same radius as the curved surface of the abutment blocks and between the ends of this untoothed portion 27 and the interrupted gear, the outer edge of the disk has lugs 28, the outer faces of which are curved upon the same radius as the outer ends of the teeth 25. The teeth of the racks 24 have their base line coincident with the inner walls of the yoke and the lug portions 28 of the disk are of such length that they will extend between one end of the rack and the adjacent end of the abutment block 26 at the adjacent end of the yoke 17.

In operation, assuming the pistons and yoke to be in the positions illustrated in Figure 1 of the drawings, explosion within the cylinder will cause the yoke 17 to move downwardly. The rack 24 at the right hand side of the yoke will engage with the interrupted gear 25, causing rotation of the disk and accordingly of the shaft 21 to which the disk is keyed, at 29. Downward movement of the pistons and yoke is limited by engagement of the abutment block 26 at the upper end of the yoke with the untoothed portion 27 of the disk and by the compression at the lower end of one of the cylinders, as hereinbefore noted.

Arriving at the end of its stroke, the abutment 26 at the upper end of the yoke remains in engagement with the portion 27 of the disk during a short period of rotation of the crank shaft at the end of which the second lug 28 engages against the left hand end of the upper abutment 26, slightly raising the yoke and bringing the gear 25 into engagement with the upper tooth of the left hand rack. The explosion then takes place

at the lower end of one of the pistons, causing the yoke to move upwardly and impart a second impulse to the shaft 21. It will thus be seen that during each cycle of operation of the pistons, the gear is engaged with one of the racks and at the end of the cycle, the gear is out of engagement with both racks. At this time, the lugs 28, by their engagement with the end teeth of the racks and the disk by its engagement with the abutment 26 prevent movement of the yoke in opposite directions. This provides a short halt at the end of each stroke, permitting either complete scavenging of the cylinder or a more complete intermingling of the fuel charge which is compressed so that it is properly prepared for firing. The latter feature is particularly desirable in that it eliminates stratification of the charge. To inaugurate the next cycle of the piston, a lug 28 engages against one of the abutments causing the slight movement of the yoke above referred to.

In order to reinforce the teeth of the racks, the gear 25 and lugs 28 against the strain placed thereon by initial engagements, the lugs and the end teeth of both the racks and gears are extended beyond the sides of the disk and yoke so as to provide increased wearing surface.

If desired, the yoke may be provided at each side thereof at that end of the rack 24 last engaged by the teeth 25 of the gear with an additional or holding tooth 30 which engages in a socket 31 formed in the coacting lug 28. These teeth will be made shorter than the teeth of the rack 24 so that they will be cleared by the lugs 28 when the yoke has arrived at the end of its movement.

It will, of course, be obvious that the construction hereinbefore set forth is capable of a certain range of change and modification without materially departing from the spirit of the invention and I accordingly do not limit myself to such specific structure except as hereinafter claimed.

I claim:—

1. Means for connecting the pistons of internal combustion engines with the shafts thereof comprising a yoke rigidly connected with the piston, said yoke being in the form of an open frame through which the shaft is directed, racks formed upon opposed sides of the frame and a disk secured to the shaft and including a segmental gear for coaction with said racks, the racks and gear being out of engagement during a portion of each cycle of the piston and coacting means upon the yoke and disk for preventing longitudinal movement of the yoke during said portion of each cycle.

2. Means for connecting the pistons of internal combustion engines with the shafts thereof comprising a yoke rigidly connected with the piston, said yoke being in the form of an open frame through which the shaft is directed, racks formed upon opposed sides of the frame and a disk secured to the shaft and including a segmental gear for coaction with said racks, the racks and gear being out of engagement during a portion of each cycle of the piston and lugs upon the disk at opposite ends of the gear engaging the end teeth of the racks during said portion of each cycle to prevent longitudinal movement of the yoke in one direction.

3. Means for connecting the pistons of internal combustion engines with the shafts thereof comprising a yoke rigidly connected with the piston, said yoke being in the form of an open frame through which the shaft is directed, racks formed upon opposed sides of the frame and a disk secured to the shaft and including a segmental gear for coaction with said racks, the racks and gear being out of engagement during a portion of each cycle of the piston and lugs upon the disk at opposite ends of the gear engaging the end teeth of the racks during said portion of each cycle to prevent longitudinal movement of the yoke in one direction, the disk, by its engagement with the ends of the yoke, preventing movement of the yoke in the opposite direction.

4. Means for connecting the pistons of internal combustion engines with the shafts thereof comprising a yoke rigidly connected with the piston, said yoke being in the form of an open frame through which the shaft is directed, racks formed upon opposed sides of the frame and a disk secured to the shaft and including a segmental gear for coaction with said racks, the racks and gear being out of engagement during a portion of each cycle of the piston and lugs upon the disk at opposite ends of the gear engaging the end teeth of the racks during said portion of each cycle to prevent longitudinal movement of the yoke in one direction, the disk, by its engagement with the ends of the yoke, preventing movement of the yoke in the opposite direction, one of said lugs at the end of said cycle having engagement with the yoke imparting an initial longitudinal movement thereto to inaugurate the next cycle of the piston.

5. Means for connecting the pistons of internal combustion engines with the shafts thereof comprising a yoke rigidly connected with the piston, said yoke being in the form of an open frame through which the shaft is directed, racks formed upon opposed sides of the frame and a disk secured to the shaft and including a segmental gear for coaction with said racks, the racks and gear being out of engagement during a portion of each cycle of the piston and lugs upon the disk at opposite ends of the gear engaging the end teeth of the racks during said portion of each cycle to prevent longitudinal movement of

the yoke in one direction, the disk, by its engagement with the ends of the yoke, preventing movement of the yoke in the opposite direction, the ends of the yoke having abutments against which the disk engages during said portion of the cycle, one of the lugs having engagement with said abutments at the end of each cycle imparting an initial movement to the yoke, inaugurating the succeeding cycle.

In testimony whereof I hereunto affix my signature.

LEROY H. NOAH.