May 6, 1930. W. S. ROHN 1,757,815

INTERNAL COMBUSTION ENGINE

Filed Oct. 30, 1926 2 Sheets-Sheet 1

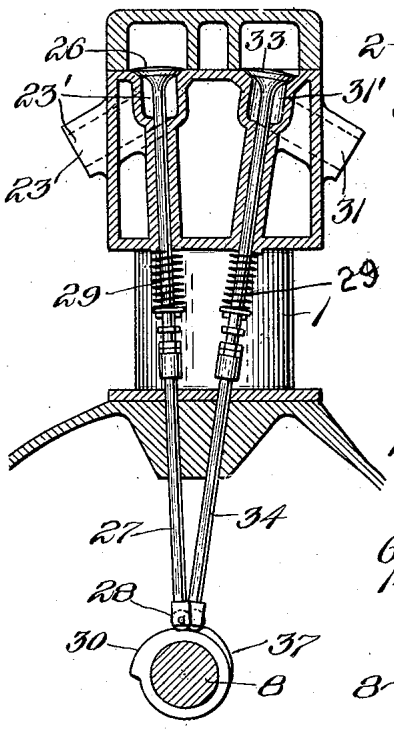

Fig. 3.

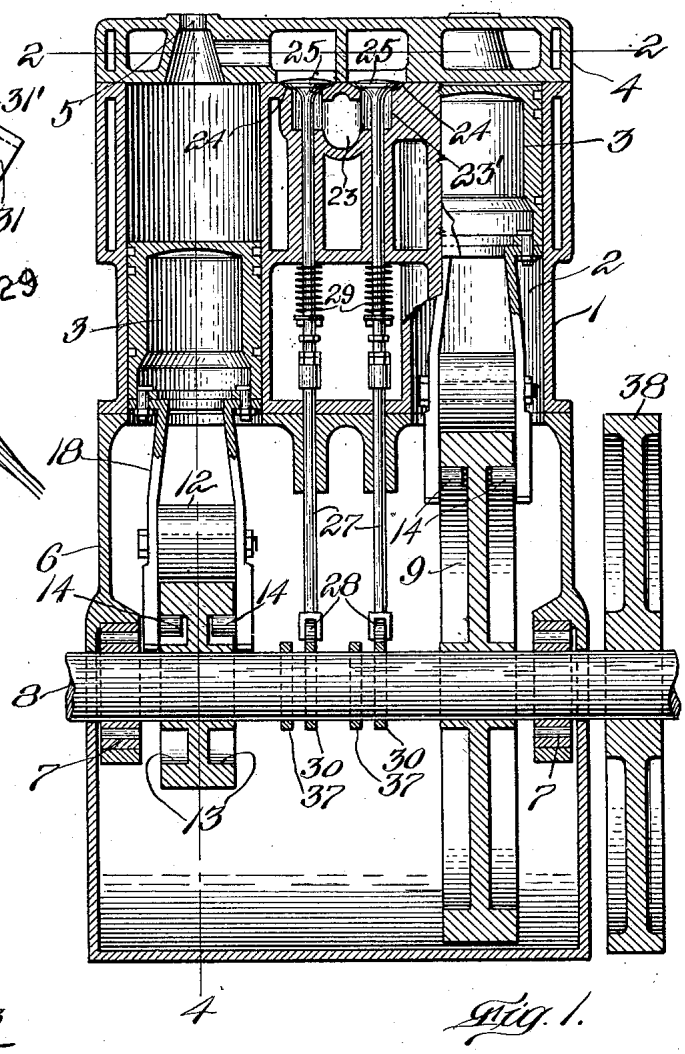

Fig. 1.

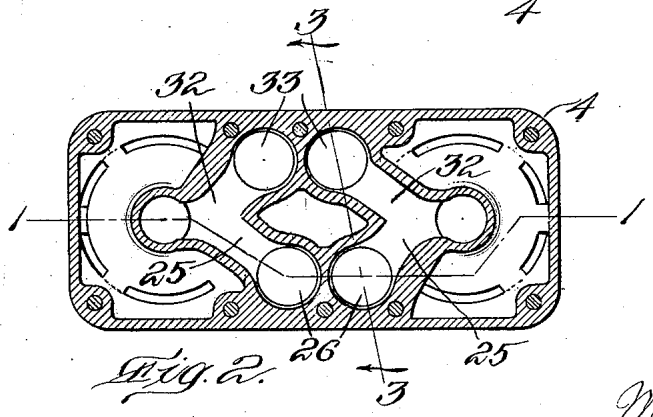

Fig. 2.

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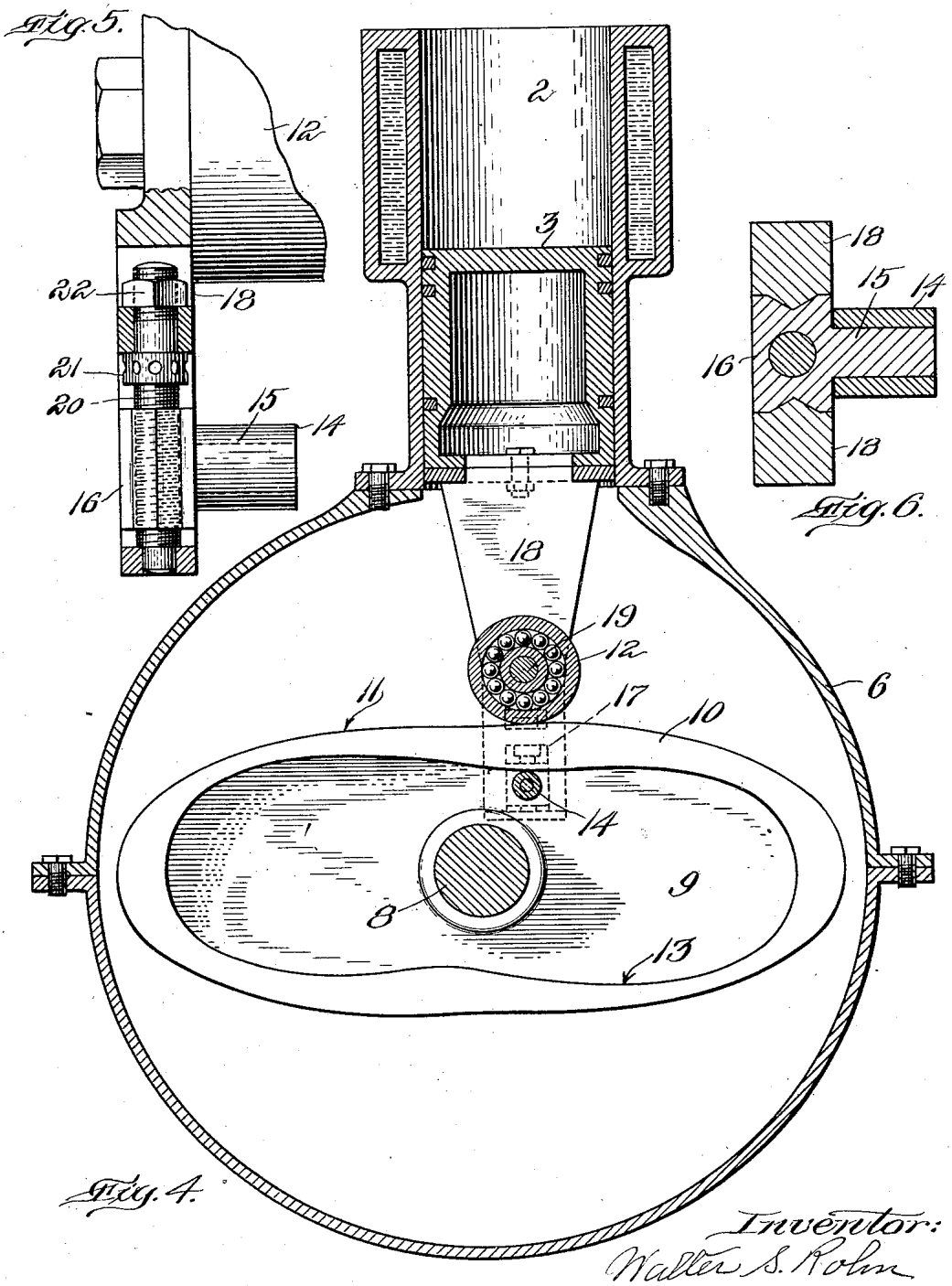

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UNITED STATES PATENT OFFICE

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INTERNAL-COMBUSTION ENGINE

Application filed October 30, 1926. Serial No. 145,201.

My invention relates to internal combustion engines and it has for its object to provide an improved engine of that class wherein the piston co-operates with a cam on, and constituting part of, the main shaft of the engine, the mode of operation involving four strokes of the piston for each rotation of the shaft.

The invention consists in certain features of construction and combination of parts which make it possible to conveniently regulate or adjust the connection between the piston and cam whereby wear of the latter may be compensated for.

In the accompanying drawings:

Figure 1 is an approximately central vertical section through an internal combustion engine constructed in accordance with my invention, the upper portion, however, being in section on the line 1—1 of Figure 2.

Figure 2 is a section on line 2—2 of Figure 1.

Figure 3 is a section on line 3—3 of Figure 2.

Figure 4 is a section on line 4 of Figure 1.

Figures 5 and 6 are details, on larger scale and are hereinafter described.

Having reference to the drawings, 1 is the cylinder block of my improved engine, said block being formed, as herein shown, with two cylinders 2, 2, in each of which is arranged a piston 3. The upper end of the cylinder block 1 is provided with a head 4 having openings 5 to receive the usual spark plugs, not shown. The cylinder block 1 and head 4 are, as usual, made with communicating water jackets.

At its lower end the cylinder block 1 is secured to a crank case 6 having roller bearings 7 supporting the main shaft 8 of the engine. Shaft 8 has secured to it, or formed upon it, two cams 9, each made upon its opposite faces with counterpart cam flanges 10, each formed with an external cam surface 11 co-operating with a relatively large roll or truck 12, and an internal cam surface 13 co-operating with a relatively small roll or truck 14.

As shown in Figure 1, each cam 9 is engaged by a pair of rolls 14 and each roll of said pair is journaled upon a stud 15 projecting from a block 16 slidably mounted in ways 17 provided near the lower end of an arm 18 rigidly connected with one of the pistons 3, while the roll 12 engaging the outer periphery of said cam is rotatably mounted upon a stud 19 secured at its ends to the two arms 18. As will be clear, each pair of arms 18 constitutes a rigid yoke extension part of its piston 3 which embraces the cam of that piston and carries the two inner rolls 14 and the outer roll 12. Thus the rolls and arms 18 constitute elements of the piston structure itself and there is no relative movement between these parts and the body of the piston 3 other than rotation of the rolls on their axes.

Each block 16 is formed with a threaded hole through it that is occupied by a screw 20 journaled near its ends in bearings provided upon the arm 18 within which the block is mounted, and each screw 20 is provided with a socketed flange 21 by means of which it can be rotated to adjust the block 16 in its ways 17, the upper end of the screw being threaded to receive upon it a lock nut 22 by means of which said screw is secured in adjusted position. Thus the rolls 14 may be accurately positioned with relation to the outer roll 14 and also adjusted relatively thereto to compensate for wear.

The cylinder block 1 is made with a fuel supply manifold or conduit 23 having branches 23′ connecting with ports 25 communicating with the cylinders 2. At the junction of the ports 23′ and 25 are provided seats 24 for inlet valves 26. Each valve 26 is provided with a downwardly extending stem 27 carrying at its lower end a roll 28. A spring 29 surrounding each valve stem yieldingly holds the valve 26, at the upper end thereof, down on to its seat 24 with the roll 28 co-operatively disposed with relation to a cam 30 on shaft 8. Each cam 30 is formed so as to open its valve 26 once during each revolution of shaft 8 and to hold the same open during one-quarter of the revolution thereof.

The cylinder block 1 is also made with an exhaust manifold or conduit 31 having branches (one of which is shown at 31′) connecting with ports 32 communicating with the cylinders 2. At the junction of the

ports 31′ and 32 are provided seats for exhaust valves 33. Each valve 33 is provided with a downwardly extending stem 34 carrying at its lower end a cam roll engaging a cam 37 on shaft 8. A coiled spring 29 surrounding each stem 34 normally holds each valve 33 closed on its seat with the cam roll at the lower end of said stem co-operatively disposed with relation to the cam 37 fast on shaft 8. Each cam 37 is formed so as to open its valve 33 once during each revolution of shaft 8, and to hold the same open during one-quarter of the revolution thereof—viz., the quarter revolution immediately preceding the opening of inlet valves 26. Of course the exact timing of the opening and closing of the inlet and exhaust valves can be varied as desired by modification of the shape of cams 30 and 37 to make their operation appropriate to the speed at which the engine is designed to operate.

The shaft 8 is shown as provided with the usual flywheel 38.

The mode of operation for each unit of the engine is as follows: With the piston 3 at the limit of its upward movement, as shown at the right of Figure 1, and with the two cams 30 and 37 controlling the inlet and exhaust valves of that cylinder in the positions shown in Figure 3, the exhaust at the completion of the preceding cycle of the unit has just been completed and the exhaust cam 37, as shown in Figure 3, has just passed out of engagement with the lower end of the stem 34 of the exhaust valve, while the intake cam 30 is about to engage the lower end of the stem 27 of the inlet valve 26. Starting with the parts in these positions, the first quarter revolution of shaft 8 raises the inlet valve 26 and holds it open while cam 9, acting through the rolls 14, positively moves the piston 3 to the limit of its outward movement toward shaft 8 at the completion of which movement the inlet valve 26 is closed by spring 29. During the next quarter revolution of shaft 8 the cam 9 shifts the piston 3 inwardly compressing the charge just taken in, at or near the completion of which movement said charge is ignited. The third quarter revolution of shaft 8 is effected by the outward stroke of the piston effected by the expanding gases. At the start of the fourth quarter revolution of the shaft 8 the cam 37 opens the exhaust valve 33 and holds the same open until the end of that last quarter revolution which completes the cycle.

What I claim is:

1. An internal combustion engine having in combination, a cylinder; a shaft provided with a piston-actuated and piston-actuating cam made upon one side face thereof with a flange; a piston within said cylinder having an extension occupying a position alongside of said cam; cam rolls carried by said extension and engaging the inner and outer peripheries of said flange; a stud block slidably mounted in ways provided on said extension carrying one of said rolls and a screw journaled on said extension having threaded engagement with said block so as to rigidly connect said block with said extension with provision for adjustment of the block on the same.

2. An internal combustion engine having, in combination, a cylinder; a shaft provided with a piston-actuated and piston-actuating cam made upon its opposite faces with flanges; a piston within said cylinder made with a rigid yoke extension embracing said cam; cam rolls carried by said yoke and engaging the inner and outer peripheries of said flanges; a stud block slidably mounted in ways provided on each arm of the yoke extension, each stud block carrying one of the rolls engaging the inner periphery of the cam, and a screw journaled on each arm and having threaded engagement with the block thereof so as to rigidly connect said block with its arm with provision for adjustment of the block on the same.

3. A shaft impeller comprising an oval shaped body portion having its outer edge providing a smooth, uninterrupted, outer endless track for a rolling driving means for said body, and said body portion having one of its faces, in proximity to its outer edge, formed with an endless inner track for a rolling holding means for said driving means, said inner track having oppositely disposed convex portions and oppositely disposed concave portions, the convex portions being alternately disposed with respect to the concave portions and disposed at the center of said track, and said concave portions being of greater length than said convex portions.

WALTER S. ROHN.