

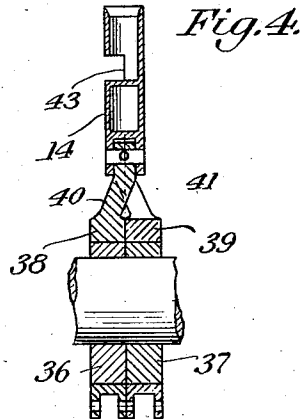
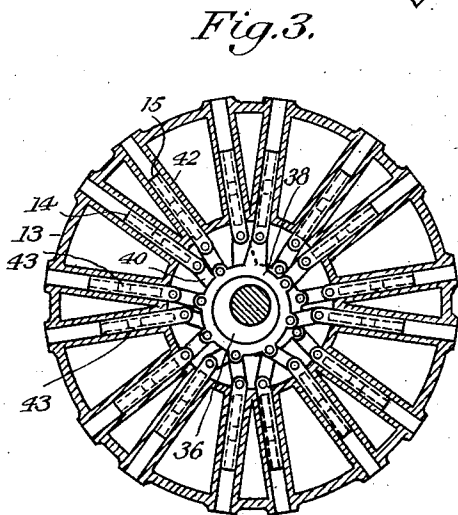
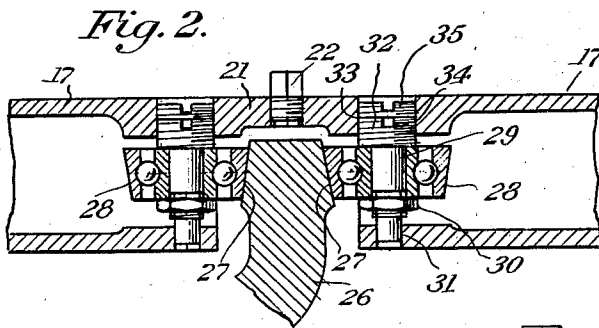
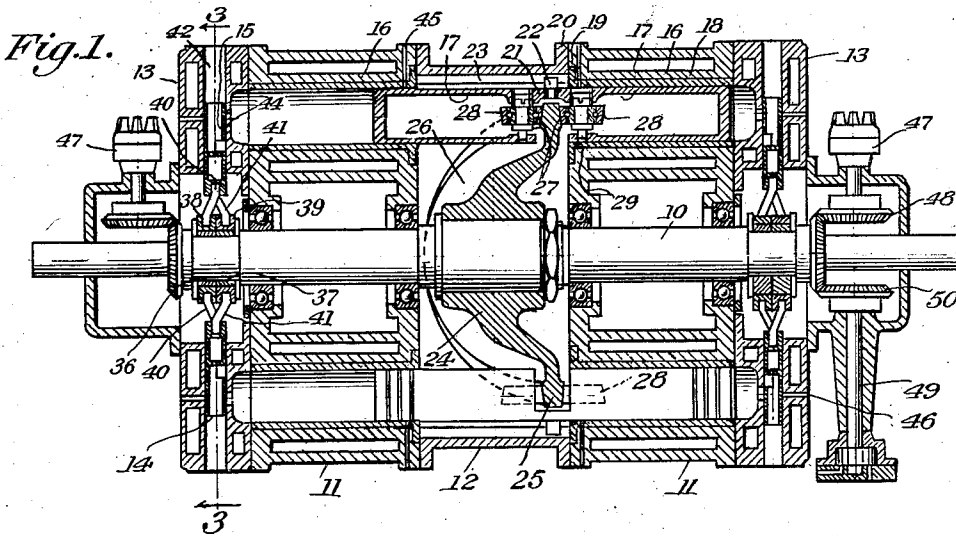
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R. LANDIS

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COMBUSTION ENGINE.

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Robert Landis
INVENTOR

UNITED STATES PATENT OFFICE

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COMBUSTION ENGINE

Robert Landis, Jerome, Ariz.

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1 Claim. (Cl. 123—58)

This invention relates to a combustion engine of the barrel type in which the cylinders are arranged with their axes parallel to the shaft and arranged in a cylindrical surface concentric with the shaft.

In combustion engines of this type the cylinders are arranged in two groups, one group at each end of the engine, and each cylinder of each group is in opposite relation to a corresponding cylinder of the other group there being a double ended piston associated with each opposite pair of cylinders, and the shaft is provided with an axial cam received by the central portions of the pistons, rollers being interposed between the opposite faces of the cam and the pistons to transmit the thrust between the pistons and the cam.

An object of the present invention is to provide an engine of the above described type in which the cylinder housings and the driving cam housing can be easily manufactured from sheet metal and tubing and welded together to reduce manufacturing costs and weight, this advantage being enhanced by a cylinder sleeve fitted into the housing to form the cylinders and permit the housing to be formed of material lighter than steel.

A further object of the invention is to provide a cam having tapered rolling surfaces to permit the rollers of the pistons to describe a proper size circle and reduce friction to a minimum.

A further object is to provide means for adjusting the rollers to obtain precision adjustment of the rollers relatively to the cam.

A further object is to provide a combustion engine of the above type with radially disposed plunger valves actuated by respective cams on the drive shaft to eliminate lifting rods, springs etc.

A further object is to provide apparatus of this character which will be formed of a few strong, simple and durable parts, which will be inexpensive to manufacture, and which will not easily get out of order.

With the above and other objects in view the invention consists of certain novel details of construction and combinations of parts hereinafter fully described and claimed, it being understood that various modifications may be resorted to within the scope of the appended claim without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawing forming a part of this specification:

Figure 1 is a longitudinal sectional view of a

combustion engine constructed in accordance with the invention.

Figure 2 is a fragmentary longitudinal sectional view, drawn to large scale, showing the rollers and the means for adjusting the rollers on the cam.

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a detail sectional view showing one of the plunger valves at one end of the engine housing and the respective cam on the engine shaft.

Referring now to the drawing in which like characters of reference designate similar parts in the various views, the combustion engine comprises a central shaft 10 mounted for rotation within a pair of cylinder blocks 11 which are arranged in axial alignment and are connected at their confronting ends to a cylindrical cam housing 12. The outer ends of the cylinder blocks are closed by cylinder heads 13 which support plunger type radially disposed inlet and exhaust valves 14 and 15 for controlling the admission of fuel to and the exhaust of burnt gases from the various cylinders of the respective block. The cylinder blocks, and the cylinder heads which form valve housings, are liquid cooled.

Each cylinder block is formed to provide a circular series of cylinders 16 arranged with their axes parallel with the shaft 10 and equally angularly spaced with respect to each other. The cylinders of one block are arranged in axial alignment with the corresponding cylinders of the other block and in each opposed pair of cylinders a double headed piston 17 is mounted for reciprocation.

An important feature of the invention is that in each cylinder a cylinder sleeve 18 is fitted and at one end abuts the respective cylinder head 13 and at the other end is provided with a flange 19 which is clamped between the block and a flange 20 on the cam housing 12. The sleeves may be formed of durable metal to provide wear surfaces for the pistons while the blocks forming the cylinders may be formed of less expensive light metal to economize in cost of production. The sleeves are all interchangeable and are easily removed and replaced by disconnecting the blocks 11 from the cam housing 12.

Each piston 17 is disposed with its closed end toward the respective head 13 and the inner open ends of each double headed piston are connected by a strut 21 having a pin 22 which fits in a guide groove 23 formed in the cam housing 12 and pre-

vents the double headed piston from turning but permits reciprocal movement of the piston.

A cam 24 is fixed securely to the shaft 10 within the cam housing 12 and is formed with a rim 25 which is circular in axial view but the axial faces 26 curve longitudinally of the shaft 10 in a simple harmonic curve to provide a cam surface 27 on each side thereof. These cam surfaces are inclined or tapered and diverge from the periphery of the rim toward the shaft 10.

The rim 25 of the cam is of such width as to be received closely by the tapered ball bearing rollers 28 which are mounted on respective pins 29 which form an important feature of the invention. Each pin, see Figure 2, is loosely engaged through the respective ball bearing roller 28 and is assembled with the roller through the medium of a nut 30. One end of the pin is mounted in an opening 31 formed in the wall of the respective piston at the open end thereof while the other end of the pin is provided with a head 32 which is screw threadedly engaged in an opening 33 formed in the open end of the cylinder diametrically opposite the opening 31. The head is provided with a kerf 34. A lock nut 35 is screw threadedly engaged in the opening 33 and bears against the head of the pin. By removing the lock nut the pin may be turned axially to adjust the roller upwardly or downwardly on the respective tapered cam surface 27 of the cam rim to compensate for wear and to maintain a precision contact between the cam surface 27, which may be called a rolling surface, and the tapered peripheral edge of the roller.

Each double headed piston reciprocates in its corresponding cylinders as the rim 25 of the cam passes between its corresponding rollers, and the rollers acting upon the rolling surfaces 27 of the cam under impulse of an explosion in one of the respective cylinders impart rotation to the cam 24 and consequently to the shaft 10. By employing two axial high points on the cam each piston will complete four strokes for each revolution of the shaft 10 so that the engine will be a four cycle engine.

The valves 14 and 15 are of the radial plunger type operated directly from the shaft 10. By referring to Figures 1 and 3 it will be seen that two cams 36 and 37 are mounted securely on the drive shaft in each respective head 13 of the engine. The cams carry respective loose rings 38 and 39. Respective master arms and connecting links 40 and 41 are pivotally connected to the rings and to the respective intake and exhaust valves 14 and 15.

The valves 14 and 15 are of the hollow plunger type open at the outer ends and sliding radially in respective tubular valve guides 42 formed in the heads and through which respectively fuel and exhaust gases are passed. The plunger valves

are provided with respective ports 43 which register with corresponding ports 44, see Figures 1 and 4, in the respective cylinder heads. The fuel enters through the hollow valve 15 and through the respective port 44 into the end of a respective cylinder. The exhaust gases escape through the respective port 44 and respective hollow exhaust valve 15.

The cylinder heads 13 are of annular formation and hollow, and the tubular valve guides 42 are spaced from each other and the side walls of the heads, in order that the cooling medium may circulate freely about and in direct contact with the valve guides substantially throughout their entire length. The tubular valve guides 42 of the respective cylinder heads 13 are arranged in a common plane normal to the axis of the heads whereby to permit the cylinder heads to be made of a comparatively small axial dimension and whereby to permit the operating eccentrics 36 and 37 to be arranged in close relation on the shaft 10.

Pressure oil is fed through openings 45 formed in the blocks and openings 46 formed in the heads, oil from the former openings lubricating the pistons and oil from the latter openings lubricating the valves.

The spark plugs for this type of engine are not shown as they are conventional, only the distributors 47 for dual ignition being shown, these distributors being geared to the shaft 10 as shown at 48. A power take off shaft 49 is shown geared at 50 to the shaft 10 to oil pump.

Since the operation of the parts has been described as the description of the parts progressed it is thought the invention will be fully understood without further explanation.

What is claimed is:

In a combustion engine having a central shaft, cylinder blocks arranged about each end of the shaft, annular cylinder heads on the outer ends of the blocks; the improvement which comprises tubular valve guides extending radially through the cylinder heads in spaced relation to each other and to the side walls of the heads, the tubular valve guides of each head being arranged in a common plane normal to the axis of the heads, a pair of the tubular valve guides being provided for each cylinder and provided at points between their ends with ports communicating with the cylinders, hollow plunger type valves disposed to reciprocate in the tubular valve guides and provided with ports movable into and out of registration with the ports in said guides, means connected to certain of the valves of each cylinder block, similar means connected to the remaining valves of each cylinder block, and means mounted on said shaft and associated with said first means for reciprocating the valves.

ROBERT LANDIS.