Jan. 28, 1964 E. A. McMAHAN 3,119,462

TWO CYCLE ENGINE

Filed Nov. 13, 1961 3 Sheets-Sheet 1

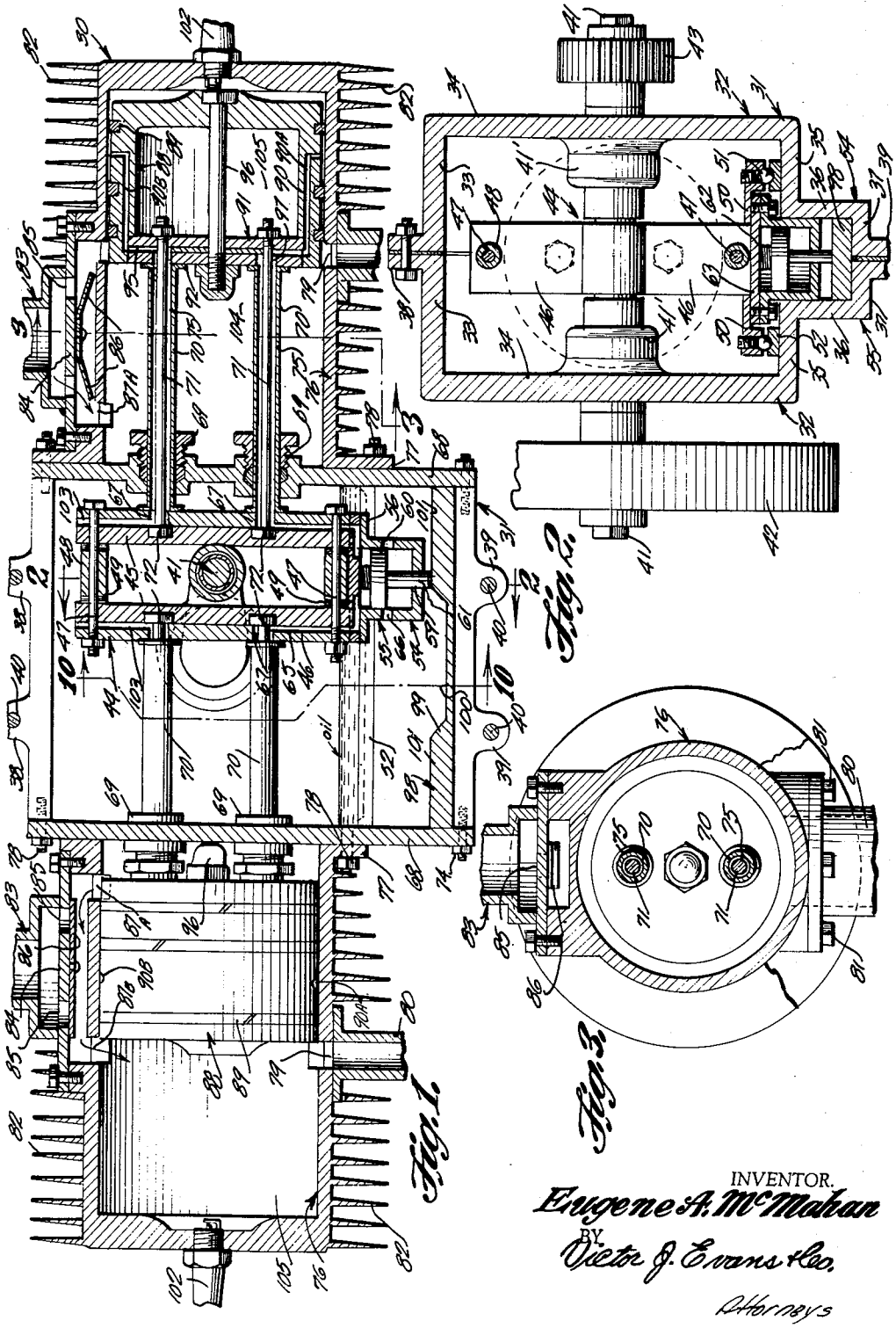


Fig. 1

Fig. 2

Fig. 3

INVENTOR.
Eugene A. McMahan
BY
Victor J. Evans & Co.
Attorneys

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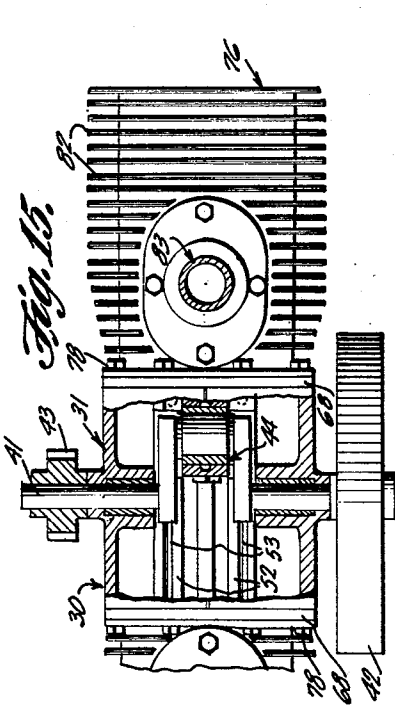


Fig. 1E.

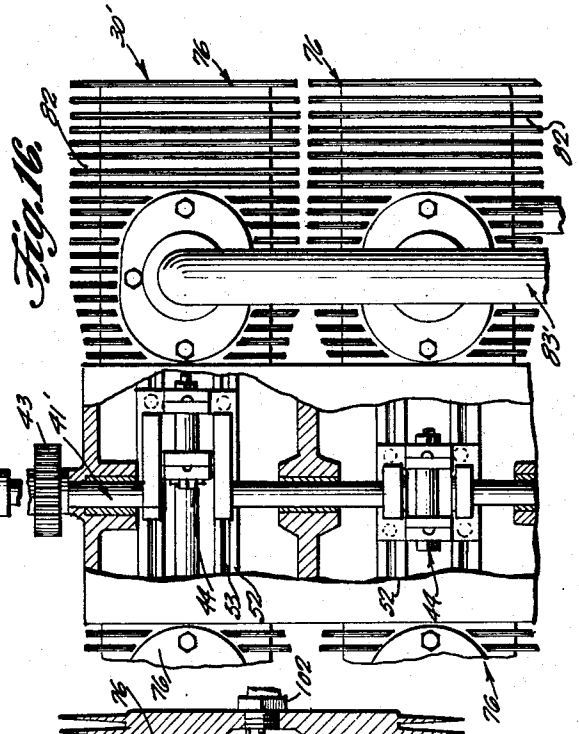


Fig. 1G.

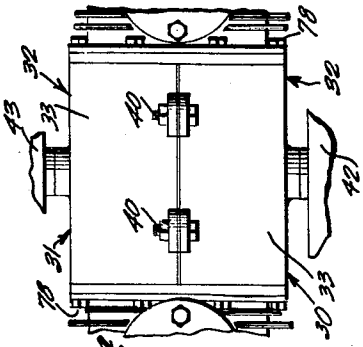


Fig. 1F.

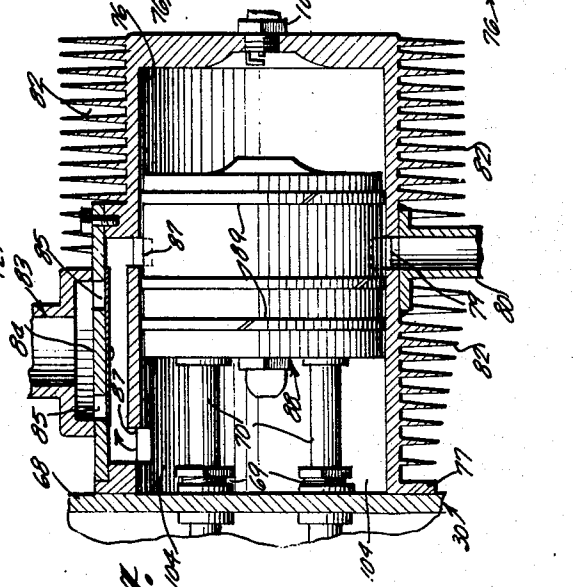


Fig. 1.

INVENTOR.
Eugene A. McMahan
BY
Victor J. Evans & Co.
Attorneys.

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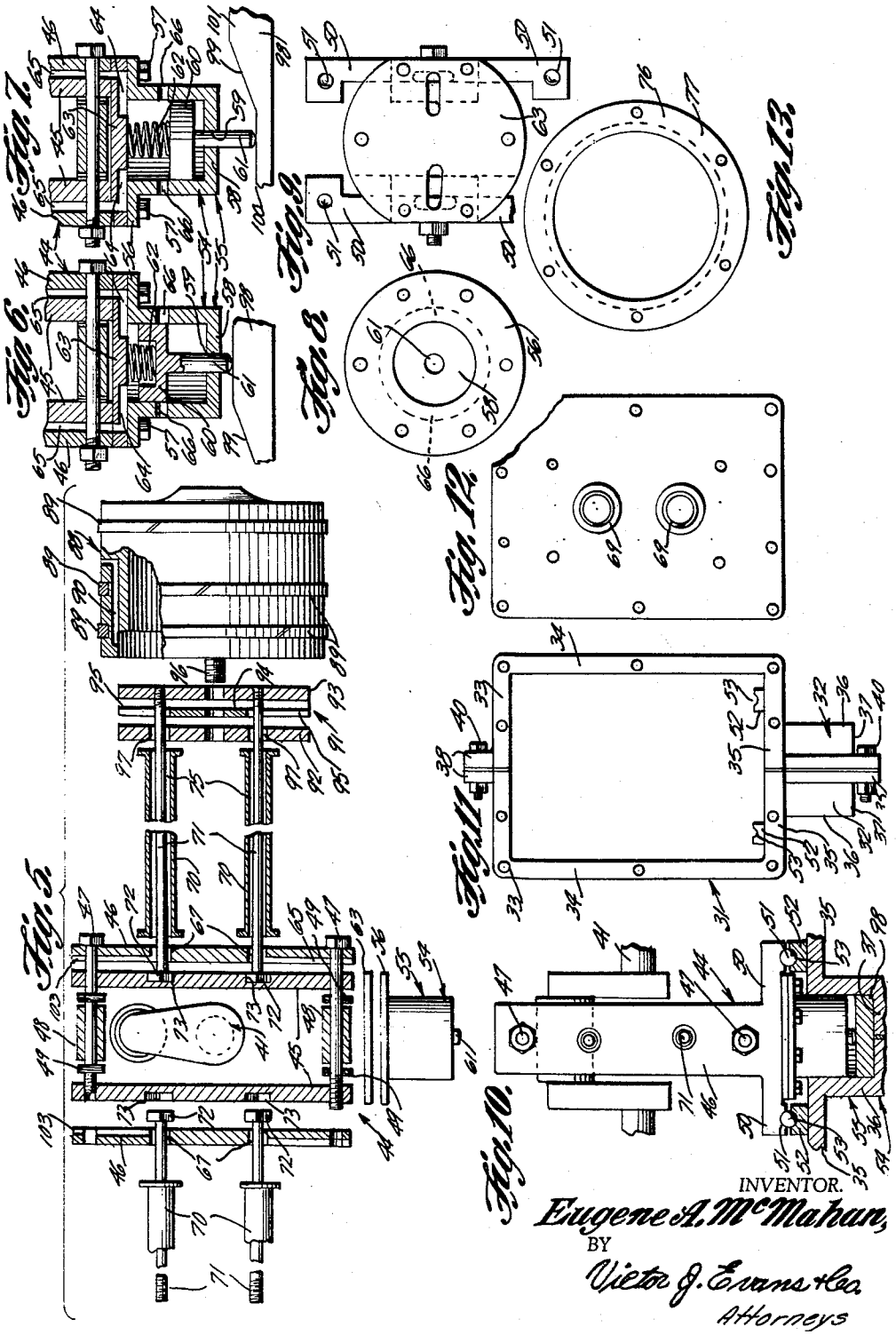


Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

INVENTOR.
Eugene A. McMahan,
BY
Victor J. Evans & Co.
Attorneys

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TWO CYCLE ENGINE

Eugene A. McMahan, 7423 Lakeside Drive,
Robins Air Force Base, Ga.

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The present invention relates to an engine, and more particularly to a two cycle engine.

The primary object of this invention is to provide a two cycle engine which may have two or more cylinders, and wherein according to the present invention there is provided a movable cross head which has an oil pump connected thereto whereby lubrication will be supplied to the various moving parts in a highly efficient and advantageous manner.

A further object is to provide a two cycle engine of the type stated which includes a cross head that is adapted to be connected to a crank shaft, and wherein there is provided a means for adjusting the cross head, as for example when wear occurs, there being a means for introducing fuel into the cylinders and withdrawing the exhaust at the proper time to insure most efficient operation of the engine.

Still another object is to provide such a two cycle engine that is economical to manufacture and efficient in operation and which is rugged in structure and foolproof in use.

These and other objects of the invention will become apparent from a reading of the following specification and claim, together with the accompanying drawings, wherein like parts are referred to and indicated by like reference characters and wherein:

FIGURE 1 is a longitudinal sectional view taken through the two cycle engine of the present invention.

FIGURE 2 is a sectional view taken on the line 2—2 of FIGURE 1.

FIGURE 3 is a sectional view taken on the line 3—3 of FIGURE 2.

FIGURE 4 is a fragmentary sectional view showing one of the cylinders with the piston in the middle of the stroke.

FIGURE 5 is a fragmentary sectional view showing the cross head and associated parts, and with the various elements separated for clarity of illustration.

FIGURE 6 is a sectional detail view showing the oil pump.

FIGURE 7 is a view similar to FIGURE 6 showing the parts of the oil pump in a different position from that shown in FIGURE 6.

FIGURE 8 is an enlarged elevational view showing the pump casing for the oil pump.

FIGURE 9 is an elevational view looking at one end of the cross head.

FIGURE 10 is a sectional view taken on the line 10—10 of FIGURE 1.

FIGURE 11 is an end view of the housing with an end plate or end member removed.

FIGURE 12 is an elevational view of one of the end members for the housing, and with parts broken away.

FIGURE 13 is an end view of a cylinder.

FIGURE 14 is a plan view of the housing, and with parts broken away and in section.

FIGURE 15 is a plan view of the housing and showing the crank and cross head and illustrating a two cycle two cylinder engine.

FIGURE 16 is a view similar to FIGURE 15 but illustrating a modification wherein there is shown a portion of a two cycle four cylinder engine constructed according to the present invention.

Referring in detail to the drawings, and more particularly to FIGURES 1 through 15 of the drawings, the numeral 30 indicates the two cycle engine of the present invention which is shown to comprise a hollow upright housing that is indicated generally by the numeral 31, and the housing 31 includes a pair of similar body members 32 which each include first wall portions 33, and second wall portions 34 are arranged at right angles with respect to the first wall portions 33, FIGURE 2. Third wall portions 35 are arranged at right angles with respect to the wall portions 34, and fourth wall portions 36 are arranged at right angles with respect to the wall portions 35, and there is provided fifth wall portions 37 which are arranged at right angles with respect to the wall portions 36. Flanges 38 and 39 extend outwardly from the wall portions 33 and 37, and opposed flanges 38 and 39 are connected together as for example by means of securing elements or bolts 40.

Bearings 41′ are secured to or formed integral with the walls 34, and the numeral 41 indicates a crank shaft which has portions thereof extending through the bearings 41′, and a fly wheel 42 is adapted to be connected to one end of the crank shaft 41, while a power take-off unit 43 is adapted to be connected to the other end portion of the crank shaft 41.

The numeral 44 indicates a cross head which is movably mounted in the housing 31 for sliding back and forth horizontal movement, and the cross head 44 includes a pair of spaced parallel inner plates 45 as well as spaced parallel outer plates 46, and the plates 45 and 46 are connected together by means of studs or bolts 47, FIGURE 1. Spacer members 48 and shims 49 are mounted on the studs 47, whereby the cross head can be adjusted as for example in order to compensate for wear.

Formed integral with the outer plate 46 or secured thereto are opposed lugs 50 which have ball bearings or ball members 51 connected thereto, and the ball members 51 are adapted to travel in or engage elongated grooves 53 in stationary tracks or rails 52, and the tracks 52 are suitably affixed to the inner surfaces of the housing section bottoms 35 of the housing.

The two cycle engine of the present invention is provided with an oil pump which is indicated generally by the numeral 54, and as shown in the drawings, the oil pump 54 includes a casing 55 that has a flange 56 which is affixed to the cross head 44 as at 57, and the casing 55 includes an end wall 58 which has an aperture or opening 59 therein, FIGURES 6 and 7. The numeral 60 indicates a piston or plunger which is movably mounted in the casing 55, and a stem or piston rod 61 projects through the aperture 59 and is secured to or formed integral with the plunger 60.

The numeral 62 indicates a coil spring or spring member which is interposed between a recessed portion of the plunger 60 and an adjacent end piece or plate 63, and the end piece 63 has grooves 64 therein which register with grooves or passageways 65 in the plate 46 so that oil can flow therethrough. The casing 55 includes spaced apart inner openings or ports 66. Apertures or ports 67 are arranged in the plates 46, and these apertures 67 communicate with or register with the passageways 65.

There is further provided a pair of spaced parallel end members 68 which are connected to the housing 31 as for example by means of bolts 74, and packing units 69 are mounted in the end members 68. Sleeves 70 are mounted for sliding movement through the packing units 69, and connecting rods 71 extend longitudinally through the sleeves 70, and clearance spaces 75 are defined in the sleeves 70 between the rods 71 and sleeves 70 so that oil from the apertures 67 can flow through the clearance spaces or passageways 75. The connecting rods 71 are adapted to have enlarged heads 72 on an end thereof

which is snugly received or seated in a recess 73 in the plate 45, FIGURE 5.

As shown in the drawings, there is provided cylinders 76 which have flanges 77 that are connected to the end members 68 as at 78, and the cylinders 76 have exhaust ports 79 which communicate with exhaust manifolds 80, and each exhaust manifold 80 may be secured in place as for example by means of bolts 81, FIGURE 3. The cylinders 76 are adapted to be provided with cooling fins 82.

As shown in the drawings, there is provided for each cylinder an intake or inlet manifold 83 which includes a wall section 84 that has openings 85 therein, and valves 86 are mounted for movement into and out of open and closed relation with respect to the openings 85, and there is provided port openings or inlet ports 87 for receiving the fuel mixture from the intake manifold 83.

Movably or reciprocally arranged in each cylinder 76 is a piston 88 which has rings 89 on the outer surface thereof, and the pistons communicate with passageways 95 in body units or end units 91, and there is provided one of the body units 91 for each piston 88. Each of the body units 91 includes contiguous plate members 92 and 93 which have a gasket 94 therebetween, and portions of the gaskets 94 may be cutaway to define the passageways 95 which are adapted to receive oil from apertures or ports 97, and the apertures 97 communicate with the clearance spaces or passageways 75. The body units 91 are adapted to be secured in place to the pistons as for example by means of bolts or fasteners 96.

Attention is directed to FIGURE 16 of the drawings, wherein there is illustrated a modification and wherein the numeral 30′ indicates a two cycle engine which may have four or more cylinders, and wherein the two cycle engine 30′ is adapted to have generally the same construction and operation as the previously described engine 30 of FIGURES 1 through 15. The numeral 83′ indicates an intake manifold for the engine 30′, and the numeral 41′ indicates the crank shaft for the engine 30′.

The numeral 98 indicates a cam which is mounted in the housing 31 adjacent the portions 37, and the cam 98 is provided with inclined shoulder portions 99 as well as straight portion 100, and the cam 98 further includes straight surfaces or portions 101, and these surfaces 100, 99 and 101 are adapted to be engaged by the stem 61 of the oil pump 54.

The numeral 102 indicates spark plugs for the two cycle engine of the present invention.

From the foregoing, it is apparent that there has been provided a two cycle egine, and in use with the parts arranged as shown in the drawings, it will be seen that the engine 30 is arranged so that the fuel is adapted to be supplied from a suitable source of supply through a carburetor into and through the manifold 83, and from the manifold 83 the fuel and air mixture is adapted to be selectively supplied through the ports 85 when the valves 86 are open as shown on the right side of FIGURE 1. The fuel air mixture can then flow through the ports or openings 87A or 87B and into the interior of a cylinder 76. The spark plugs 102 are adapted to selectively ignite the fuel air mixture in the cylinder 76 whereby the pistons 88 will be reciprocated in the cylinders, and at the proper time the exhaust gases are adapted to flow outwardly through the ports 79 and then through the exhaust manifold 80 to a suitable point of discharge.

As the pistons 88 reciprocate in the cylinders 76, there will be corresponding movement of the cross head 44 since the rods 71 connect the portions 91 of the pistons 88 to the cross head 44. With the crank shaft 41 having a portion thereof positioned between the wear plates 45, it will be seen that as the cross head 44 reciprocates or moves back and forth in the housing 31, the crank shaft 41 will be rotated, and this rotation of the crank shaft 41 can be used for any desired or required purpose, and for example the rotation of the crank shaft 41 can be used for

turning a member 43 that can be operatively connected to a suitable load or structure being operated or driven.

An important aspect or feature of the present invention is the lubrication means which includes the oil pump 54, and the housing 31 is adapted to be filled with a quantity of oil up to a predetermined level. Thus, as the cross head 44 moves back and forth in the housing 31 the stem 61 will be moved into and out of engagement with the surfaces 101, 99 and 100 of the cam 98 and this engagement of the stem 61 with the surfaces 101, 99 and 100 will cause up and down or in and out movement of the stem 61 through the aperture 59 to cause corresponding movement of the plunger 60 in the casing 55. Due to the provision of the intake port 66, oil in the housing 31 will be drawn into the casing 55 through the port 66, and then at the proper time this oil will be forced or pumped inwardly by movement of the plunger 60 and this oil will then be pumped through the groove 64 and into the passageways 65, and the spring 62 functions as a return spring to return the plunger 60 and its associated parts from a position such as that shown in FIGURE 6 to a position such as that shown in FIGURE 7, as for example when the stem 61 is in engagement with the surface 100 of the cam 98. The oil from the passageway 65 is then forced or pumped through the aperture 67 and this oil then flows through the clearance space or passageways 75 and then through the ports 97 and then through the passageways 95 and into the grooves 90 of the pistons 88 whereby sufficient and proper lubrication will be supplied between the moving pistons 88 and the stationary walls of the cylinders 76. Each piston 88 may be provided with a pair of grooves or passageways 90 so that one of the grooves 90 can function as a means for permitting the oil to be discharged therethrough in order to provide lubrication between the piston and cylinder, while the other groove 90 can function as a return groove whereby after the oil has served its purpose in providing lubrication, the oil can return through such groove 90 and then flow back through one of the passageways 95 and then return back to a space or passageway 75 and then discharge or return to the crank case or interior of the housing 31 through a passageway 103 in a plate 46 of the cross head 44. Thus, the grooves 65 function as supply grooves or lines whereby the oil can be pumped by the pump 54 so that the oil flows through the grooves 65 and then through registering apertures 67 and then through the passageway 75 and eventually into a groove 90 in the piston 88, and another groove 90 is adapted to function as a return line or groove so that the return line or groove can permit the oil to eventually return to the passageway 103 in order to permit the oil to re-circulate. In FIGURE 1, the inlet or supply groove in the pistons indicated as at 90A, while the return groove is indicated at 90B.

As the cross head 44 reciprocates and moves back and forth from the housing 31, the ball bearings or members 61 which are carried by the lugs 50 travel in the grooves 53 of the tracks 52 so that this arrangement helps insure that the cross heads and pump will be properly guided and maintained in alignment during actuation thereof.

Although the invention herein described is fully capable of achieving the objects and providing the advantages hereinbefore mentioned, it is to be understood that it is merely illustrative of the presently preferred embodiment of the invention, and that it is not to be limited to the details of construction herein described other than as defined in the appended claim.

What is claimed is:

In an engine including at least one cylinder, an upright housing connected to said cylinder, and a cross head mounted in said housing for back and forth horizontal movement, an oil pump, said pump including a casing depending from said cross head, a piston mounted in said casing for upward and downward movement, a piston rod connected to said piston and having a portion projecting

through the lower end of said casing, a cam carried by said housing bottom and engageable by the free end of said piston rod and operable responsive to back and forth movement of said cross head to effect upward and downward movement of said piston rod, there being an inlet and an outlet in said casing, and conduit means in said cross head adapted to connect said outlet in communication with said cylinder.

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