Feb. 16, 1943. S. C. RAYBON 2,311,254

ENGINE

Filed Dec. 16, 1940 3 Sheets-Sheet 1

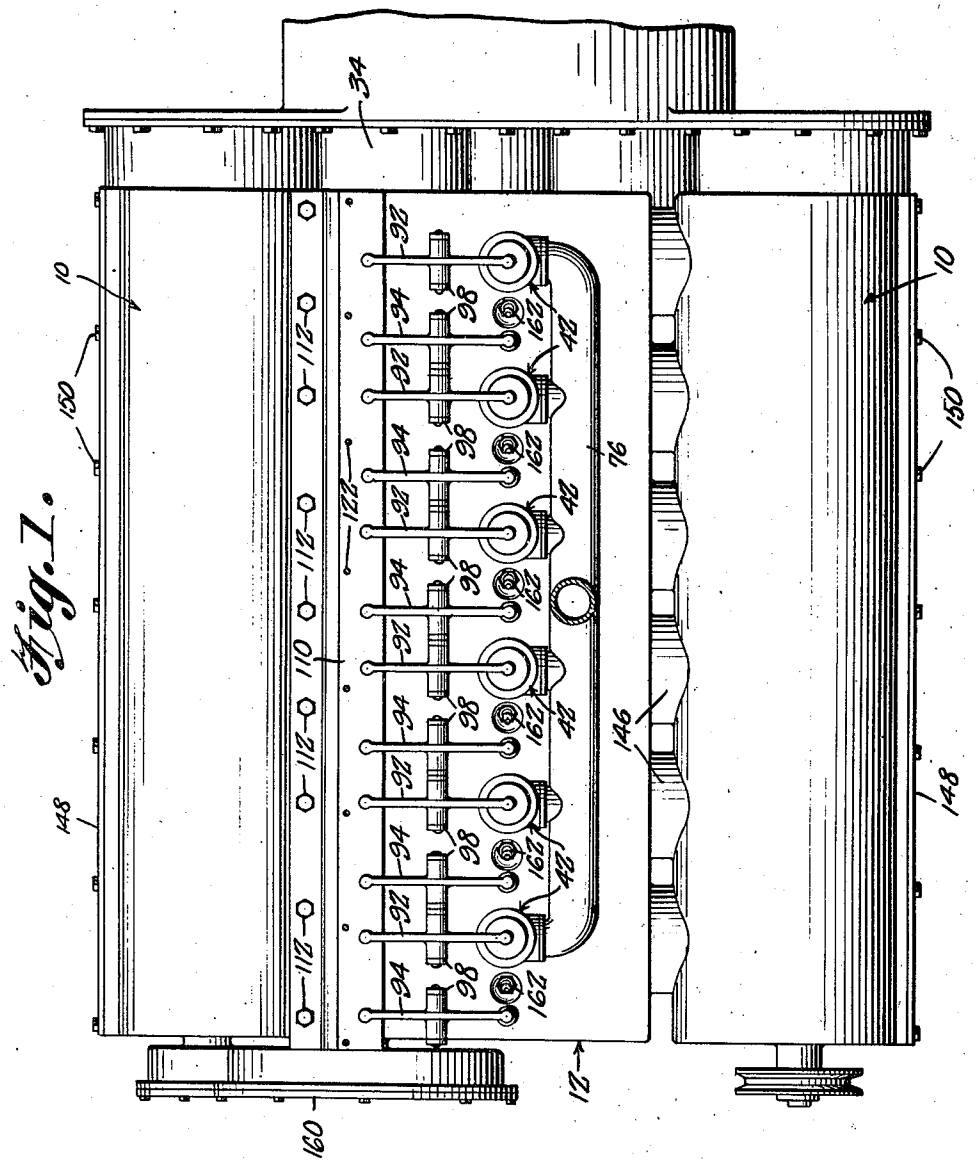


Fig. 1.

Sidney C. Raybon,
INVENTOR

By Victor J. Evans & Co.
ATTORNEYS

P. J. Hickey
WITNESS

Feb. 16, 1943. S. C. RAYBON 2,311,254

ENGINE

Filed Dec. 16, 1940 3 Sheets-Sheet 2

Fig. 2.

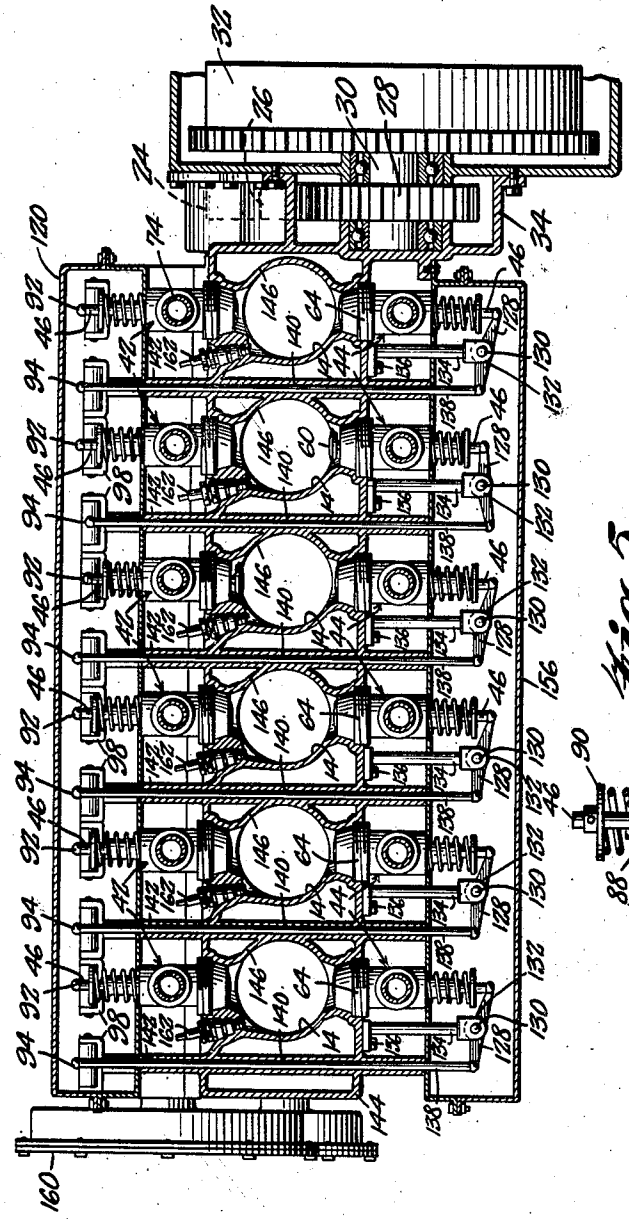


Fig. 6.

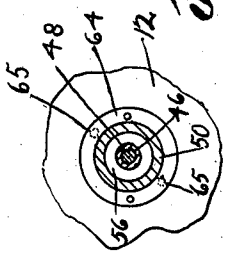
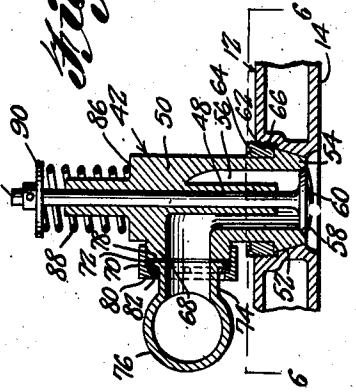


Fig. 5.



Sidney C. Raybon,
INVENTOR

BY Victor J. Evans & Co.
ATTORNEYS

WITNESS

Feb. 16, 1943. S. C. RAYBON 2,311,254

ENGINE

Filed Dec. 16, 1940 3 Sheets-Sheet 3

Fig. 3.

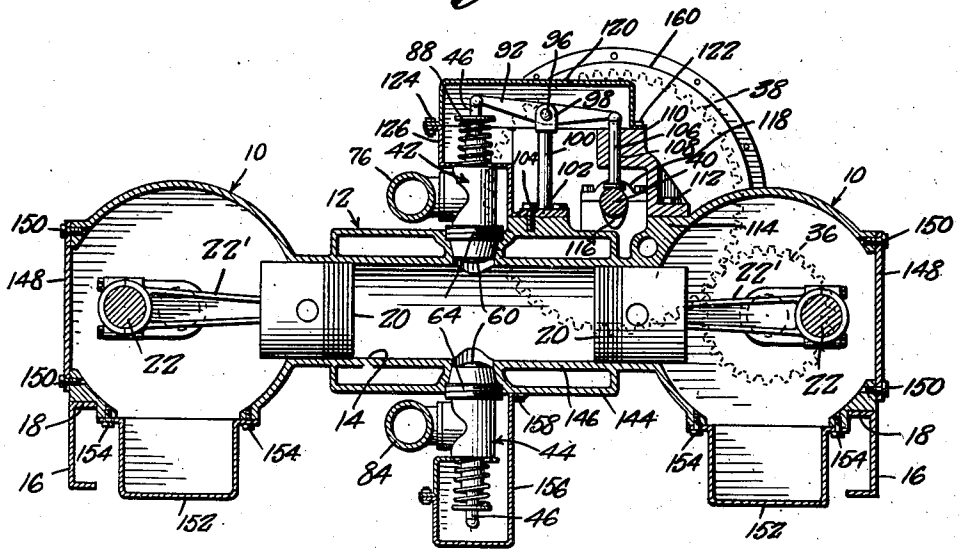
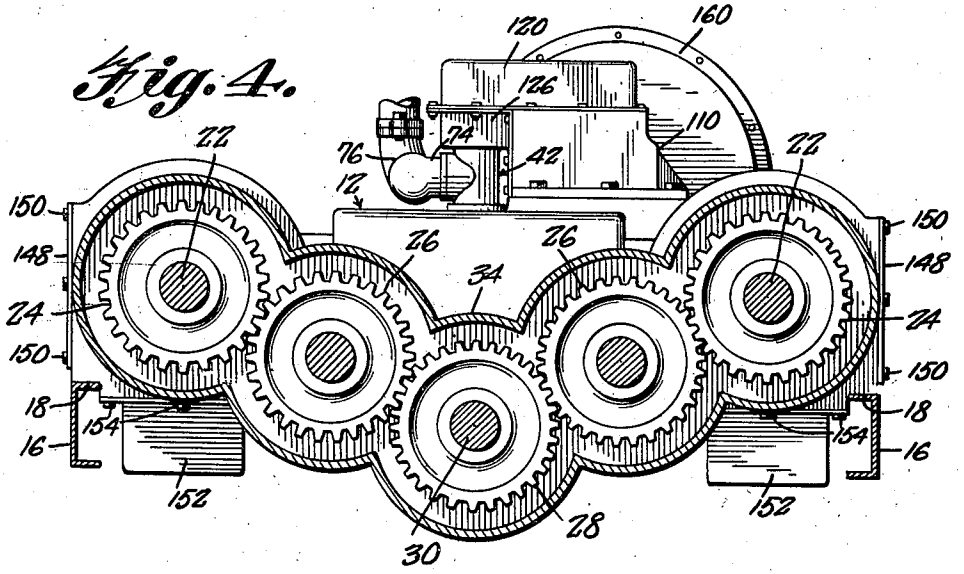


Fig. 4.



Sidney C. Raybon, INVENTOR

BY Victor J. Evans & Co.

ATTORNEYS

WITNESS

Patented Feb. 16, 1943 2,311,254

UNITED STATES PATENT OFFICE

2,311,254

ENGINE

Sidney C. Raybon, Dawson, Ga.

Application December 16, 1940, Serial No. 370,410

5 Claims. (Cl. 123—51)

My invention relates to internal combustion engines, and has among its objects and advantages the provision of an improved engine wherein two oppositely travelling pistons operate in each cylinder, together with a novel valve arrangement and actuating means therefor.

In the accompanying drawings:

Figure 1 is a top plan view of the invention;

Figure 2 is a longitudinal sectional view of the invention;

Figure 3 is a transverse sectional view;

Figure 4 is an end view illustrating the manner in which the two parallel crankshafts are operatively connected to a common power take-off shaft;

Figure 5 is a sectional detail view illustrating one of the valve mounts; and

Figure 6 is a view taken from the position indicated by line 6—6 of Figure 5.

In the embodiment selected to illustrate the invention, the engine comprises two parallel crank cases 10 interconnected by a cylinder block 12 provided with a plurality of horizontal cylinder bores 14 lying in a common plane. For an engine designed for mounting in automobiles or trucks, the chassis frame members 16 provide supports for the crank case faces 18.

Fig. 3 illustrates one of the cylinder bores 14 and two pistons 20 operating therein. Each cylinder bore is provided with two opposed pistons moving simultaneously in opposite directions. Each pair of pistons 20 is connected with a crankshaft 22 in one of the crank cases 10. The two crankshafts 22 lie in parallelism and each is provided with a gear 24, see Fig. 4 meshing with an idle gear 26. The two gears 26 mesh with a gear 28 keyed to the power take-off shaft 30, which shaft is provided with the usual flywheel 32, as illustrated in Fig. 2. Gears 24, 26 and 28 are enclosed in a housing 34.

The power take-off shaft 30 is operatively connected with the two crankshafts 22 through the medium of the two sets of gears 24 and 26. While Fig. 2 illustrates the engine as embodying six cylinders, the present invention is equally well adapted to engines embodying a greater or less number of cylinders. The firing order of the engine may be in conformity with standard practice. One of the crankshafts 22 is provided with a gear 36 meshing with a gear 38 which drives a cam shaft 40 through the medium of which the intake and exhaust valves are actuated.

According to Figs. 2 and 3, the intake valves 42 are aligned in a straight row lengthwise of the engine block and along the top thereof, while the exhaust valves 44 are aligned axially underneath the intake valves in a straight row depending from the bottom of the engine block. Fig. 5 illustrates the specific construction of one of the intake valves 42. The valve stem 46 is slidably guided in the bore 48 of the guide member 50, which guide member is provided with a tapered end 52 pressed against the face of a tapered bore 54 leading into the cylinder bore 14. Guide member 50 includes a passage 56 for the fuel mixture and the member is provided with a valve seat 58 arranged to be engaged by the valve element 60 on the lower end of the stem 46.

A threaded bore 62 is provided in the block 12 in axial alignment with the tapered bore 54 for the reception of a nut 64 engaging the shoulder 66 on the guide member 50 to press the tapered end 52 firmly against the face 54 to effect a seal tight condition. Nut 64 may be split to facilitate mounting on the guide member 50 and subsequently welded into a unitary structure, as at 65 in Figure 6. A spanner wrench may be employed for turning the nut in the bore 62.

Projecting laterally from the guide member 50 is a boss 68 externally threaded for the reception of a threaded collar 70. Between the flange 72 on the end of a neck 74 projecting from the intake manifold 76 and the end of the boss 68 is positioned a gasket 78 which is firmly clamped in position through tightening of the collar 70. Collar 70 is flanged at 80 to engage a gasket 82 pressed against the outer face of the flange 72. The passage 56 extends through the boss 68 and communicates with the opening in the neck 74. Fig. 1 illustrates the intake manifold 76 as extending longitudinally of the engine, and all the intake valves 42 and the exhaust valves 44 are identical in construction with the illustration of Fig. 5. Fig. 3 illustrates the location of the intake manifold 76 above the cylinder block 12 with the exhaust manifold 84 positioned beneath the cylinder block and vertically aligned with the intake manifold 76.

In Fig. 5, a shoulder 86 is formed on the guide member 50 to constitute an abutment for the valve spring 88 abutting the washer 90 keyed to the valve stem 46. Since the exhaust valve structures are identical with the intake valve structures, the same reference numerals are applied to both the valve structures. In Figs. 1 and 3, the rocker arms 92 for actuating the intake valves 42 and the rocker arms 94 for actuating the exhaust valves 44 are all aligned in a straight row above the cylinder block 12. Each of the rocker arms 92 and 94 is pivotally

connected at 96, see Fig. 3, with the bifurcated head 98 at the upper end of a vertical support 100 having a flange 102 bolted to the cylinder block 12, as at 104. Each of the rocker arms 92 is actuated through the medium of a push rod 106 slidably guided in a bore 108 in a casting 110 bolted at 112 to a ledge 114 formed on the cylinder block 12. Each of the push rods 106 is actuated through an individual cam 116 on the cam shaft 40, which cam shaft is rotatably journaled in bearings 118, one of which is illustrated in Fig. 3. The aligned rocker arms 92 are enclosed in a housing 120 bolted at 122 to the casting 110 and at 124 to a housing section 126 secured to the cylinder block 12. The intake valve structures 42 project partly inside the housing 120 and the housing section 126.

Fig. 3 illustrates one of the rocker arms 92 engaging the valve stem 46 of the one intake valve structure 42 illustrated therein. In Fig. 2, rocker arms 128 engage the valve stems 46 of the exhaust valves 44, which rocker arms are arranged in a straight row underneath the rocker arms 92 and at right angles thereto. Each rocker arm 128 is pivotally connected at 130 with the bifurcated head 132 of a vertical support 134 depending from the cylinder block 12 and bolted thereto, as at 136. A long vertical push rod 138 is provided for each of the rocker arms 128, and each push rod 138 is slidably guided in a vertical bore 140 in the cylinder block 12 and in tubular extensions 142 extending upwardly and downwardly from the cylinder block. Thus the rocker arms 128, which are located underneath the cylinder block 12, are actuated through the medium of the long push rods 138 which extend upwardly for coaction with the rocker arms 94 mounted above the cylinder block. The one cam shaft 40 actuates the two sets of rocker arms 92 and 94. In arranging the intake valve structures 42 and 44 in respective groups on opposite sides of the cylinder block 12, each group of valve structures is readily accessible, and the groups are axially aligned so as to function advantageously in connection with the firing chambers of the respective cylinders in an engine of the two piston opposed type.

The cylinder block 12 is provided with a water jacket 144 about the greater lengths of the cylinders 146. Each of the crank cases 10 is provided with a plate 148 detachably secured thereto by bolts 150. Each case is also provided with a pan 152 detachably secured thereto by screws 154. A housing 156 encloses the greater portions of the exhaust valves 44, which housing is detachably secured to the cylinder block 12 by screws 158. A housing 160 encloses the two gears 36 and 38, and each cylinder 146 is provided with a spark plug 162 aligned in a row in the plane of the intake valves 42, see Fig. 2.

Having thus described certain embodiments of my invention in detail, it is, of course, understood that I do not desire to limit the scope thereof to the exact details set forth except insofar as those details may be defined in the appended claims.

I claim:

1. In an internal combustion engine, a cylinder having two oppositely travelling pistons therein and coacting with the cylinder to provide a combustion chamber between the pistons, an intake valve communicating with said combustion chamber at one side of the cylinder, an exhaust valve communicating with said combustion chamber on the opposite side of said cylinder, a cam shaft, a pair of rocker arms actuated by said cam shaft upon one side of said cylinder, one of said rocker arms being operatively connected with one of said valves, an operating connection extending from the other rocker arm to the opposite side of the cylinder and operatively connected with the other of said valves, two parallel crankshafts respectively operatively connected with said pistons, a power take-off shaft, and operating connections between the two crankshafts and said power take-off shaft.

2. In an internal combustion engine, a plurality of cylinders arranged side by side and each having two oppositely travelling pistons therein coacting with their respective cylinder to provide a combustion chamber between the pistons, said cylinders being connected as a unit, each cylinder having an intake valve communicating with the combustion chamber therein, said intake valves being located along the same sides of the cylinders, each cylinder having an exhaust valve communicating with its respective combustion chamber, said exhaust valves being located on opposite sides of the cylinders, a cam shaft, rocker arms actuated by said cam shaft along the same sides of the cylinders, some of the rocker arms being operatively connected with the intake valves, the cylinders being provided with guide means extending transversely of the cylinders, operating connections extending through said guide means and operatively connected with the other rocker arms and the exhaust valves, two parallel crankshafts operatively connected with the two groups of pistons, a power take-off shaft, and operating connections between the two crankshafts and said power take-off shaft.

3. In an internal combustion engine, an engine block having a plurality of cylinder bores having their axes lying in a common plane, each cylinder bore being provided with two oppositely travelling pistons coacting with the cylinder bore to provide a combustion chamber between the two pistons, intake valves communicating with the respective combustion chambers and aligned along one side of said engine block, exhaust valves communicating with the respective combustion chambers and positioned on the other side of said engine block, a cam shaft located along said one side of the engine block, rocker arms aligned along said one side of the engine block and actuated by said cam shaft, certain of said rocker arms being operatively connected with said intake valves, said engine block being provided with guide openings, operating connections extending through said guide openings and operatively connecting the other rocker arms with said exhaust valves, an intake manifold communicating with said intake valves and located along said one side of the engine block, and an exhaust manifold communicating with the exhaust valves and located on said other side of the engine block.

4. In an internal combustion engine, an engine block having a plurality of cylinder bores having their axes lying in a common plane, each cylinder bore being provided with two oppositely travelling pistons coacting with the cylinder bore to provide a combustion chamber between the two pistons, intake valves communicating with the respective combustion chambers and aligned along one side of said engine block, exhaust valves communicating with the respective combustion chambers and positioned on the other side of said engine block, a cam shaft located along said one side of the engine block, rocker arms aligned

along said one side of the engine block and actuated by said cam shaft, certain of said rocker arms being operatively connected with said intake valves, said engine block being provided with guide openings, operating connections extending through said guide openings and operatively connecting the other rocker arms with said exhaust valves, said cylinder bores having their axes lying in a common horizontal plane, said intake valves being located on the top side of the engine block, and said exhaust valves being located on the bottom side of the engine block.

5. In an internal combustion engine, an engine block having a plurality of cylinder bores having their axes lying in a common plane, each cylinder bore being provided with two oppositely travelling pistons coacting with the cylinder bore to provide a combustion chamber between the two pistons, intake valves communicating with the respective combustion chambers and aligned along one side of said engine block, exhaust valves communicating with the respective combustion chambers and positioned on the other side of said engine block, a cam shaft located along said one side of the engine block, rocker arms aligned along said one side of the engine block and actuated by said cam shaft, certain of said rocker arms being operatively connected with said intake valves, said engine block being provided with guide openings, operating connections extending through said guide openings and operatively connecting the other rocker arms with said exhaust valves, a crank case extending along two opposite sides of the engine block, a crankshaft inside each crank case, a power take-off member, operating connections between said power take-off member and said crankshafts, and said crankshafts being operatively connected with the respective gangs of pistons.

SIDNEY C. RAYBON.