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VALVE ACTUATING MECHANISM

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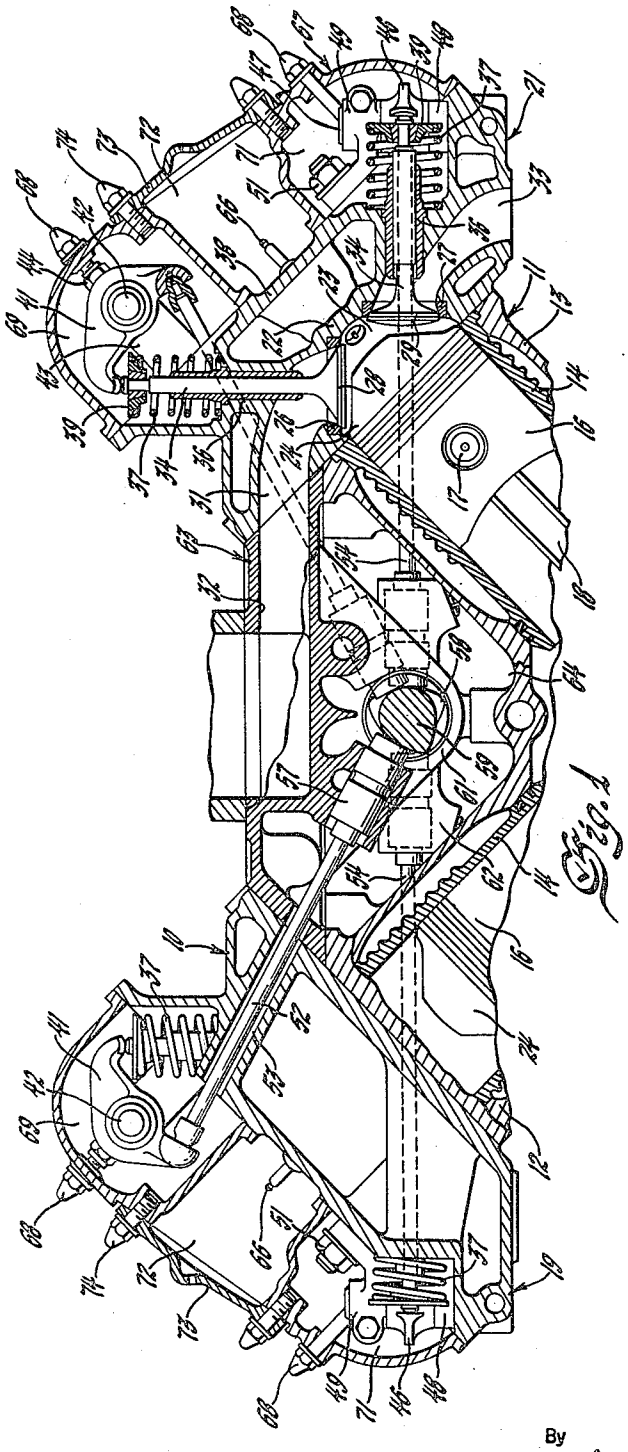


Fig. 1

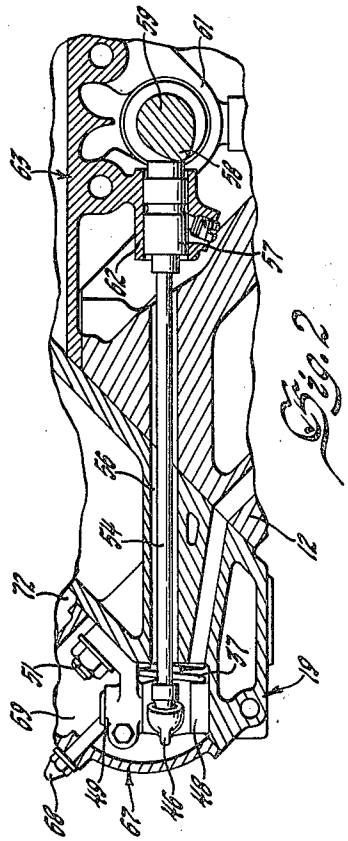


Fig. 2

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VALVE ACTUATING MECHANISM

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9 Claims. (Cl. 123—55)

This invention relates to engines and has particular relation to valve-in-head, V-type, four stroke cycle internal combustion engines for automotive or other uses.

It is proposed to construct an efficient, high powered, V-type engine having a single camshaft for the two rows of cylinders thereof, with angularly disposed rows of valves mounted on the inside and the outside of the heads of each of the cylinders, with push rods extending on one side of each cylinder to the opposite side thereof, with push rods extending at an angle to the first push rods and to the adjacent side of each cylinder, with a rocker arm for each push rod and valve and with the rocker arms for each pair of push rods and valves for each cylinder being mounted for operation in planes intersecting one another.

In the drawings:

Figure 1 illustrates a fragmentary transverse sectional view through a V-type, valve-in-head engine embracing the principles of the invention.

Figure 2 also illustrates a fragmentary transverse sectional view through a different part of the engine than that illustrated in full lines by Figure 1.

In the drawing, the engine 10 comprises an engine block 11 formed to provide parallel rows 12 and 13 of aligned cylinders indicated at 14. The cylinders contain pistons 16 connected by piston pins 17 and connecting rods 18 to an engine crankshaft mounted in bearings formed in the block 11 and the axis of which is approximately on a line where the planes of the axes of the cylinders 14 intersect. In the present instance the cylinders of each row or bank of cylinders 12 and 13 are arranged at 90° with respect to one another, although they may be arranged at any suitable angle. The engine has heads 19 and 21 in the lower walls 22 of which hemispherical combustion chambers 23 are formed between the parts of the walls 22 directly beyond the cylinders 14 and the enlarged ends 24 of the pistons 16. The walls 22 of the combustion chambers 23 are formed to provide inlet and exhaust ports 26 and 27 respectively which are adapted to be opened and closed by inlet and exhaust valves 28 and 29 respectively. The ports 26 communicate with inlet passages 31 which are supplied with a combustible mixture of hydrocarbon fuel and air by an inlet manifold indicated at 32. The exhaust ports 27 communicate with exhaust passages 33 by which the products of combustion from the engine may be discharged into whatever exhaust manifolds may be employed.

The valves 28 and 29 are poppet type valves having valve stems 34 slidably mounted in the heads 19 and 21 in bearing sleeves indicated at 36. The valves 28 and 29 are adapted to be closed by valve springs 37 which are confined between the outer walls 38 of the heads 19 and 21 and spring washers 39 which are secured to the outer ends of the stems 34. The valves 28 and 29 are located at 90° with respect to one another on the inside and outside of each of the cylinders 14 and the combustion chambers 23. The axes of the valves of each cylinder also lie on one of a plurality of transverse planes through the

engine 10. The axes of the valves of each cylinder also are disposed at 45° with respect to the axis of each cylinder and intersect within each cylinder substantially on the axis thereof. The valves 28 are actuated by rocker arms 41 which are mounted on rocker shafts 42, one for each bank of cylinders of the engine. The rocker shafts 42 are mounted on the inside of the heads 19 and 21 and outside of the stems of the valves 28 on brackets 43 secured to the heads by bolts 44. The rocker arms 41 operate on the rocker shafts 42 in parallel transverse planes through the engine 10.

The valves 29 are operated by rocker arms 46 which are mounted adjacent the outside of the heads 19 and 21 on transversely disposed shafts 47 secured at one end in bosses 48 formed in the heads and at the opposite ends in brackets 49 secured to the heads by bolts 51. The rocker arms 46 operate in the same longitudinal plane extending through the engine 10. The rocker arms 41 are operated by angularly disposed rows of push rods indicated at 52. The rows of push rods 52 extend in opposite directions from the central part of the engine 10 through openings 53 formed in the heads 19 and 21 and inlet manifold 32 and into operative engagement with the outside ends of the rocker arms 41 at the outer ends of the adjacent sides of the cylinders 14. The rocker arms 46 also are operated by rows of push rods indicated at 54. The rows of push rods 54 extend in opposite directions from the central part of the engine, across the cylinders through openings 56 at one side thereof and into engagement with the ends of the rocker arms 46 at the opposite sides of the rows of cylinders 14.

The inner ends of the push rods 52 and 54 include valve lifters 57 adapted to be operated by cams 58 formed on a camshaft 59 which is supported in the space between the rows of cylinders 12 and 13 upon camshaft bearings indicated at 61. The valve lifters 57 for the push rods 52 and 54 are slidably mounted in bosses 62 which hold the lifters for the different rows of push rods in position to be properly engaged by the cams 58. The bosses 62 and the bearings 61 are formed as intergal parts of the support 63 in which the inlet manifold 32 also is formed.

The support 63 is bolted or otherwise secured to the cyinder block 11 and to the heads 19 and 21 in such a way as to provide a camshaft gallery 64 between the banks of cylinders and the support. The camshaft 59 is mounted in the bearings 61 with the axis of rotation thereof in the central vertical plane of the engine 10.

Rows of spark plugs indicated at 66 which project into the central parts of the combustion chambers 23 are employed in igniting the combustible mixtures compressed by the pistons 16 into the combustion chambers 23. The valve operating mechanisms for the valves 34 and 36 and the rows of spark plugs 66 are enclosed in covers 67 which are secured to the heads 19 and 21 by bolts indicated at 68. The covers 67 are formed in such a way as to provide a separate compartment 69 for the valve actuating mechanism for the valves 28, a separate compartment 71 for the valve actuating mechanisms for the valves 29, and a separate compartment 72 for the spark plugs 66. The inner walls of the covers 67 forming the compartments 69 and 71 are spaced from one another to provide the compartments 72 which are closed by walls 73 secured to the adjacent walls of the compartments 69 and 71 by bolts indicated at 74.

The valve arrangement and the actuating mechanism for the valves are adaptable for use with many different types of valve-in-head engines employing hemispherical or other types of combustion chambers and the mechanism can be operated by a single camshaft located at one side of one or more rows of cylinders.

I claim:

1. An internal combustion engine comprising an engine

cylinder having a pair of valves in the head thereof, said valves being disposed in said head on opposite sides of the axis of said cylinder and with the axes of the stems thereof in a plane intersecting said cylinder in uniform relation to said cylinder axis, said valves being also arranged in said head with the axes thereof intersecting one another within said cylinder, a camshaft for actuating said valves and being disposed on one side of said cylinder with the axis of said shaft being perpendicular to said plane through said valve stems and said cylinder, a pair of push rods operatively associated with cams formed on said camshaft, and a pair of rocker arms operatively associated with the ends of said push rods opposite said camshaft and with the stems of said valves for actuating said valves, said rocker arms being mounted for oscillation on the head of said cylinder with the axes of rotation thereof normally intersecting planes perpendicular to one another.

2. An internal combustion engine comprising a cylinder having a pair of valves in the head thereof, said valves being diametrically opposed to one another within said cylinder and on opposite sides of said head, rocker arms for operating said valves, rocker shafts for supporting said rocker arms, said rocker shafts being mounted with the axes thereof in perpendicular relation to planes intersecting one another at right angles, a camshaft on one side of said cylinder and a pair of push rods operatively associated with said camshaft for operating said rocker arms.

3. An internal combustion engine comprising a cylinder having a pair of valves operatively associated with the head thereof and a spark plug in said head between said valves, a rocker arm for operating each of said valves, each of said rocker arms being disposed to operate in normally disposed planes, a push rod for operating each of said rocker arms, a single camshaft for operating said push rods, a cover for the valve mechanism associated with one of said rocker arms, a cover for the valve mechanism associated with the other of said rocker arms, said covers being secured to said head in spaced relation to one another and on opposite sides of said spark plug, and a cover for said spark plug, said spark plug cover being secured to said valve mechanism covers and enclosing the space between said valve mechanism covers.

4. An internal combustion engine comprising an engine cylinder having a pair of valves in the head of said cylinder, valve operating mechanisms for said valves, each of said valve actuating mechanisms having rocker arms disposed to operate in normally disposed planes, and being supported in spaced relation to one another by said head, a cover for said valve operating mechanisms, said cover having spaced compartments for each of said mechanisms, a spark plug for said cylinder and being mounted in said head in the space between said compartments of said cover, and a cover for said spark plug and being secured to said first mentioned cover over the space between said compartments.

5. An internal combustion engine comprising a pair of cylinders disposed in opposed relation to one another and having pistons therein adapted to be operated by a single crankshaft, a camshaft extending in parallel relation to the axis of said crankshaft and between and on one side of said cylinders, a pair of push rods extending in opposite directions from said camshaft and toward the opposite sides of said cylinders, a pair of push rods extending in opposite directions and toward the adjacent sides of said cylinders, rocker arms mounted on the heads of each of said cylinders for operation by said push rods, a pair of valves in the heads of each of said cylinders for operation by said rocker arms, and a rocker shaft supporting each of said rocker arms, the rocker shafts for the valves of each of said heads being mounted on said heads with the axes thereof normal to planes intersecting one another.

6. An internal combustion engine comprising a pair of angularly disposed cylinders having pistons therein adapted to be operated by a single crankshaft, a pair of valves in the head of each of said cylinders with the stems thereof

disposed at the same angle with respect to one another as said cylinders are disposed with respect to one another, a camshaft for said engine mounted in the space between said cylinders of said engine and having the axis thereof normally intersecting a transverse plane having a uniform relation to the axes of said cylinders and said valves, a push rod and rocker arm mechanism for each of said valves and operatively associated with said camshaft, and means for pivotally supporting said rocker arm for each of said cylinders for operation in planes intersecting one another.

7. An internal combustion engine comprising a pair of angularly disposed cylinders having pistons therein adapted to be operated by a single crankshaft, a pair of valves in the head of each of said cylinders with the stems thereof disposed at the same angle with respect to one another as said cylinders are disposed with respect to one another, a camshaft for said engine mounted in the space between said cylinders of said engine and having the axis thereof normally intersecting a transverse plane having a uniform relation to the axes of said cylinders and said valves, a push rod and rocker arm mechanism for each of said valves and operatively associated with said camshaft, and means for pivotally supporting said rocker arm for each of said cylinders for operation in planes normally intersecting one another.

8. An internal combustion engine comprising a pair of rows of aligned cylinders having pistons operable by a single crankshaft, a camshaft between said rows of cylinders and on one side thereof and with the axis thereof parallel to the axis of said crankshaft, oppositely disposed rows of aligned push rods intersecting the planes of the axes of the cylinders in each of said rows within the cylinders of each of said rows, other oppositely disposed rows of aligned push rods intersecting th planes of the axes of each of said rows of cylinders beyond the head ends of said cylinders, there being one push rod from each row of said push rods extending in the same direction for each cylinder of said rows of cylinders, a pair of valves in the head of each cylinder of said rows of cylinders, a rocker arm operated by one push rod for each valve of said cylinders, and means for mounting said rocker arms for operation in different groups, one group of said rocker arms being mounted in planes intersecting the other group.

9. An internal combustion engine comprising angularly disposed rows of cylinders having pistons therein adapted to be operated by a single crankshaft, a camshaft for said engine and mounted therein for rotation on one side of said cylinders and in the space between said angularly disposed rows of cylinders, said camshaft having an axis of rotation parallel to the axis of rotation of said crankshaft, a push rod for each of said cylinders extending from said camshaft on one side of each of said cylinders to the opposite side of each of said cylinders, a push rod for each of said cylinders extending between said camshaft and an adjacent side of each of said cylinders, a pair of valves for each of said cylinders and means responsive to the operation of one of said push rods for operating each of said valves, said push rods extending to said opposite sides of said cylinders being disposed in a plane with certain of said means and certain of said valves and said camshaft.

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