Dec. 17, 1935. H. CAMINEZ 2,024,334

VALVE MECHANISM FOR INTERNAL COMBUSTION ENGINES

Filed March 17, 1933 2 Sheets-Sheet 1

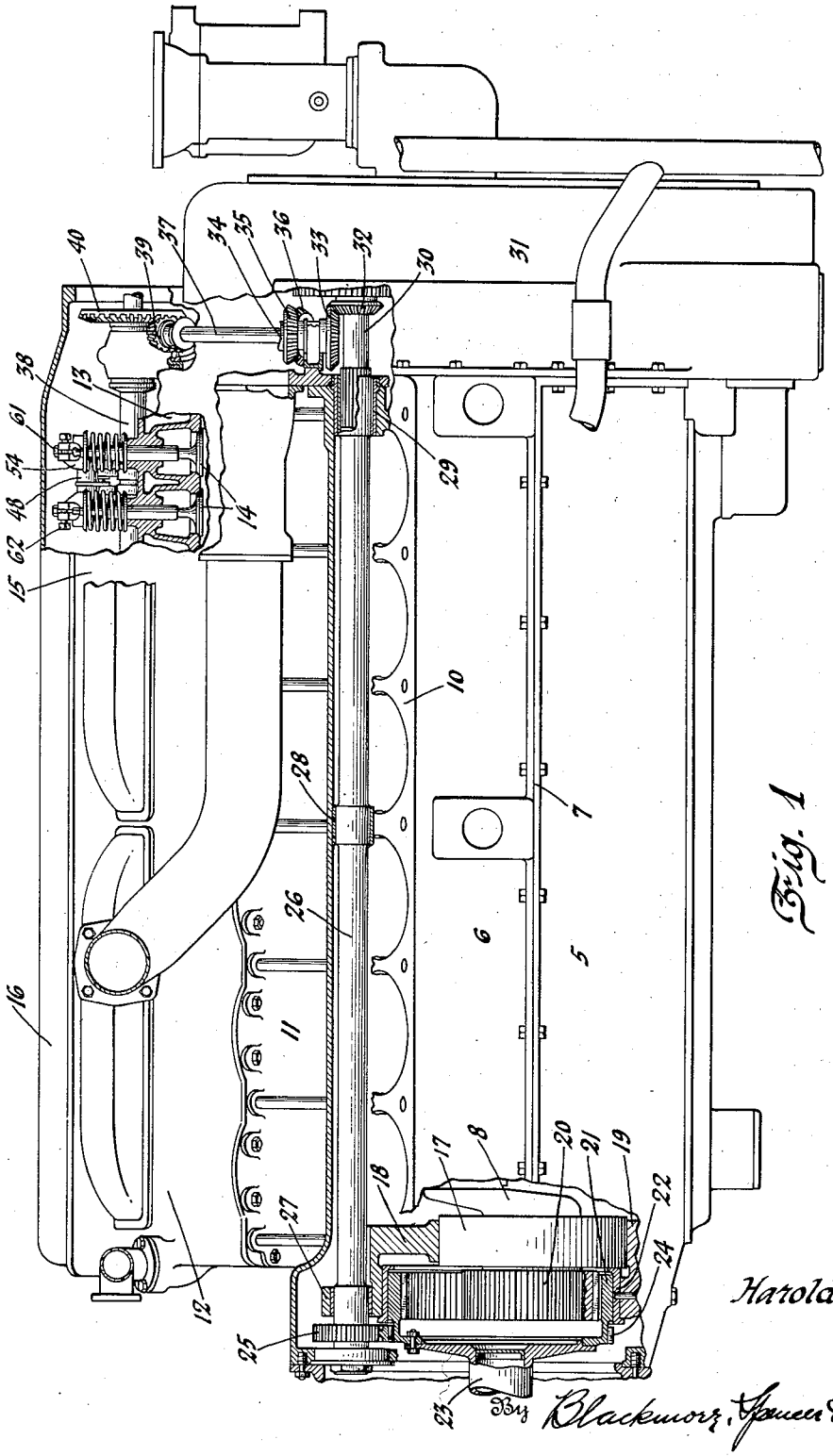

Fig. 1

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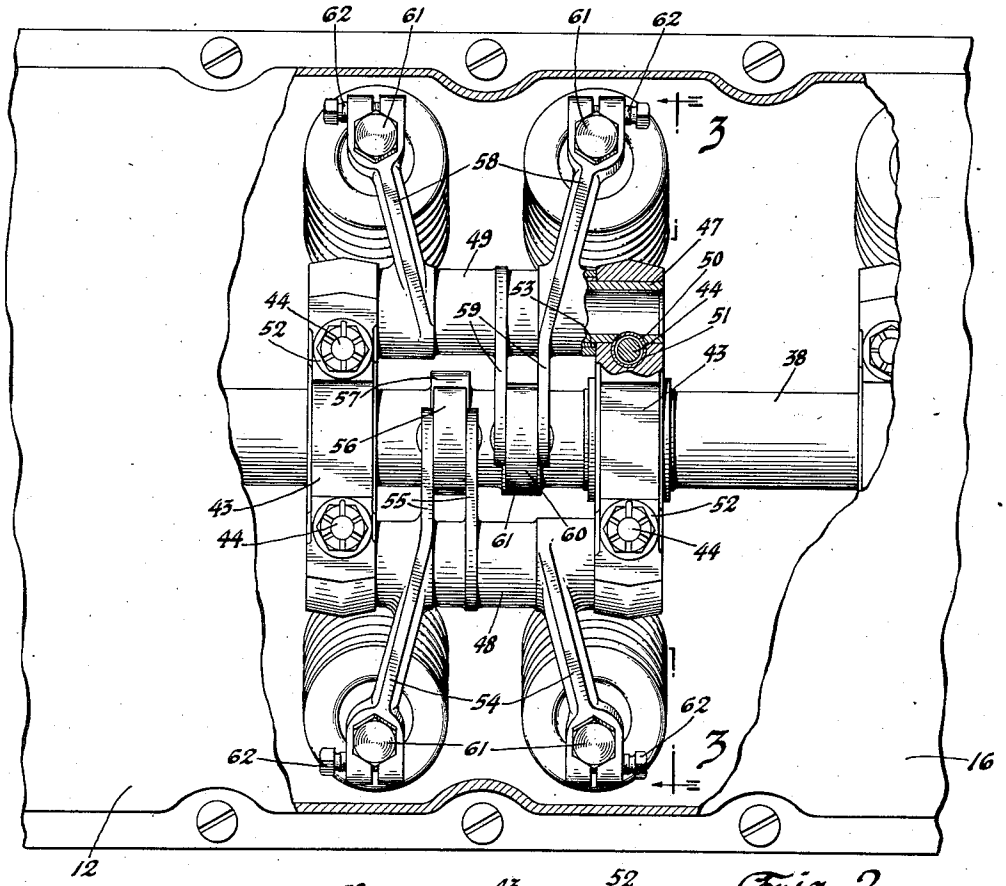

Fig. 2

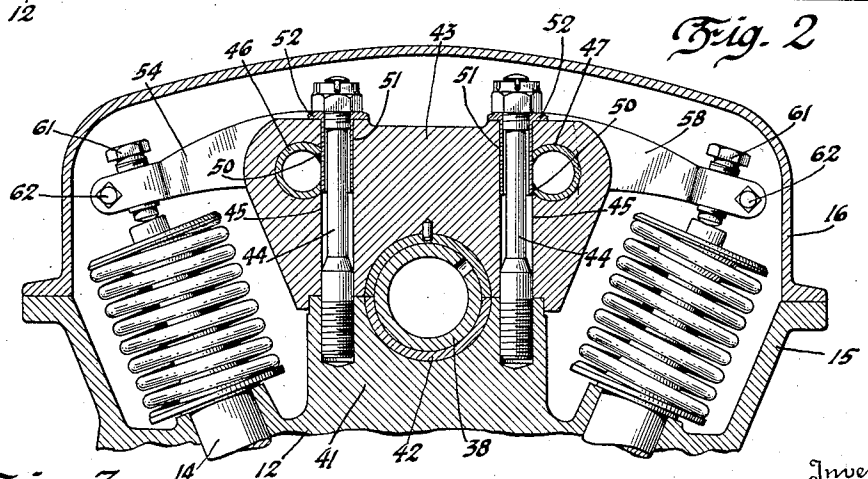

Fig. 3

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VALVE MECHANISM FOR INTERNAL COMBUSTION ENGINES

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5 Claims. (Cl. 123—90)

My invention relates to internal combustion engines, and particularly to valve operating mechanism for operating the supply and exhaust valves which control the flow of combustible mixture into, and of burned gases from the cylinders of such engines. My invention is illustrated as applied to a multiple cylinder engine having two cylinder blocks, each made up of a plurality of cylinders, arranged at an angle of 60 degrees to one another; although it is applicable to all forms of engines wherein the valve seats are in the cylinder head, and the valves are operated by a cam shaft supported by the head.

The object of my invention is to provide improved means for supporting the rocker arms whereby the valves are operated in proper position relative to the valves, the same being of simple construction and having features whereby the valve operating mechanism may be readily disassembled and reassembled without disturbing the proper relationship between the valves and the operating mechanism therefor; and to otherwise improve valve operating mechanism of the type to which my invention relates.

With the above and other objects of invention in view my invention consists in the improved valve operating mechanism illustrated in the accompanying drawings and hereinafter described and claimed; and in such variations and modifications thereof, within the scope of the concluding claims, as will be obvious to those skilled in the art to which my invention relates.

In the drawings wherein the preferred embodiment of my invention is illustrated:

Figure 1 is a view showing an internal combustion engine equipped with my improved valve operating mechanism, the cylinder block shown being the farther one of the two blocks of the engine.

Figure 2 is a fragmentary plan view upon a larger scale showing the valve operating mechanism for one cylinder. Mechanism identical with that shown is provided for each cylinder of the engine.

Figure 3 is a view showing a section upon a vertical transverse plane indicated by the line 3—3, Figure 2.

In the drawings, the reference numerals 5, 6 designate the lower and upper parts of the crank case of the engine, the parts meeting at 7 in the plane of the crank shaft 8 and being secured together by bolts as shown. The upper crank case section is provided with oppositely inclined surfaces 10 to which the cylinder blocks are secured by suitable bolts, the farther block being indicated by the numeral 11 and the two blocks being arranged at an angle of 60 degrees to one another.

Each cylinder block has a plurality of cylinders, and a single head 12 common to all of them; although the valves and immediate operating mechanism therefor of a single cylinder only will be described as these parts are repeated for each of the cylinders. The heads are hollow, as indicated at 13 in Figure 1; and a cooling liquid flows along the passage thus provided to cool the valves and other head parts. Double valves are provided for controlling both the supply of mixture to and the exit of burned gases from each cylinder, the two valves 14, 14, Figure 1, being both supply valves. The upper part of the head has a peripheral flange 15, Figure 3; and the numeral 16 designates a cover secured to said flange for covering the entire mechanism for each block. Removal of the cover, therefore, exposes the valve operating mechanism for all the cylinders of a block as will be appreciated.

The front end of the crank shaft 8 is supported in a bearing 17 held in semi-circular seats in transverse webs 18, 19 of the crank case sections; and has a pinion 20 which meshes with internal teeth of an annular speed reducing member 21 rotatably supported in a bearing 22, which also is held in semi-circular seats associated with the webs aforesaid. This speed reducing member is connected with a shaft 23 which carries the propeller of an airplane, dirigible balloon or similar craft; or, and as a matter of course, said shaft may drive whatever the engine is designed to drive.

The speed reducing member 21 is provided with external teeth 24 which mesh with a gear 25 which drives a shaft 26 suported in bearings 27, 28, 29, and which shaft extends along and through the upper part of the crank case section 6, just beneath the top wall thereof. The rear end of this shaft has a splined driving connection with a short shaft 30 supported within an accessory housing 31 separate from and secured to the rear end of the crank case, but which housing is not disclosed in detail as it forms no part of the invention to which this present application relates.

The short shaft 30 has a bevelled pinion 32 which meshes with a similar gear 33 upon a vertically arranged shaft 34 supported in bearings in the housing 31; and which shaft 34 carries a gear 35 which meshes with two gears, which drive inclined shafts through which the cam shafts of the two cylinder blocks are driven, the gear 36 and inclined shaft 37 whereby the cam shaft

38 of the farther block is driven being shown in Figure 1. The final drive for the shaft 38 is through bevel gears 39, 40. The gear train through which the gear 40 is driven from the gear 32, the bearings for the shafts involved in such driving, and other features having to do therewith are not disclosed in detail, as they belong more properly to the accessory housing 31 which forms no part of the invention to which this present application relates. The speed ratio between the pinion 29 and the gear 40 is obviously two-to-one to secure operation of the engine upon a four stroke cycle.

The cam shaft 38 which extends throughout the length of the head 12 is supported by pedestals 41 upon the top wall of said head, in bearings 42 which are clamped between semi-circular seats in said pedestals and in brackets 43 resting upon and secured to said pedestals; the brackets being secured to the pedestals by stud bolts 44 extending through passages 45, and which bolts at their lower ends are of the same diameter as the passages to form dowels which locate and fix the positions of the brackets upon the pedestals.

Supported at their ends in holes at the upper ends of the brackets 43, which holes intersect the passages 45, are two hollow shafts 46, 47 which support the rocker 48 for operating the two intake valves 14, and the rocker 49 for operating the exhaust valves; the stems and springs for the intake valves being below in Figure 2 and at the left in Figure 3, and those for the exhaust valves being above in Figure 2 and at the right in Figure 3. The shafts 46, 47 are provided with transverse cylindrical grooves 50 at their ends, and the numeral 51 designates locating bushings which surround the upper ends of the bolts 44 and fit closely within the passages 45 and lie within the grooves 50, to thereby prevent both rotary and longitudinal movement of the hollow shafts 46, 47. The upper ends of the locating bushings 51 have heads 52 which lie beneath the nuts at the upper ends of the bolts 44, all as shown in Figure 3 of the drawings.

The valve operating rockers 48, 49 are preferably provided with pressed-in bushings 53 which bear upon the shafts 46, 47; and the rocker 48 is provided with two arms 54 which engage the stems of the intake valves, and with a double or two-part arm 55 which carries a roller 56, which is engaged and operated to oscillate said rocker 48 by an inlet valve operating cam 57 carried by cam shaft 38. Likewise the rocker 49 is provided with two arms 58 for operating the exhaust valves, and with a double arm 59 which carries a roller 60 engaged by an exhaust valve operating cam 61 upon the cam shaft. The outer ends of the arms 54, 58 have threaded valve operating tappets 61 which engage the ends of the stems of the several valves and whereby their extent of opening movement may be determined and their proper seating insured, said tappets after being adjusted being locked in place and prevented from turning by locking screws 62 extending through the slitted extremities of the rocker arms.

In view of the premises it will be appreciated that my invention provides a simple, compact, and effective valve operating mechanism which may be conveniently assembled and properly adjusted in building up the engine, and which may be disassembled when necessary and reassembled without disturbing the proper relationship of the parts with one another. This feature of ready disassembling obviously applies not only to the parts individually if the mechanism is to be taken entirely apart but furthermore, and which is of even greater importance, it will be appreciated that the entire valve mechanism for a cylinder may be removed as a unit by removing the nuts at the upper ends of the four bolts 44 and access thus had to the valves which the unit operates; the brackets 43 and the shafts 46, 47 with the rockers 48, 49 upon them being held together as a unit by the locating bushings 51. Then upon replacing the unit assembly the enlarged lower ends of the bolts 44, acting as dowels as explained, will position the brackets 43 so that the rockers will be properly related to the valves which they operate. Exceeding compact and readily removable valve operating mechanisms for each cylinder, and which mechanisms are independent of one another so that each unit may be removed independently of the others, are thus provided; and the mechanism for each cylinder block is enclosed in the head thereof and covered by the cover plate 16 of the block in question as will be appreciated.

Having thus described and explained my invention I claim and desire to secure by Letters Patent:

1. In valve operating mechanism of the class described, a cylinder head having a supporting pedestal; a bracket supported by said pedestal and having a passage extending therethrough and a hole intersecting said passage for receiving the end of a rocker supporting shaft; a holding bolt extending from said pedestal through the passage aforesaid in said bracket; a rocker supporting shaft the end of which enters the hole in said bracket; and means within said passage and engaging the end of said rocker supporting shaft for holding said shaft in place.

2. In valve operating mechanism of the class described, a cylinder head having a supporting pedestal; a bracket supported by said pedestal and having a passage extending therethrough, and a hole intersecting said passage for receiving the end of a rocker supporting shaft; a holding bolt extending from said pedestal through the passage aforesaid in said bracket; a rocker supporting shaft the end of which enters the hole in said bracket, and which shaft has a transverse groove adjacent its end; and a locating bushing within said passage and surrounding said holding bolt and having a flange at its upper end, said bushing lying within said groove to thereby hold said shaft in place.

3. In valve operating mechanism of the class described, a cylinder head having a supporting pedestal; a bracket supported by said pedestal and having two passages extending therethrough and two holes, one intersecting each of said passages, for receiving the ends of two rocker supporting shafts; holding bolts extending from said pedestal through the passages aforesaid; a camshaft bearing located between said holding bolts; two rocker supporting shafts the ends of which enter the holes in said bracket, and which shafts each has a transverse groove adjacent its end; and locating bushings within said passages and surrounding said holding bolts, and lying within the grooves in said rocker supporting shafts to thereby hold said shafts in place.

4. In valve operating mechanism of the class described, a cylinder head having a supporting pedestal; a bracket supported by said pedestal and having two passages extending therethrough and two holes, one intersecting each passage, for receiving the ends of two rocker supporting

shafts; a cam shaft bearing supported in two semi-circular recesses, one formed in said pedestal and the other in said bracket; holding bolts extending from said pedestal through the passages in said bracket; two rocker supporting shafts the ends of which lie in the holes in said bracket, and which shafts have transverse grooves merging with said passages; and locating bushings within said passages and surrounding said holding bolts, and which bushings extend through the grooves in said rocker supporting shafts to thereby hold them in place in said holes.

5. In valve operating mechanism of the class described, two brackets spaced apart from one another and each having two fastening bolt passages extending through it, and two holes intersecting said passages; two rocker supporting shafts the ends of which are supported in said holes, and which shafts have transverse grooves adjacent their ends which merge with said passages; two valve operating rockers supported one upon each of said shafts; and locating bushings within said passages and lying within the grooves aforesaid in said rocker supporting shafts whereby said brackets, said shafts, and said rocker arms are held together as a unit.

HAROLD CAMINEZ.