May 27, 1930. W. A. WOOD 1,760,853

ENGINE VALVE OPERATING MEANS

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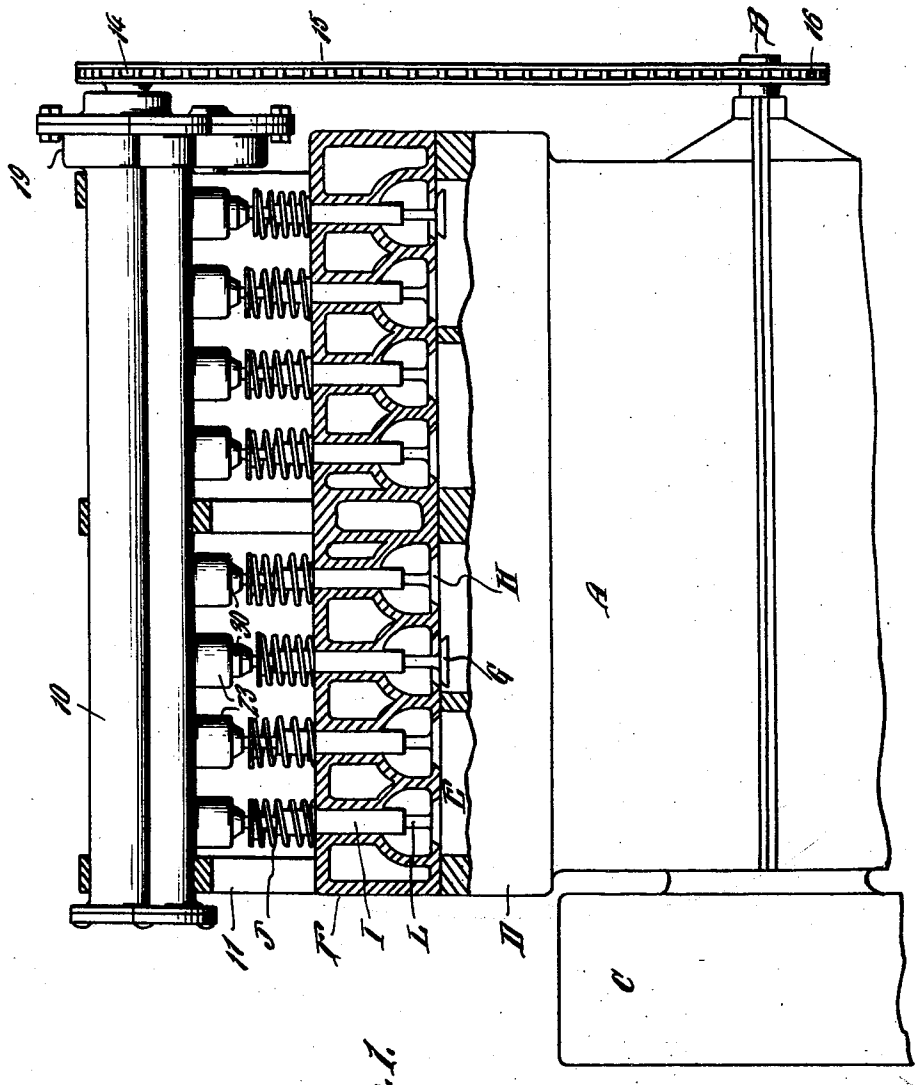


Fig. 1.

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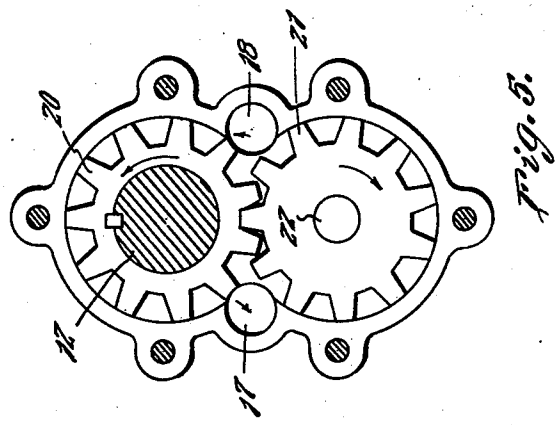


Fig. 3.

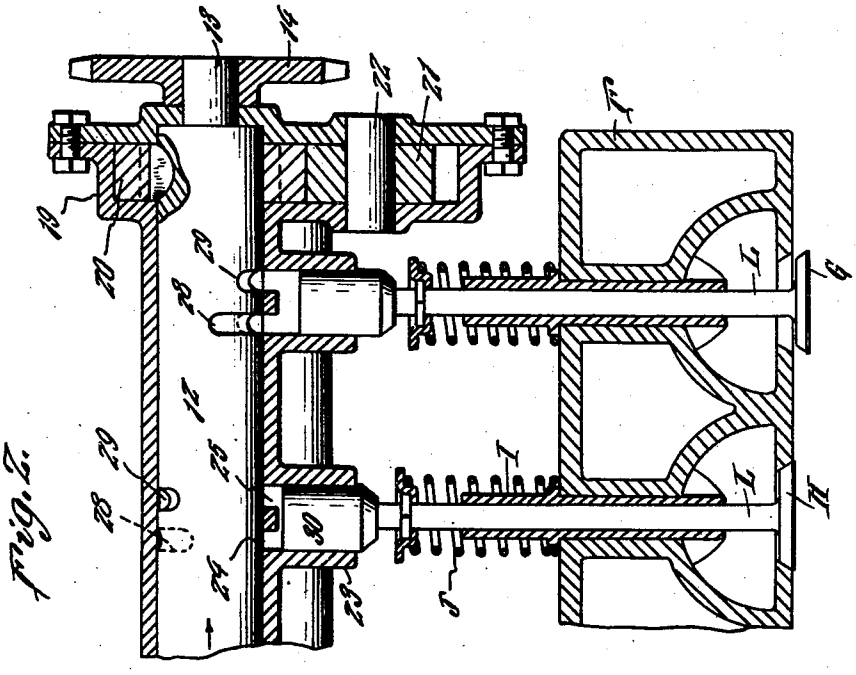


Fig. 2.

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ENGINE VALVE OPERATING MEANS

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Fig. 1.

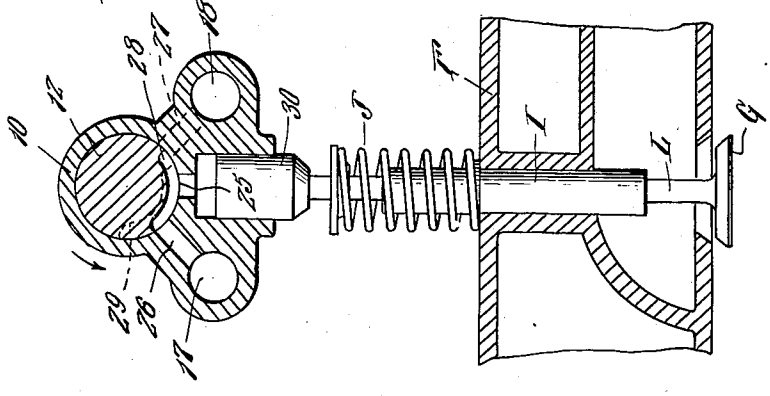
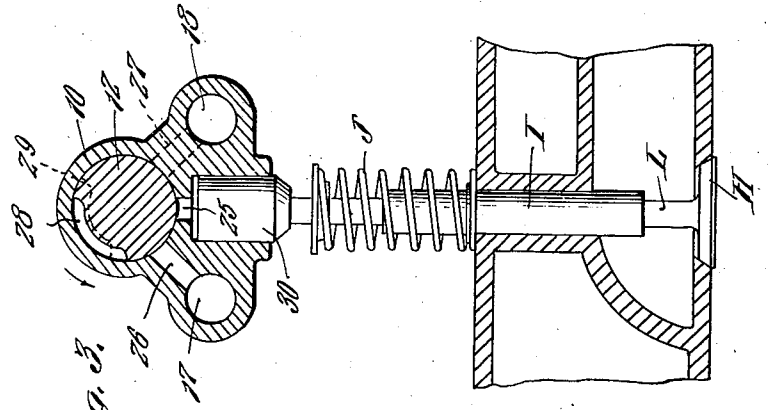


Fig. 2.



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UNITED STATES PATENT OFFICE

WALTER A. WOOD, OF FLINT, MICHIGAN, ASSIGNOR TO GENERAL MOTORS RESEARCH CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF DELAWARE.

ENGINE-VALVE-OPERATING MEANS

Application filed December 10, 1928. Serial No. 325,061.

This invention relates to an arrangement for operating valves hydraulically, and is designed especially for use with internal combustion engines used on automobiles.

It is well known that mechanical valve gear must be adjusted so that there is a slight amount of clearance between the parts when cold so that after the engine has been running a while and the parts become heated and expand, the expansion will simply take up the clearance, and allow the valves to seat properly. Even with perfect adjustment the valves will be quite noisy until the engine warms up owing to the clearance which must be provided. However, most of the time the adjustment will be far from perfect so that there will always be a certain amount of clearance and the resulting impact of the tappet on the camshaft, the valve on its seat, and the intermediate parts of the valve operating gear on each other will produce objectionable noise.

My improved hydraulic valve gear is of the type in which a source of fluid under pressure is provided, and provision is made for directing the fluid to the valves in proper sequence to effect their unseating. My gear consists of a fluid pump, a series of hydraulic chambers, one for each valve, and a distributor for directing fluid under pressure from the pump to the chambers to operate the valves. My system is preferably a closed one, that is, it is so designed that the fluid after operating the valve is returned directly to the intake side of the pump. My design is also a very compact one. Thus the pump and distributor are mounted on a common axis and the hydraulic chambers are arranged closely adjacent the distributor. The whole assembly is designed so that it may be formed as a single unit adapted for ready attachment to the engine block.

In the drawings:

Figure 1 is a side elevation of an overhead valve engine equipped with my valve gear, parts being broken away to better show the construction.

Figure 2 is a longitudinal section through a portion of the gear.

Figures 3 and 4 are sectional views through the center line of one of the valves taken at right angles to the section of Figure 2, and showing one of the valves in seated and unseated positions.

Figure 5 is a view of the pump with the cover removed.

I have illustrated on the drawings a conventional form of internal combustion engine provided with a crankcase A, within which is journaled the usual crankshaft B, equipped with a flywheel contained within the housing C. D represents the cylinder block formed to provide cylinders E, of which there may be any desired number. F indicates the detachable cylinder head. The head is formed at each cylinder with the valve openings, or ports normally closed by valves G and, H constituting the intake and exhaust valves respectively. The valves are provided with stems L slidably mounted in guides I, and are normally urged to closed position by means of suitable coil springs J. The parts so far described are conventional, the valve stems ordinarily being engaged either by overhead rocker arms operated by tappets from the usual camshaft, or directly by an overhead camshaft to effect their opening and closing.

According to my invention the mechanical valve operating gear is done away with, and instead a hydraulic arrangement is employed. My hydraulic valve operating gear comprises a casing 10 suitably mounted on the cylinder head by means of brackets 11. The casing is closed at both ends, and contains within its main bore as clearly shown in Figure 2, a rotary distributor 12 having at one end a reduced extension 13 projecting outside of the casing, and carrying a sprocket 14 driven by chain 15 from sprocket 16 mounted upon the crankshaft B. By this arrangement, it is obvious that the distributor will be driven in timed relation to the crank shaft. At opposite sides the casing 10 is provided with intake and discharge manifolds 17 and 18, respectively. The manifolds communicate with a source of fluid pressure illustrated as a gear pump comprising transmission gears 20 and 21, the gear 20 being keyed to the distributor 12, and the gear 21 being mounted upon a stub shaft 22 journaled within the casing 19, which houses the pump. While I have pre-

ferred to illustrate the pump as mounted on the distributor and driven therefrom, it is obvious that this is not essential, the pump simply representing one convenient source of supply of fluid pressure.

A hydraulic chamber is provided for operating each of the valves. This chamber is preferably in the form of a cylinder 23, which for convenience in manufacture, may be made integral with the casing 10. The chamber is provided with a movable wall in the form of a piston 30, which may be a part of the valve stem, but is preferably separate. The distributor 12 is provided adjacent each of the hydraulic chambers 23 with a pair of grooves 28 and 29. The groove 28 cooperates with port 26 leading from the discharge manifold 17, and the port 25 leading from the distributor to the hydraulic chamber 23. When the groove 28 is in the position shown in Figure 4, oil is discharged from the manifold 17 through the port 26, groove 28, and the port 25 into the hydraulic chamber causing the piston 30 to be forced downwardly unseating the valve as shown in Figure 4. As will be obvious from an inspection of Figure 4, this communication is established some time prior to the distributor 12 reaching the position shown in Figure 4. During the entire period that this communication is established the valve G is held open. If the valve be an intake valve during this period combustible mixture is supplied the cylinder E, if an exhaust valve, burnt gases will be carried away. Upon further rotation of the distributor, the groove 29 establishes communication between the port 25 leading to the hydraulic chamber and the port 27 leading to the intake manifold 18. Upon this communication being established the pressure of the fluid on the piston 30 is relieved and the valve spring J forces the fluid out of the chamber through the port 25, groove 29, and port 27 into the intake manifold 18, hence it is conducted to the intake side of the gear pump.

The grooves 28 and 29 are so placed in the distributor that the valves are opened and closed in proper sequence in accordance with the firing order of the engine.

The casing 10 will be provided with a suitable inlet for initially filling the system, and if desired, this inlet may consist of a connection leading from the engine crankcase to the intake side of the pump to insure that the reservoir will be filled with fluid at all times.

The described construction is very simple, and compact. It may be removed as a unit for inspection, or repair, and obviously, by slight modification could be adapted to engines having valves in other locations than in the head.

I claim:

1. In an engine, one or more cylinders each having intake and exhaust ports, valves for controlling the opening and the closing of the ports, the valves having stems, a piston mounted on each valve stem, a casing extending longitudinally of the engine transversely of all of the cylinders thereof, the casing being formed with relatively small cylinders slidably receiving said pistons, the casing having a cylindrical bore and being formed with longitudinally extending intake and exhaust manifolds communicating through ports with the bore, said bore communicating with the relatively small cylinders through other ports, means for supplying liquid pressure to the intake manifold and removing it from the exhaust manifold, and a rotary valve member within the casing having ports therein adapted to establish communication successively between the intake ports and the last named ports and between the last named ports and the second named ports.

2. A fitting for hydraulic valve gear provided with spaced intake and discharge manifolds, hydraulic chambers between said manifolds, a distributing chamber communicating with said manifolds and said chambers, and a distributor in said distributing chamber for controlling said communication.

3. A fitting for hydraulic valve gear provided with spaced intake and discharge manifolds, hydraulic chambers between said manifolds, a distributing chamber communicating with said manifolds and said chambers, and a distributor in said distributing chamber for controlling said communication, said fitting being provided at one end with a pump chamber communicating with said manifolds, and a pump in said chamber.

4. A fitting for hydraulic valve gear provided with spaced intake and discharge manifolds, and with a pump chamber at one end communicating with said manifolds, a distributing chamber between said manifolds and communicating therewith, a rotary distributor in the distributing chamber, a rotary pump in the pump chamber, said pump and distributor being connected together for rotation about a common axis.

In testimony whereof I affix my signature.

WALTER A. WOOD.