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VALVE GEAR FOR INTERNAL COMBUSTION ENGINES

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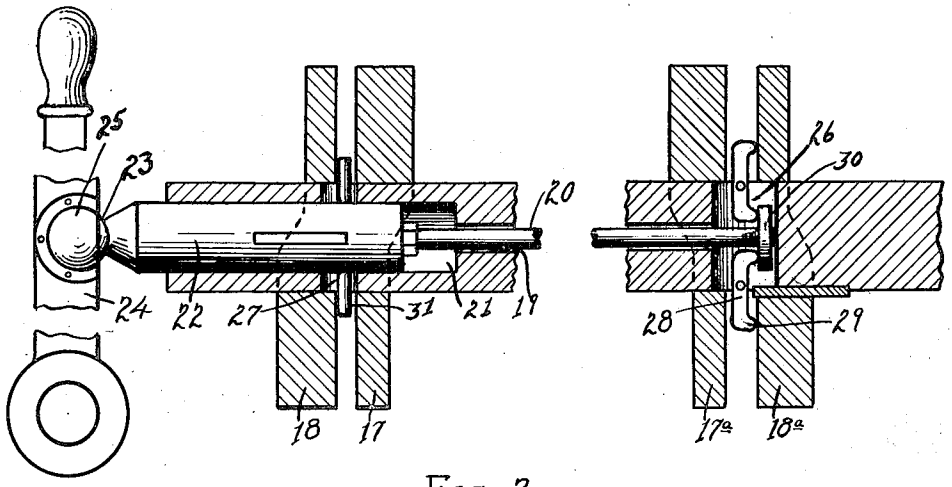

FIG. 2

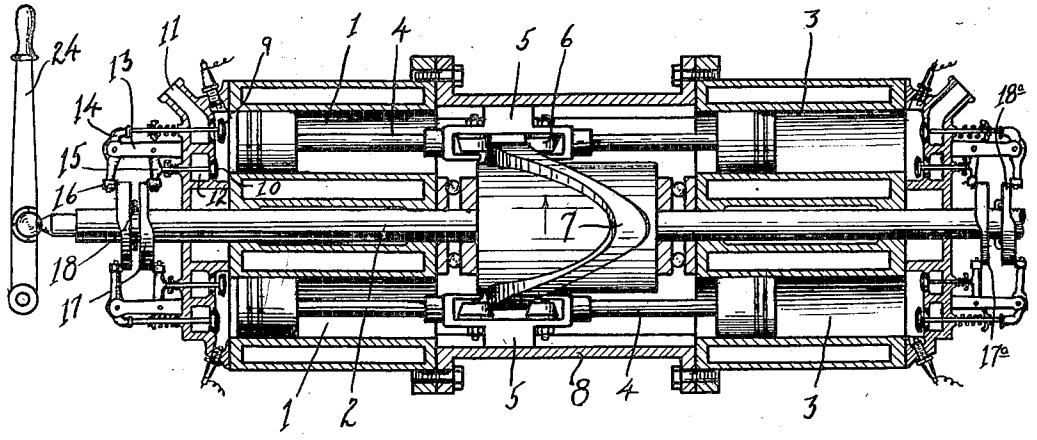

FIG. 1

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VALVE GEAR FOR INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that I, PETER W. MURPHY, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Valve Gears for Internal-Combustion Engines, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to valve gears for internal combustion engines of a rotary type in which the longitudinal axes of the cylinders are parallel with the central driven shaft and in which reciprocation of the pistons in the cylinders causes rotation of the shaft, and a particular object of the invention is to provide a valve gear controlled by rotation of the central shaft and provided with a manual means whereby a set of either the intake or exhaust valves may be manually controlled to release the compression produced in the cylinders and to allow a ready manual rotation of the shaft. These several objects and the novel features of the construction of the invention in its preferred form are hereinafter more fully described and claimed and shown in the accompanying drawings in whch—

Fig. 1 is a longitudinal vertical section of an engine embodying my invention.

Fig. 2 is an enlarged detail of the manual means for controlling operation of the valves.

As will be readily understood the engine comprises a series of cylinders 1 arranged in a circle about a central shaft 2 and preferably the engine embodies two sets of cylinders oppositely disposed as indicated in Fig. 1, the second set of cylinders 3 being arranged similarly to the series of cylinders 1 and the piston rod of the piston in one cylinder, as indicated at 4, is fixedly connected with the piston rod of the opposite cylinder in the group 3. These are centrally connected to a sliding member 5 having rollers 6 thereon positioned on opposite faces of a central cam member 7 fixed to the shaft 2. The explosion in one cylinder drives the sliding member 5 in its ways provided in the surrounding casing 8 therefor and rotates the cam member and shaft. The cylinders as indicated clearly at the left of Fig. 1 are each provided with an intake valve 9 and an exhaust valve 10 reciprocably positioned in a head provided for the cylinders and controlling the intake manifold 11 and exhaust manifold 12 respectively. These valves are preferably spring closed as shown and on the head for each cylinder is positioned a bracket 13 in which is pivotally mounted a lever 14 for operating the stem of the valve 9 and a similar lever 15 for operating the stem of the valve 10. These levers are each provided with rollers 16 and the central drive shaft 2 is provided with what I have termed a split cam having corresponding members 17 and 18 having oppositely arranged faces so that at the time of opening the intake valve by reason of the lever 14 and roller thereon riding on the high part of the cams 18 or 18^a, the exhaust valve is closed by reason of the roller on the lever 15 engaging the low part of the cams 17 or 17^a.

The several cylinders of the engine are each provided with the intake and exhaust valve and operating levers therefor, and, by rotation of the cam members with the shaft 2, the said levers and corresponding valves of the several cylinders are successively operated. These levers, as will be readily understood from the drawing, are each provided with portions contacting the end of the valve stems and movement of the levers by the cams controls the opening and closing of the valves. In an engine of this type a large number of cylinders may be employed in each series and under such condition it is difficult to manually rotate the shaft 2 to introduce the initial charge by reason of the high compression developed in the several cylinders. To relieve the cylinders from compression I have made one of the cam members as for instance, 18 controlling the intake valves at each end of the engine slidable on the shaft 2 as will be understood from Fig. 2. The cam members 18 and 18^a at each end of the engine are slidably keyed to the shaft while the companion cam members 17 are fixed from movement longitudinally or rotatably relative to the shaft. To operate these slidable cam members during operation of the engine I have formed the shaft with a central bore 19 sufficiently large to allow a rod 20 to

freely pass therethrough. The shaft is provided at one end with an enlarged recess 21 in which is slidably positioned a cylindrical member 22 to which the rod 20 is secured preferably being threaded therein. This cylindrical portion 22 terminates in a ball end 23 and I have provided a lever 24 pivotally mounted in any convenient manner relative to the engine bed or bracket thereon, and this lever is provided with a socket 25 for the said ball end 23. By operating the lever, the member 22 and rod 20 may be reciprocated in the shaft during revolution thereof. As will be understood from Fig. 2 the shaft is provided with apertures 26 and 27 extending transversely therethrough and pivotally mounted in the recess 26 is a pair of pivoted levers 28 having points 29 normally engaging the inner flat face of the cam 18ª. The rod 20 terminates in a disc shaped member 30 which may be secured thereto in any approved manner, and the inner ends of the levers 28 engage the face of this disc member 30 as shown so that by pulling on the rod 20 through operation of the lever 24, the disc member 30 turns the levers 28 on the pivots forcing the cam member 18ª outwardly longitudinally of the shaft and thus turns the levers 14 controlled by the cam face of the member 18ª, on the pivots therefor against the tension of the valve springs opening the valves and holding the same open by reason of the positioning of the cam member 18. Under this condition no compression may take place in the cylinders and the shaft 2 may be freely rotated while the valves controlled by the other cam member 17 or 17ª are operated in the usual manner. There are two sets of valves for the two series of cylinders and, therefore, the cam 18 at the opposite end of the shaft and near the lever must necessarily be operated in the same manner as described with the other cam member 18ª. For this purpose I have provided pins 31 extending through opposite sides of the cylindrical member 22 and through the surface of the shaft through the aperture 27 therein. These pins engage against the inner face of the cam member 18 and on operating the rod and cylindrical member 22 the said second named cam member 18 is moved longitudinally of the shaft simultaneously with and in a direction reverse to that of the other similar cam member 18ª. Thus upon one movement of the lever both cam members are moved longitudinally in opposite directions on the shaft and both sets of cylinders are freed from compression simultaneously.

The lever 24 may be provided with a notched segment if desired, (but not here shown). In any event on release of the cam members, which have been moved in a manner described, both the cam members 18 and 18ª are returned to normal position through operation of the springs on the valves which will turn the levers 14 on the pivots and move the valve to normal position where it is continuously held by the pressure exerted by the springs. It is evident that by this arrangement both series of valves may be readily operated manually even during operation of the engine to release the compression in the cylinders and by a means that a simple and inexpensive form and admirably adapted for the purpose.

Having thus briefly described my invention what I claim is—

1. In an internal combustion engine, a main shaft, sets of opposed cylinders circularly disposed around the shaft, pistons for the cylinders, a driving connection between the pistons and the shaft adapted to cause rotation of the shaft, a head common to the cylinders of each set provided with an intake and an exhaust passage each in communication with a compression chamber of the cylinders, an intake valve for each cylinder controlling communication between the intake passage and cylinder, an exhaust valve for each cylinder controlling communication between the said cylinder and exhaust passage, a valve operating member for each set of intake valves and a valve operating member for each set of exhaust valves, both of said members being on the main shaft and controlling the operation of the valves for each cylinder in succession, and means for moving one of each of said valve operating members to simultaneously open the corresponding set of valves.

2. In an internal combustion engine, a main shaft, a series of circularly arranged cylinders disposed around the shaft, pistons for each cylinder, a driving connection between the pistons and the shaft adapted to cause rotation of the shaft, a head common to the said cylinders provided with an intake and an exhaust passage each in communication with the compression chamber of the cylinder, an intake valve for each cylinder controlling communication between the intake passage and cylinder, an exhaust valve for each cylinder controlling communication between the cylinder and exhaust passage, a cam rotatable with the shaft controlling operation of the intake valves, a second cam rotatable with the shaft for operating the exhaust valves, and means for moving said first cam longitudinally of the shaft to cause simultaneous operation of the valves controlled thereby.

3. In an internal combustion engine, a main shaft, sets of opposed cylinders circularly disposed about the shaft, pistons for the cylinders, a driving connection between the pistons and shaft adapted to cause rotation of the shaft by reciprocation of the pistons, a head common to the cylinders of each set provided with an intake and an ex-

haust passage in communication with the compression chamber of each cylinder, a spring controlled intake valve for each cylinder controlling communication between the intake passage and cylinder, a spring controlled exhaust valve for each cylinder controlling communication between the exhaust passage and the cylinder, a disc like cam member on the shaft and rotatable therewith, a pivoted lever for each intake valve adapted to open the valve by rotation of the cam, a second disc like cam member, a pivoted lever for each exhaust valve engaging the said second cam member whereby rotation thereof causes operation of the said valves, there being a set of cams for each set of cylinders, said main shaft having a longitudinal bore, a rod positioned therein, means on the rod whereby the movable cam of each set may be actuated by movement of the rod longitudinally of the shaft.

4. In an internal combustion engine having a series of circularly arranged cylinders, a centrally disposed shaft, pistons in the cylinders, means whereby reciprocation of the pistons causes rotation of the shaft, spring-controlled exhaust and intake valve for each cylinder, a disc like cam member opening the intake valves in succession, a second cam member similar to the first cam member and adapted by rotation to open the exhaust valves in succession in timed relation with the opening of the intake valves, the two cam members being secured to the shaft in a manner to rotate therewith, the member for the intake valves being splined to the shaft, manual means for moving the first said cam member to hold all the intake valves open simultaneously, the said springs of the valves causing movement of the cam member to normal position upon release of the said manual means.

5. In an internal combustion engine, a main shaft, sets of opposed cylinders circularly disposed around the shaft, pistons for the cylinders, a driving connection between the pistons and the shaft adapted to cause rotation of the shaft, a head common to the cylinders of each set provided with an intake and an exhaust passage each in communication with a compression chamber of the cylinders, an intake valve for each cylinder controlling communication between the intake passage and cylinder, an exhaust valve for each cylinder controlling communication between the said cylinder and exhaust passage, valve operating members controlling the operation of the valves for each cylinder in succession, and means for moving one of said valve operating members to simultaneously open the corresponding set of valves.

6. In an internal combustion engine, a main shaft, a series of circularly arranged cylinders disposed around the shaft, pistons for each cylinder, a driving connection between the pistons and the shaft adapted to cause rotation of the shaft, an intake and an exhaust passage, an intake valve for each cylinder controlling communication between the intake passage and cylinder, an exhaust valve for each cylinder controlling communication between the cylinder and exhaust passage, a cam controlling operation of the intake valve, a second cam for operating the exhaust valves, and means for moving said first cam longitudinally of the shaft to cause simultaneous operation of the valves controlled thereby.

7. In an internal combustion engine, a main shaft, sets of opposed cylinders circularly disposed about the shaft, pistons for the cylinders, a driving connection between the pistons and shaft adapted to cause rotation of the shaft by reciprocation of the pistons, an intake and an exhaust passage, a spring controlled intake valve for each cylinder controlling communication between the intake passage and cylinder, a spring controlled exhaust valve for each cylinder controlling communication between the exhaust passage and the cylinder, a cam member, a pivoted lever for each intake valve adapted to open the valve by rotation of the cam, a second cam member, a pivoted lever for each exhaust valve engaging the said second cam member whereby rotation thereof causes operation of the said valves, there being a set of cams for each set of cylinders, said main shaft having a longitudinal bore, a rod positioned therein, means on the rod whereby one cam of each set may be actuated by movement of the rod longitudinally of the shaft.

8. In an internal combustion engine having a series of circularly arranged cylinders, a shaft, spring controlled exhaust and intake valves for each cylinder, a disc like cam member opening the intake valves in succession, a second cam member similar to the first cam member and adapted by rotation to open the exhaust valves in succession in timed relation with the opening of the intake valves, manual means for moving the first said cam member to hold all the intake valves open simultaneously, the said springs of the valves causing movement of the cam member to normal position upon release of the said manual means.

9. In an internal combustion engine having a cylinder, a shaft, pistons and intake valves, a cam rotating with said shaft to open said valves on the intake stroke of the piston and means separate from the cam for actuating said cam to open said valves on the compression stroke of the piston.

10. In an internal combustion engine having a main shaft, a cylinder, a piston and an intake valve, a cam keyed to the shaft to open said valve on the intake stroke of the

piston, and means to move the cam along the shaft to cause the cam to open the valve on the compression stroke of the piston.

11. In an internal combustion engine, a shaft, cylinders parallel to and around the shaft, pistons for the cylinders, intake valves, a cam on said shaft to open said valves on the intake stroke of the piston and means to move the cam longitudinally of the shaft to cause the cam to open the valves on the compression stroke of the pistons.

12. In an internal combustion engine, a shaft, cylinders parallel to and around the shaft, pistons for the cylinders, intake valves, a cam on said shaft to open said valves on the intake stroke of the piston and manually controlled means to move the cam longitudinally of the shaft to cause the cam to open the valve on the compression stroke of the pistons.

In testimony whereof, I sign this specification.

PETER W. MURPHY.