April 15, 1924. 1,490,613

A. LEPORT ET AL

VALVE MECHANISM

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Fig. 2.

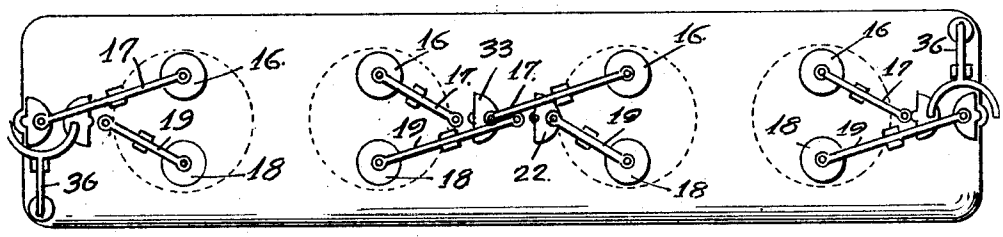
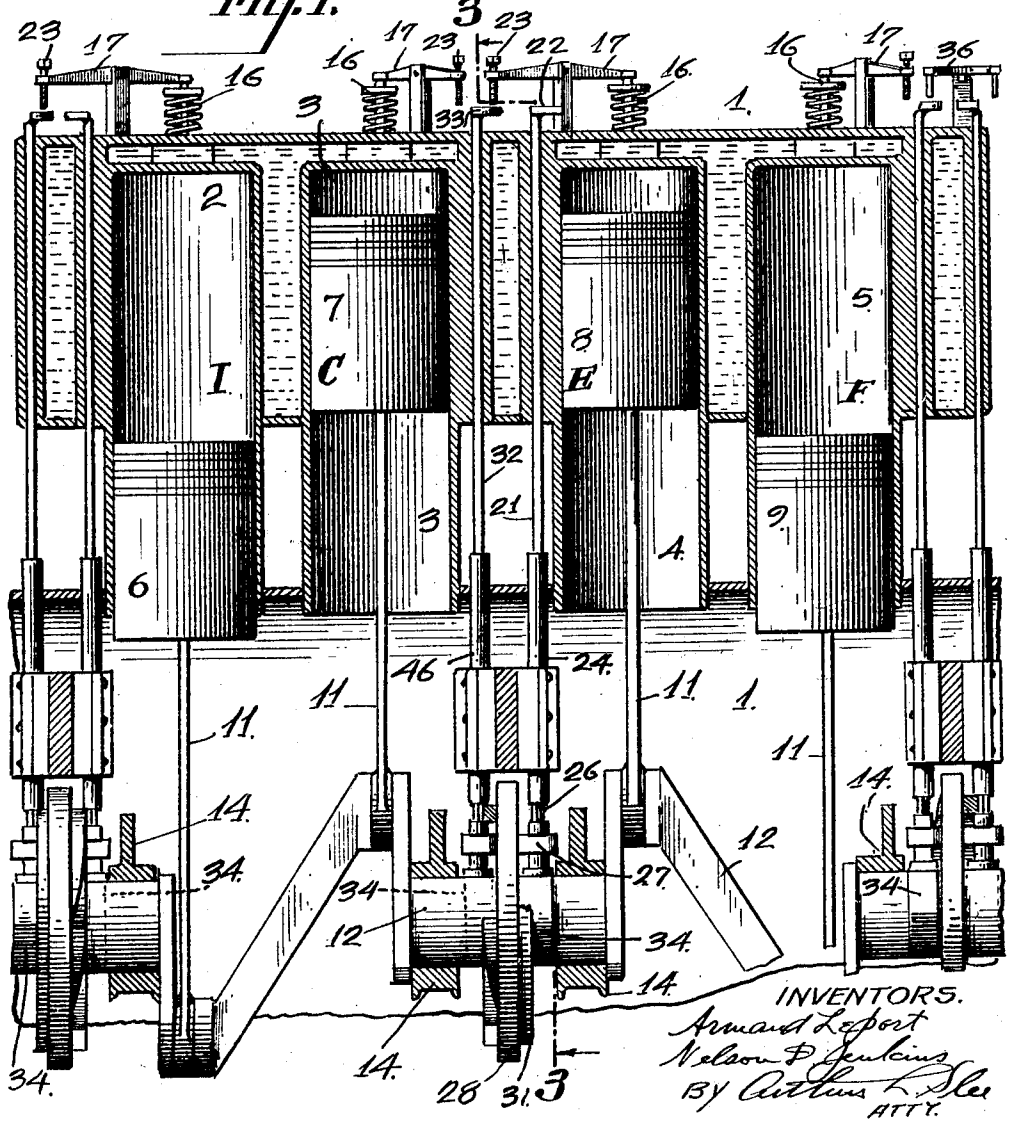


Fig. 1.



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Fig. 4.

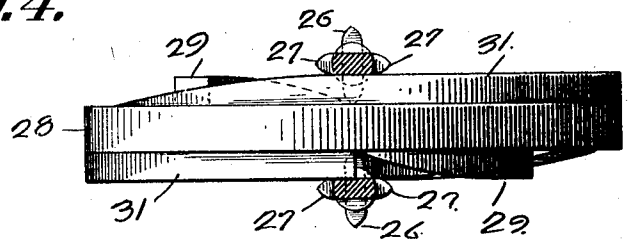
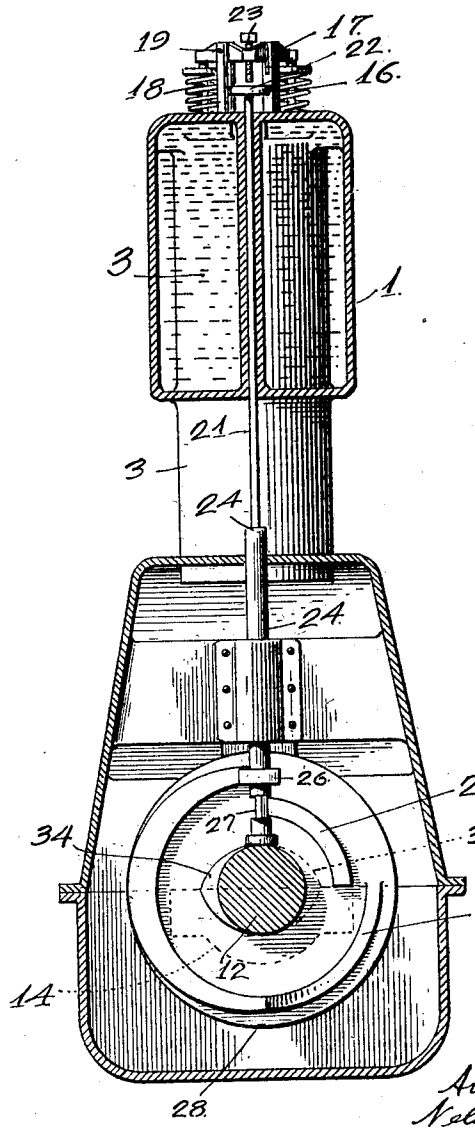


Fig. 3.



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UNITED STATES PATENT OFFICE.

ARMAND LEPORT AND NELSON D. JENKINS, OF SAN FRANCISCO, CALIFORNIA.

VALVE MECHANISM.

Application filed February 23, 1922. Serial No. 538,752.

To all whom it may concern:

Be it known that we, ARMAND LEPORT and NELSON D. JENKINS, citizens of the United States, and residing in the city and county of San Francisco, State of California, have invented a new and useful Improvement in a Valve Mechanism, of which the following is a specification.

Our invention relates to improvements in valve mechanisms for internal combustion motors wherein the exhaust valves of a pair of cylinders are operated by a single tappet and push rod, and the intake valves of the same pair of cylinders are similarly operated by a single push rod and tappet, said tappets operating in conjunction with cams mounted directly on the crank shaft by means of which cams said intake and exhaust valves are actuated in proper synchronism with the respective pistons.

The primary object of our invention is to provide a new and improved valve mechanism for internal combustion motors.

Another object of the invention is to provide a new and improved valve mechanism having fewer parts.

A further object is to provide a new and improved device of the character described wherein the actuating cams are mounted directly upon the crank shaft of the motor thereby reducing lost motion and providing a more correct and closer timing adjustment between the valves and the crank shaft.

A still further object of the invention is to provide a new and improved valve mechanism wherein a single tappet and push rod is arranged to actuate two valves, either exhaust or intake thereby further reducing the number of parts.

We accomplish these and other objects by means of the preferred form of the invention disclosed in the drawings forming a part of the present specification, wherein like numerals of references are used to designate similar parts throughout the said specification and drawings, and in which:

Fig. 1 is a vertical sectional view of a four-cylinder internal combustion motor, disclosing our invention applied thereto;

Fig. 2 is a plan view of the motor disclosing the arrangement of the upper portions of the valve actuating mechanism;

Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 1 of the drawings; and

Fig. 4 is an enlarged plan view of the actuating cams.

Referring to the drawings the numeral 1 is used to designate in general an internal combustion motor having four cylinders 2, 3, 4 and 5 within which are slidably mounted the usual pistons 6, 7, 8 and 9 respectively, said cylinders being connected in the usual manner by means of suitable connecting rods 11 to a crank shaft 12 rotatably mounted in what we term split bearings 14.

Each cylinder is provided with an intake valve 16 actuated by rocker arms 17, and an exhaust valve 18 similarly operated by rocker arms 19.

In order to more clearly illustrate the manner in which the intake and exhaust valves of a pair of cylinders is actuated and operated in synchronism with the cycles of the pistons of that pair of cylinders we will describe the valve mechanism for the central pair of cylinders 3 and 4.

For convenience the push rod ends of all of the rocker arms 17 and 19 are arranged in the same vertical plane with the crank shaft 12.

A vertically disposed push rod 21 is rotatably mounted in the motor 1 in its central plane and is provided at its upper end with a semi-circular plate 22 which plate, when the push rod 21 is rotated in a manner hereinafter more fully described, alternately moves under the adjusting screws 23 mounted in the push rod ends of the rocker arms 19 of the exhaust valves 18 of the cylinders 3 and 4.

The lower end of the push rod 21 is detachably connected in any suitable manner with a tappet 24 in such a manner that the said push rod and tappet will always bear the same relative position to each other when connected.

The tappet 24 is provided adjacent its lower end with two pair of diametrically disposed arms 26 and 27 arranged at right angles to each other and in different planes, as disclosed in Figs. 1 and 3 of the drawings.

A double-faced cam 28 is mounted directly upon the crank shaft 12 midway of the split bearing 14 and is provided on one side with an inclined projection 29 which extends approximately one-quarter distance around the face of said cam and is arranged to engage one of the diametrically opposed arms 26 and move the same and the tappet 24 through a one-quarter revolution when one of the arms 27 will then be brought within the path of a second projection 31

which is inclined for a quarter distance on the face of the cam 28 and which engages said arm 27 and again moves the tappet 24 through another quarter revolution, the remaining portion of the projection 31 being parallel with the plane of rotation so as to engage the side of the arm 27 and hold the same against further movement as disclosed in Fig. 4 of the drawings.

In other words, during one-half of each revolution of the cam 28 the push rods will be rotated through one-half of a revolution which will move the semi-circular disc 22 from an engageable position below one exhaust valve rocker arm 19 of the cylinder 3 to the engageable position below the push rod end of the rocker arm of the exhaust valve 18 of the cylinder 2, or vice versa. In other words rotation of the push rod 21 will move the semi-circular member 22 thereon to be moved alternately into engageable positions beneath the rocker arms of a pair of two adjacent cylinders.

A second push rod 32 is rotatably arranged parallel with the push rod 21 and is likewise provided with a semi-circular plate 33 which is arranged to be moved alternately into engageable positions between the rocker arms 17 of the intake valves 16 of the cylinders 2 and 3.

It is obvious then, that one push rod will be operated to engage and actuate two exhaust valves while the second rod for that pair of cylinders will similarly be operated to engage and actuate the two intake valves of the same pair of cylinders.

The projections 29 and 31 are the same on all of the cams 28 excepting that said projections are positioned to actuate their respective exhaust and intake valves in synchronism with the cycles of their respective cylinders.

Directly mounted upon the crank shaft 12 and on each side of the cam 28 is a tappet cam 34 which engages the bottom of its respective tappet and raises said tappet and push rod to move the semi-circular portion on top of said push rod to engage the adjusting screws 23 on the rocker arms and through said rocker arms to actuate their respective valves. These cams 34 are also timed or positioned relatively to each other and to the crank shaft to actuate said tappets, push rods and rocker arms in synchronism with the cycles of the pistons.

As there is only one cylinder on each end of the motor and two push rods must be provided for actuating the intake and exhaust valves properly we have provided a bifurcated dummy rocker arm 36 adjacent these push rods, which bifurcations assume the same relative position to the rocker arms of the adjacent cylinder which would be assumed by the rocker arms of another cylinder.

These dummy rocker arms are provided to take the push of the rods and cams 34 when the valves of the end cylinder are not to be operated, as during the compression and firing strokes.

In operation we will assume that cylinders 2, 3, 4 and 5 are, according to the standard order of firing, on their intake, compression, exhaust and firing strokes, respectively, as indicated in Fig. 1 of the drawings by the letters I, C, E and F.

The pistons 7 and 8 of the cylinders 3 and 4 respectively, being illustrated at the ends of their compression and exhaust strokes respectively, it is obvious that the exhaust valve 18 of the cylinder 4 has just been closed by the action of the tappet 24 and the projections 29 and 31 on the cam 28, these projections being then in the position disclosed in Fig. 3 of the drawings. It is also obvious that the intake valve 16 of the cylinder 4 is about to be opened and this is illustrated by the dotted position of the cam 34 immediately to the left of the central bearing cam 28, which is turning over toward the observer and is about to lift the tappet 46 and push rod 32 to actuate the rocker arm 17 of the intake valve 16 of said cylinder 4.

Reference to Fig. 2 of the drawings will disclose that both semi-circular plates 22 and 33 are positioned under the ends of the rocker arms 17 and 19 of the cylinder 4.

During the next half revolution of the crank shaft the tappet 24 will be rotated to bring the plate 22 under the exhaust valve rocker arm 19 of the cylinder 3 and the same half revolution of the crank shaft will cause the cam 34 on the left hand side of the central bearing to raise the tappet 46, plate 33 and actuate the rocker arm 17 to operate the intake valve 16 of the cylinder 4 as that cylinder will then be on its intake stroke.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. The combination with an internal combustion motor, crank shaft, valves and pistons thereof, of a tappet arranged to actuate the exhaust valves of a pair of adjacent cylinders of said motors; a second tappet arranged to actuate the intake valves of the same cylinders; and cams mounted directly upon said crank shaft and arranged to actuate said tappets to alternately engage and actuate the intake and exhaust valves of said cylinders in synchronism with the cycles of said pistons.

2. The combination with an internal combustion motor, crank shaft, valves and pistons thereof, of a tappet arranged to alternately engage and actuate the exhaust valves of adjacent cylinders of said motor; a second tappet arranged to alternately engage and actuate the intake valves of the same

cylinders; means for actuating the said tappets to alternately engage their respective valves; and means directly mounted upon the crank shaft for actuating said tappets in synchronism with the cycles of the said cylinders.

3. The combination with an internal combustion motor, crank shaft, valves and pistons thereof, of a tappet for each pair of cylinders arranged to be moved into engageable position with either one of the intake valves of said pair of cylinders; a second tappet arranged to be moved into engageable position with the exhaust valves of said cylinders; and means directly connected to the crank shaft of said motor and arranged to actuate said tappets to engage said valves and actuate the said valves in synchronism with the cycles of its respective piston.

4. The combination with an internal combustion motor, and the crank shaft, valves and pistons thereof, of a rotatable tappet mounted within said motor for each pair of cylinders, when rotated intermittently, to be moved into engageable position with either intake valve of said pair of cylinders; a second tappet rotatably mounted and arranged to be moved into engageable position with either exhaust valve of said pair of cylinders; means directly mounted upon the crank shaft for rotating the tappets to move the same into engageable position to the proper valve; and means mounted directly on the said crank shaft for actuating said tappets to operate their respective valves in synchronism with their respective pistons.

5. The combination with an internal combustion motor and the crank shaft, valves and pistons thereof, of a vertically disposed tappet rotatably mounted within said motor for each pair of cylinders and having a semi-circular plate on the top thereof arranged to be moved into engageable position with either intake valve of said pair of cylinders; a second vertically disposed tappet rotatably mounted within said motor for the same pair of cylinders and likewise having a semi-circular plate on the top thereof arranged to be moved into engageable position with either exhaust valve of the same pair of cylinders; a cam mounted directly on the crank shaft and arranged to engage the lower ends of both tappets and to rotate the same to bring the semi-circular plates into engageable position with the proper valves and in synchronism with the pistons; and cams mounted on either side of the first mentioned cams and arranged to actuate the tappets to operate the valves in synchronism with said pair of pistons.

In witness whereof we hereunto set our signatures.

ARMAND LEPORT.
NELSON D. JENKINS.