J. V. LAVIOLETTE.

VALVE GEAR FOR MULTICYLINDER INTERNAL COMBUSTION ENGINES.

APPLICATION FILED JUNE 10, 1911.

1,067,666. Patented July 15, 1913.

Fig: 1.

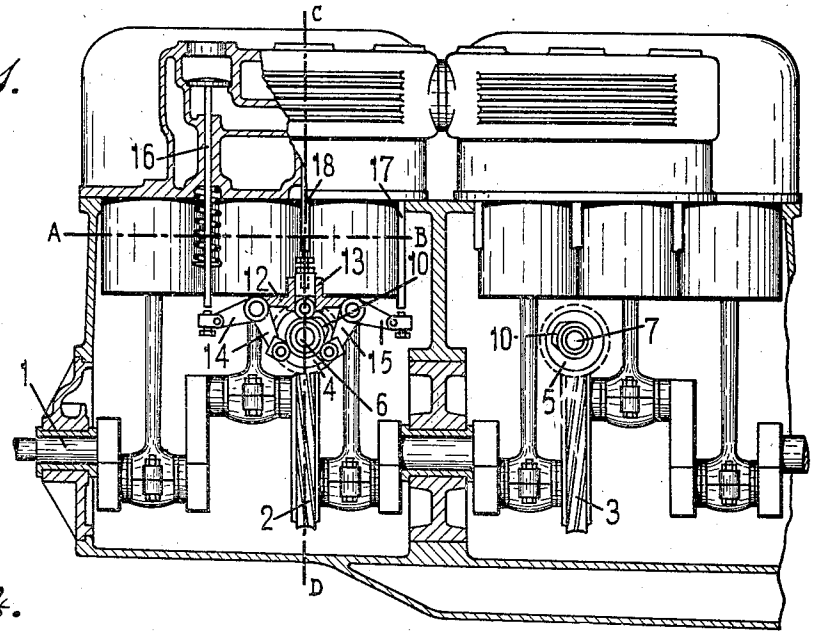


Fig: 4.

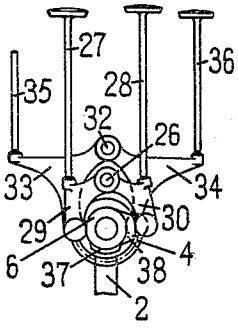


Fig: 5.

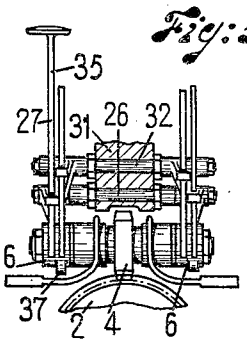


Fig: 3.

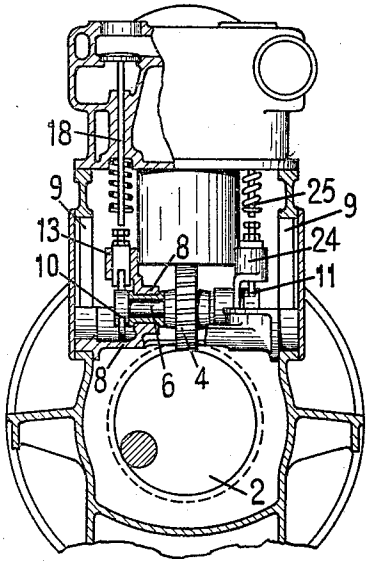
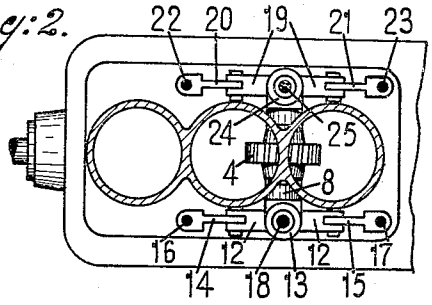


Fig: 2.



Witnesses

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VALVE-GEAR FOR MULTICYLINDER INTERNAL-COMBUSTION ENGINES.

1,067,666. Specification of Letters Patent. **Patented July 15, 1913.**

Application filed June 10, 1911. Serial No. 632,419.

Be it known that I, JOSEPH VALENTIN LAVIOLETTE, subject of the King of Belgium, residing at Sarphatipark No. 51, Amsterdam, Province of North Holland, Kingdom of the Netherlands, have invented certain new and useful Improvements in or Relating to Valve-Gear for Multicylinder Internal-Combustion Engines, of which the following is a specification.

The present invention relates to a valve gear for multi-cylinder internal combustion engines of the type in which the valve shaft is operated by a worm wheel driven direct from the crank shaft. The invention differs from the known valve gears of this kind by the feature that the inlet and exhaust valves of all the working cylinders forming a complete cylinder unit are operated from one common valve shaft alone, a bracket, which latter may be mounted in a detachable bridge piece secured to the wall of the casing bracket and is provided on either side with cams or valve tappets, for the inlet and exhaust valves, arranged on either side of the adjacently mounted, separate cylinders. The valves are preferably operated by bell crank levers which are preferably pivotally mounted on the detachable bridge-piece in such a manner that they can be removed from the engine casing together with the bridge-piece. When more than two cylinders are to be operated, the middle valve rods may be provided with a guide, preferably in the bridge-piece. In the case of engines with four or more cylinders, the bell crank levers appertaining to the inner or outer valve spindles are preferably adapted to pivot on gudgeons arranged in different planes the said bell crank levers being operated by cams or tappets that are spaced angularly on the valve shaft. The bell crank levers may if desired be mounted in any convenient position; for instance, they may be mounted on special bearing blocks secured on the lower heads of the cylinders.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 represents a vertical longitudinal section through a six cylinder engine composed of two triple cylinder units; Fig. 2 is a section along the line A—B of Fig. 1; Fig. 3 is a section along the line C—D of Fig. 1; Fig. 4 is a front elevation, and Fig. 5 is a side elevation partly in section of a modification intended for four cylinder units.

In the construction illustrated in Figs. 1 to 3 for engines composed of units of three cylinders each, there is mounted between each pair of adjacent cranks of the crank shaft 1, a worm wheel 2, 3, meshing with the worm wheels 4, 5 of the valve gear shafts 6, 7 with a ratio of two-to-one. The valve gear shafts are mounted, in the known manner, in a bridge-piece 8 which is secured on cylindrically bored out bearing surfaces in the engine casing, and can be easily drawn out of the casing, through the openings 9, for the purpose of effecting repairs or the like. The valve gear shafts 6 and 7 are provided at each end with cams or valve tappets 10, 11 which operate the three inlet and the three exhaust valves respectively belonging to the cylinder-unit. The bridge-piece is provided on either side with lateral arms 12, in which are pivotally mounted bell crank levers 14 15 the lower arms of which carry antifriction rollers which latter rest upon the cams or tappets 10 and 11, while the other arms operate the inlet valve spindles 16 and 17. The spindle 18 of the middle valve rests directly on the tappet and is guided in a guide 13 in the bridge-piece. On the other side of the cylinders (Fig. 2) the bridge-piece 8 has corresponding lateral arms 19, in which are pivotally mounted the bell-crank levers 20, 21 for the exhaust valves 22 and 23, while the spindle 25 of the middle exhaust valve is guided by means of the guide 24. The two-arm levers 14 and 15 are arranged in such a manner that their rollers, which rest on the tappets, form an angle of 120 deg. with relation to one another and to the roller of the valve spindle 18 (Fig. 1). The dimensions of the levers are selected so that all three valves have an equal stroke. The rollers, by means of which the exhaust valves are operated, are also spaced at an angle of 120 deg. The cams or tappets 10 and 11 are spaced at an angle of 180 deg. relatively to one another, with the result that at all times one of the cams is subjected to the influence of the spring pressure of one of the six valve spindles. Now, since this pressure is the same for each valve spindle, a uniform resistance, acting in the same direction, is continuously transmitted

to the shafts 6 and 7, whereby the engine is caused to run very uniformly and quietly.

The valves are operated in the following manner: For an engine provided with an uneven number of cylinders for one cylinder unit, as for example, three cylinders, the cam 10 of the rotating valve gear shaft will, at suitable intervals, operate the bell-crank levers 14 and 15 of the inlet valves and thereby effect pivoting movements of said levers about their gudgeons or axes whereby the ends of the bell-crank levers will lift the spindles 16 and 17. As soon as the rollers on the bell-crank levers leave the cam 10, the spindles 14 and 15 are returned to their original or initial positions by means of springs, as usual. The middle inlet valve spindle 18 is lifted directly by the cam 10 and slides in the guide 13. A spring moves this spindle downwardly after the cam has passed the end of the spindle. The operation of the exhaust valves is similar to the operation of the inlet valves. For a four cylinder unit, all valves are operated by means of bell-crank levers, the four spindles for the inlet valves being arranged on one side of the unit and are operated by two sets of bell-crank levers, each consisting of two levers and each set of levers is operated by a cam in the same manner as described for the outer spindles of the three cylinder unit.

In the modification, shown in Figs. 4 and 5, for engines with cylinder-units composed of four cylinders, the gudgeons 6 carry two cams or tappets side by side on each end, mounted at a relative angle of 90 degrees. The pivot 26 for the levers 29, 30 operating the middle inlet-valve spindles 27 and 28, is secured to the lower end 31 of the two middle cylinders (Fig. 5) or in a bridge-piece of the casing. Above this pivot is a second pivot 32 carrying the levers 33 and 34 for the inlet valve spindles 35 and 36 of the outer cylinders. On the inlet-valve side of the valve shaft 6, on the right hand side of Fig. 5, the four levers of the four exhaust-valve spindles are operated in exactly the same way by the two tappets mounted on the other end of the valve shaft 6. It will be evident that in this arrangement still more than in that for three cylinders according to Figs. 1 to 3, the shaft 6 is always subjected to the pressure of one or more of the valve spindles, and that, consequently, a uniform and unidirectional resistance is exerted on the worm wheels 2 and 4.

What I claim is:

1. In valve mechanism for multiple cylinder internal combustion engines, the combination of a cylinder unit embodying a plurality of cylinders, a valve shaft, tappets on said valve shaft and arranged in angular relation, valve spindles coöperating directly with said tappets to operate certain valves of the cylinder unit, and levers connected to the remaining valve spindles and coöperating at different angles with said tappets.

2. In a valve gear for multi-cylinder internal combustion engines the combination with a plurality of cylinders forming a cylinder-unit, of a transverse valve shaft, a bridge-piece detachably secured to the engine casing and in which said valve shaft is mounted, tappets on each end of said valve shaft said tappets being angularly spaced relatively to one another, and bell crank levers coöperating at different angles with said tappets to operate the valves appertaining to certain of the cylinders of said cylinder-unit.

3. In a valve gear for multi-cylinder internal combustion engines the combination with a plurality of cylinders forming a cylinder-unit, of a transverse valve shaft, a bridge-piece detachably secured to the engine casing and in which the valve shaft is mounted, tappets on each end of said valve shaft, said tappets being angularly spaced relatively to one another and bell crank levers pivotally mounted on said bridge piece and coöperating with said tappets to operate the valves appertaining to certain of the cylinders of said cylinder-unit.

4. In a valve gear for multi-cylinder internal combustion engines the combination with a plurality of cylinders forming a cylinder-unit and arranged side by side in line, of a transverse valve shaft, a bridge-piece detachably secured to the engine casing and in which said valve shaft is mounted, tappets on said valve shaft said tappets being angularly spaced relatively to one another, valve spindles coöperating directly with the tappets to operate the valves appertaining to the inner cylinders of said cylinder-unit and bell crank levers coöperating at different angles with said tappets to operate the valves appertaining to the outside cylinders of said cylinder-unit.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOSEPH VALENTIN LAVIOLETTE.

Witnesses:
D. P. De Young,
Thomas H. Mehan.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."