

1,063,162.

J. M. JENCKES.
VALVE GEAR FOR GAS ENGINES.
APPLICATION FILED AUG. 18, 1909.

Patented May 27, 1913.

5 SHEETS—SHEET 1.

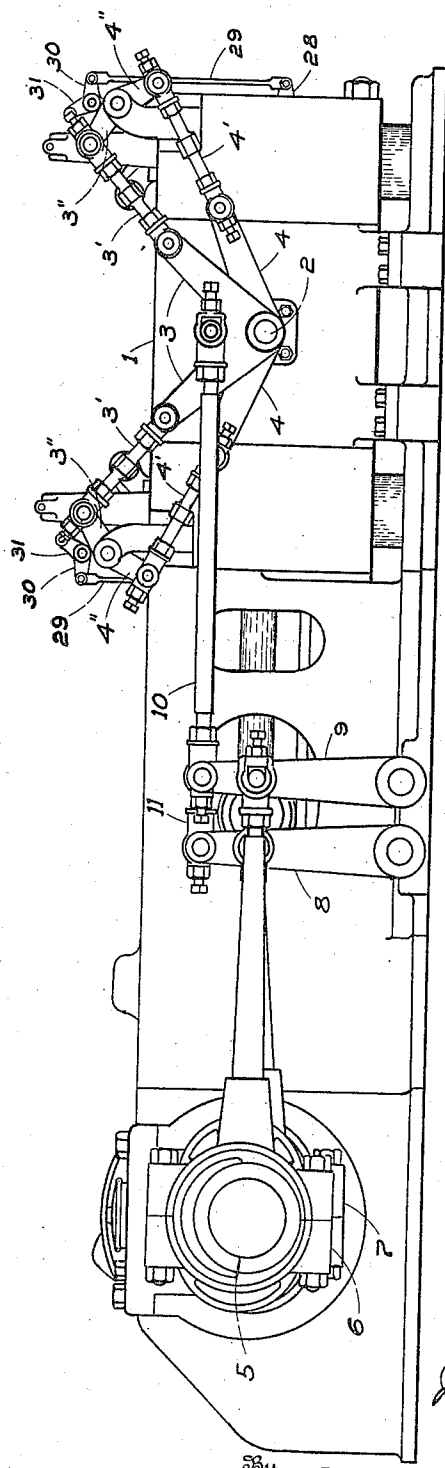


FIG. 1.

Witnesses

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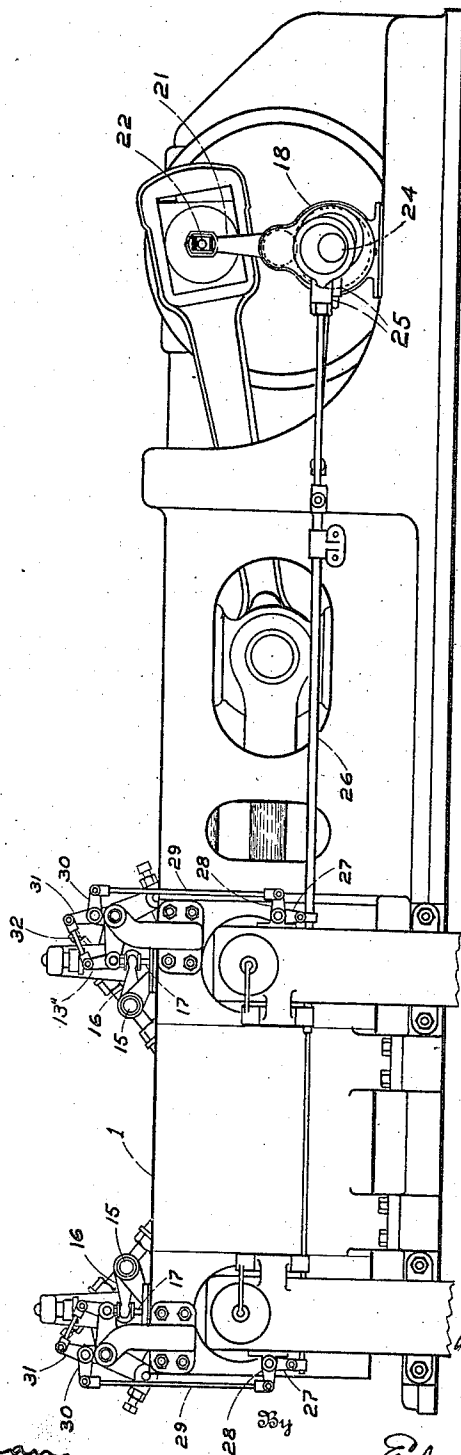


FIG. 2.

Witnesses

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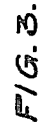
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6 SHEETS—SHEET 3.



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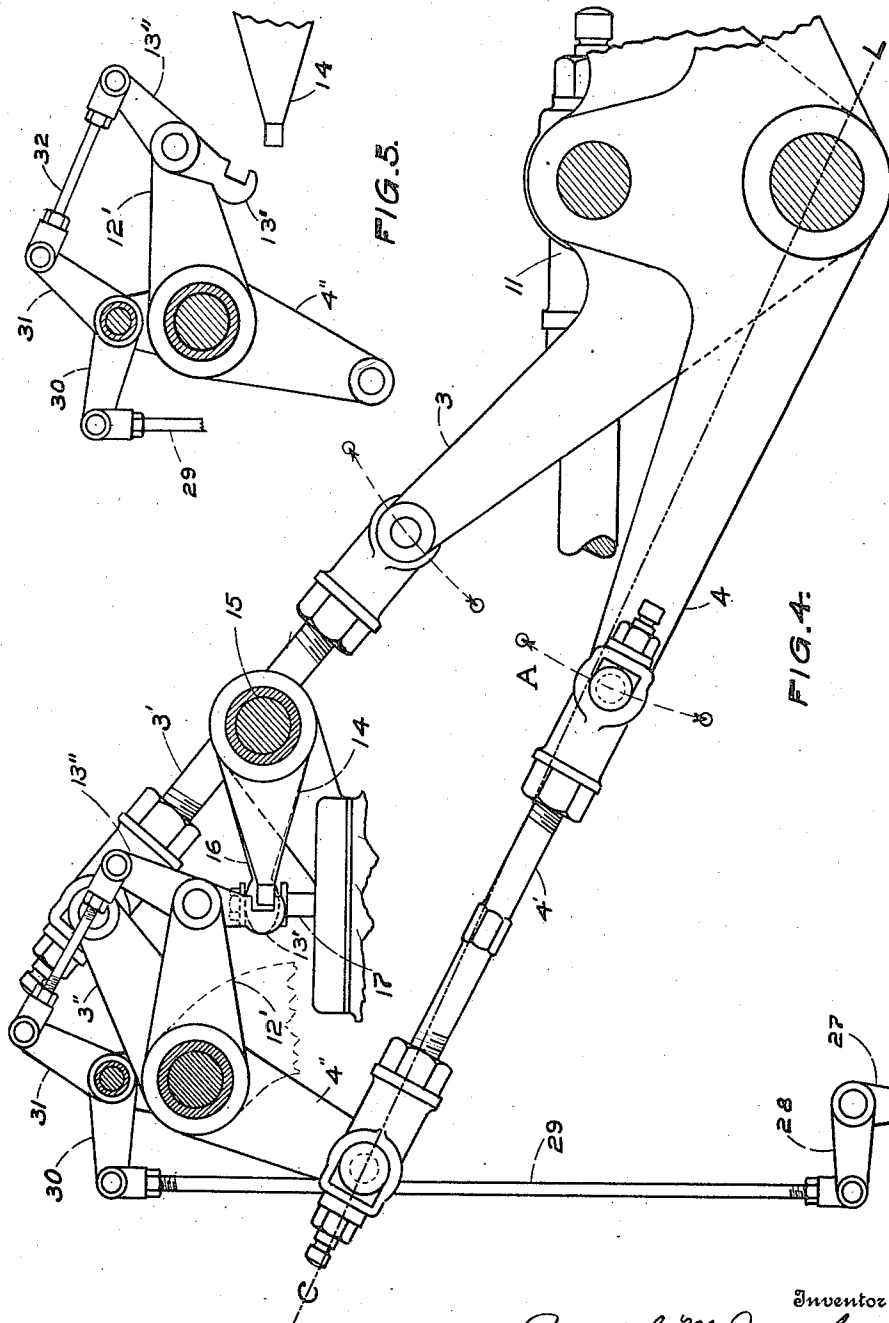
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5 SHEETS—SHEET 4.



Witnesses

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5 SHEETS—SHEET 5.

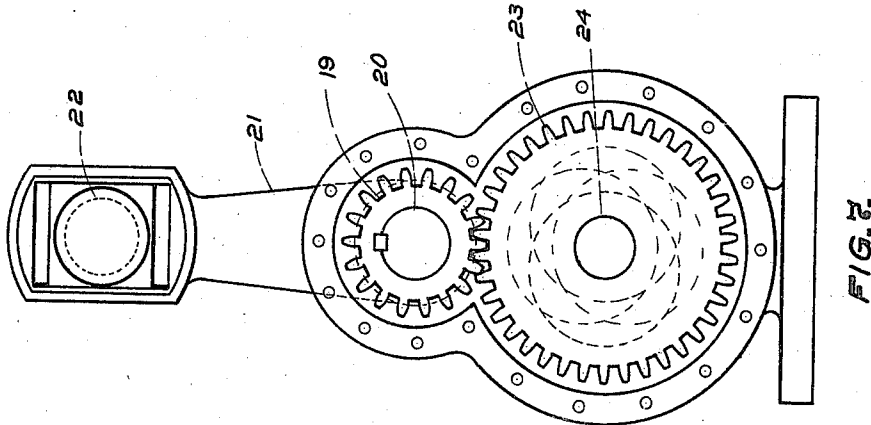


FIG. 5.

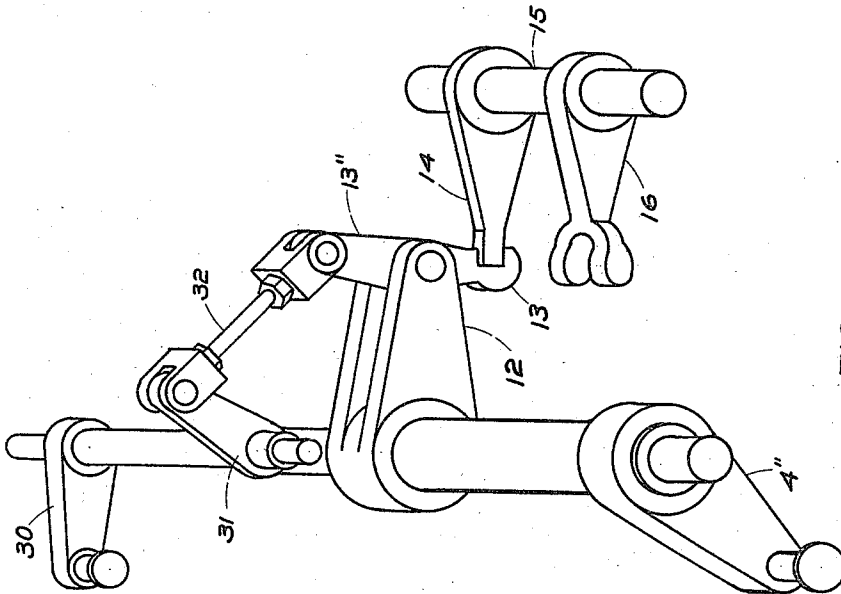


FIG. 6.

Witnesses

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UNITED STATES PATENT OFFICE.

JOSEPH M. JENCKES, OF OIL CITY, PENNSYLVANIA.

VALVE-GEAR FOR GAS-ENGINES.

1,063,162.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed August 18, 1909. Serial No. 513,434.

To all whom it may concern:

Be it known that I, JOSEPH M. JENCKES, citizen of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Valve-Gears for Gas-Engines, of which the following is a specification.

My invention relates to an improved valve gear for four-stroke-cycle gas engines.

The construction and operation of my invention are herein fully set forth, reference being had to the accompanying drawings which show one way in which my invention may be mechanically expressed. Certain details of construction could vary considerably, however, from that shown in the drawings, without departing from the spirit and scope of my invention.

Referring to the drawings: Figure 1 is a left side elevation of a double-acting, four-stroke-cycle gas engine equipped with my improved valve gear. Fig. 2 is a right side elevation of such engine. Fig. 3 is a plan view of one end of the cylinder and shows the greater portion of two sets of valve-actuating mechanism. Figs. 4 and 5 are enlarged side elevations of the main elements of my gear. Fig. 6 is a perspective view of a portion of said gear. Fig. 7 is a front elevation of the reducing or two-to-one gear by means of which my valve-actuating mechanism is harmonized or properly timed with the four-stroke-cycle of the engine, the eccentrics and the front of the gear-case being removed to show the construction more clearly.

The same reference numerals indicate identical parts in all the views.

The particular object of my invention is to provide a valve gear for gas engines, having valves of the puppet type, which will operate such valves in a more easy and less injurious manner than the gearing now commonly employed,—one which will open or unseat the valve with less jerk and close or reseat the same without shock and pound, as is now commonly the case.

Another object of my invention is to provide a valve operating mechanism which will positively actuate the valve in both directions,—both opening and closing,—whereas, at present, nearly all puppet valves are closed by means of a spring, which occasionally fails to perform its function.

With these objects in view, I have devised

a valve gear of the wrist-plate type and adapted the same to the operation of valves of the puppet type.

In the drawings I have shown my improved valve gear applied to a single-cylinder, double-acting, four-stroke-cycle engine, but, it is equally applicable to a single-acting engine, and to multi-cylinder engines, whether single or double acting; it is not, however, in the form shown, applicable to engines of the two-stroke cycle type.

The drawings show an engine in which both the inlet and exhaust valves are mechanically operated, hence, gearing for the operation of two sets of valves is shown, but, inasmuch as any one set of gearing is identical in its elemental construction with each other set,—with slight modifications which are apparent—one set of gearing will be described and the description may be construed as applying to any other set. The construction which I have shown in the drawings and prefer to employ is substantially as follows: Upon the side of the gas engine cylinder 1, I provide a suitable stub-shaft 2 for the reception of two wrist plates 3 and 4,—one to actuate the inlet valves and one to actuate the exhaust valves. Upon the main shaft 5 of the engine I mount two eccentrics, 6 and 7, by means of which, motion is imparted to the rocker-arms 8 and 9, as is clearly shown in Fig. 1. Said rocker-arms are connected to the wrist-plates 3 and 4 by means of the carrier rods 10 and 11, and by this construction an oscillating motion is transmitted to said wrist-plates which is isochronal with the reciprocation of the engine piston,—that is to say, said oscillations are not synchronous with the valve action of a four-stroke cycle engine, but twice as frequent.

Referring especially to Fig. 4, I will now describe in detail the valve-gear which is actuated by the wrist-plate 3: The arm of said plate 3 is connected by means of a link 3' to the outer end of the arm 3'', of a bell crank; the other arm 12 of said bell crank (which in said Fig. 4 coincides in position with arm 12', hence see Figs. 3 or 6), carries upon its outer end a hook 13, (Fig. 6) adapted to engage the free end of the valve-lever arm 14, which is rigidly affixed to the shaft 15, and to which shaft the valve-engaging and actuating lever 16 is rigidly attached, that engages the valve-stem 17 and actuates the valve. In the position shown

in Fig. 4, the exhaust-valve has just closed and the inlet-valve is about to open, hence the arms 12 and 12', also the valve-lever arms 14 and 14' and the hooks 13' coincide in position, therefore but one of each is seen in said figure. The valve-gear which is actuated by the wrist-plate 4 is substantially identical in construction with that actuated by plate 3, and is as follows,—Fig. 4 being especially referred to:—The arm 4 of said plate is connected by means of the link 4', to the arm 4'' of the bell-crank, the other arm 12' of said bell-crank carries upon its outer end the hook 13', adapted to engage the free end of the valve-lever arm 14' (Fig. 3), which is affixed to the shaft 15' and to which shaft the valve-engaging lever 16' is also rigidly attached, and engages the valve-stem 17', for the purpose of actuating the valve. I do not, however, wish to be understood as confining myself to a construction precisely as here shown, as it might on certain designs and types of engines, be preferable to engage the stem of the valve directly with the hook 13, thus dispensing with the shaft 15 and arm 14.

Inasmuch as the engine is, as aforesaid, a four-stroke cycle engine, and the oscillation of the arms 12 and 12' are isochronal with the reciprocations of the piston, I provide means by which the hooks 13, 13' are caused to engage their respective valve-lever arms 14, 14' at each alternate cycle of the vibration of said arms 12 and 12' and to swing clear of said valve lever arms respectively at each intermediate cycle of its vibration. For the purpose of securing such action of hooks 13 or 13', I provide a reducing or timing gear 18,—Fig. 2—which is shown in front elevation in Fig. 7, with the eccentrics and the front portion of the case which incloses the gears removed. Said reducing gear consists of a pinion 19 which is secured to its shaft 20, which shaft is revolved by means of a crank-arm 21 that is connected to the crank-pin 22 of the engine, as shown in Fig. 2. A gear 23 meshes with and is driven by pinion 19. Gear 23 is twice the diameter of pinion 19, hence, the speed of said gear is one-half that of the pinion, also one half that of the crank-shaft of the engine. Gear 23 is rigidly affixed to its shaft 24 and upon said shaft eccentrics 25 are mounted; said eccentrics are connected by means of rods 26 to one arm 27 of a bell-crank, the other arm 28 of said bell crank is coupled by means of a link 29 to an arm 30 of another bell crank, and the other arm 31 of said bell-crank is coupled by means of the link 32 to the upper arm 13'' of the hook 13. By this construction hook 13 is caused to engage arm 14 at one upward stroke, as shown in Figs. 4 and 6, and to swing free of said arm 14, as shown in Fig. 5 at its next upward stroke, thus properly

timing the operation of the valve for the four-stroke cycle of the engine.

In Fig. 4 I have shown a center line C—L which passes through the center of the stub-shaft 2 of the wrist-plate and the center of the wrist-pin of the bell-crank 4''. The arm 4 of the wrist-plate oscillates across this line as shown by the double-pointed arrow A and it will be readily understood that the movement of the various other related elements of the valve-gear is slowest at the instant the arm 4 is crossing said center line; I have, therefore, so arranged the operation of my gearing that the valve-operating lever 14 will be engaged also released by hook 13 at or about the instant the arm 4 is crossing said center line, and by said arrangement all shock, jar and pounding of the valve upon its seat is eliminated, and one of the particular objects of my invention thus attained.

The operation of hook 13 is such that it not only engages the valve lever arm 14 at the proper time for opening the valve, but it retains its hold thereon until the valve is nearly seated, and thus said valve is actuated in both its opening and its closing movement, in a positive manner, whereas, when a spring only is employed for seating the valve, which is the usual practice, the force of the spring is not always sufficient to overcome the frictional resistance of the valve, especially in instances where the valve-stem passes through a stuffing-box, and for any reason becomes abnormally heated.

It is a fact well known to those familiar with the construction and operation of gas engines, that in order to maintain and retain its maximum efficiency, it is essential that the valve-gear be capable of such adjustment as to accurately provide for wear, that the proper timing of the operating parts may be secured and their proper relation maintained. Such adjustability is amply provided for in my gear and more fully attained than it has been in any other gas engine valve gear of which applicant has knowledge, and while such adjustability is not a patentable feature of my invention, it adds to the value of those features which are novel and patentable.

What I claim is:

1. A valve gear for four-stroke cycle gas engines consisting of a wrist-plate, means for oscillating said wrist-plate isochronally with the reciprocations of the engine piston, a bell-crank, means connected to said wrist-plate adapted to actuate said bell-crank, valve-actuating mechanism attached to said bell crank adapted to positively actuate a valve of such engine throughout its opening and closing movement, and means for causing said valve-actuating means to actuate said valve in harmony with the four-stroke cycle of the engine.

2. In a valve gear for four-stroke cycle gas engines, the combination with the main shaft and the valves of such engine, of a wrist-plate, means connected to said main shaft adapted to cause the oscillation of said wrist-plate, a bell-crank adapted to be operated by means connected to said wrist-plate, a valve-actuating device carried by said bell-crank positively operating one of said valves throughout its opening and closing movement, a reducing gear adapted to be operated by said main shaft, an operating medium for said valve-actuating device connecting said device and said reducing gear and adapted to harmonize the operation of said valve actuating device with the four-stroke cycle of the engine.

3. In a valve gear for four-stroke cycle gas engines, the combination with the main shaft and the valves of such engine, of a wrist-plate, means connected to said main shaft and adapted to oscillate said wrist-

plate isochronally with the reciprocations of the piston of said engine, a bell-crank, valve-actuating means carried by said bell-crank adapted to positively operate one of said valves throughout its opening and closing movement, means connected to said wrist-plate and adapted to operate said bell-crank, a reducing gear adapted to be operated by the crank-pin of said engine, means connecting said reducing gear and said valve actuating means to cause it to engage the stem of said valve at each alternate vibration of said engaging means, for the purpose of actuating said valve in harmony with the four-stroke cycle of said engine.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH M. JENCKES.

Witnesses:

E. R. INMAN,
GILSON SHAFFER.

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

It is hereby certified that in Letters Patent No. 1,063,162, granted May 27, 1913, upon the application of Joseph M. Jenckes, of Oil City, Pennsylvania, for an improvement in "Valve-Gear for Gas-Engines," an error appears in the printed specification requiring correction as follows: Page 1, lines 42, 53, and 59, for the word "puppet" read *poppet*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of June, A. D., 1914.

[SEAL.]

J. T. NEWTON,

Acting Commissioner of Patents.