F. P. BENSON.

EXHAUST VALVE MECHANISM FOR GAS ENGINES.

APPLICATION FILED JULY 20, 1908.

931,839.

Patented Aug. 24, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

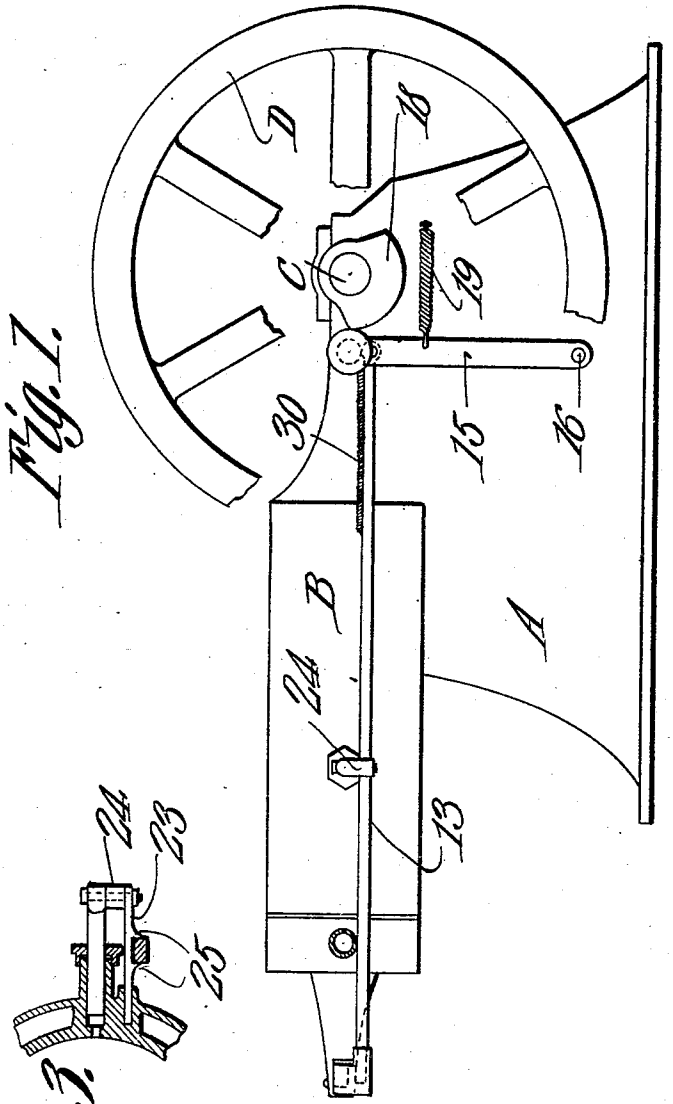

Fig. 3.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

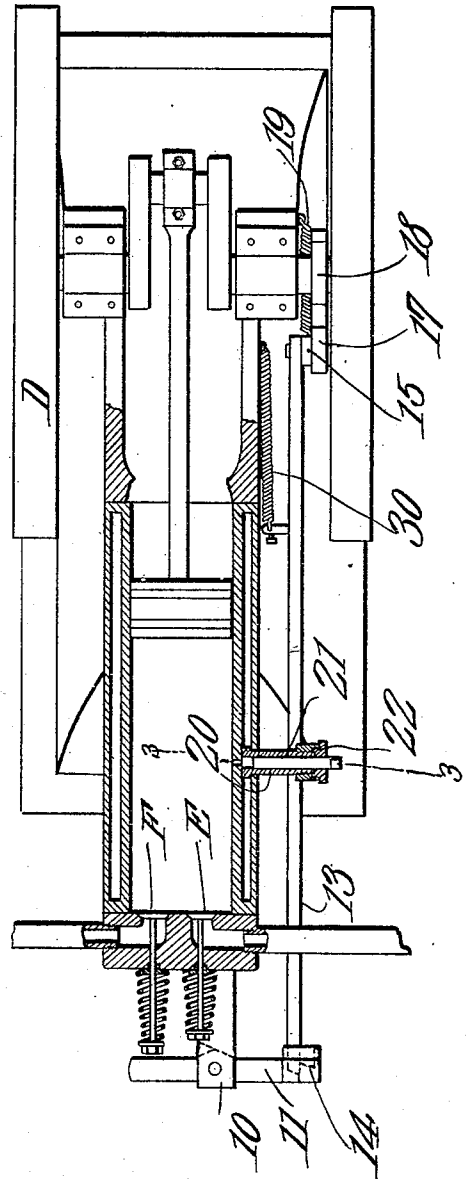
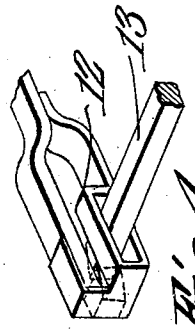


Fig. 4.



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UNITED STATES PATENT OFFICE.

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EXHAUST-VALVE MECHANISM FOR GAS-ENGINES.

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To all whom it may concern:

Be it known that I, FRED P. BENSON, a citizen of the United States, residing at Hutchinson, in the county of Reno and State of Kansas, have invented a new and useful Exhaust-Valve Mechanism for Gas-Engines, of which the following is a specification.

This invention relates to gas engines of the four cycle type, and has for its principal object to provide a mechanism of simple construction for actuating the exhaust valve at the proper time without the necessity of employing a counter-shaft and the complex mechanism usually associated therewith.

A further object of the invention is to provide an exhaust valve operating mechanism that is adjustable to operative position by the pressure of the exploded charge at or near the end of the working stroke.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is a side elevation of a four cycle gas engine provided with a valve operating mechanism constructed in accordance with the invention. Fig. 2 is a plan view of the same, partly in section. Fig. 3 is a detail section on the line 3—3 of Fig. 2. Fig. 4 is a detail perspective view of a portion of the exhaust valve lever and valve rod.

Similar characters of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The engine is provided with a suitable base or frame A which carries a cylinder B and is provided with bearings for the reception of a main crank shaft C. The crank shaft is connected to the piston of the engine in the usual manner and is provided with a fly wheel D. At one end of the cylinder is arranged a suction inlet valve E and an exhaust valve F, both of which may be of any ordinary construction. Secured to the end of the cylinder is a bracket 10 to which is pivoted a lever 11 that is arranged to engage the stem of the exhaust valve and open the same once during each two revolutions of the crank shaft. The outer end of this lever is provided with an elongated slot 12 that is arranged to receive the rear end of an operating rod 13, which during three successive movements of the piston will remain inoperative, but on the fourth movement, that is to say, on the exhaust stroke, the rear end of the rod will be moved outward to engage a stop 14 at the end of the lever, so that if the rod is then moved endwise, the movement will be transmitted through the lever to the exhaust valve stem and the exhaust valve will be held open to permit the expulsion of the products of combustion. The end of the rod 13 and the seat 14 are slightly tapered to interlock and hold the parts together. The slotted portion 12 of the lever acts as a support or bearing for the rear end of the rod, and the front end of said rod is pivotally connected to the upper end of a vertically disposed rocker arm 15 that is pivoted on a stud 16 projecting from the base or frame. The rocker arm carries an anti-friction roller 17 that bears against a cam 18 carried by the crank shaft C and held constantly in engagement with the cam by means of a helical tension spring 19. The actuating surface of this cam is somewhat less than one-half its circumference, so that during the four half revolutions of the shaft necessary to a complete cycle of operations, the rod will remain idle during two of such half revolutions and will be moved rearward, or in the direction of the lever 11 during the remaining two half revolutions.

Tapped through the water jacket and communicating with the bore of the main cylinder is a small cylinder 20 which contains a plunger 21 that is exposed to the pressure within the cylinder at the completion of the suction inlet stroke, and at the completion of the working stroke, but provision is made for preventing outward movement of the plunger under the light pressure at the completion of the inlet stroke, so that the plunger is operated only at the end of the working stroke. To prevent the escape of gas, the outer end of the cylinder 20 is closed by a cap gland 22.

Arranged below the plunger 21 is a guide rod 23, the outer end of the plunger and rod being rigidly secured together by a clamp 24, while the inner end of the rod is ar-

ranged to work within a suitable guiding opening that is bored in the wall of the jacket. This rod is provided with a pair of spaced lugs 25 which are arranged to receive the exhaust valve operating rod 13, so that at the completion of the working stroke of the piston the valve rod will be forced outward until its free end is in engagement with the stop 14 of the lever, this occurring immediately before the active portion of the cam 18 arrives opposite the roller 17.

In engines designed to operate at low speed, the plunger 21 is arranged nearer the crank shaft than in engines designed to operate at high speed, so that sufficient time is given to enable the valve rod to be shifted to operative position before the cam starts to move the rod. In each case the rod will have been moved into lever engaging position by the time the piston completes the exhaust stroke, and then the cam serves to force the rod backward and acts through the lever to maintain the exhaust valve in open position during the entire working stroke, or such portion of the stroke as may be deemed best. At the completion of the working stroke, the inactive portion of the cam comes opposite the roller 17 so that the rod is free to move forward and the exhaust valve will close and then when the plunger containing cylinder is again opened to the main cylinder at the completion of the suction inlet stroke, the plunger will move inward to valve rod releasing position, this being preferably accomplished by means of a spring 30 acting on the valve actuating rod, as shown in Fig. 2. During the next stroke, that is to say, the compression stroke, the valve operating rod will be thrown backward by the cam, but during this stroke the end of the rod will ride loosely in the slot of the lever 11. In order to hold the lever 11 in proper position to be engaged by the valve rod, the bracket 10 has a slightly tapered slot 10′ through which the lever extends. The slot permits free rocking of the lever during opening of the exhaust valve, but prevents excess movement in the opposite direction. In order to reverse the engine, it is merely necessary to shift the cam half way around the shaft.

What is claimed is:

1. In exhaust valve operating mechanism for gas engines, an exhaust valve lever, an integral rod, an actuating means for the rod, a housing upon the lever for one end of the rod, the rod working at times freely in said housing and being adapted at other times to positively engage at its said end in a seat formed in the housing, and means under the control of the pressure in the cylinder for moving the rod into position for such engagement.

2. In exhaust valve operating mechanism for gas engines, an exhaust valve lever, a rod integral throughout and arranged for continuous reciprocation, one end of the rod having a loose bearing in said exhaust valve lever, means for continuously reciprocating the rod, the said lever having a stop in the bearing thereon adapted to be positively engaged by the said end of the rod at times, and means under the control of the pressure in the cylinder for moving the rod into position for disengagement.

3. In exhaust valve operating mechanism for gas engines, an exhaust valve lever, a rod integral throughout, means acting to continuously reciprocate said rod, the said lever being formed with a housing for loosely receiving one end of the said rod and in the said housing with a seat having an angularly disposed wall, the said end of the rod being beveled and being engageable at times positively in said seat in the housing and at all times being free to reciprocate in the said housing, a reciprocatory member positively engaging the rod at a point in its length, and means by which the said member is supported and under the control of the pressure in the cylinder for shifting the said member to move the rod into position with its end engaging said seat.

4. In exhaust valve operating mechanism for gas engines, an exhaust valve, a rocking arm actuated by the shaft of the engine, an oscillatory valve actuating lever arranged to engage and open the exhaust valve, said lever being formed with a seat, and a rod connected with the arm and resting with one end in the seat, the said seat having a portion to be engaged by the said end of the rod upon lateral movement of the same, and means under the control of pressure in the cylinder for so moving the said rod.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

FRED P. BENSON.

Witnesses:
A. D. KROUS,
J. C. KROUS.