

No. 803,032.

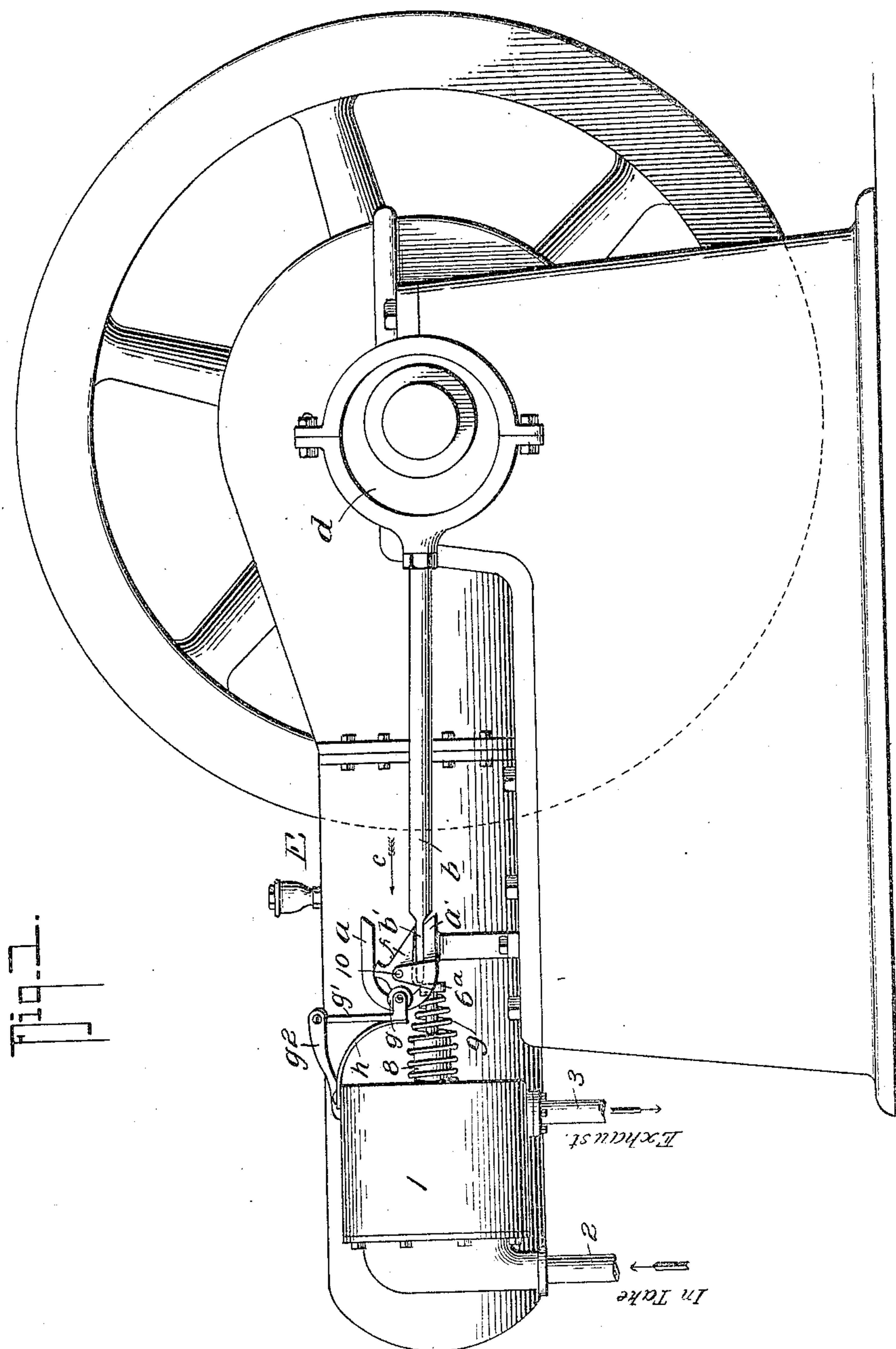
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L. D. TOLIVER. '

VALVE ACTUATING MECHANISM FOR EXPLOSIVE ENGINES.

APPLICATION FILED DEC. 13, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

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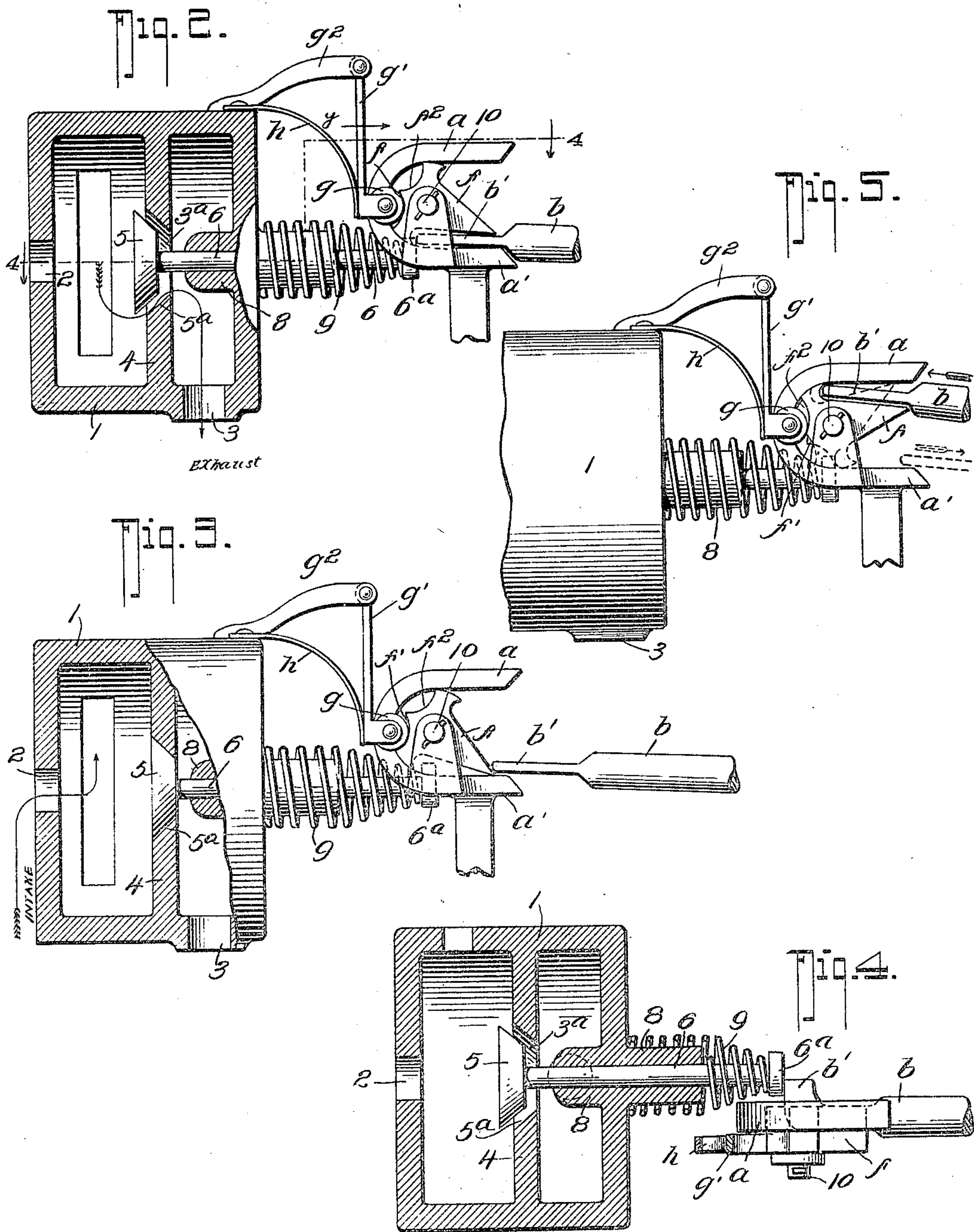
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# UNITED STATES PATENT OFFICE.

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## VALVE-ACTUATING MECHANISM FOR EXPLOSIVE-ENGINES.

No. 803,032.

Specification of Letters Patent.

Patented Oct. 31, 1905.

Application filed December 13, 1904. Serial No. 236,679.

*To all whom it may concern:*

Be it known that I, LORENZO D. TOLIVER, residing at Abilene, in the county of Dickinson and State of Kansas, have invented a new and Improved Valve-Actuating Mechanism for Explosive-Engines, of which the following is a specification.

My invention seeks to provide a simple, economical, and effectively-acting means for actuating valves of explosive-engines, particularly the exhaust-valves of that class of gas-engines known as "four-cycle engines" and in which an explosion takes place for every two revolutions of the main shaft under four strokes of the piston; and the main object of my invention is to provide a valve-operating means of the character specified which automatically adjusts itself to operate the valve at proper times and to dispense with the use of noisy cog-gears or complicated mechanism and which is so combined with the valve and the power-shaft that a perfect operation of the engine is obtained, and the said engine is rendered susceptible of being equipped with any of the common types of governor devices now in general use.

With the above and other objects in view my invention comprehends generally an actuating arm or lever suitably mounted in guides for reciprocal movement and connected to the power or main shaft by an eccentric or other means for converting the rotary motion of the shaft to a reciprocal motion for the actuating-lever, said actuating-lever being also arranged to engage with the exhaust-valve of the engine at predetermined times, and a shunting or deflector device adapted to cooperate with the actuating-lever and arranged to be automatically shifted by the actuating-lever to deflect the said lever to prevent its engaging with or acting on the exhausting-valve at each alternate forward thrust of the said actuating-lever, the exhausting-valve automatically closing after each engagement of the actuating-lever therewith.

In its more subordinate features my invention consists in certain details of construction and special arrangement of parts, all of which will be hereinafter described, pointed out in the claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a conventional type of explosive-engine with my improvements applied, the valve-operating lever

being shown in the position of having opened the exhaust-valve. Fig. 2 is a sectional view of so much of the engine as is necessary to illustrate the operation of my invention, the valve-actuating devices being in the position shown in Fig. 1. Fig. 3 is a view similar to Fig. 2, the valve-actuating lever being shown in its forward position and the deflecting device adjusted to shift the movement of the front end of the actuating-lever to miss the valve-stem. Fig. 4 is a horizontal section taken substantially on the line 4-4 of Fig. 2. Fig. 5 is a detail view showing the valve-engaging end of the actuating rod or arm shifted to disengage the valve-stem, the deflector device being shown in its uppermost position in dotted lines.

In the drawings I have shown so much of an explosive or gas engine of the ordinary or conventional type as is necessary to properly disclose a practical application of my invention, and in said drawings, 1 designates the casing of the explosive-chamber of the engine E and which is provided with an intake 2 for the working agent and with an exhaust 3 in that part of the casing that communicates, through the exhaust-opening 3<sup>a</sup> in the division-wall 4, that separates the intake exhaust ends of the casing 1, as clearly shown in Fig. 2.

The exhaust-valve 5 rests on the seat 5<sup>a</sup>, surrounding the opening 3<sup>a</sup>, and it has a stem 6, that is reciprocally mounted in the gland 8 on the casing 1, and the said valve 5 is normally held against the seat 5<sup>a</sup> to close off the opening 3<sup>a</sup> by the coiled spring 9, mounted on the stem 6 between the gland 8 and the collar 6<sup>a</sup> on the outer end of the valve-stem 6, as clearly shown in the drawings.

So far as described the parts are of a well-known construction, and they therefore *per se* form no part of my invention, which is confined to the means for controlling and effecting the opening and closing of the valve at proper predetermined intervals.

No special reference is herein made to the igniting devices and the means for effecting the charge and compression of the working agent, as such means are well known to those skilled in the art to which my invention belongs.

Suitably suspended from or attached to the engine casing or frame is a horizontally-disposed U-shaped guide-frame *a*, disposed in the longitudinal plane and just in front of



the stem 6 of the exhaust-valve, as best shown in Fig. 4, by reference to which it will be seen that the rear or closed end of the frame  $a$  is at a point near that end of the valve-stem having the collar  $6^a$ .

$b$  designates an actuating arm or lever, the forward end of which is flattened and widened, as at  $b'$ , and the said end is supported on the lower leg  $a'$  of the frame  $a$ , with its rear edge  $b'$  projected laterally of the frame  $a$ , so as to engage the collar  $6^a$  on the valve-stem when the arm or actuating-lever is moved forward in the direction indicated by arrow  $c$  on Fig. 1, as will be presently more fully explained.

The inner end of the arm  $b$  is connected to an eccentric  $d$  by the usual band-straps, and the eccentric is mounted on the engine-shaft, as shown.

So far as described it will be apparent that by reason of connecting the rod or arm  $b$  to the engine-shaft and suspending its free or outer end on the U-shaped frame, as shown, a complete reciprocal forward and rearward movement is imparted to the said lever arm or rod  $b$  at each complete revolution of the engine-shaft, and each alternate forward thrust of the actuating lever or rod  $b$  is required to properly actuate the exhaust-valve. For this purpose a deflector means is mounted on the frame  $a$ , that automatically adjusts itself to control the front end of the rod or arm  $b$  at the required times to deflect it to a position out of alinement with the valve-stem 6. For such purpose I mount within the legs of the frame  $a$  a deflector-block  $f$ , which is pivotally mounted upon a stud-pin 10 to rock to vibrate in the vertical plane, and the said block  $f$  has its rear or head portion formed with two concaved seats  $f'$   $f''$ , disposed at each side of the center or axial point of the block.

The block  $f$  is of angular shape with its apex or point projected in the direction of rod or arm  $b$ , and the tapered end is of such length that when rocked in one direction the point rests against the upper leg of the frame  $a$  when the front end of the bar or rod  $b$  is pulled from under it. To automatically hold the said block to its different rocked positions, the said block has its front face projected forwardly from the frame  $a$  and has its head portion that has the concaved seats arranged to be engaged by a friction-roller  $g$ , mounted in a hanger  $g'$  pendent from the member  $g''$  and pressed in the direction of the arrow  $y$  by a spring  $h$ , as clearly shown in Fig. 1, by reference to which it will be readily apparent that since the thrust of the roller-bearing is in a plane above the pivot of the block  $f$  the front end will be pressed down, it being also understood that when the block has been shifted to its other position, as shown in Fig. 5, the thrust of the roller-bearing will be in a line below the pivot of the block, and the front end in consequence thereof will be held pressed against the upper leg of the frame  $a$ .

From the foregoing description, taken in connection with the drawings, the complete construction and manner in which my invention operates, it is believed, will be readily understood by those skilled in the art to which it appertains.

Assuming the engine to be in motion and the rod or arm  $b$  to be moving forward in the direction of the arrow on Fig. 1, as the arm  $b$  reaches the end of its thrust its widened front end rides on the lower leg of the frame  $a$ . It is guided by the block  $f$  and engages the downwardly-pendent shoulder  $f''$  on the said block and at the same time its inner laterally-projected edge strikes the collar  $6^a$  on the valve-stem 6, and as it finishes the forward thrust the arm or rod  $b$  pushes back the valve 5 and opens the exhaust from the explosion-chamber to the outlet 3 and at the same time the block  $f$  is rocked to the position shown in Fig. 1, and as the pressure of the roller-bearing is now shifted in a direction above the axis of the block it is manifest that when the flattened end of the rod or arm  $b$  recedes from under the block  $f$  the spring-pressure of the roller-bearing forces the front end of the triangular-shaped block down onto the bottom leg of the frame  $a$  (see Fig. 3) and then closes off the lower path of movement of the outer end of the rod or arm  $b$ . Now on the next forward thrust of the arm or rod  $b$  the same will ride up the inclined face of the block  $f$ , and hence be deflected out of alinement with the valve-stem, (see Fig. 5,) and thus not actuate the said valve, which is held closed under spring-pressure, and as it reaches the limit of its forward thrust it engages the upper leg  $f'$  of the block and rocks the said block back again to the position shown in Fig. 5, where it is held by the spring roller-bearing engaging the upper concavity  $f''$  in the rear face of the block, which returns the block to the position shown in dotted lines on Fig. 5 and leaves the lower path of movement of the rod or arm  $b$  free, so the front end of the said arm or rod on the next forward thrust will again engage with and open the exhaust-valve.

My invention differentiates, so far as I know, from means heretofore employed for controlling the exhaust-valve of engines of the character stated in the simplified arrangement of the parts in the direct application of the actuating-arm against the valve, whereby to effect a positive, uniform, and accurate action on the valve and the deflecting devices for shifting the actuating-arm so at each alternate stroke it misses the valve-stem and arranging the said deflector devices that they are also directly actuated and adjusted to their different positions by each forward thrust of the actuating-arm that is connected to the engine-shaft.

Having thus described my invention, what



I claim, and desire to secure by Letters Patent, is—

1. The combination with the exhaust-valve, a means for automatically holding it to its closed position, and a reciprocable plunger-rod actuated from the drive-shaft to open said valve; of a support adjacent the outer end of the valve-stem, for the outer end of the plunger-rod, a deflector device pivotally mounted on said support automatically held to its different adjustments under spring tension, said device having oppositely-disposed abutments arranged to be alternately engaged by the plunger-rod, whereby to set the deflector device to bring the end of the plunger-rod in and out of alinement with the valve-stem for the purposes described.

2. In an explosive-engine of the character described, in combination with the exhaust-valve stem, means for normally holding it to its closed position and the reciprocable rod actuated from the engine drive-shaft and whose front end is adapted to engage with the projecting end of the exhaust-valve stem; of a means for deflecting said rod out of and into alinement with the valve-stem, consisting of a wedge-shaped deflector pivotally supported adjacent the outer end of the valve-stem; a spring-actuated device that operates with the deflector, and positively holds the said deflector at its different adjustments under spring tension, said deflector having a pair of oppositely-disposed abutments adapted to be alternately engaged by that end of the reciprocating rod that engages the valve-stem, substantially as shown and described.

3. In an explosive-engine of the character described, the combination with the valve-

stem and the longitudinally-reciprocable rod, connected directly to the drive-shaft, and having its free end arranged to engage with the valve-stem; of a support for the free end of the rod, a deflector mounted on the support, said deflector being pivotally mounted, provided with a wedge-shaped portion to co-act with the free end of the reciprocating rod, also having a pair of oppositely-disposed abutments adapted to be alternately engaged by the free end of the reciprocating rod, and provided with a pair of bearing-seats arranged one above and the other below its fulcrum and a spring-pressed detent adapted to alternately engage said seats whereby to hold the deflector under spring tension to its set positions as set forth.

4. The combination with the exhaust-valve having a projecting stem and spring held to its closed position, and the reciprocating rod *b* having an eccentric connection with the engine-shaft; of the U-shaped support *a* adjacent the outer end of the valve-stem, and which forms a rest for the free end of the rod *b*, the deflector-block *f* pivotally mounted in the support *a*, said block having a forwardly-extending wedge-shaped portion, concaved seats *f'* *f''* in its head, and oppositely-projected shoulders with which the free end of the rod *b* engages, said rod *b* having an extension to engage the valve-stem, the roller-bearing *g* and spring *h* all being arranged substantially as shown and for the purposes described.

LORENZO D. TOLIVER.

Witnesses:

J. B. FAVOR,  
R. M. WHITE.