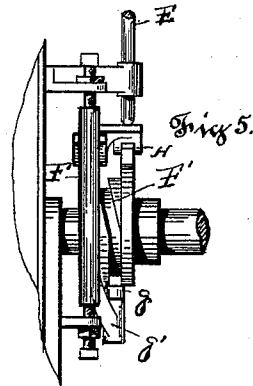
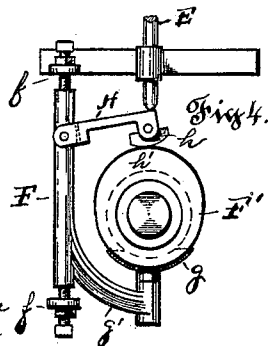
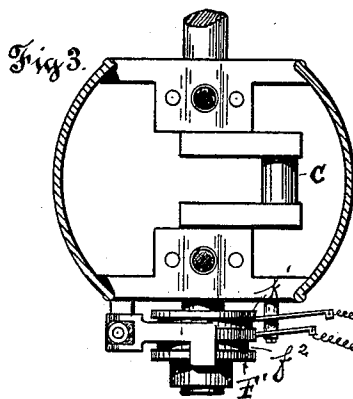
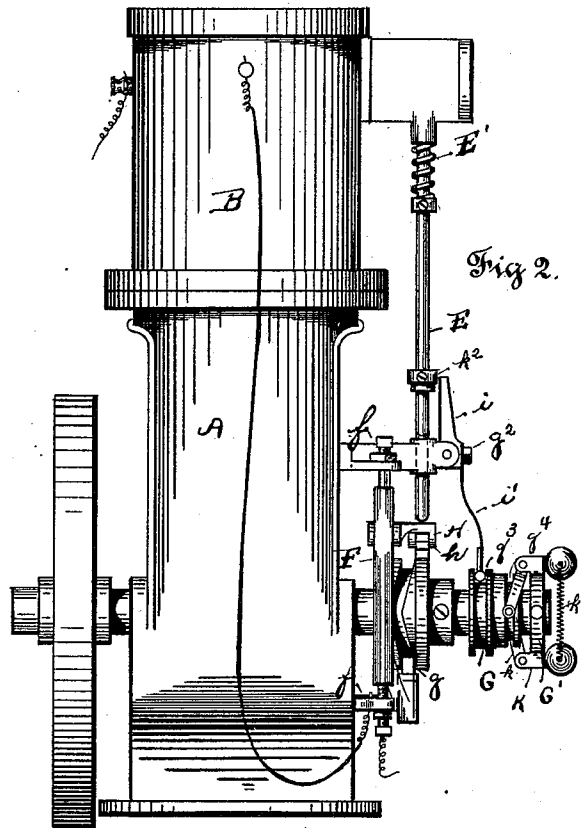
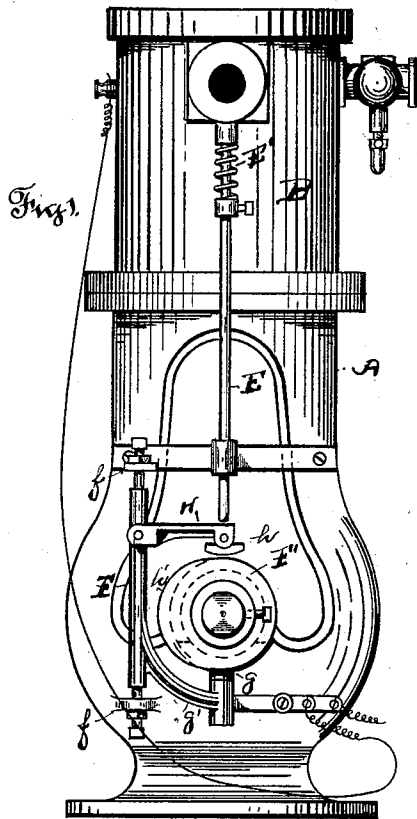


(No Model.)

M. M. BARRETT & J. F. DALY.  
OPERATING MECHANISM FOR GAS ENGINES.

No. 463,435.

Patented Nov. 17, 1891.



Witnesses.

D. J. Osborne.  
Jno. F. Uhlhorn

Inventors  
Mora W. Barrett  
John F. Daly  
By M. A. Barrett  
Atty.

# UNITED STATES PATENT OFFICE.

MORA M. BARRETT AND JOHN F. DALY, OF SAN FRANCISCO, CALIFORNIA,  
ASSIGNORS TO THE PACIFIC GAS ENGINE COMPANY, OF SAME PLACE.

## OPERATING MECHANISM FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 463,435, dated November 17, 1891.

Application filed April 16, 1891. Serial No. 389,255. (No model.)

*To all whom it may concern:*

Be it known that we, MORA M. BARRETT and JOHN F. DALY, citizens of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Operating Mechanism for Gas-Engines; and we do hereby declare the following to be a full, clear, and exact description of said invention, such as will enable others skilled in the art to which it most nearly appertains to make, use, and practice the same.

Our invention has relation to certain new and useful improvements in the operating mechanism for gas-engines, which consists in the arrangement of parts and details of construction, as will be hereinafter more fully set forth in the drawings and described and pointed out in the specification.

Our present invention relates more particularly to certain improvements upon the mechanism for operating the exhaust-valve of gas-engines, fully set forth and described in Letters Patent No. 430,505, granted us on the 17th day of June, 1890. Practical working of machines constructed in accordance with the aforesaid Letters Patent No. 430,505 has demonstrated the fact that owing to the liability of the slide-bar or rocking lever, which operates the exhaust-valve through the medium of the valve-stem, becoming clogged or stuck damage ensues by reason of one or both parts breaking, due to the driving force exerted thereon. Such breakage necessitates cessation of work until repaired. We have further discovered that the swiveled switch-piece working in the grooved cam quickly wears out, thus necessitating constant repairs.

Our invention further consists in providing a speed-regulating attachment, whereby the unnecessary loss or expenditure of power to overcome the compressing of air contained within the engine-cylinder is obviated, thereby creating a saving in the consumption of gas necessary to run the machine and overcoming undue wear upon the engine. Heretofore with each downstroke of the piston the suction thereof caused an inflow of air into the engine-cylinder, which formed a

cushion against the upstroke thereof, which necessarily had to be overcome by compression. We have discovered that by providing a speed-regulating governor, whereby the exhaust-valve is held open until closed automatically, as hereinafter described, by said governor, we create the air-suction through the exhaust-opening with the downstroke of the piston and discharge thereof upon the upstroke, thereby allowing of the piston working in free air, so to speak, so as to overcome the consumption of gas before necessary to effect the compression of air contained in the cylinder, and at the same time allowing of the engine running for a longer time with each charge thereof.

The object of our invention is to provide mechanism for operating the exhaust-valve which shall be simpler in its construction, more effectual of operation, less expensive, and more lasting than any heretofore known to us.

Referring to the drawings forming a part of this specification, wherein similar letters of reference are used to denote corresponding parts throughout the entire specification, Figure 1 is a front view in elevation of a gas-engine; Fig. 2, a side view in elevation showing our improved operating mechanism applied thereto; Fig. 3, a horizontal section on a plane above the crank-shaft; Fig. 4, detail front view of the operating mechanism, and Fig. 5 an end view thereof.

The letter A indicates the frame of the gas-engine, and B the cylinder thereof, which, being of the ordinary kind, calls for no specific description herein. Working in bearings formed in frame A is the crank-shaft C, which is operated by the engine-piston. (Not shown.) The valve-stem is indicated by the letter E, which is adapted to to operate the exhaust-valve in order to allow of the engine-cylinder clearing itself of spent gas. The spring E' serves to hold the valve upon its seat, similar to that shown in Patent No. 430,505. Projecting from the frame A are lugs or ears *f*, between which upright F is movably secured, so as to allow for oscillation thereof. Secured upon and working with the crank-shaft C is the cam F', which is provided with intersecting grooves *f' f'*<sup>2</sup>.

Within said grooves fits and works the switch-piece *g*, which is secured to downwardly-extending arm *g'* of upright *F*, and as said switch-piece moves from one groove to the other said arm is thrown in or out by reason of the upright being pivoted between ears *f*. Pivoted near the top of said upright, so as to allow for upward or downward movement, is the forwardly-extending arm *H*, the outer end of which is provided with the downwardly-extending toe *h*, which rests over cam *F'*. Upon the outer face of said cam we secure in any suitable manner the shoe *h'*, which contacts with toe *h* during the rotation of the cam, as arm *H* is thrown outward by the movement of upright *F*. When shoe *h'* is carried around and contacts with toe *h*, the arm *H* is lifted upward, and inasmuch as valve-stem *E* rests thereon the latter is raised upward, so as to unseat the exhaust-valve and allow for the escape of the spent gas contained within the engine-cylinder. If so desired, the shoe may be formed integral with the cam, but by preference we make the same removable, inasmuch as in case of much wear thereon the same may be quickly removed and another put in place thereof with very little delay being caused in the working of the engine.

Upon the outer portion of shaft *C* is loosely secured the sleeve *G*, which is provided with grooves *g<sup>3</sup> g<sup>4</sup>*, and upon the outer end is rigidly secured the collar *G'*. Pivotaly secured to valve-stem guide *g<sup>2</sup>* is the stem *i*, to which is attached the spring-plate *i'*, the end of which is adapted to work in the groove *g<sup>3</sup>* of sleeve *G*. Within groove *g<sup>4</sup>* fit the pivoted arms *k* of governor *K*, the balls of which are connected by means of spring *k'*. As the speed of the engine increases, the governor-balls are thrown outward and causes the out movement of sleeve *G*, and as the valve-stem is lifted through the before-described mechanism the upper end of governor-stem *i* is thrown inward by pressure of spring *i'* until it rests under collar *k<sup>2</sup>*, fastened to the valve-stem, and thus serves to support the valve-stem and maintain the exhaust-valve open until the speed of the engine has reduced or worked down sufficient to cause the pressure of spring *k'* to close or draw together the governor-balls, thereby moving the sleeve *G* back

upon the shaft *C* and forcing the spring *i'* to force the governor-stem *i* from beneath collar *k<sup>2</sup>*, so as to allow the valve-stem to fall and seat the exhaust-valve. While the exhaust-valve is held open the engine draws in and discharges air through the exhaust-opening, thus allowing the piston to work in free air, inasmuch as upon its upstroke the indrawn air is discharged through the exhaust-opening. Heretofore the exhaust-valve has closed immediately upon the discharge of spent gas. Consequently as the piston moved downward air was drawn into the cylinder through the air-passage and with its upstroke said air had to be compressed, thereby creating unnecessary wear upon the machine and expenditure of gas. This we completely overcome by the present device.

We are aware that minor changes may be made in the arrangement of parts and details of construction without causing or necessitating a departure from the nature and scope of our invention.

Having thus described our invention, what we claim as new, and desire to secure protection in by Letters Patent of the United States, is—

1. The combination, with the operating-cam provided with intersecting grooves, swiveled upright, arm projecting downwardly from said upright, switch-piece secured to said arm and working in the intersecting grooves, and pivoted arm extending forward from the upright, said arm adapted to be uplifted during the rotation of the cam, so as to unseat the valve through the medium of the valve-stem, substantially as and for the purpose set forth.

2. The combination, with the operating-cam provided with intersecting grooves, of the swiveled upright connected to the engine-frame, and switch-piece working in the intersecting grooves and adapted to throw the valve-lifting mechanism in or out of contact with the rotating cam, substantially as and for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

MORA M. BARRETT.  
JOHN F. DALY.

Witnesses:

N. A. ACKER,  
J. W. KEYS.