(No Model.) 2 Sheets—Sheet 1.

J. J. PEARSON.

METHOD OF OPERATING GAS ENGINES.

No. 426,736. Patented Apr. 29, 1890.

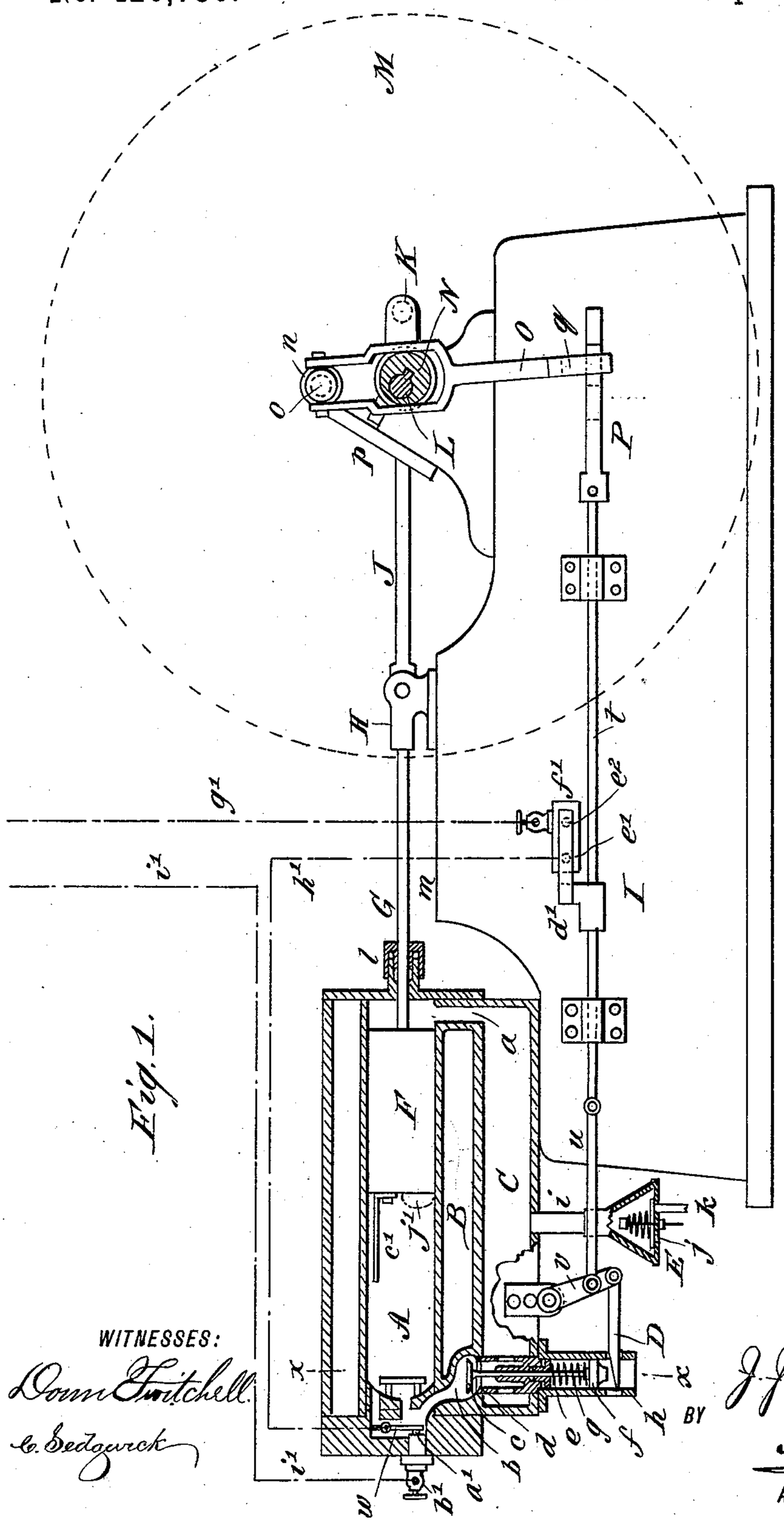

Fig. 1.

WITNESSES:

Donn Twitchell.

C. Sedgwick

INVENTOR:

J. J. Pearson

Munn & Co

ATTORNEYS.

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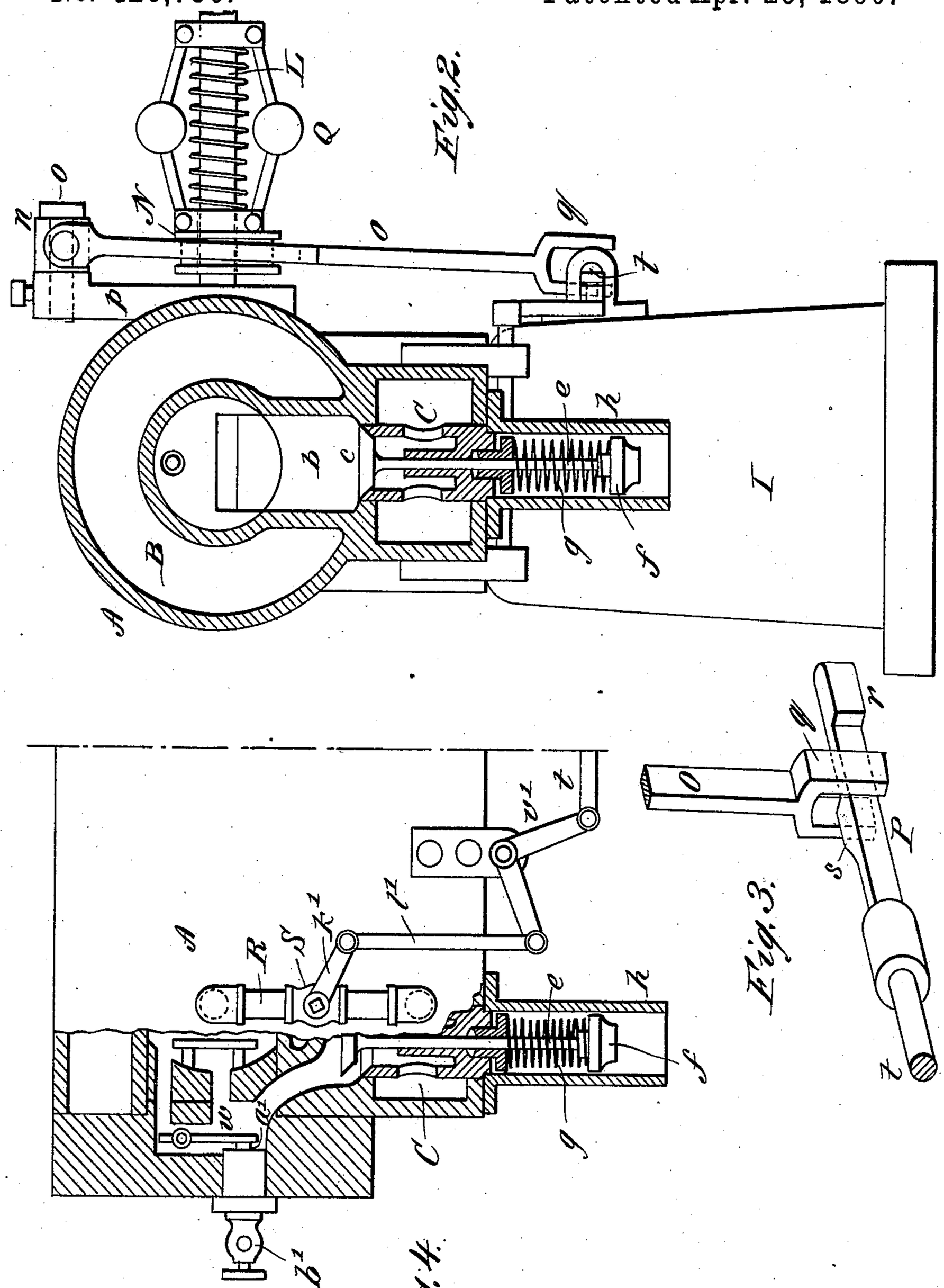

Fig. 2.

Fig. 3.

Fig. 4.

WITNESSES:

Donn Twitchell

G. Sedgwick

INVENTOR

J. J. Pearson

BY

Munn & Co

ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN J. PEARSON, OF NEW YORK, ASSIGNOR TO HIMSELF, AND JULIUS KUNZE, OF YONKERS, NEW YORK.

METHOD OF OPERATING GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 426,736, dated April 29, 1890.

Application filed July 17, 1889. Serial No. 317,807. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. PEARSON, of New York city, in the county and State of New York, have invented a new and Improved Method of Operating Gas-Engines, of which the following is a specification, reference being had to the annexed drawings, in which—

Figure 1 is a side sectional elevation of a gas-engine embodying my improvement. Fig. 2 is an enlarged vertical transverse section taken on line *x x* of Fig. 1. Fig. 3 is a perspective view of a portion of the valve-holding mechanism; and Fig. 4 is a side elevation, partly in section, of the rear end of the cylinder, showing a modification of my improvement.

Similar letters of reference indicate corresponding parts in all the views.

In the engine illustrated in the annexed drawings the practice has been to draw a charge of explosive mixture into the reservoir and into the forward end of the power-cylinder by the rearward movement of the power-piston, and to compress the said charge in the reservoir when the piston moves forward, the said charge being confined in the reservoir by a valve communicating with the back end of the power-cylinder and standing normally closed, the said valve being held to its seat by a spring and by the pressure of gas generated in the power-cylinder by the explosion of the combustible mixture; and when the pressure in the power-cylinder was relieved by the opening of the exhaust-port the said valve was raised by the superior pressure of the combustible mixture contained in the reservoir, thereby admitting a charge of the mixture to the power-cylinder, and the said charge was compressed on the return of the power-piston. This engine was provided with a governor, which held the valve communicating between the power-cylinder and the reservoir closed when no explosion was required in the power-cylinder. Under these conditions, as the momentum of the engine carried the piston back and forth in the power-cylinder, the charge of gas and air or other products of combustion contained in the back end of the power-cylinder was compressed over and over again, and in a similar manner the combustible charge contained in the forward end of the power-cylinder and in the reservoir was compressed during every forward stroke of the power-piston. This operation consumed a great deal of power, the loss of which was estimated to be as great as twenty-five per cent. of the entire power of the engine.

The object of my invention is to obviate this difficulty by establishing a free passage between the reservoir and the cylinder when no explosion is required and by rendering the igniting apparatus inoperative while the engine is running by its own momentum. I accomplish these objects by holding the valve in the passage between the power-cylinder and the reservoir open when no explosions are required, and by rendering the igniting apparatus inoperative during this time, so that the contents of the power-cylinder may pass freely into and out of the reservoir during the time the engine is running by its own momentum, thereby avoiding the undue absorption of power in the compression of the gases.

The engine to which my improvement has been applied is known as the "Baldwin Gas-Engine." In this engine the power-cylinder A is provided with a water-jacket B, and upon its lower side with a gas and air reservoir C, which communicates through the open port *a* with the forward end of the power-cylinder. It also communicates through the opening *b* with the rear end of the power-cylinder, the said opening being closed normally by a valve *c*, arranged to close upon the valve-seat *d* and shut off communication between the power-cylinder A and the reservoir C. The spindle *e* of the valve *c* extends downwardly through a stuffing-box in the bottom of the reservoir C, and is provided with a head *f*, between which and the stuffing-box is placed a spiral spring *g*. A sleeve *h* surrounds the spindle *e*, and is perforated on diametrically-opposite sides to receive the wedge D. A tube *i* enters the bottom of the reservoir C, and is provided at its lower end with a gas and air check-valve E, which receives air through apertures *j* and gas through the pipe *k*.

The power-cylinder A contains a piston F,

which is attached to a piston-rod G, passing through a stuffing-box *l* on the front end of the cylinder and carrying a cross-head H. The cross-head H is guided by ways *m* on the bed I of the engine, and is connected by the rod J with the crank K on the crank-shaft L. The crank-shaft L is provided with the usual fly-wheel M.

On the crank-shaft L is secured an eccentric N, and a forked lever O, which embraces the eccentric, extends upward and is pivoted to a sleeve *n*, supported by a stud *o*, projecting from an arm *p*, secured to the pillow-blocks of the engine. The lower end of the lever O is provided with a fork *q*, which is arranged at right angles to the plane of the fork at the upper end, and embraces a bar P, provided upon opposite sides with lugs *r s*, the said fork *q* being of sufficient width to pass both of said lugs *r s* when the fork is in a middle position.

The eccentric N is provided with flanges, which embrace the sides of the forked upper end of the lever O, and the said eccentric is connected with a centrifugal governor Q, which is able to move the eccentric longitudinally on the shaft L, thereby bringing the fork *q* into engagement with the lug *r* or *s*, or into a middle position, where it touches neither of the said lugs, according as the engine is going at a speed which is too high or too low, or is working normally.

The bar P is connected with the rod *t*, which passes through guides upon the base I, and is connected by a link *u* with a lever *v*, which is pivoted to a support attached to the reservoir C, and is also pivotally connected to the wedge D.

In a chamber in the rear of the power-cylinder A is pivoted a lever *w*, arranged to touch a contact-point *a'*, which is insulated from the cylinder, but connected with the binding-post *b'*, receiving the electrical conductor for conveying to the engine the current for igniting the explosive charge. To the power-piston F is secured an arm *c'*, arranged to touch the shorter arm of the lever *w* as the piston completes its rearward stroke, thereby causing a spark at the contact-point *a'*, which ignites a charge.

The rod *t* carries a switch-arm *d'*, which is capable of forming an electrical connection between the contact-points *e' e²*, supported by an insulating-block *f'*, attached to the base of the engine. The circuit through which the igniting-current passes is over the wire *g'*, the contact-point *e²*, switch-arm *d'*, contact-point *e'*, wire *h'*, to the lever *w*, thence through the contact-point *a'*, binding-post *b'*, and wire *i'*, back to the generator.

During the normal working of the engine, when the piston F moves toward the rear end of the cylinder A it forms a partial vacuum in the reservoir C, which causes the valve E to open and admit a charge of gas and air to the reservoir, after which the piston F moves forward to compress the mixture in the reservoir. At the same time a charge of explosive mixture previously introduced behind the piston F by the pressure due to the explosion forces the valve *c* to its seat, where it remains until the pressure in the cylinder A is relieved by the opening of the exhaust-port *j'*, when the pressure of the mixture in the reservoir C raises the valve *c* and allows a charge of the explosive mixture to flow into the cylinder A behind the piston F, and the said piston on its return compresses the explosive charge and causes its ignition by breaking the connection between the lever *w* and the contact-point *a'*. This cycle of operation continues so long as the speed of the engine does not change and the rod *t*, wedge D, and the switch-arm *d'* remain quiet; but when the speed of the engine increases the governor moves the eccentric N outwardly, the said eccentric carrying with it the lever O, bringing the fork *q* at its lower end into engagement with the lug *s* on the bar P, thereby moving the rod *t* lengthwise, thus carrying the switch-arm *d'* out of contact with the point *e²* and interrupting the electric circuit, so that no ignition can occur, at the same time moving forward the wedge D, so as to hold open the valve *c* and thus maintain a free communication between the interior of the power-cylinder and the reservoir C, so that the explosive charge is carried into the cylinder and forced back into the reservoir alternately without offering any resistance to the free movement of the piston F. This state of things continues until the speed of the crank-shaft passes a little below the normal, when the governor Q moves the eccentric N in the opposite direction, thus causing the lever O to move toward the bed of the engine and bring the fork *q* into engagement with the lug *r* on the bar P. This results in the movement of the rod *t* toward the crank-shaft end of the engine, thus withdrawing the wedge D from beneath the stem of the valve *c*, at the same time completing the electric circuit between the points *e' e²*, so that the explosive charges will be again retained in the cylinder and exploded, as before described, and when the normal speed of the engine is reached the governor Q will have moved the lever O into a middle position, so that it cannot strike the lugs *r s*.

In the modification shown in Fig. 4 I accomplish substantially the same result by connecting the power-cylinder A and the reservoir C by a pipe R, in which is placed a stop-cock S, provided with a lever *k'*, which is connected by a rod *l'* with a bell-crank lever *v'*, which is operated by the rod *t* in the same manner as the lever *v* is operated, so that when the engine runs at its normal speed the stop-cock S remains closed; but when the speed increases unduly the rod *t* is moved longitudinally, as in the other case, and acting through the bell-crank lever *v'* it opens the stop-cock S, thus establishing communication between the power-cylinder and the

reservoir, so that the contents of the cylinder and reservoir may have free circulation through the pipe R, and when the speed of the engine falls below the normal the rod *t* is moved in the opposite direction and the stop-cock S is closed.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The method of operating a gas-engine, which consists in drawing a charge of combustible or explosive mixture into a reservoir by means of the power-piston, compressing the said charge in the reservoir by the power-piston, and allowing the charge to pass from the reservoir to the power-cylinder when the pressure in the power-cylinder is less than that of the reservoir during the normal working of the engine, and automatically establishing communication between the reservoir and the power-cylinder when the speed of the engine is too high, at the same time rendering the igniting apparatus inoperative, so that no ignition of the charge can take place while the communication between the power-cylinder and the reservoir is open, as herein specified.

2. The method of reducing the resistance to the motion of the piston of a gas-engine by establishing communication between the power-cylinder and gas and air reservoir while the ignitor is inoperative, as herein specified.

3. The method of governing a gas-engine, which consists in opening and closing the passage between the power-cylinder and the gas and air reservoir, and interrupting the ignition of the explosive charge, substantially as herein specified.

JOHN J. PEARSON.

Witnesses:
HENRY H. CYPHER,
CHARLES H. SNIFFIN.