No. 672,615. Patented Apr. 23, 1901.

J. DOORENBOS.

GAS OR GASOLENE ENGINE.

(Application filed Feb. 20, 1899.)

(No Model.) 2 Sheets—Sheet 1.

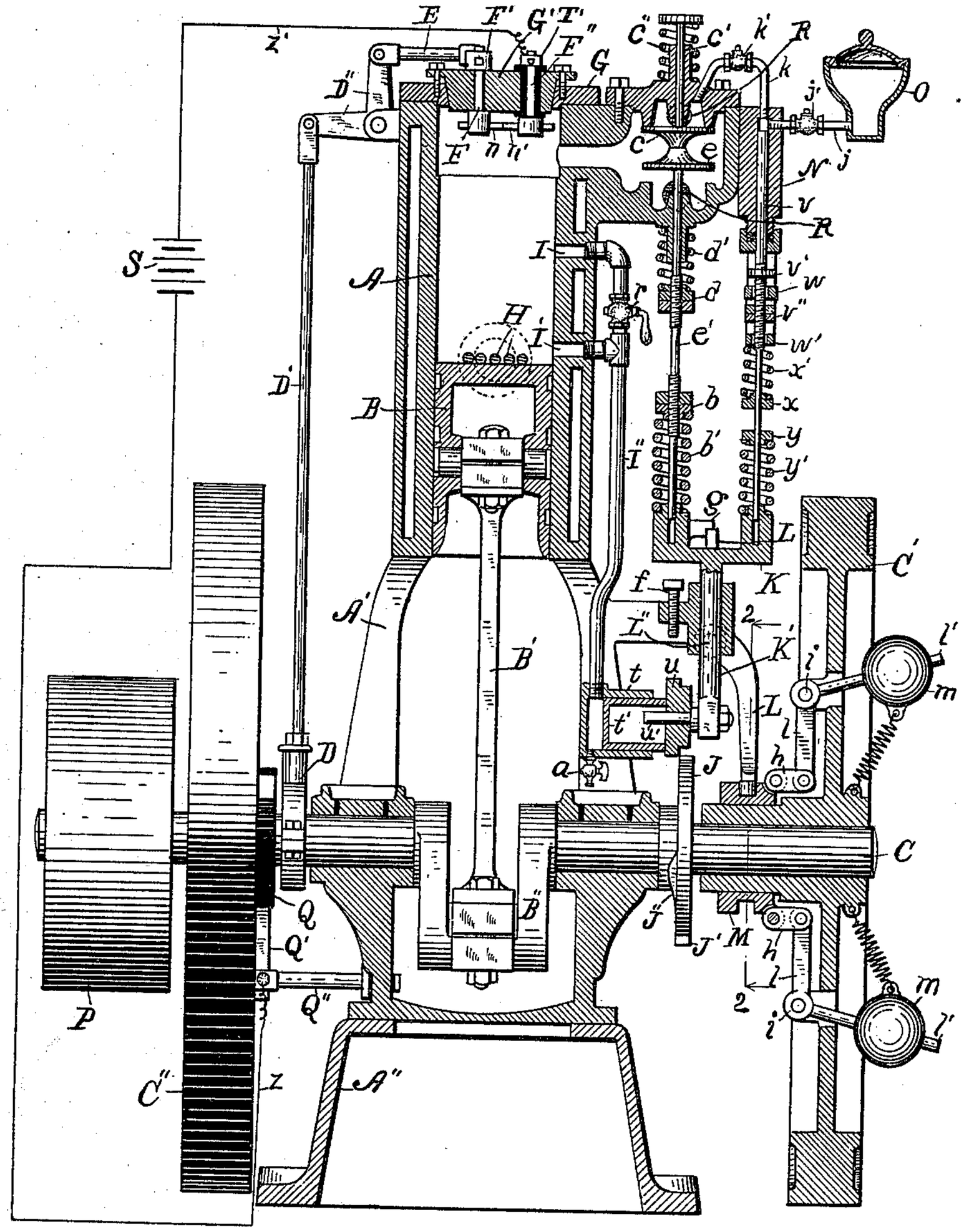

Fig. 1

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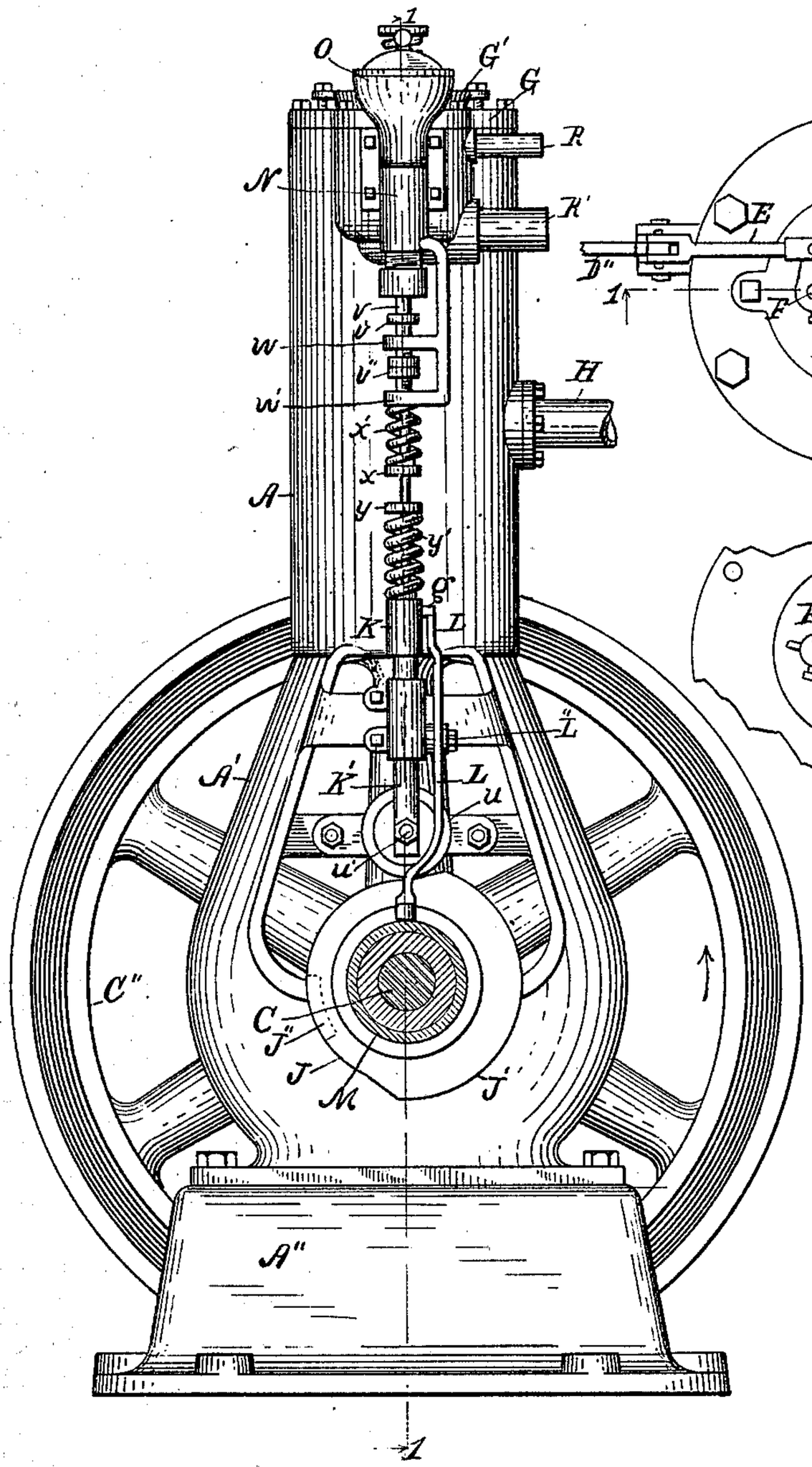

Fig. 2

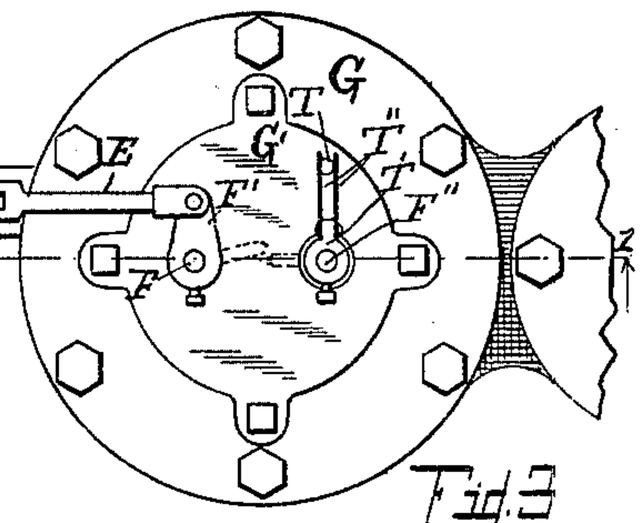

Fig. 3

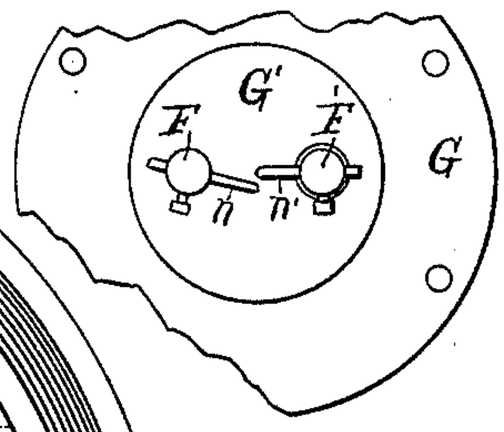

Fig. 4

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UNITED STATES PATENT OFFICE.

JOHN DOORENBOS, OF KALAMAZOO, MICHIGAN.

GAS OR GASOLENE ENGINE.

SPECIFICATION forming part of Letters Patent No. 672,615, dated April 23, 1901.

Application filed February 20, 1899. Serial No. 706,198. (No model.)

To all whom it may concern:

Be it known that I, JOHN DOORENBOS, a citizen of the United States, residing at the city of Kalamazoo, in the county of Kalamazoo and State of Michigan, have invented certain new and useful Improvements in Gas or Gasolene Engines, of which the following is a specification.

This invention relates to improvements in gas or gasolene engines.

The objects of this invention are, first, to provide an improved means of governing and controlling the engine; second, to provide an improved governing means for an engine which governs by controlling the charge to the engine; third, to simplify the construction of a gas or gasolene engine and provide a structure which shall be very economical in the use of the explosive, avoiding all waste by using the explosive only when it is needed to properly propel the engine.

Further objects will definitely appear in the detailed description to follow.

I accomplish these objects of my invention by the devices and means described in this specification.

The invention is illustrated in the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a vertical longitudinal detail sectional view through an engine embodying the features of my invention, taken on a line corresponding to line 1 1 of Figs. 2 and 3. Fig. 2 is a detail sectional elevation of my improved engine, taken on a line corresponding to line 2 2 of Fig. 1. Fig. 3 is an enlarged detail plan view of the upper end of the engine-cylinder, showing relation of the sparking means at that point. Fig. 4 is a detail inverted plan view of the head of the engine-cylinder G appearing in Fig. 3.

In the drawings similar letters of reference refer to similar parts throughout the several views and all of the sectional views are taken looking in the direction of the little arrows at the ends of the section-lines.

Referring to the lettered parts of the drawings, A is the engine-cylinder, A′ is the frame of the engine, supporting the cylinder, and A″ is the supporting-base for the entire structure.

Supported in the frame A′ is the shaft C of the engine, and the piston B is connected thereto by a pitman B′ direct without the intervention of a piston-rod.

To ignite the charge within the cylinder A, I provide an electric generator S. I provide a commutator on the shaft C, to which the wire *z* from the generator is connected, and the wire *z*′ connects the generator to an insulated post F″ in the head G′ of the cylinder. This post is insulated and adapted to rock or rotate in its bearings, and companion post F is not insulated, but also rotates in its bearings. An arm F′ extends out from the post F and is connected by the link to a bell-crank D″, pivoted on the side of the cylinder, and the opposite arm of the bell-crank is connected by the rod D′ to an eccentric D on the shaft. A striking-point or electrode *n* extends laterally to one side of the post F inside the cylinder and is adapted to strike against a similar striking-point or electrode *n*′, projecting laterally from the shaft F″. The shaft F″ is held yieldingly in position by a pair of springs T″, which extend to each side of a pin T, which hold the post normally in such position that it will be easily struck by the striking-point *n* when the engine is in operation by the eccentric through the connections I have named.

The charge of gasolene for the engine is supplied from a tank O. The charge is delivered through pipe *j* and check-valve *j*′ and pump *n*, where it is forced along through the pipe *k* past the check-valve *k*′ into a chamber above the valve *c*, where it is ready to be sucked into the engine-cylinder at the proper time when the valve is lowered by the proper mechanism. The supply of air enters at the port R above this valve C. A spring C″ holds the valve against its seat in the upward position. The main exhaust of the engine is the ports H, opening through the side of the cylinder just above the piston-head when it is in its lowest position. An auxiliary exhaust R′ is provided for the discharge of the foul gases from the cylinder after each explosion. This is controlled by the valve *e*, which closes this passage during the inflow of the charge. The valve *c* of the inlet-port and the valve *e* of the auxiliary exhaust R′, as well as the pump *n*, are controlled by the action of a cam carried on the shaft through its connections to the

shaft L″, which connections I will now fully describe.

At the upper end of the rod or shaft L″ is a cross-head K. A rod *e′* extends down from the valves *e c*, and on this rod are placed springs *d′* and *b′*, the tension of which is adjusted by the lock-nuts *d b*. A heavier spring *b′* is provided on the lower end of the rod, the tension of which is adjusted by the jam-nuts *b*. This is placed at the lower end of the rod *e′*, and this is adjusted to allow the cross-head to have a little motion independent of the rod. A similar structure is provided for the actuation of the pump N, the piston *v* of which is a small rod. This extends down into a perforation in the cross-head K. Stops *v′ v″*, the stop *v″* of which is adjustable, are provided to regulate the stroke of the pump, these stops striking against a collar *w* on the upstroke. The spring *x′* rests between suitable collars and tends to hold the pump-plunger down, and a heavier spring *y′* is provided, resting against the collar *y*, through which the cross-head actuates the same, overcoming the tension of the weaker spring *x′*. The movement of the cross-head is adjusted by the screw *f*, the head of which forms a stop to limit the downward movement of the same.

This entire structure when the engine is running above the desired speed, and the drawings so illustrate the same, is held up by the upper end of a lever L engaging a catch *g* on a cross-head K. The lower end of the lever L projects into an annular groove on the collar M, which collar revolves with the shaft C. Governor-weights *m m*, pivoted at *i i*, are connected by levers *l l* and links *h h* to the collar M, and through this connection move the collar back and forth on the shaft C or hub to the wheel C′, and so control the lever L. These weights are held normally toward the center of the wheel by coiled springs or other means, which appear clearly in Fig. 1 of the drawings.

On the lower end of the shaft K′ is a horizontal pin *u*, which carries an antifriction-roller *u*, which has a shoulder formed in its face and which is adapted to be acted upon by the disk J, having the cams J′ and J″, as clearly appears in Figs. 1 and 2. The cam-disk J traverses the smaller portion of the roller *u* and acts upon it during its revolution. The cam J′, when the structure is in the position appearing in the drawings, acts upon it to relieve the pressure of the catch *g* on the lever L at each revolution. The object of this is to permit its easy release, as will appear distinctly farther on.

Connected with the engine-cylinder is a small pipe I″, having two distinct connections I and I′ with the cylinder. A stop-cock *r* is in the pipe to shut off the connection to the port I, the object of which will appear farther on. This pipe connects to a small auxiliary cylinder *t*, which is provided with a small stop-cock to afford a little vent for the same. Within this auxiliary cylinder *t* is a piston or plunger *t*, which projects out so that it acts upon the antifriction-roller *u* to move it out and the cam J″ returns it.

This, I think, describes all of the various parts of my improved engine, and I will now indicate the operation of the structure, and from this operation the uses of the various parts will appear.

I will first describe the engine as running at a normal speed, in which event the stop-cock *r* is closed. We will assume that the piston of the engine has just been driven down to the position shown in Fig. 1 by the explosion of a charge. It will be observed that as the port I′ is a little above the main exhaust H a small quantity of the product of the explosion will be forced down the pipe I″ into the cylinder *t*, where it forces the piston *t′* over to the position indicated in the drawings, where it is engaged and acted upon by the cam-plate J. As the cam-plate J revolves, the peripheral cam J′ lifts the shaft K′, and thereby forces a charge by the pump N over onto the valve *c*. As the cam-plate J continues to revolve the cam J″ will strike against the shoulder portion of the roller *u* and force it back, and with it the piston *t*, into its cylinder. The next explosion returns the roller *u* into position to be acted upon by the cam-plate, and the operation is repeated until the speed of the engine passes normal or a predetermined point, when the governing means, heretofore described, causes the lever L to engage the lug *g* on the cross-head when the same is in its highest position, as shown in the drawings. The engine will then continue to revolve without any actuation of its valve mechanism until the speed of the engine again becomes normal, further than that the cam J′ slightly raises the shaft K′, with its cross-head, on each revolution, which will make it easy for the lever L to be withdrawn from under the lug *g*. While the speed of the wheel C′ is higher than the speed to which the engine is set, through the action of the governor-balls *m* the collar M is constantly drawn outward, which keeps the lever L constantly under the catch *g*, and prevents the actuation of the valve mechanism. When the speed falls below the predetermined point, the weights *m* react, and force the collar inwardly, which forces the upper end of the lever L from under the catch and allows the shaft K′ to drop. This permits the valve C to open, air rushes in through the port R when the piston descends and the engine is charged. When the piston again travels up, it compresses the charge, and at that moment the connections for the igniter through the eccentric D′ and the connections I have named actuate the sparker, so that when the commutator on the shaft comes to position the charge will be ignited at the right moment. The force of this charge drives the piston down and reacts, as before stated, to drive the piston *t′* and forces the antifriction-roller *u* into the position indicated in the drawings. When the piston re-

turns after each explosion, the foul air is forced out through the port R′ beneath the valve *e*.

From this description of the operation of my improved engine it will be observed that a charge is taken and ignited only when the speed of the engine drops to the predetermined point at which the governor is set and that there is no consumption of gas, gasolene, or other fuel except when an impulse is given to the engine. The saving must be very great. The means is very simple and very effective. In starting the engine it will be found for the first stroke or two desirable to leave the stop-cock *r* open, so that the full effects of the explosion will be received, as the charge is likely at the start not to be rightly tempered to secure the best effects. A stop-cock *a* is provided, which is left a little open, so that the piston *l*′ can be easily forced back by the operation of the cams on the cam-plate J without interruption.

Having thus described my improved engine and its method of operation, I desire to state that while I have shown the same on an upright engine it is adapted for use on a horizontal engine. I desire to state also that much of the mechanism I have shown can be greatly varied. While I consider the sparking means I have shown to possess considerable merit, I think there are others which might be utilized in this connection. It is needless to remark that where gas is used in place of gasolene the pump N will not be necessary to deliver the charge. I am aware also that different connections might be provided to utilize the exhaust or the force of the explosion in the engine to connect and disconnect a valve mechanism and control the engine, and while I believe that the structure I have shown possesses great merits I desire to state that I am aware that the device can be very much varied without departing from my invention.

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

1. In an explosion-engine, the combination of the engine-cylinder with the usual balance-wheel and connections; an auxiliary cylinder, a connection from the engine-cylinder to the auxiliary cylinder; a plunger or piston within the cylinder; a roller carried thereby; a cam-plate on a shaft of the engine with cams for acting upon the roller and returning it to its initial position, and connections from the roller to the valve mechanism to control the same, all coacting substantially as described for the purpose specified.

2. In an explosion-engine, the combination of the engine-cylinder; an auxiliary cylinder connected to the engine-cylinder a little in advance of the main exhaust to be actuated by the gases delivered from the engine-cylinder; an antifriction-roller controlled by the piston of said auxiliary cylinder; a shaft with a transverse pin on which said roller revolves and moves back and forth; a cross-head on said shaft; a valve to control the inlet to said engine and a pump for delivering a charge of gasolene or other explosive into the same; rods connected to said valve and pump projecting into sockets on the said cross-head; a heavy spring between the said cross-head and each rod; a lever to engage in a catch on said cross-head or shaft; a collar with annular groove to engage said lever; governor-weights connected to said collar to be moved by said weights; and a cam-plate J secured to a shaft of the engine having a peripheral cam J′, to act upon the antifriction-roller and a cam J″, on the face to throw the antifriction-roller out of engagement, all coacting together substantially as described for the purpose specified.

3. In an explosion-engine, the combination of the engine-cylinder; an auxiliary cylinder connected to said engine-cylinder; a valve-gear to charge the engine and connections from the said auxiliary cylinder to the said valve-gear to be actuated by each explosion, and a governor to lock the valve-gear when the speed of the engine is above a predetermined point, and to release the same when the speed of the engine falls below that point; and a suitable igniter for said engine coacting, for the purpose specified.

4. In an explosion-engine, the combination of the engine-cylinder; an auxiliary cylinder connected to the said engine-cylinder; a valve-gear to charge the engine and connections from said auxiliary cylinder to said valve-gear to be actuated by each explosion; and a governor to lock the valve-gear when the speed of the engine is above a predetermined point, and to release the same when the speed of the engine falls below that point, as specified.

5. The combination of an engine-cylinder, an auxiliary cylinder actuated by the exhaust; and inlet-valve mechanism connected to the inlet-valve; means connected to the auxiliary cylinder for throwing such mechanism into gear.

In witness whereof I have hereunto set my hand and seal in the presence of two witnesses.

JOHN DOORENBOS. [L. S.]

Witnesses:

CASSA M. CHAPPELL,

OTIS A. EARL.