No. 657,810. Patented Sept. 11, 1900.

W. E. CARY.

GAS ENGINE.

(Application filed July 8, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

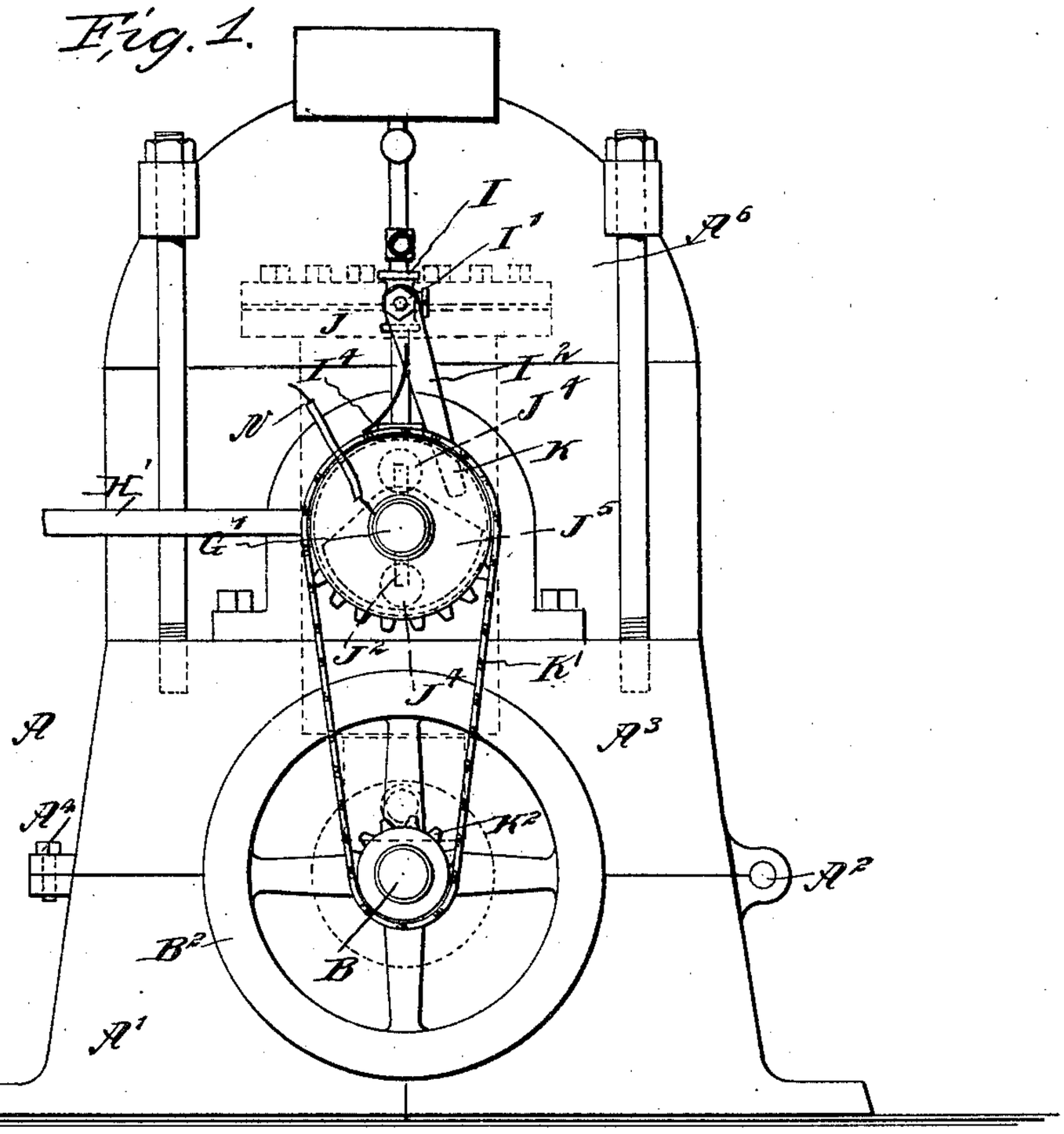
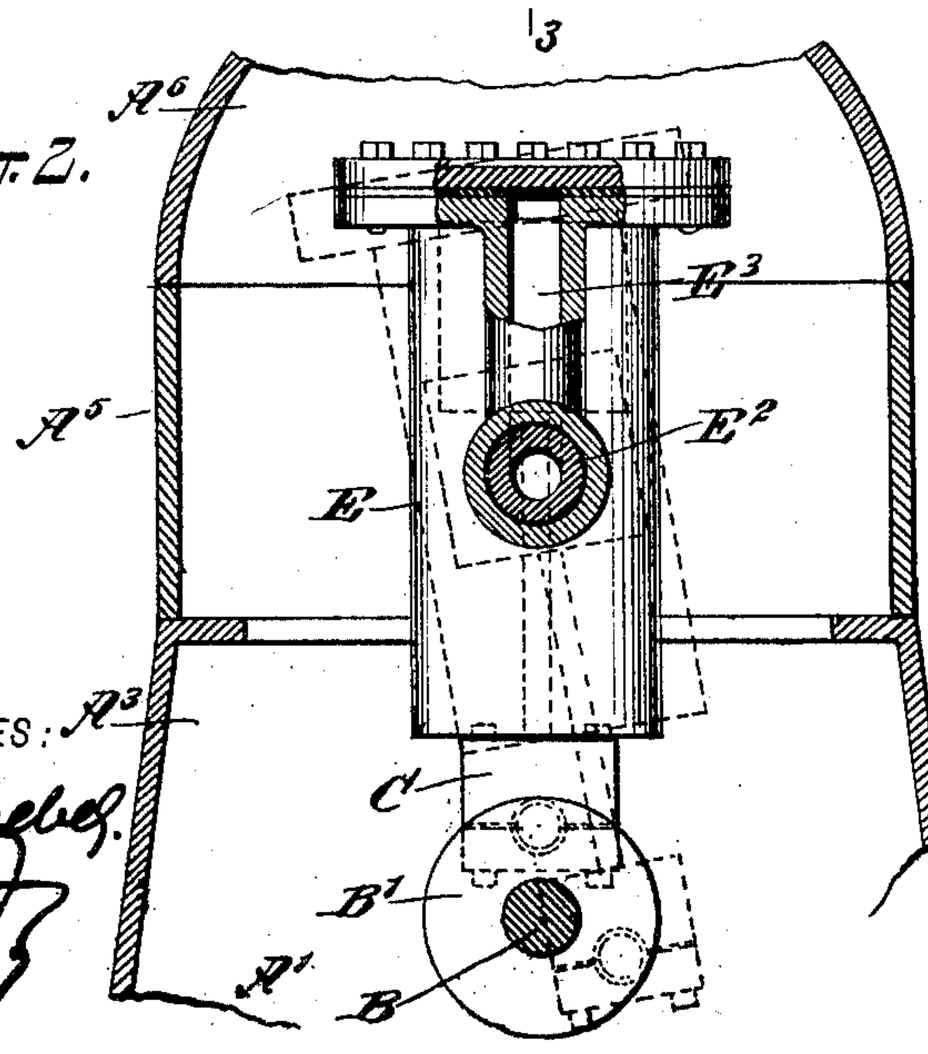


Fig. 2.



WITNESSES:
William P. Gaby.
Rud. Forster

INVENTOR
W. E. Cary
BY Munn
ATTORNEYS.

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Fig. 3.

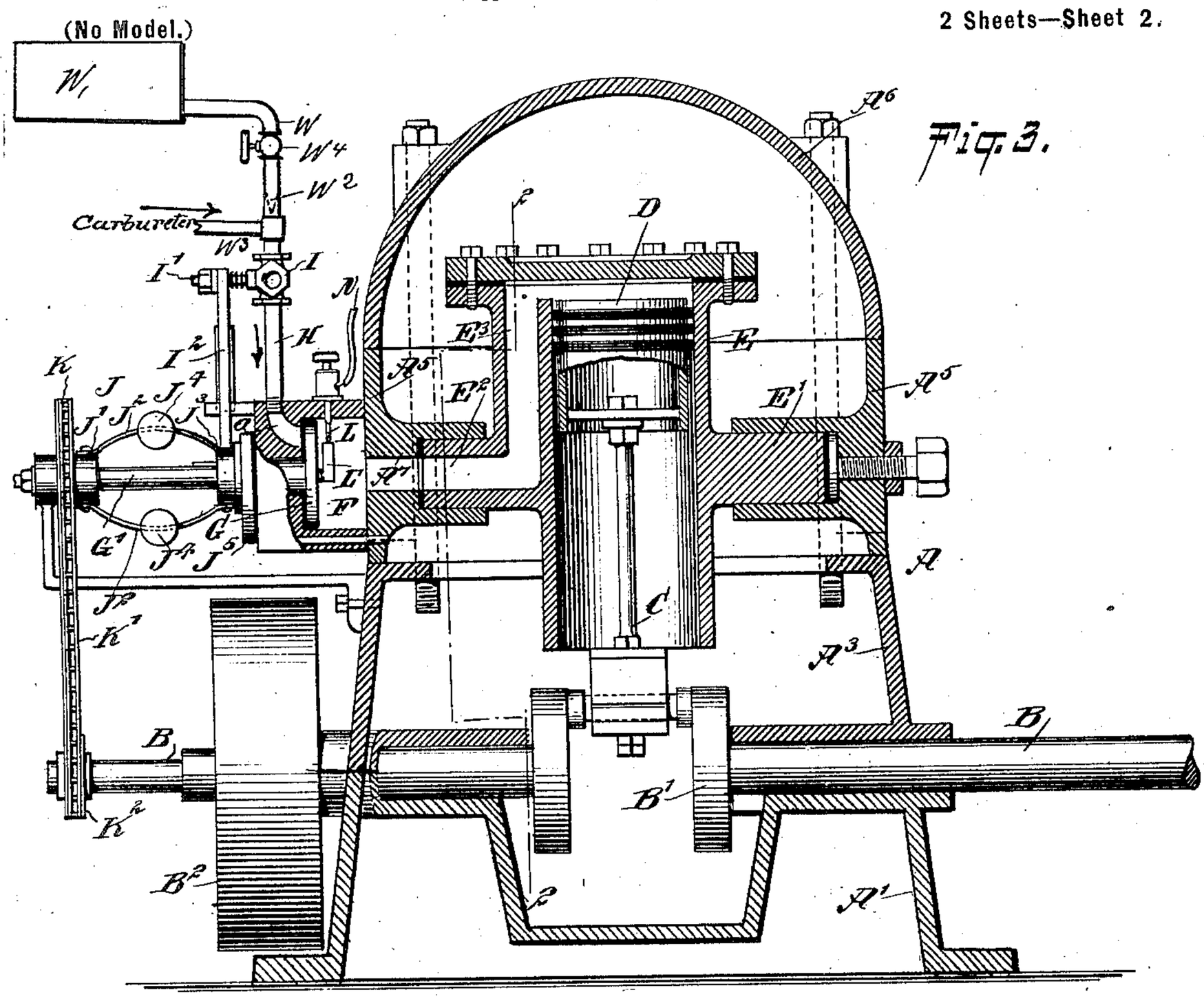


Fig. 4.

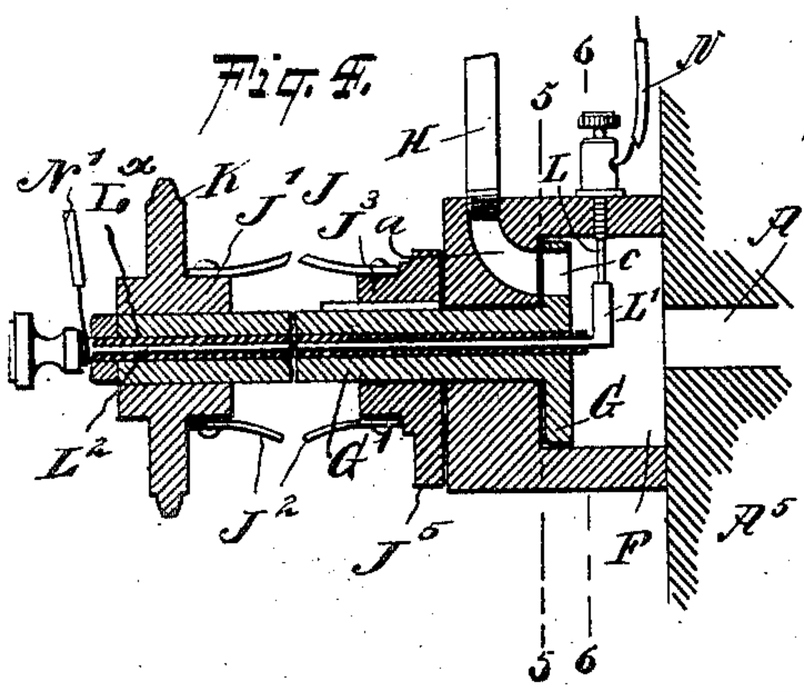


Fig. 5.

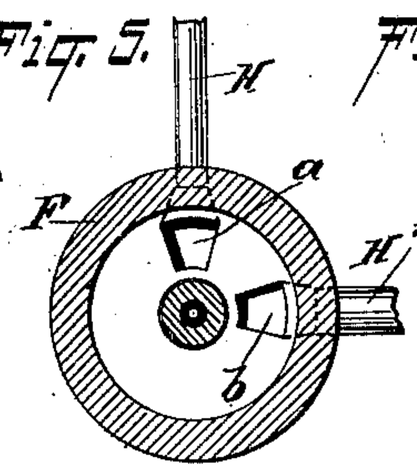


Fig. 6.

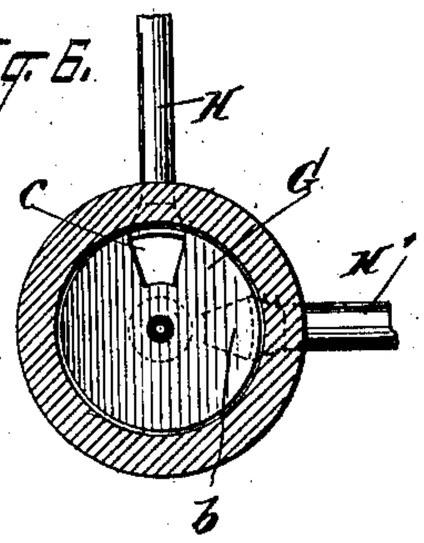
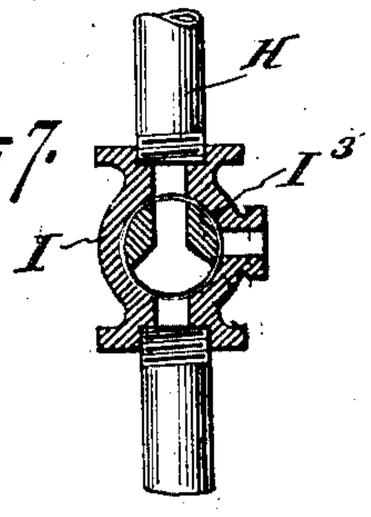


Fig. 7.



WITNESSES:

William P. Goebel.

Rud. F. Hoffer.

INVENTOR

W. E. Cary

BY

ATTORNEYS.

UNITED STATES PATENT OFFICE.

WILLIAM E. CARY, OF SPRINGFIELD, VERMONT

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 657,810, dated September 11, 1900.

Application filed July 8, 1899. Serial No. 723,162. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. CARY, of Springfield, in the county of Windsor and State of Vermont, have invented a new and Improved Gas-Engine, of which the following is a full, clear, and exact description.

The invention relates to four-cycle gas-engines; and its object is to provide a new and improved gas-engine which is simple and durable in construction, very effective in operation, and arranged to utilize the motive agent to the fullest advantage and to insure a regular ignition of the explosive charge at the proper time.

The invention consists of novel features and parts and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

A practical embodiment of my invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is an end elevation of the improvement. Fig. 2 is a transverse section of part of the same on the line 2 2 in Fig. 3. Fig. 3 is a sectional side elevation of the improvement on the line 3 3 in Fig. 1. Fig. 4 is an enlarged sectional side elevation of the charge-controlling valve and igniter. Fig. 5 is a transverse section of the same on the line 5 5 in Fig. 4. Fig. 6 is a similar view of the same on the line 6 6 in Fig. 4, and Fig. 7 is an enlarged sectional side elevation of the governor-controlled inlet-valve.

The improved gas-engine is provided with a frame or casing A, having a base A′ on which is hinged at A^2 a section A^3, fastened to the base by bolts A^4, as is plainly indicated in Fig. 1. On the top of the section A^3 are bolted the bearings A^5 and a cap A^6, and in the base A′ and the section A^3 is journaled the main shaft B, one half of the bearings for said shaft being in the section A′ and the other half in the section A^3, so that when the latter is swung into an open position ready access is had to the shaft.

On the shaft B, within the casing A, is formed or secured a crank B′, connected by a pitman C with a piston D, mounted to slide in an oscillating cylinder E, open at the lower end and closed at the top, and having its sides provided with trunnions E′ E^2, journaled in the bearing-section A^5 of the casing. The trunnion E′ is solid, and the trunnion E^2 is made hollow to connect at its inner end with a channel E^3, formed on one side of the cylinder and leading to the upper end of the cylinder, at the working end thereof. The outer end of the hollow trunnion E^2 connects by an aperture A^7 in the section A^5 with the interior of a valve-chamber F, bolted or otherwise fastened to the side of the casing A. A rotary valve G operates in the chamber F to control an inlet-port *a*, leading to a supply-pipe H, connected with a suitable source of motive-agent supply and containing a three-way valve I, controlled by a governor J on the stem G′ of the valve G.

The stem G′ is driven from the main shaft B and is for this purpose provided with a sprocket-wheel K, over which passes a sprocket-chain K′, also passing over a sprocket-wheel K^2, secured on the shaft B adjacent to the fly-wheel B^2. The sprocket-wheels K^2 and K are so proportioned that it requires two revolutions of the shaft B to make one revolution of the stem G′ and the valve G. The chamber F is also provided with an exhaust-port *b*, leading to an exhaust-pipe H′ for carrying off the products of combustion, and the two ports *a* and *b* are adapted to alternately register with a corresponding port *c*, formed in the valve G, as is plainly indicated in Figs. 4 and 6.

In the chamber F is arranged an electric igniting device comprising a fixed electrode L and an electrode L′, moving with the valve G in and out of contact with the fixed electrode L to make a spark at the proper time for igniting the explosive charge in the chamber F at the time the ports *a* and *b* are closed, and the charge is compressed on the return or upward stroke of the piston D when the latter is about in position to make its down stroke. The fixed electrode L is connected by a wire N with a battery or other suitable source of electricity, and the electrode L′ has a shank L^2 extending centrally through the stem G′ to connect at its outer end by a wire N′ with the battery or other source of electricity. The shank L^2 is covered with an insulating-sleeve L^3, as shown.

The throttle or inlet valve I is preferabl

in the form of a three-way valve, as shown in Fig. 7, and has its valve-stem I' provided with a spring-pressed arm I^2, normally resting on a fixed lug I^1 and adapted to receive a swinging motion from the governor J to open or close the valve more or less, according to the speed of the engine. If the engine attains too high a speed, the valve connects with the outer air instead of the supply, so that no explosive charge is passed into the chamber F and the cylinder until the speed of the engine is reduced.

The governor J is provided with a disk J', fixed or formed on the wheel K or on the valve-stem G', and connected by spring-arms J^2 with a disk J^3, mounted to turn with and to slide longitudinally on the said stem G'. The spring-arms J^2 are provided with the usual weights or balls J^4, moving outward on an increase of speed of the engine to draw the disk J^3 toward the other disk J', the spring-arms by their own resiliency moving the disk J^3 in a reverse direction away from the disk J' on a decrease of speed of the engine. On the movable disk J^3 is secured or formed a cam J^5, normally standing at one side of the arm I^2, but adapted to move into the path of said arm on an increase of speed of the engine to impart a swinging motion to the arm I^2 to turn the stem I' and the plug I^3 of the throttle-valve I and cut off the supply of the motive agent accordingly, as above explained. The position of the arm I^2 on the stem I' may be varied relative to the ports in the plug I^3 (see Fig. 7) and the speed of the engine varied while running. In order to vary the point at which the governor will act on the arm I^2, the nut on the valve-stem I' is screwed up or unscrewed, so as to bring the arm I^2 nearer to or farther away from the cam J^5. Hence when this is done the cam will have to reach a different point to affect the three-way valve I, and the speed of the engine will reach a different point before the governor will act to close or open the valve I.

The operation is as follows: When the piston D is on the first downstroke, the ports *c* and *a* are in register with each other to allow the piston to draw an explosive charge from the pipe H, through the registering ports into the chamber F, and into the cylinder E by way of the hollow trunnion E^2, the opening A^7, and the channel E^3. When the piston is on the return stroke, the ports *a* and *c* are disconnected, and consequently the charge previously drawn into the cylinder is compressed, and on the completion of the return stroke the electrode L' passes the fixed electrode L to produce the usual spark to ignite the charge and give an impulse to the piston D on the second downstroke. On the next upstroke of the piston D the port *c* registers with the port *b*, so that the products of combustion are discharged. On the next downward stroke a fresh charge is drawn in and the above-described operation is repeated.

In order to increase the power of the engine and to keep the cylinder E cool without a water-jacket, I prefer to spray a charge of water into the charge while passing through the inlet-pipe to the chamber F and which charge of water is instantly vaporized, and the compression and intense heat of combustion causes a decomposing of the vapor to consume the gases and give a great increase of pressure to the piston D after the gaseous charge is ignited. For this purpose I connect with the throttle-valve I by a pipe W a water-tank W' and connect a water-nozzle W^2 and pipe W^3, leading from a carbureter, with said pipe W. W^4 designates a valve. The vaporizing of the water absorbs the heat of the cylinder and keeps it cool, and the engine develops a great deal more power than it would without the charge of water.

From the foregoing it is evident that the engine can be started without any adjustment of valves and stopped by simply switching off the current to the electrodes L L', thereby eliminating all fire-risk, especially as the gasolene-tank for furnishing the explosive mixture to the pipe H may be placed any distance away from the engine proper, and only one charge of air and gasolene is taken into the chamber at a time.

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

1. In a gas-engine provided with a valve-chamber and a supply-pipe, a rotary valve for controlling the admission of the motive agent from the supply-pipe to the valve-chamber, a throttle-valve in the supply-pipe, a spring-pressed arm held by one end on the stem of the throttle-valve and having its other end free, means for adjusting said arm along the throttle-valve stem, a governor comprising two disks on the rotary valve-stem, one of said disks being fixed on the stem and the other mounted to slide on and turn with said stem, weight-carrying springs connecting said disks, and a cam on the slidable disk, said cam being normally out of engagement with the arm on the throttle-valve stem and engaging the free end of said arm to swing the same when the slidable disk moves toward the other disk, as set forth.

2. In a gas-engine provided with a valve-chamber and supply-pipe, a rotary valve for controlling the admission of the motive agent from the supply-pipe to the valve-chamber, a throttle-valve in the supply-pipe, a spring-pressed arm having one end on the stem of said throttle-valve, a governor on the stem of the rotary valve and having a slidable disk formed with a cam adapted to engage said arm to swing the same whereby to close the throttle-valve when the disk is slid, and means for holding said arm at different points on the stem of the throttle-valve whereby the disk will have to reach different points to engage with said arm, as and for the purpose set forth.

3. In a gas-engine, a casing having a valve chamber and supply-pipe connected thereto

a hollow rotary valve-stem coupled with the engine-shaft and carrying a valve for controlling the admission and exhaust of the motive agent, a stationary electrode in the valve-chamber, a movable electrode having a shank inserted through the hollow valve-stem, a disk fixed on said shaft and a disk slidable thereon, ball-carrying spring-arms connecting said disks, a cam on the slidable disk, and a throttle-valve whose plug has a spring-pressed swinging arm secured thereto and adapted to be engaged by said cam, as set forth.

WILLIAM E. CARY.

Witnesses:
FANNY E. HERRICK,
CARRIE J. CARY.