No. 725,668. PATENTED APR. 21, 1903.

L. F. BURGER.

GOVERNING MECHANISM FOR GAS ENGINES.

APPLICATION FILED NOV. 11, 1901.

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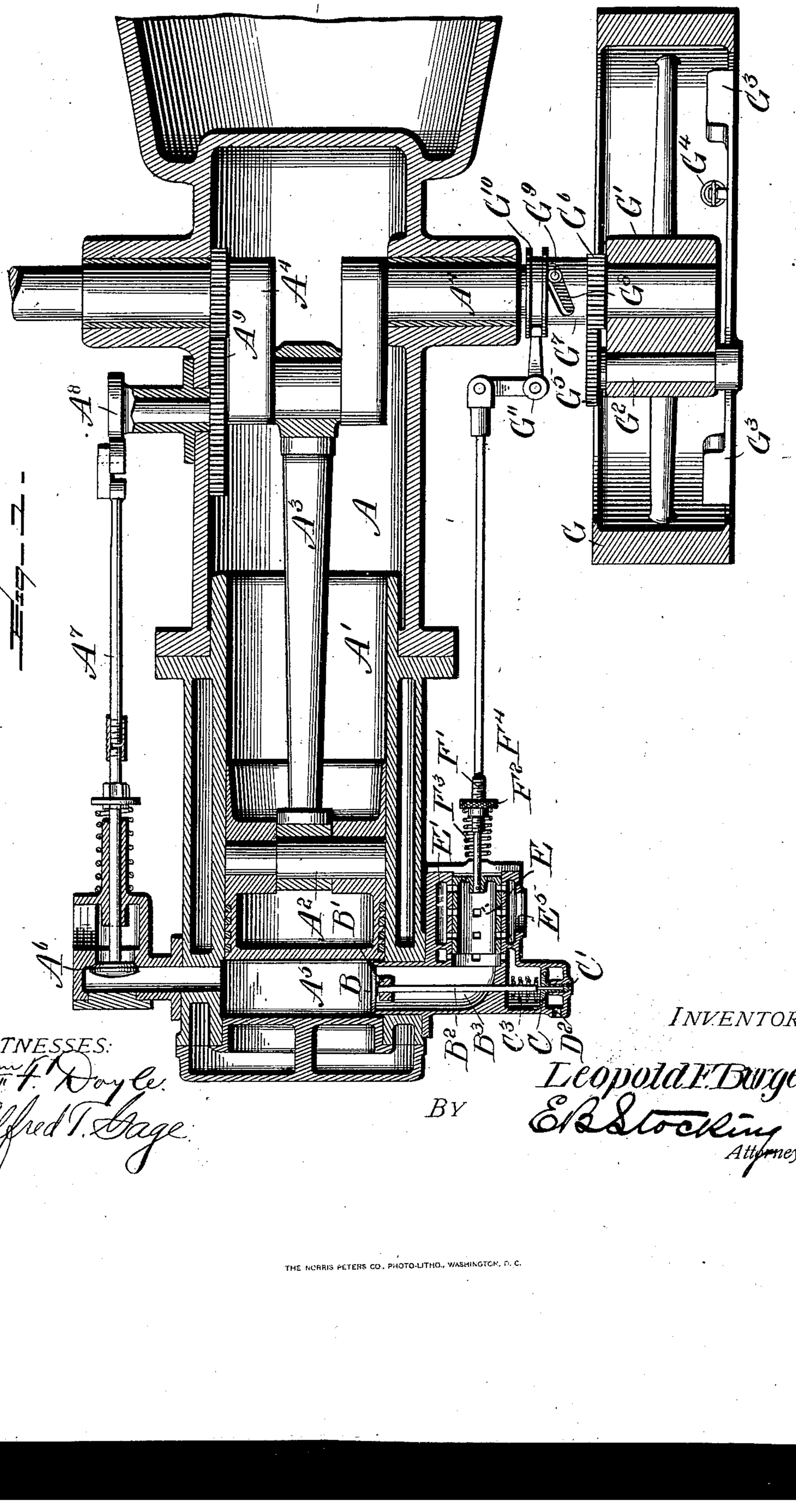

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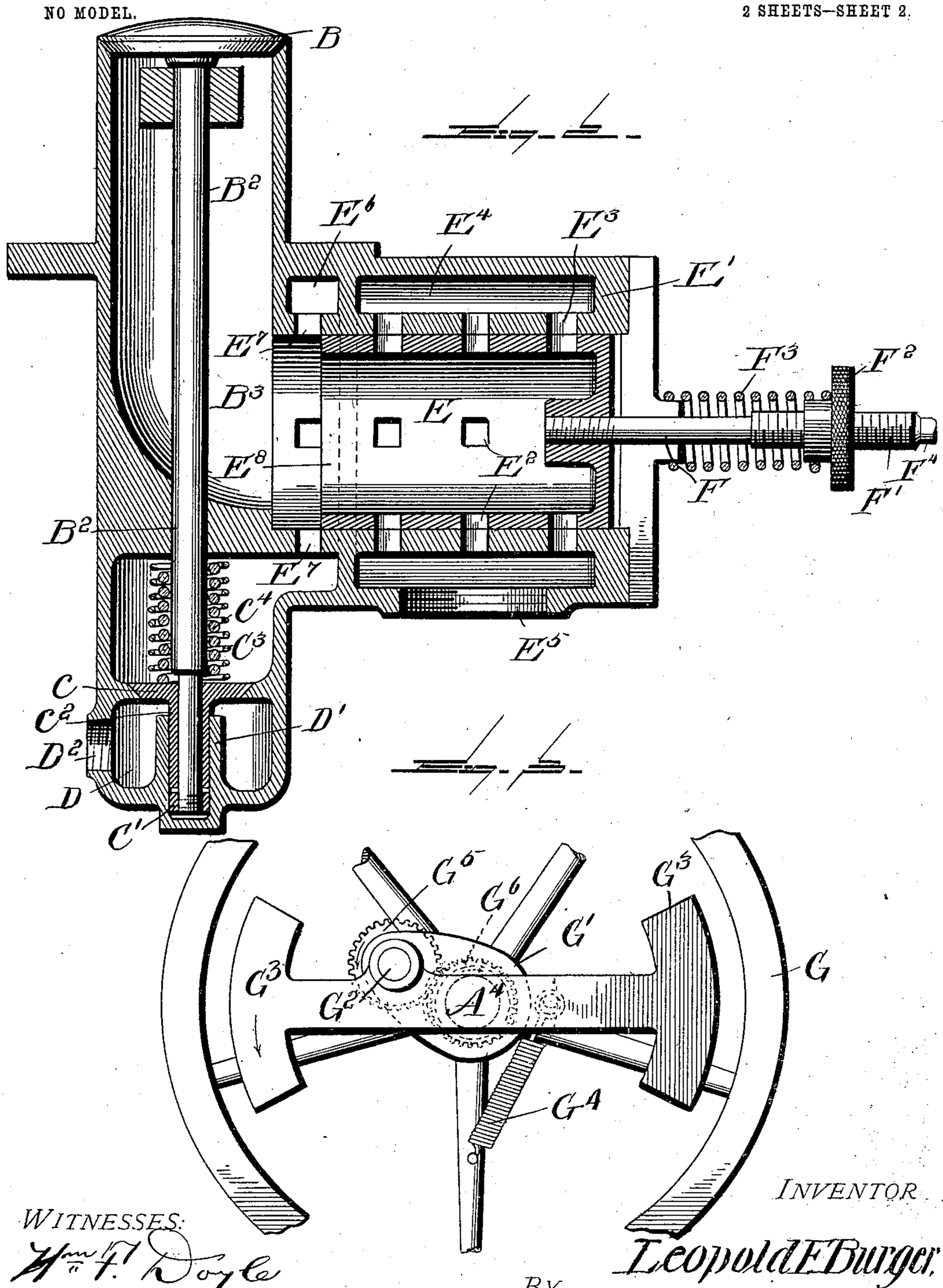

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GOVERNING MECHANISM FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 725,668, dated April 21, 1903.

Application filed November 11, 1901. Serial No. 81,939. (No model.)

To all whom it may concern:

Be it known that I, LEOPOLD F. BURGER, a citizen of the United States, residing at Anderson, in the county of Madison, State of Indiana, have invented certain new and useful Improvements in Governing Mechanism for Gas-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to gas-engines, and particularly to a governing-valve and mechanism carried by a driven part of said engine for actuating said valve.

The invention has for an object to improve the construction of the governing-valve, whereby the air and fuel may be admitted to the combustion-chamber of the engine in proper amounts, dependent upon the speed of rotation of the crank-shaft thereof, so that the fuel is supplied as needed to develop the power required.

A further object of this invention is to improve the construction of slide-valve used for this purpose, whereby the feed of both the air and fuel may be regulated and the degree of movement of the valve adjusted.

A further object of the invention is to provide a governing-valve in connection with independent valves for controlling the fuel-inlet to the governing-valve and the air-inlet to the engine.

Other and further objects and advantages of the invention will hereinafter appear and the novel features thereof pointed out by the appended claims.

In the drawings, Figure 1 is a horizontal section through an engine embodying my invention. Fig. 2 is a similar view, upon an enlarged scale, of the governing-valve and intake and fuel valves; and Fig. 3 is a detail elevation of the speed-governing mechanism.

Like letters of reference refer to like parts in the several figures of the drawings.

The present invention is capable of application to any desired class of engines, but for the purpose of illustration is herein shown in connection with an engine comprising a casing A, having therein a cylinder A′ and a piston A^2, connected by a pitman A^3 with a crank-shaft A^4. The closed end of the cylinder A′ is provided with a combustion-chamber A^5, communicating with an exhaust-valve A^6, adapted to be operated by a rod A^7, bearing against a cam A^8, suitably driven from the crank-shaft A^4 by means of a gear A^9.

Communicating with the combustion-chamber A^5 is an intake-valve B, suitably supported by a cross-bar B′ and having an extended stem B^2 extending through a mixing-chamber B^3. This stem carries at its lower end a fuel-valve C, slidingly mounted thereon, while below the valve C a nut C′ is provided, which is adapted to travel with the stem within a tubular guide D′, provided within the fuel-chamber D at the lower portion of the valve-casing. The valve C is provided with a tubular stem C^2, surrounding the stem B^2 of the inlet-valve B and disposed within the guide D′, while the fuel is admitted to the chamber D by a suitable inlet, as shown at D^2. Both the valves B and C are restored to their seats by means of a coiled spring C^3, disposed between the face of the valve C and the end wall of the mixing-chamber B^3. Within the spring C^3 a shorter and heavier spring C^4 is placed, which in the opening movement of the valves forms a cushion to check the force thereof, thus causing the valves to stop very easily and quietly to prevent crystallization of the parts thereof.

It will be noted that when the valve C rests upon its seat and the valve B is in a like position there is a space between the end of the tubular portion C^2 and the nut or collar C′, carried by the stem of the intake-valve B. This structure permits the intake-valve to open slightly before the fuel-valve C is engaged by the collar C′ and lifted thereby. Likewise in the closing movement the valve C seats before the intake-valve B, and thus prevents all escape or loss of fuel and completely cuts off the flow of gas into the engine when the governing-valve is properly adjusted.

The governing-valve E is slidingly mounted within a casing E′ at one side of the mixing-chamber B^3 and is provided with a series of ports E^2, adapted to register with ports E^3, communicating with the air-chamber E^4 in the casing E′, into which the air is admitted

by a suitable opening at E^5. The casing E^2 is provided with a separate gas or fuel chamber E^6, communicating by ports E^7 with the mixing-chamber and with the expansion-chamber beyond the fuel-valve, which ports are adapted to be covered by the end E^8 of the sliding governing-valve, thus producing a governing-valve for controlling the entrance of air and fuel into the mixing-chamber and a structure in which a single movable part controls the entrance of the explosive mixture, and consequently the speed of the engine.

The valve E is provided with a stem F, having thereon a threaded portion F', adapted to carry an adjusting-nut F^2, between which and the casing E' a tension-spring F^3 is interposed, and by adjusting the nut F^2 the tension of the spring F^3 may be varied and the amount of power necessary to shift the regulating-valve consequently controlled. The valve-stem F is extended beyond the threaded portion to form a connecting-rod F^4, extending to a speed-governing mechanism carried by a fly-wheel G upon the crank-shaft A^4 of the engine. The speed-governor is mounted upon the fly-wheel eccentrically to the axis thereof by means of a block G', in which the shaft G^2 is journaled, said shaft bearing at one end the weighted arms G^3, which are connected with a fixed part of the wheel by means of spring G^4, Fig. 3, and at the opposite end is provided with a pinion G^5, meshing with a similar pinion G^6, carried by a rotatable sleeve G^7, supported upon the crank-shaft A^4. This sleeve is provided with a slot G^8, in which a pin G^9 from the crank-shaft extends. At one end of the sleeve a flanged way G^{10} is provided, into which one arm of a bell-crank G^{11} extends, while the other arm thereof is pivotally connected to the rod F^4. By this construction when the sleeve G^7 is rotated through the movement of the governor-arms it is also given a longitudinal movement upon the crank-shaft, thus shifting the governing-valve E through the crank-arm G^{11} and valve-rod F^4.

In the operation of the engine shown with the parts in the position shown in Fig. 1 the outward stroke of the piston A^2 will draw air and fuel through the governing-valve E into the mixing-chamber B^3 and from thence into the combustion-chamber A^5. The return stroke of the piston compresses the explosive mixture just admitted, and the same is then ignited by any suitable means, which drives the piston B outward the second time until at the end of its stroke the exhaust-valve A^6 is opened and the burned products of combustion are exhausted until the piston has returned to the inner end of its stroke, when the exhaust-valve is closed and the foregoing operation repeated. This operation is described in connection with a four-cycle engine in which the explosive mixture is drawn into the cylinder on every second outward stroke of the piston; but the invention is applicable to any class of engine.

In the operation of the governing-valve the outward stroke of the piston creates a vacuum, thus drawing the intake-valve B from its seat and also the fuel-valve, both of which are afterward closed by a single spring C^3. The fuel passing through the valve C enters the mixing-chamber by the ports E^7, which are controlled by the end E^8 of the governing-valve, while the air is received from the chamber E^4 through the ports E^3 and E^2 into the body of the cylindrical governing-valve E and is then mixed with the fuel in the mixing-chamber B^3, thus producing the explosive mixture, which passes through the intake-valve B to the cylinder. As the engine begins to rotate above its normal speed the governor-arms carried by the fly-wheel are caused to rotate, thus producing a rotary and lateral movement of the sleeve G^7 and a second movement of the sliding governing-valve E, which partially or wholly covers the inlet-ports for the air and fuel until the charge for the engine is reduced to such an extent as to keep the engine running at a uniform speed whether light or loaded. This speed can be regulated by means of an adjusting-nut F^2 and spring F^3, and if the tension of the spring be increased the speed of the engine is correspondingly increased, as more pressure from the governor is required to operate the regulating-valve, while a decrease of pressure produces the opposite result. It will be noted that the fuel-valve C is not secured to the valve-stem B^2, but slidingly mounted thereon, so as to permit the valve C to reach its seat before the valve B, and both of these valves are seated by the spring C^3, as the spring C^4 acts as a cushion in the opening movement of the valves. A further important feature is the operation of the fuel or gas valve C independent from the regulating-valve E, which prevents all escape of gas into the engine or engine-room, which is liable to occur when the increase of pressure causes the engine to stop and fill with gas, which escapes into the room. This arrangement also prevents any possibility of the gas escaping into the engine except when the same is running and the governing-valve opened, as hereinbefore described. It will furthermore be seen that the gas is only admitted to the chamber controlled by the valve E during the intake stroke of the engine, and consequently at the time required for use.

The governor herein shown is of the inertia type, being pivoted eccentrically to the axis of the fly-wheel and rotating therewith, it being held in position by the spring until the speed of the engine becomes greater than the set of the governor-spring. The spring then lacks power to hold the governor, and the latter begins to hang back, thus rotating its shaft through the gears and sleeve, which is loose to rotate upon its shaft, and shifts the

eccentric for operating the governing-valve. The diagonal slot-and-pin connection between the sleeve and shaft causes the former to have a lateral movement upon the shaft and in so doing move the crank-arm connections for shifting the governing-valve.

It will be obvious that changes may be made in the details of construction and configuration without departing from the spirit of the invention as defined by the appended claims.

Having described my invention and set forth its merits, what I claim, and desire to secure by Letters Patent, is—

1. In a gas-engine, the combination of a casing having independent air and fuel chambers each provided with inlet-ports, a governing-valve adapted to control said ports, and an independent fuel-valve automatically operated to control the flow of fuel to the fuel-chamber; substantially as specified.

2. In a gas-engine, the combination of a casing having independent air and fuel chambers each provided with inlet-ports, a governing-valve adapted to control said ports, an independent fuel-valve to control the flow of fuel to the fuel-chamber, and an intake-valve connected to said fuel-valve to operate the same in its movement; substantially as specified.

3. In a gas-engine, the combination of a casing having independent air and fuel chambers each provided with inlet-ports, a governing-valve adapted to control said ports, an independent fuel-valve to control the flow of fuel to the fuel-chamber, an intake-valve connected to said fuel-valve to operate the same in its movement, a mixing-chamber between said intake and governing valves, and a restoring-spring for said intake and fuel valves; substantially as specified.

4. In a gas-engine, the combination of a casing having independent air and fuel chambers each provided with inlet-ports, a governing-valve adapted to control said ports, an independent fuel-valve to control the flow of fuel to the fuel-chamber, an intake-valve connected to said fuel-valve to operate the same in its movement, a mixing-chamber between said intake and governing valves, a restoring-spring for said intake and fuel valves, a stem from said governing-valve, an adjustable nut upon said stem, and a regulating-spring extending from said nut to a fixed part; substantially as specified.

5. In a gas-engine, the combination of a mixing-chamber, a valve-casing at one side thereof having a gas-chamber therein provided with ports upon its inner periphery at the entrance to said mixing-chamber, an air-chamber in said casing provided with ports beyond said gas-ports, a cylindrical sliding governing-valve provided with peripheral ports therethrough connecting with the air-ports in the casing, and an end portion for said valve next the mixing-chamber for controlling said fuel-ports; substantially as specified.

6. In a gas-engine, a valve-casing having independent air and gas chambers therein provided with ports upon their inner periphery, a cylindrical sliding governing-valve provided with peripheral ports communicating with the air-ports and with an end portion for covering said fuel-ports, a mixing-chamber beyond one end of said governing-valve, an intake-valve at the end opposite the mixing-chamber, a fuel-valve mounted upon the stem of said intake-valve within an expansion-chamber leading to the fuel-port, and a restoring means for said intake and fuel valves; substantially as specified.

7. In a gas-engine, a valve mechanism comprising a casing having a mixing-chamber and an intake-valve at one end thereof and a gas-chamber at the opposite end separated by a partition from the mixing-chamber, a stem from said intake-valve extending through both of said chambers, a fuel-valve in said gas-chamber having a tubular stem surrounding the stem of the intake-valve and slidably supported within a guide from the casing, a collar upon the stem of the intake-valve within said guide and spaced from the stem of the fuel-valve when seated to permit a different length of travel for each of said valves, and a restoring-spring for said fuel-valve surrounding the stem of the intake-valve within the gas-chamber.

8. In a gas-engine, a valve-casing comprising a mixing-chamber and an intake-seat at one end and a seat for a fuel-valve and an expansion-chamber at the opposite end, and an intermediate cylindrical seat for a governing-valve at one side of said expansion-chamber having independent air and fuel chambers therein communicating by ports with said valve; substantially as specified.

9. In a gas-engine, a valve-casing comprising a mixing-chamber having a valve-seat at one end and a seat for a fuel-valve at the opposite end, an intermediate cylindrical seat for a governing-valve having independent air and fuel chambers therein communicating by ports with said valve, a cylindrical governing-valve having ports therein to register with said ports from the air-chamber and an end portion to control the ports from the gas-chamber, a wall at one end of the mixing-chamber having a fuel-port therein to form an expansion-chamber between the fuel-valve and mixing-chamber, an intake-valve for the mixing-chamber, a fuel-valve, and means for seating said valves; substantially as specified.

10. In a gas-engine, a valve-casing comprising a mixing-chamber having a valve-seat at one end and a seat for a fuel-valve at the opposite end, an intermediate cylindrical seat for a governing-valve having independent air and fuel chambers therein communicating by ports with said valve, a cylindrical governing-valve having ports therein to register with said ports from the air-chamber and an

end portion to control the ports from the gas-chamber, a wall at one end of the mixing-chamber having a fuel-port therein to form an expansion-chamber between the fuel-valve and mixing-chamber, an intake-valve for the mixing-chamber, a fuel-valve, means for seating said valves, a valve-stem extending from said governing-valve, and a tension-spring acting on said stem to normally hold said valve open at one extreme of its movement; substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

LEOPOLD F. BURGER.

Witnesses:
JESSE L. VERMILLION,
EDWARD F. VERMILLION.