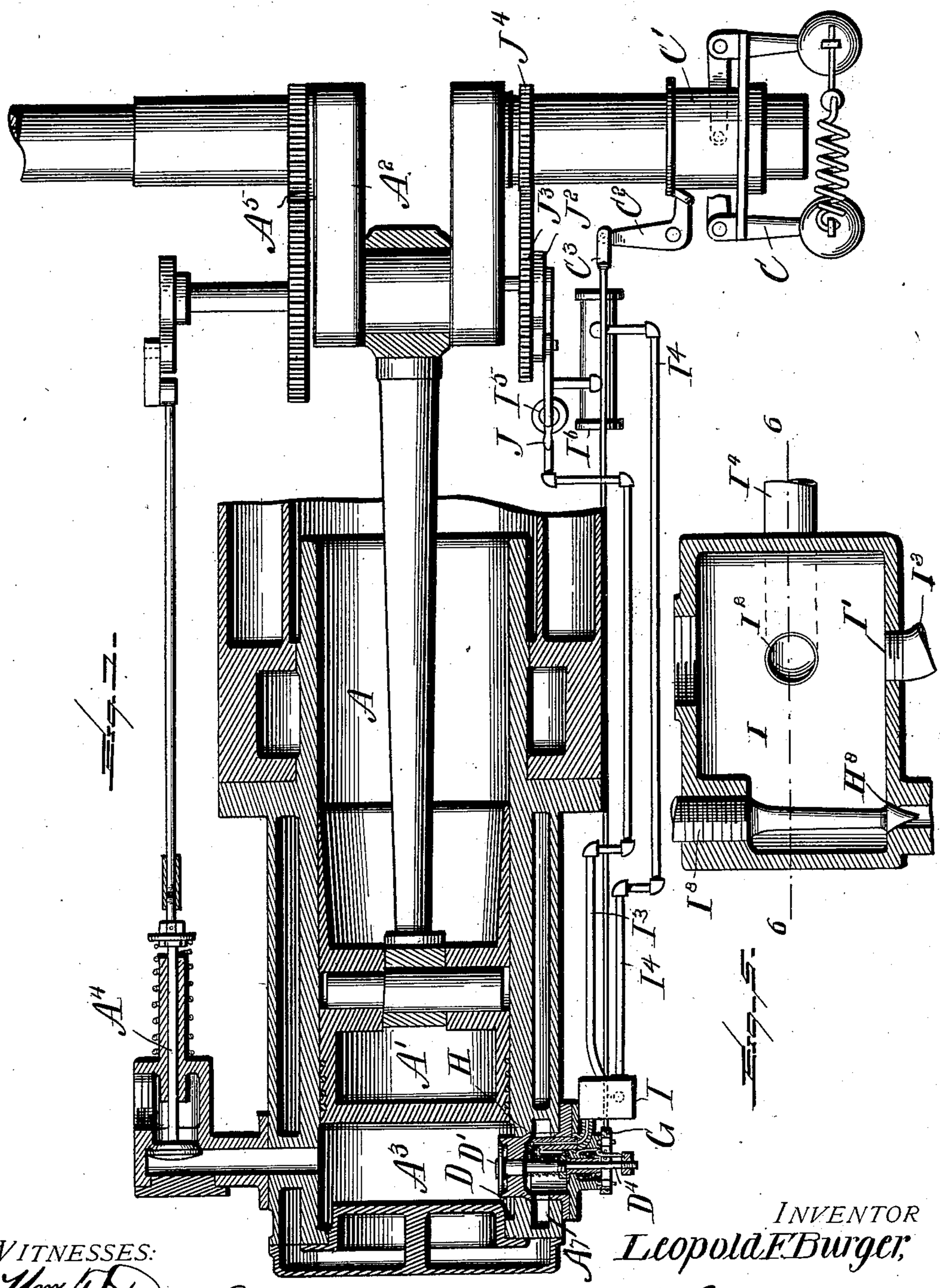
No. 722,672. PATENTED MAR. 17, 1903.

L. F. BURGER.

VALVE FOR GAS ENGINES.

APPLICATION FILED NOV. 11, 1901.

NO MODEL. 2 SHEETS—SHEET 1.



WITNESSES:

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Fig. 4.

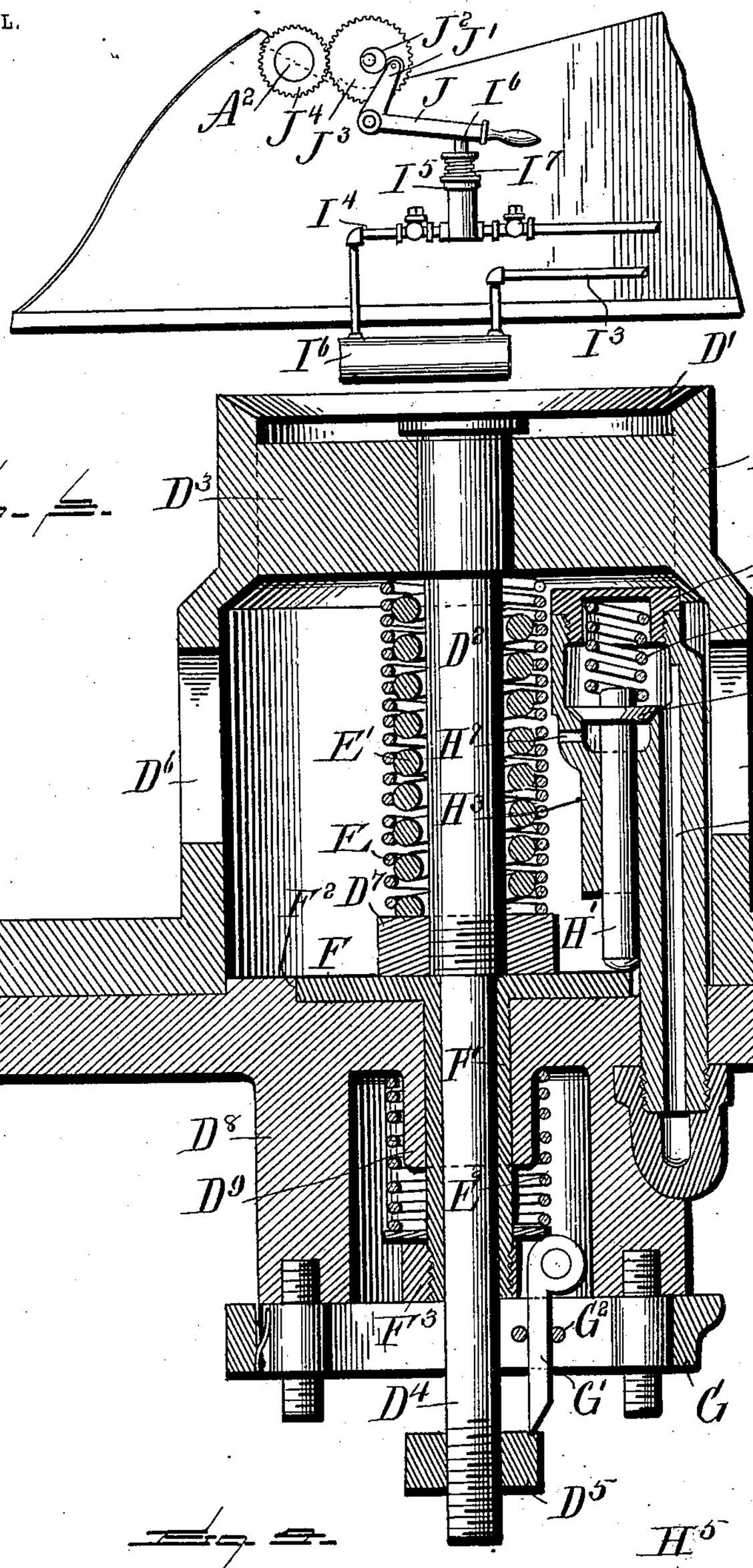

Fig. 5.

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

LEOPOLD F. BURGER, OF ANDERSON, INDIANA, ASSIGNOR TO WOOLLEY FOUNDRY AND MACHINE WORKS, OF ANDERSON, INDIANA.

VALVE FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 722,672, dated March 17, 1903.

Application filed November 11, 1901. Serial No. 82,070. (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 Valves 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 that class in which a liquid fuel is admitted at the intake-valve and afterward vaporized.

The invention has for an object to improve the construction of the fuel-controlling valve, whereby the air and fuel inlets may be opened in unison or the flow of oil stopped, while the air-valve continues to open by disconnecting the valves.

A further object of the invention is to improve the construction of the fuel-inlet, whereby the same discharges behind the air-valve and vaporizes the fuel within the valve-casing.

Other and further objects and advantages of the invention will be hereinafter set forth, and the novel features thereof pointed out by the appended claims.

In the drawings, Figure 1 is a horizontal section through the engine, embodying the invention; Fig. 2, a detail elevation of the fuel-pump. Fig. 3 is a horizontal section through the intake-valve and vaporizer. Fig. 4 is a detail section of the fuel-inlet-valve casing. Fig. 5 is a vertical section through the fuel-reservoir, and Fig. 6 a horizontal section on the line 6 6 of Fig. 5.

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

The present invention is capable of application to any suitable class of engines, but for the purpose of illustration is herein shown in connection with an engine and valve, operating mechanism disclosed in my application, Serial No. 79,374, filed of even date herewith, so that the principal features of novelty herein refer to the feed of liquid fuel and means for controlling the same.

In the form of engine shown the letter A designates a cylinder having therein a piston A', connected to drive a crank-shaft A^2. This cylinder is provided at one end with a combustion-chamber A^3, communicating with an exhaust-valve A^4, adapted to be driven by a gearing A^5 from the crank-shaft A^2. This shaft is also provided with a ball speed-governor, as indicated at C, which is pivotally connected to a sliding collar C', bearing against a bell-crank C^2, from which a connecting-rod C^3 extends to a slide-bar G for operating the valve-connecting device, all as more fully shown and described in the application hereinbefore referred to.

Projecting into the combustion-chamber A^3 is a valve-casing D, carrying at its end an air-valve D', which is provided with a stem D^2, passed through a bearing D^3 and having its extended end D^4 projected beyond the casing and bearing a collar D^5. The casing D is provided below the bearing D^3 with a series of air-inlet openings D^6, while the stem D^2 of the air-valve has secured thereon a bearing-nut D^7, against which a spring E bears and extends to the bearing D^3 for the purpose of restoring the valve to its seat. This spring E is coiled, and within the same an oppositely-coiled heavier spring E' of greater tension and less length is disposed, so as to check or cushion the opening action of the valve. The lower portion D^8 of the valve-casing is provided with a guide-sleeve D^9, through which the extended portion D^4 of the valve-stem passes. Between this stem and guide a tubular extension F' from a push-plate F is disposed, and this plate is adapted to rest in a suitable seat F^2, while the end of the extension thereof is provided with a pivoting-lug F^3, carrying a pawl G', controlled by the slide-bar G by means of the pins G^2, carried by said bar at opposite sides thereof, while the point of the pawl or dog G' is adapted to bear against the collar D^5 when the parts are connected together, as shown in Fig. 3. Between the lug F^3 and the body of the valve-casing a spring E^2 extends for the purpose of restoring the push-plate F and holding the same upon its seat. When the valve-casing D is placed in position upon the engine, as

shown in Fig. 1, the air-inlet D^6 communicates with an air-space A^7 in the engine-casing which is open to the atmosphere.

The fuel-valve H is provided with an extended stem H′, resting upon the push-plate F, and is held in contact therewith by means of a coiled spring H^2. This valve is located within a casing H^3, provided with a valve-seat H^4, an injector-opening H^7, and a feed-channel H^5, communicating at it its end with a reservoir I, Figs. 5 and 6. Above the valve-seat H^3 a removable cap H^6 is applied for retaining the spring H^2 in position above the valve. The reservoir is supplied with a suitable inlet-opening I′ and outlet I^2 at one side, which communicate with the pipes I^3 and I^4, respectively, the former of which extends through a pump I^5 to a storage-tank I^6 for the fuel, while the latter communicates directly tween the reservoir and tank by means of the pipe I^4, as shown in Fig. 1. The pump I^5 may be of any desired construction—for instance, provided with a depressible piston I^6, adapted to be restored by a spring I^7 and to be operated by a crank-arm J, having the member J′ thereof in contact with a driving-cam J^2. Upon the shaft of this cam a pinion J^3 is provided, which in turn meshes with a pinion J^4 upon the crank-shaft A^2 of the engine. The result of this connection is to operate the pump in the continued rotation of the shaft, so as to supply a constant and sufficient quantity of fuel under an equal pressure to the fuel-valve H by gravity from the reservoir.

In the class of engine shown when the piston A′ is moved outward air and fuel are drawn into the cylinder through the air-valve D′ and the fuel-valve H, which are connected to operate together by means of a pawl, carried by the push-plate F. The oil or other fuel which passes the valve H when the same is raised by the push-plate F passes through an injector or inlet H^7, formed in the casing H^3, thus striking the springs and being thoroughly distributed, so that it is vaporized almost instantly. This vaporizing occurs in the body of air which has entered through the ports D^6, and a thorough mixing is thus effected. In the return movement of the piston the air and fuel comprising the explosive mixture are compressed and then ignited by any suitable means. The force of the explosion drives the piston outward again until at the end of the stroke the exhaust-valve is opened and retained in that position until the piston has returned to the inner end of its stroke, when the exhaust is closed and the explosive mixture again drawn to the cylinder by the successive outward movement of the piston. It will be observed that while the two valves are normally connected by the pawl to operate in unison they are entirely independent of each other, and any excess of speed causes the governor C through the connecting-rod C^3 to withdraw the pawl from contact with the collar on the stem of the air-valve, thus leaving this valve free to operate under the suction from the engine, while the fuel-valve H will not be effected thereby. The capacity of the passage H^5 may be controlled by means of a needle-valve H^8, located therein, as shown at I^8 in Fig. 5.

The details of construction described and illustrated in my application hereinbefore referred to will not be specifically described in this case, as they are not of an essential character to the operation of this invention.

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 in 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, a valve-casing comprising a mixing-chamber, an air-valve at one end of said chamber provided with a stem extending therethrough, a fuel-valve and casing located within said chamber, a push-plate slidingly mounted upon said stem within the mixing-chamber for operating said fuel-valve, and means for connecting said plate to said stem; substantially as specified.

2. In a gas-engine, a valve-casing comprising a mixing-chamber, an air-valve at one end of said chamber provided with a stem extending therethrough, a fuel-valve and casing located within said chamber, a push-plate slidingly mounted upon said stem within the mixing-chamber for operating said fuel-valve, and a shifting device carried by said push-plate to engage the free end of said stem; substantially as specified.

3. In a gas-engine, a valve-casing comprising a mixing-chamber, an air-valve at one end of said chamber provided with a stem extending therethrough, a fuel-valve and casing located within said chamber, a push-plate slidingly mounted upon said stem within the mixing-chamber for operating said fuel-valve, means for connecting said plate to said stem, a reservoir communicating with said fuel-valve adjacent thereto, a supply-tank located below said reservoir, a feed and return pipe circuit between said tank and reservoir, and a pump in said circuit to effect the feed to the reservoir; substantially as specified.

4. In a gas-engine, a valve-casing comprising a mixing-chamber, an air-valve at one end thereof and provided with a stem extending therethrough, a push-plate within the mixing-chamber having a tubular extension around said stem, means for connecting said extension and stem together and for disconnecting the same, a fuel-valve and casing disposed within said mixing-chamber, and a stem from said fuel-valve contacting with the push-plate for operating said fuel-valve in the movement of said plate; substantially as specified.

5. In a gas-engine, a valve-casing comprising a mixing-chamber, an air-valve at one end

thereof and provided with a stem extending therethrough, a push-plate within the mixing-chamber having a tubular extension around said stem, means for connecting said extension and stems together and for disconnecting the same, a fuel-valve and casing disposed within said mixing-chamber, a stem from said fuel-valve in contact with said plate, a restoring-spring above said fuel-valve, a restoring-spring for said push-plate, a restoring-spring for said air-valve, and an inlet-passage in the casing of said fuel-valve communicating with the mixing-chamber; substantially as specified.

6. In a gas-engine, a valve-casing comprising a mixing-chamber, an air-valve at one end thereof provided with a stem passing therethrough, a restoring-spring surrounding said stem, a fuel-valve discharging within said chamber, and a valve-casing for said fuel-valve having an opening adapted to discharge upon said spring; substantially as specified.

7. In a gas-engine, a casing for a fuel-valve comprising a spring-chamber at one end, a guide-sleeve at the opposite end having adjacent to said chamber a discharge-chamber and opening therefrom laterally to said sleeve, a valve-seat disposed between said spring-chamber and discharge-chamber, and a feed-passage communicating with said spring-chamber and extending parallel with said guide-sleeve; substantially as specified.

8. In a gas-engine, an air-valve having an extended stem with contact means upon its free end, a push-plate provided with a tubular extension slidingly mounted upon said stem, a valve-casing provided with a seat for said plate and a guide for said tubular extension, a pivoted device upon the end of said extension to contact with the means upon the free end of said stem, a restoring-spring extending between said stem and casing, and a fuel-valve disposed within the casing at one side of said push-plate and having a stem in contact therewith; substantially as specified.

9. In a gas-engine, an air-valve having an extended stem with contact means upon its free end, a push-plate provided with a tubular extension slidingly mounted upon said stem, a valve-casing provided with a seat for said plate and a guide for said tubular extension, a pivoted device upon the end of said extension to contact with the means upon the free end of said stem, a restoring-spring extending between said stem and casing, a fuel-valve disposed within the casing at one side of said push-plate and having a stem in contact therewith, a crank-shaft for said engine, a speed-governor on said shaft connected to operate said pivoted device, an exhaust-valve, an operating cam therefor driven by said crank-shaft, and a fuel-pump communicating with said fuel-valve and driven by said crank-shaft; substantially as specified.

10. In a gas-engine, a valve-casing, an air-valve at one end thereof having an extended stem, a push-plate provided with a tubular extension around said stem, a valve-casing provided with a lug upon said extension, a restoring-spring extending between said lug and casing, a fuel-valve disposed at one side of said push-plate, a pawl pivoted to said extension, a collar carried by said valve-stem beyond said pawl, and means for moving said pawl into or out of the path of said collar; 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.