(No Model.)

2 Sheets—Sheet 1.

R. VON KALKREUTH.

GAS ENGINE.

No. 358,134. Patented Feb. 22, 1887.

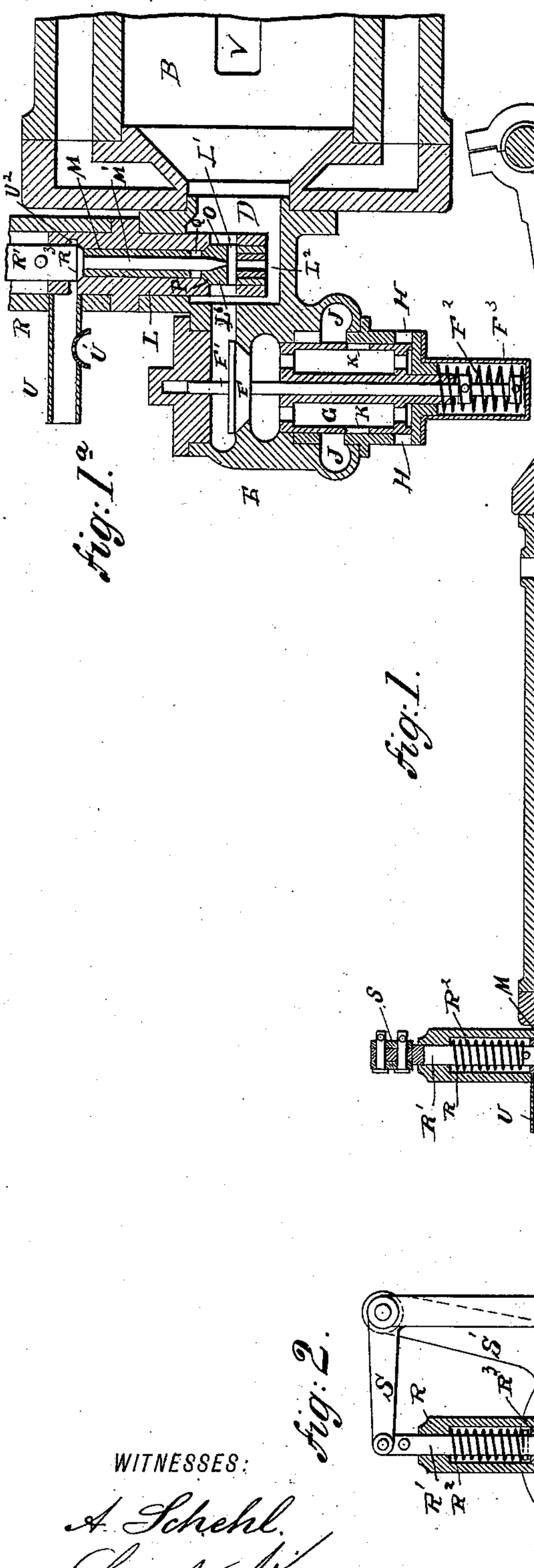

Fig. 1a.

Fig. 1.

Fig. 2.

WITNESSES:

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Carl Kapp

INVENTOR

Robert von Kalkreuth

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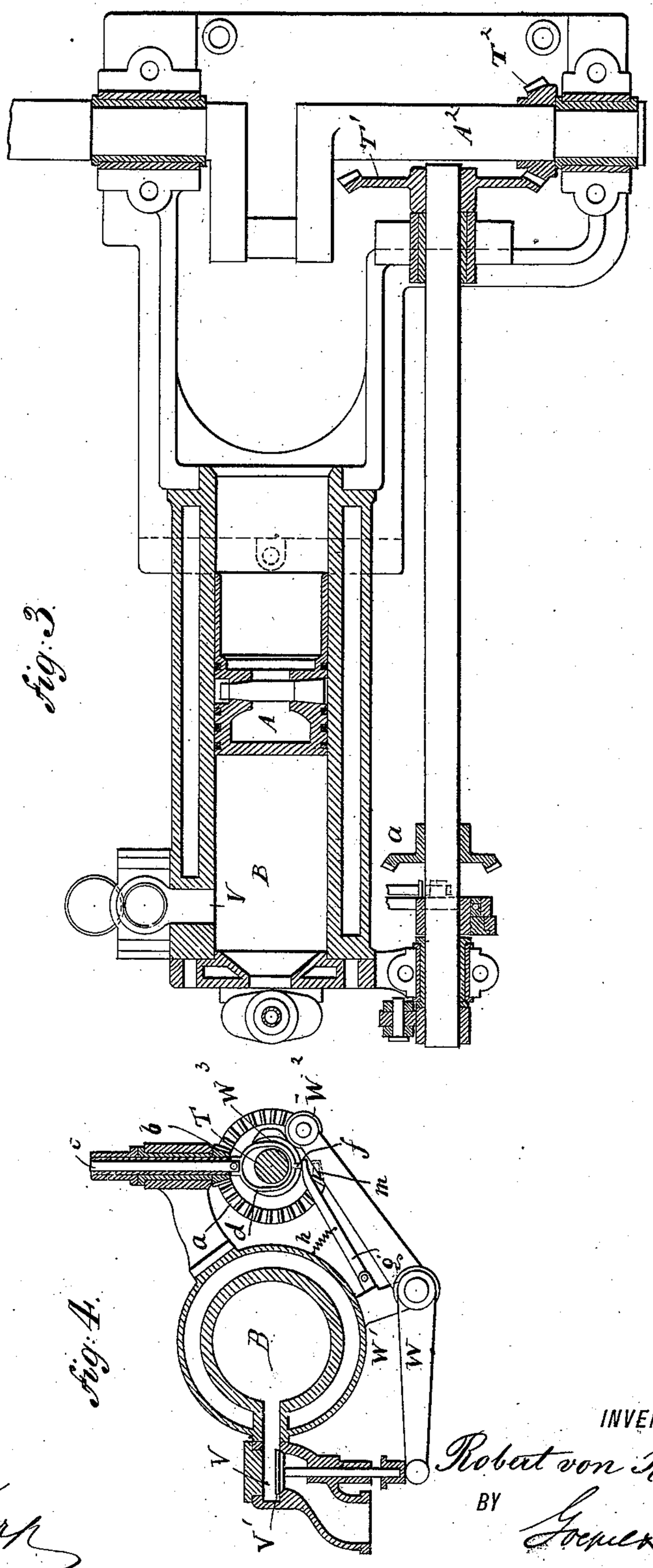

Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

ROBERT VON KALKREUTH, OF GREEN POINT, NEW YORK.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 358,134, dated February 22, 1887.

Application filed June 9, 1886. Serial No. 204,576. (No model.)

To all whom it may concern:

Be it known that I, ROBERT VON KALKREUTH, of Green Point, in the county of Kings and State of New York, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

The object of my invention is to simplify the construction of gas-engines in such a manner that the parts do not wear off as rapidly as those of the gas-engines of the usual construction, fit better, and a greater percentage of power is obtained.

The invention consists in the combination, with the cylinder and piston, of a valve-chamber connected with the closed end of the cylinder and containing valves, an explosion-valve, and a plug operated by mechanism from the main shaft of the engine.

The invention consists, further, in the combination, with the piston and cylinder and inlet-valves, of an outlet-valve, a lever controlling the same, a rod operated by a governor and acting on the lever controlling the exhaust-valve, all as will be fully described and set forth hereinafter.

In the accompanying drawings, Figures 1 and 1ª are longitudinal sectional elevations of my improved gas-engine. Fig. 2 is a partial end view and cross-sectional view of the same. Fig. 3 is a sectional plan view, parts being broken out; and Fig. 4 is a cross-sectional view of the governor.

Similar letters of reference indicate corresponding parts.

A piston, A, working in the cylinder B, is connected by the connecting-rod A′ with the crank-shaft A^2. The closed end C of the cylinder is tapered, as shown in Fig. 1, and provided with an opening, C′, which establishes communication between the closed end of the cylinder and the mixing-chamber D, connected with a valve-chamber, E, containing the puppet-valve F, provided with a stem, F′, which is suitably guided. A spiral spring, F^2, surrounds the lower part of the stem and rests against the bottom of the valve-chamber E and a cross-piece, nut, or head of the stem, which spring presses the stem downward, thereby keeping the valve F closed. A suitable casing, F^3, surrounds the lower end of the stem and the spring F^2 on said stem.

Below the valve F a cylindrical valve, G, is fixed on the stem, fits closely in a cylindrical valve-seat of the valve-chamber, and is provided at the top and bottom with a spider-frame, or with a frame having apertures, as shown.

The valve-chamber E is provided at the bottom with the apertures H in its sides, to permit the air to enter. The gas is conducted into the valve-chamber and circulates in the channel J, extending around the bore of the chamber and around the valve G, the valve being provided in its sides with the apertures K, which can register with the apertures of the channel for establishing communication between the channel J and the interior of the valve G.

The tubular valve-guide L is held vertically on the top of the mixing-chamber D, and its lower end is a short distance above the bottom of the said mixing-chamber. A transverse slot, L′, is formed in the lower end of the tubular guide L, and the bottom of the transverse slot is provided with the apertures L^2.

Within the tubular guide L the tubular valve-stem M is mounted to slide vertically, said valve-stem being provided with a longitudinal bore, M′. On the lower end of the tubular valve-stem M the head O is formed, along the top of which the beveled shoulder P is provided, which fits against a corresponding seat in the tubular valve-casing. Apertures Q are provided in the tubular valve-stem M, directly above the said beveled shoulder P.

On the top of the tubular guide L the tubular casing R is held, in which the plug R′ is mounted to reciprocate vertically, said plug being surrounded by a spring, R^2, between a cross-pin of the valve and the top of the casing R, thereby pressing the lower end of said valve-plug downward against the seat-shoulder R^3, formed in the top of the tubular guide. The upper end of the plug R′ is pivoted to the end of one shank of an angle-lever, S, pivoted to an arm, S′, of the cylinder, the other end of the angle-lever carrying a roller, S^2, which runs on a cam, S^3, of a shaft, T, parallel with the cylinder, and driven by means of the cog-wheels T′ T^2 from the main shaft A^2. A tube, U, extends from the upper part of the tubular guide L, in which tube U the burner-cap U′ is held, in which cap the igniting flame is lo-

cated. A channel, U^2, extends from the tube U to the upper open end of the tubular valve-stem M′, the lower end of said valve-stem being closed, as shown.

The outlet-valve V for the exhaust-gases is provided with an opening closed by a puppet-valve, V′, the stem of which rests on one end of the lever W, pivoted on the arm W′ of the cylinder, the other end of the lever W carrying a roller, W^2, which runs on a cam, W^3, of the shaft T.

By means of the beveled gearing *a b* the governor-rod *c* is revolved, (from the shaft T,) which may carry a governor of any approved construction, the governor being mounted in such a manner that when the speed increases the governor-rod is moved downward. To permit of said downward movement, the lower end of the rod is provided with the stirrup *d*, through which the shaft T passes, and at the lower end of the stirrup a projection, *f*, is provided, which rests on the free end of the lever *g*, pivoted to the arm W′, and pulled toward the cylinder by the spring *h*, fixed to the cylinder and to said lever. The lever W is provided near the upper end of the lever *g* with a lateral projection, *m*, on which the free end of the lever *g* can rest. When the piston has completed its stroke in the inverse direction of the arrow *a′*, and the exhaust-gas forced out of the cylinder, the piston begins its stroke in the direction of the arrow *a′*, a vacuum is produced at the closed end of the cylinder, and the suction raises the puppet-valve F, whereby the cylindrical valve G on the stem F′ of the puppet-valve F is also raised, whereby the openings H in the valve-chamber are opened and air admitted into the bottom of the valve-chamber, which air passes up through the cylindrical valve G. At the same time the apertures K in the sides of the cylindrical valve G register with the apertures in the sides of the channel J, thus permitting the gas to pass from said channel into the cylindrical valve G, and from the same up through the opening formerly closed by the puppet-valve. The mixture of gas and air, which mixture is completed in the chamber D, is drawn into the rear or closed end of the cylinder, and when the piston makes its first return-stroke in the inverse direction of the arrow *a′* the gas is compressed, and this compression causes the closing of the valves F and G. While the gas is being drawn into the cylinder, the tubular valve-stem M is lowered, and its lower end rests on the bottom of the slot L′ of the tubular guide L. The mixture of gas and air can pass through the aperture L′ in the bottom of the tubular valve M into said valve. When the piston commences its return-stroke in the inverse direction of the arrow *a′*, the mixture of gas and air is compressed, as stated, and some of the compressed gas passes through the apertures L^2 in the bottom of the tubular guide L, and, acting on the bottom of the head on the lower end of the tubular valve M, forces such valve upward. The gas in the bore of the tubular valve M cannot escape, as the upper end of said valve is closed by the plug R′. At the end of that stroke of the piston in the inverse direction of the arrow *a′* at which the gas has been compressed the cam acts on the lever S, whereby the plug R′ is raised, thus permitting a quantity of the mixture of gas and air in the tubular valve M′ to escape and come in contact with the flame in the tube U′. The gas in the tubular valve M explodes and the plug R immediately drops after it has been raised, and said plug forms an abutment for the gases of the explosion, causing the explosion to exert its force downward, whereby the tubular valve M is forced down sufficiently to expose the apertures Q, through which the burning gases can come in contact with the mixture of gas and air in the mixing-chamber D in the rear part of the cylinder, which gases are exploded, whereby the piston is forced outward—that is, in the direction of the arrow *a′*. When the piston has completed its stroke in the direction of the arrow *a′*, the cylinder is filled with products of explosion—that is, the exhaust-gases. When the piston begins its return-stroke in the inverse direction of the arrow *a′* after the explosion, the cam W^3 acts on the lever W, whereby the puppet-valve V′ is raised and the exhaust-air is permitted to pass through the pipe V and out of the cylinder, which valve V′ is immediately closed as soon as the gases have escaped. During the next stroke in the direction of the arrow *a′* a vacuum is again produced in the cylinder, the valves F and G are raised, gas and air drawn into the cylinder, gas and air compressed by the return-stroke of the piston, the valve M raised, the gases ignited, and so on.

In case the engine runs too rapidly, the rod *c* is moved downward by a suitable governor, and, acting on the lever *g*, presses the same downward, which in turn acts on the projection *m* of the lever W, keeping that end of the lever W opposite the one acting on the puppet-valve V′ lowered, whereby the puppet-valve is kept raised more or less, thus permitting the escape of a greater or less quantity of the mixture of air and gas, whereby the force of the explosion is reduced. As soon as the speed of the engine decreases, the rod *c* rises again and the spring *h* can draw the lever *g* from the lateral projection *m* of the lever W, thus permitting the valve V′ to settle down upon its seat.

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

1. The combination, with a cylinder and piston, of a valve-chamber connected with the closed end of the cylinder, which valve-chamber is provided with gas-conducting channels having apertures for establishing communication with the interior of the chamber, such valve-chamber also having apertures for establishing communication with the outer air, and of a puppet-valve and a cylindrical valve

in said chamber, both valves being mounted on the same stem, substantially as shown and described.

2. In a gas-engine, the combination, with a cylinder and piston, of a valve-chamber connected with the closed end of the cylinder and valves in said valve-chamber, a tubular igniting-valve between the valve-chamber and the closed end of the cylinder, a plug closing the upper end of the tubular igniting-valve, a pivoted angular rocking lever connected with the upper end of the plug, a shaft running parallel with the cylinder and operated from the main shaft, and a tappet on said shaft, which tappet operates that end of the rocking angular lever opposite that one connected with the plug and valve-chamber, substantially as shown and described.

3. In a gas-engine, the combination, with the cylinder, piston, and inlet-valves, of the outlet-valve, a lever, W, on which the outlet-valve rests, a cam acting on the lever W, a stirrup, W^3, a governor-rod, *c*, a lever, *g*, spring *h*, and a lateral projection, *m*, on the lever W, substantially as shown and described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

ROBERT VON KALKREUTH.

Witnesses:
OSCAR F. GUNZ,
SIDNEY MANN.