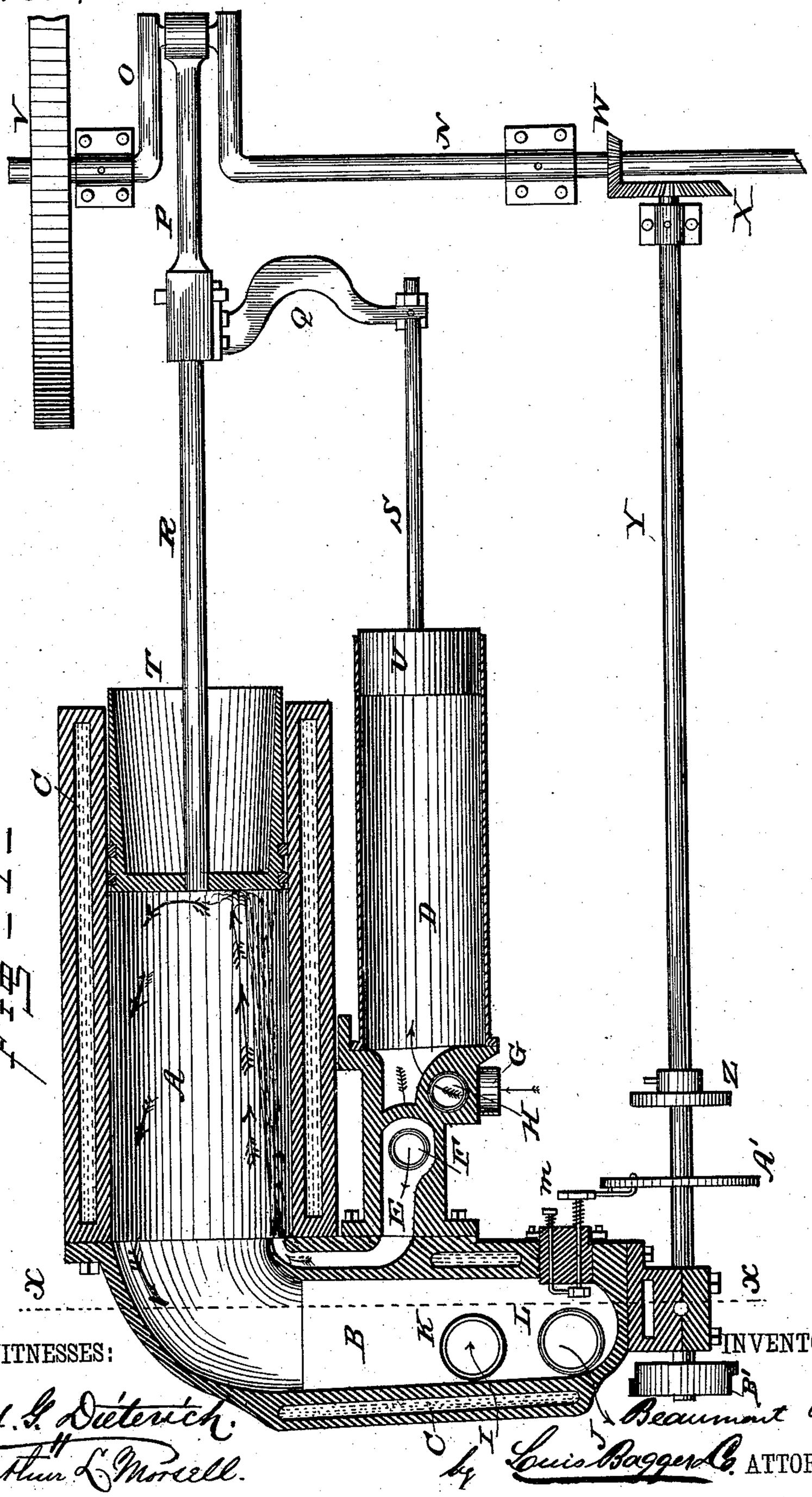
(No Model.)

2 Sheets—Sheet 1.

B. PARKER.

GAS ENGINE.

No. 308,572. Patented Nov. 25, 1884.



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(No Model.)

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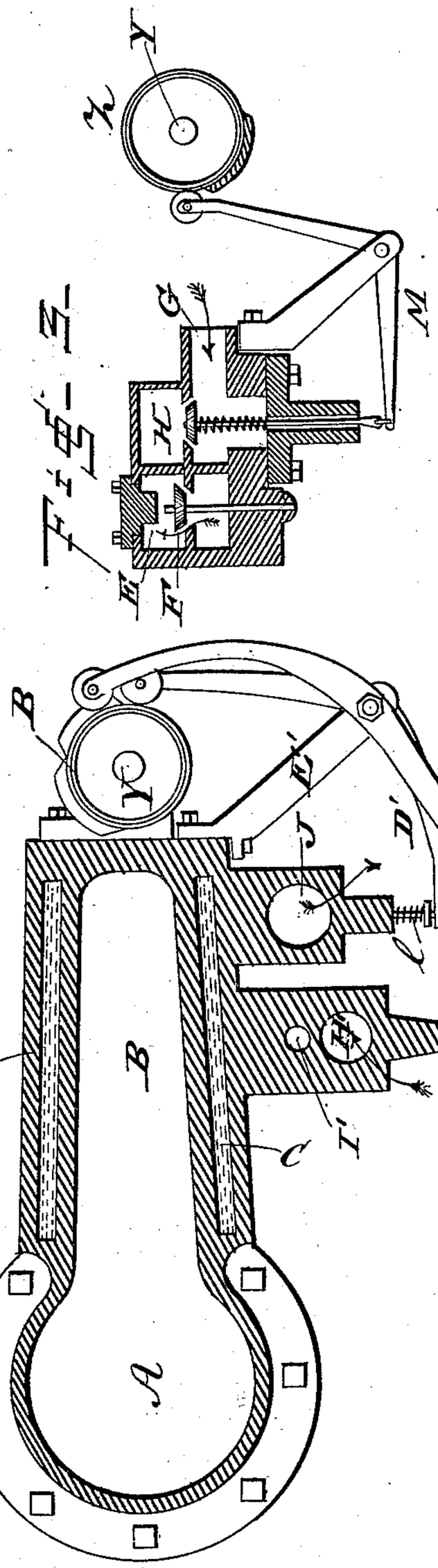

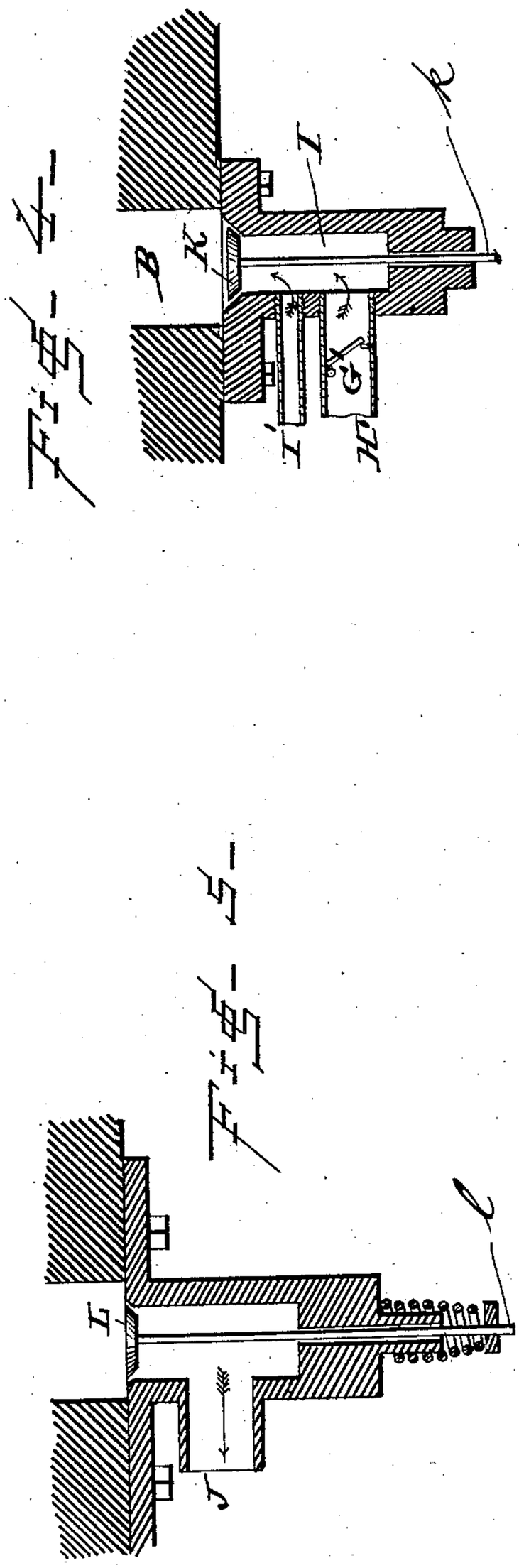

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UNITED STATES PATENT OFFICE.

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GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 308,572, dated November 25, 1884.

Application filed May 14, 1884. (No model.)

To all whom it may concern:

Be it known that I, BEAUMONT PARKER, of Highland, in the county of Doniphan and State of Kansas, have invented certain new and useful Improvements in Gas-Engines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a longitudinal sectional view, on a horizontal plane, of my improved gas-engine. Fig. 2 is a vertical transverse section through the dotted line *x x* in Fig. 1. Fig. 3 is a detail view of the valves and valve mechanism appertaining to the air-cylinder. Fig. 4 is a detail view of the inlet-ports and valve appertaining to the explosion-chamber; and Fig. 5 is a detail view of the exhaust-port and its valve, also appertaining to the explosion-chamber.

Similar letters of reference indicate corresponding parts in all the figures.

This invention relates to gas-engines, and has for its object to provide an engine which shall be compact, simple, and durable in its construction, and yet be of great power and general efficiency.

To this end my improvement consists in the construction and combination of parts, which will be hereinafter more fully described and claimed.

My improved gas-engine comprises a power-cylinder, A, an explosion-chamber, B, and an air-cylinder, D. The parts A and B, which are subjected to great heat, are surrounded by the usual water-jackets, C. The power-cylinder has a piston, T, with a piston-rod, R, and the air-cylinder has a piston, U, with a piston-rod, S, the outer ends of the two piston-rods R and S being connected rigidly by a cross-head, Q, so that they and their respective pistons will move in unison with each other, and with the same length of stroke. The cross-head Q is connected by a pitman, P, to the crank O of the drive-shaft N, which has a fly-wheel or balance-wheel, V, and a bevel-pinion, W, the function of which will be hereinafter described. The rear end of the power-cylinder A opens up into the explosion-chamber or combustion-chamber B, to which the explosive charge is fed through the port or inlet I, while the inert products of combustion are exhausted through the port or outlet J. The air-cylinder D communicates with the rear end of the power-cylinder A through a passage, E, which is provided with a valve, F, Fig. 3, which will open on pressure against it in the direction of the power-cylinder, but will be closed or seated against its seat by pressure in the opposite direction or from the power-cylinder through the passage E in the direction of the air-cylinder. The mouth of the passage E, where it opens up into the power-cylinder at its end, is flush with the side of the same, so that a jet of air forced through the passage E from the air-cylinder D in the direction of the arrow will be injected into the power-cylinder A, near one side of the same, up against the piston T, where the current of injected air will be deflected back along the other side of the cylinder and into the explosion-chamber, as indicated by arrows, thus effectually clearing the power-cylinder of the inert products of combustion resulting from the explosion of the charge. The gas and air which are to form the explosive charge are fed to the explosion-chamber B through the inlet I. (Shown in detail in Fig. 4, by reference to which it will be seen that the inlet has a valve, K, adapted to seat itself to close communication with chamber B.) The inlet I has a gas-port, I′, and an air-port, H′, so that the gas and air will be mixed as they enter the inlet-chamber I, and before they pass, when valve K is open, therefrom into the explosion-chamber B. The stem *k* of the inlet-valve K is actuated by a spring in such a manner that its normal condition will be closed; but it may be opened by pressure on the projecting outer end of the spring-actuated valve-stem, in like manner as the spring-actuated stem *l* of the exhaust-valve L, (shown in detail in Fig. 5,) the said inlet and exhaust valves K and L being respectively actuated by bell-cranks or elbow-levers C′ and D′, in the manner hereinafter to be described. The air-port H′ is provided with a valve, G′, to prevent the escape of air after it has entered the inlet-chamber or mixing-chamber I. The

air-cylinder D communicates with the outer air through the air port or inlet G, Fig. 3, which has a spring-actuated valve, H, operated by a bell-crank, M. Another valve, F, to which reference has already been made, opens or closes communication between the rear end of cylinder D and the air-passage E, said valve F being worked automatically by the pressure in the passage E, within which it is seated, in the manner already described. A shaft, Y, journaled in suitable bearings, has at one end a bevel-wheel, X, which meshes with the pinion W on the drive-shaft or main shaft N. The relative size of the intermeshing wheels W and X is such that shaft Y will make one complete revolution to every two revolutions of shaft N; or, in other words, shaft Y will make one complete revolution for every four strokes of the pistons T and U. Upon shaft Y are suitably fastened a cam, Z, for actuating the bell-crank M, by which valve H is operated, another disk or cam, A′, for actuating the igniting device *m*, which may be of any approved construction, and a third double cam, B′, the office of which is to actuate the alternately-operating valves K and L through the medium of the bell-cranks C′ and D′, which have already been described, and have their fulcrums in an arm, E′, suitably fastened to the frame of the machine. It will thus be seen that the several valves are actuated once for every four strokes of the two connected pistons.

Having in the foregoing described the construction of my improved gas-engine, I shall now proceed to describe its operation, which is as follows: Assume both pistons to be at the end of the instroke, or in position nearest to the explosion-chamber; now ignite the charge with which the explosion-chamber has been filled through the inlet or mixing-chamber I, and both pistons will move outward simultaneously—the one T impelled by the gases which result from the explosion, and the other, U, because its rod S is connected to piston-rod R by the cross-head Q. This outward stroke of piston T is what I call the "power-stroke," and it imparts a one-half revolution to the drive-shaft N. During the outward stroke of piston U valve H in the air-inlet G is open, and air-cylinder D takes in a charge of air while piston T is completing the power-stroke. On the next or return-stroke of the two pistons the charge of air in the air-cylinder is forced through the passage E into the power-cylinder, as has already been described, sweeping out the inert products of combustion, while the power-piston is moving back to the starting-point near the explosion-chamber. This completes one revolution of shaft N and one half-revolution of shaft Y. On the return-stroke of the power-piston a fresh charge of gas and air has been fed into the explosion-chamber through its inlet I, the valve K of which is open at this stage, while the products of combustion have been exhausted through port J, the valve L of which was open, but is closed by its spring at the same time that inlet-valve K is opened by its cam B′ and lever C′. At the next explosion we have the third stroke of piston T, which is the second power-stroke; but as the piston U in air-cylinder D moves outward with this stroke, valves F and H are closed, and there is a vacuum created in the air-cylinder. During the next or fourth movement of the pistons in the direction of the explosion-chamber the charge of gas and air, which has been fed into the explosion-chamber for the next explosion, will be compressed by the power-piston, which is impelled on its return-stroke by the vacuum in the air-cylinder and piston U, which actuates the crank-shaft N through pitman P and cross-head Q, and thus imparts sufficient momentum to the fly-wheel to effectually compress the fresh charge in the explosion-chamber. This compressure of the explosive charge is thus brought about by the direct action of atmospheric pressure against the air-piston in conjunction with the momentum of the fly-wheel. This brings us to the completion of the fourth stroke of the pistons, when one revolution of shaft Y has been completed, and the several operating parts and their actuating mechanism have resumed the position at which they were at the starting-point.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In a gas-engine, the combination of the power-cylinder, the air-cylinder arranged parallel to the same, the two pistons adapted to move in unison with each other, the explosion-chamber, the feed and exhaust valves and the mechanism for operating the same, and the passage leading from the air-cylinder to the open end of the power-cylinder and deflected to adapt it to force the current of air passing through it parallel to the axis of the power-cylinder and against the piston of the same, substantially as and for the purpose set forth.

2. In a gas-engine provided with an air-forcing apparatus for cleaning out the inert products of combustion from the power-cylinder and combustion-chamber, an air duct or passage connecting the power-cylinder and the air-forcing apparatus, having its inlet into the former bent or deflected parallel to the axis of the power-cylinder, substantially as and for the purpose herein shown and described.

3. In a gas-engine, the combination, with a power-cylinder and an air-cylinder located parallel to each other, of a cross-head connecting the piston-rods of both cylinders, a crank-shaft connected by a pitman with the said cross-head, a longitudinal shaft operated by the said crank-shaft or main shaft and equipped with a series of cam-wheels or eccentrics, suitable inlet and exhaust ports and valves, arranged substantially as described, and levers arranged to operate the several

valves and to receive motion from the cam-wheels or eccentrics, substantially as herein described, for the purpose shown and set forth.

4. In a gas-engine, the combination of the power-cylinder, explosion-chamber, air-cylinder, passage connecting it with the power-cylinder, inlet and exhaust ports, valves, the pistons connected rigidly to a common cross-head, the main shaft or crank-shaft, the counter-shaft having cam-wheels or eccentrics, and the levers actuated thereby and operating the valves, all constructed, combined, and arranged to operate substantially in the manner and for the purpose herein shown and described.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

BEAUMONT PARKER.

Witnesses:

J. CARPENTER,

J. R. STEARNS.