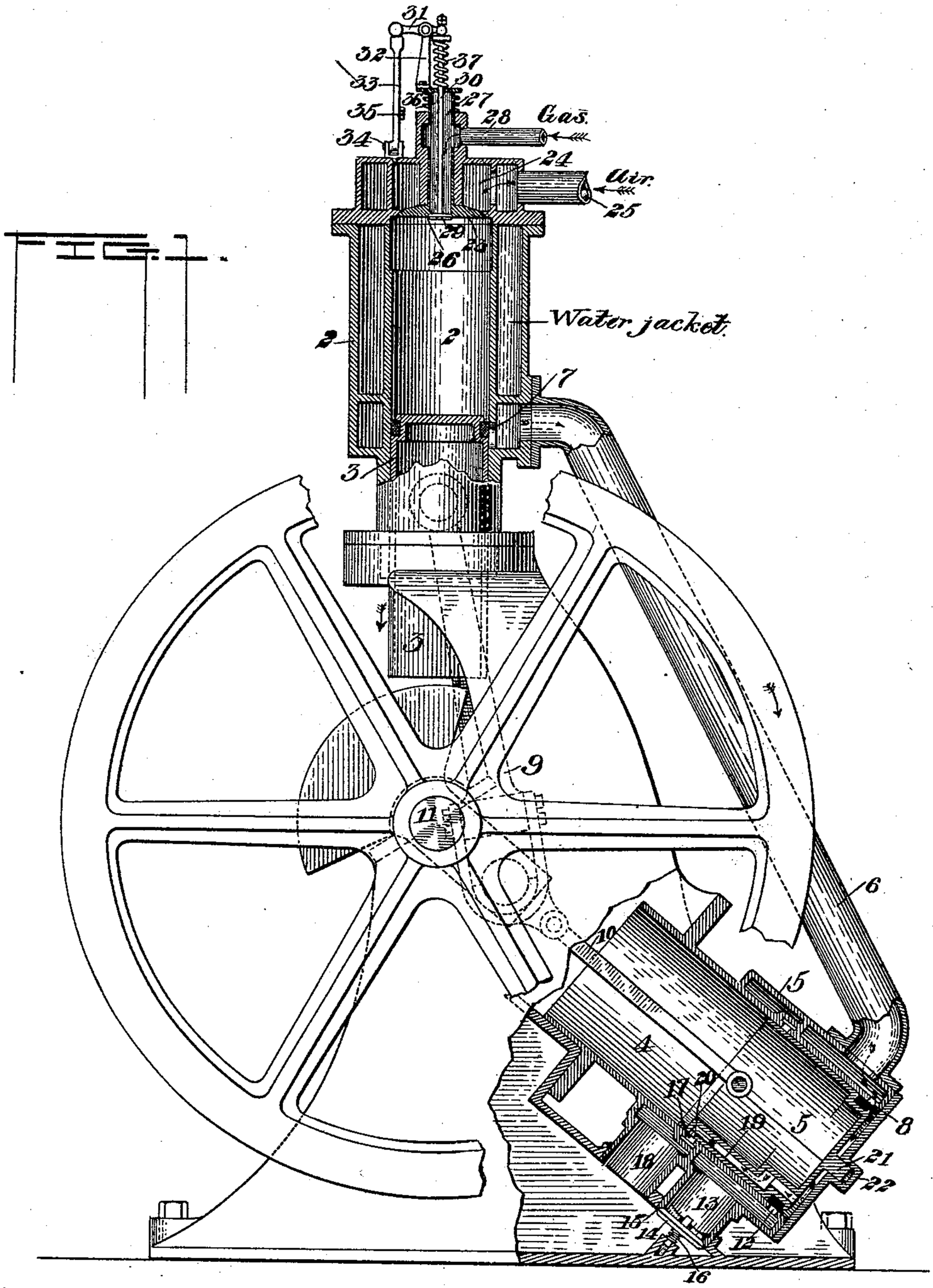
(No Model.)

2 Sheets—Sheet 1.

J. S. CONNELLY.

GAS MOTOR.

No. 457,460. Patented Aug. 11, 1891.



Witnesses.

Edwin R. Conner.

L. A. Conner, Jr.

Inventor.

John S. Connelly

by W. Bakewell & Sons

his Attorneys.

(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

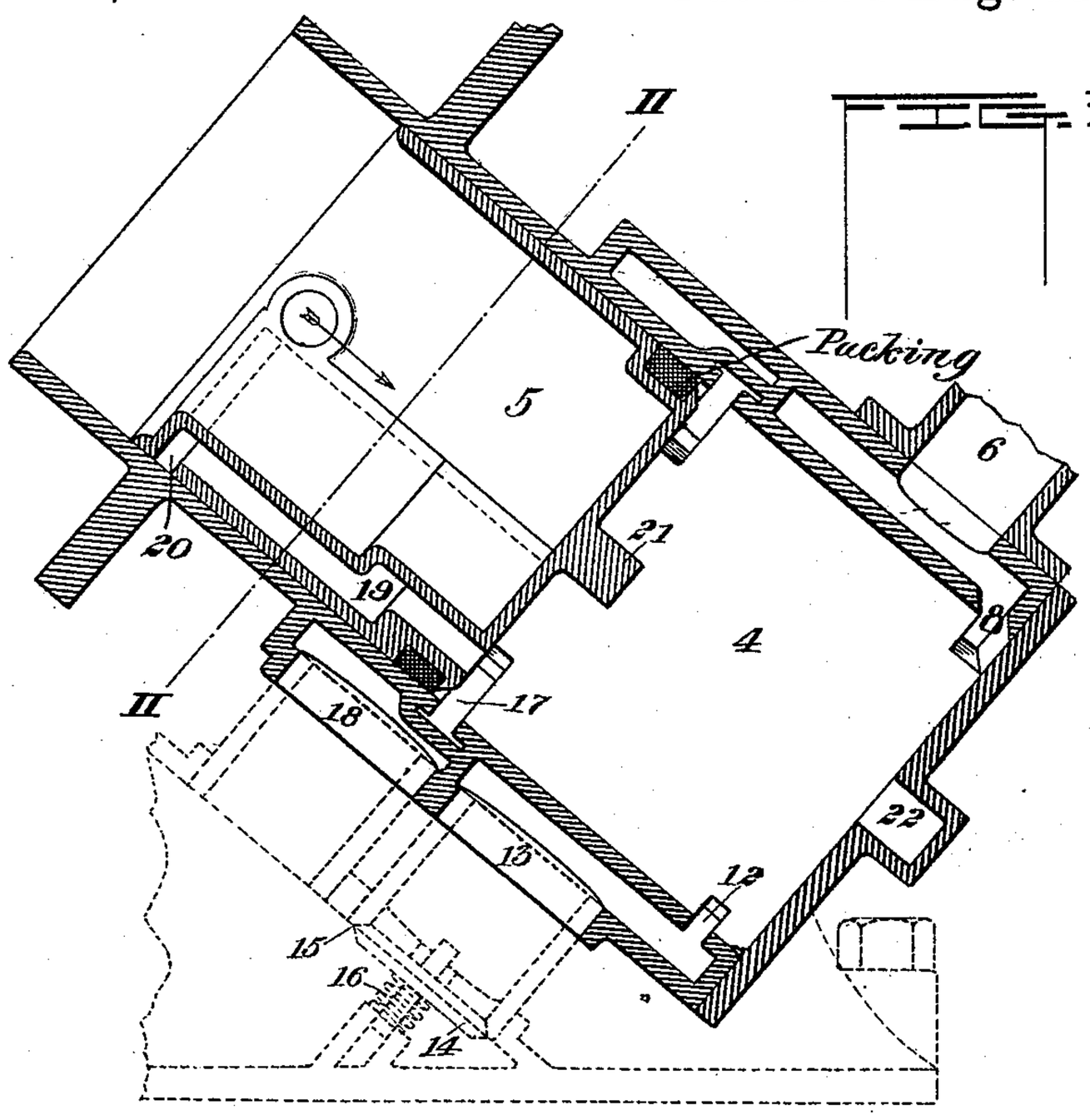
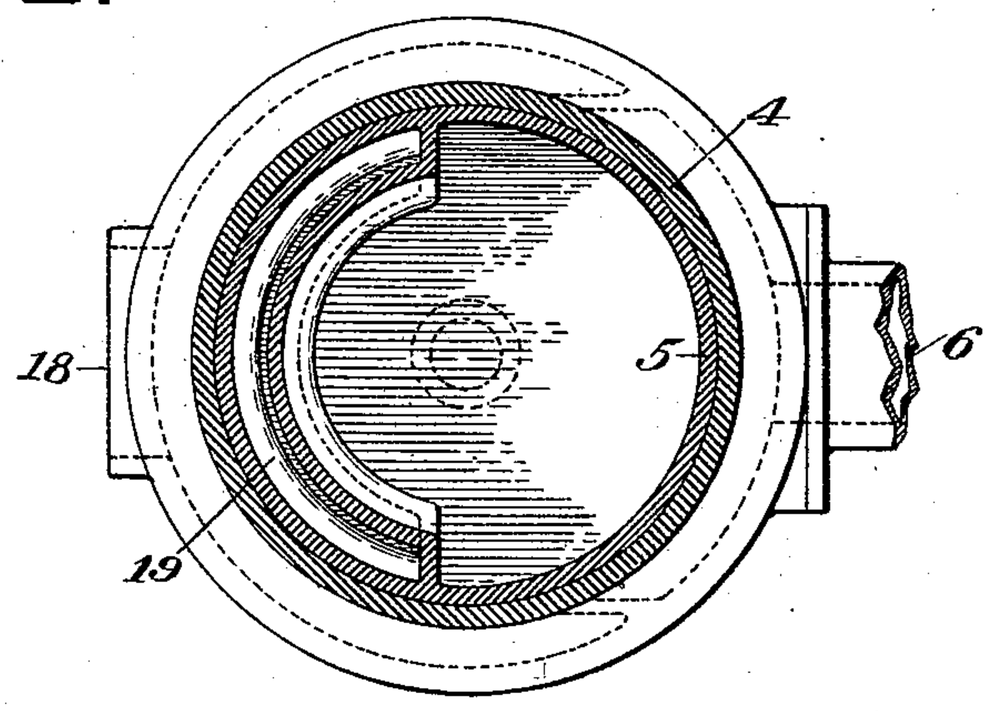


FIG. 2.



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UNITED STATES PATENT OFFICE.

JOHN STORER CONNELLY, OF PLAINFIELD, NEW JERSEY.

GAS-MOTOR.

SPECIFICATION forming part of Letters Patent No. 457,460, dated August 11, 1891.

Application filed February 11, 1891. Serial No. 381,039. (No model.)

To all whom it may concern:

Be it known that I, JOHN STORER CONNELLY, of Plainfield, in the county of Union and State of New Jersey, have invented a new and useful Improvement in Gas-Motors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation of my improved gas-motor, showing the primary cylinder and the charging-cylinder in vertical central section. Fig. 2 is a cross-section on the line II II of Fig. 3. Fig. 3 is a vertical section of the charging-cylinder.

Like symbols of reference indicate like parts in each.

In the drawings, 2 represents the primary cylinder of the gas-engine in which the explosion of the charge is effected.

3 is the piston of this cylinder.

4 is the charging-cylinder, the function and operation of which are hereinafter explained.

5 is the piston of the cylinder 4.

6 is a pipe or channel connecting the primary cylinder at ports 7 near its front end with the charging-cylinder at a port or ports 8 near its rear end. The pitmen 9 and 10 of the pistons of the two cylinders are connected with a crank or cranks on the main shaft 11 of the engine, and the charging-cylinder is preferably set an angle to the line of the primary cylinder, as shown.

12 is a port or series of ports connecting the rear part of the cylinder 4 with an exhaust-passage 13, which is controlled by a puppet-valve 14, seating inwardly against a seat 15 and provided with a seating-spring 16 of small tension.

17 is a port or series of ports leading from a more advanced part of the cylinder 4 and opening into an exhaust-passage 18, which need not be controlled by a valve. The trunk of the piston 5 is preferably provided with a passage 19, opening at a port 20, which at the back position of the piston (shown in Fig. 1) registers with the port 17, and at such back position the port 12 is covered and closed by the piston.

In order to cushion the back-stroke of the piston 5, I prefer to provide it with a projection 21, which enters a cylindrical cavity 22 at the back end of the cylinder. The piston of the primary cylinder 2 is adapted to control the port 7 to open it near the end of the outstroke.

The admission of the explosive charge into the primary cylinder is effected as follows: 23 is a valve of large area, preferably of about the cross-sectional area of the cylinder, and situate at the rear end thereof and adapted to open and close communication between the cylinder and a port 24, into which air is admitted from a suitable inlet 25. In the middle of the valve 23 is a valve-opening 26, communicating with a hollow stem 27, which stem is in communication through a lateral opening with a gas-inlet pipe 28. A valve 29 controls the port 26, its stem 30 passes through the hollow stem 27 and is connected with a lever 31, pivoted to a post 32, which projects from the top of the stem 27.

33 is a lever pivoted at 34 and connected by a rod 35 with the governor of the engine, the construction being such that if the speed of the engine should increase above the desired limit the governor will pull the lever 33 from beneath the lever 31, and that otherwise when the engine is running at normal speed the lever 33 stands beneath the end of the lever 31, as shown.

I do not claim, broadly, the use of the lever or its connection with the governor.

In another patent application, Serial No. 385,151, filed March 16, 1891, I show and describe gas and air inlet mechanism in many respects like that herein shown, together with a special form of governing device operated by compressed air, which governing device is therein specifically claimed.

The operation is as follows: Suppose the parts be in the position shown in Fig. 1, with the primary piston on its outstroke and just about to uncover the port 7, and with the piston of the charging-cylinder at the beginning of its outstroke. As the primary piston proceeds, it uncovers the port 7 and the nearly-spent explosive gases from the cylinder 2 escape through the channel 6 and enter the rear of the cylinder 4, passing through the passage 19 and escaping through the then-connected ports 17 20 to the exhaust-passage 18. As the piston 5 begins its outstroke, it closes the port 17, and the further progress of the

piston, creating a partial vacuum behind it in the cylinder 4 and in the then-connected cylinder 2, causes a suction on the valve 23, which unseats it and admits air into the cylinder 2. Owing to the large area of the air-valve but very little suction is required to open it. The inward motion of the stem 27 of the air-valve carries with it the post 32 and the lever 31, and the end of this lever engaging the lever 33 causes the other end to have a downward motion and to unseat the gas-valve 29, so as to admit gas also into the cylinder. The motion of the piston 5 not only causes the entrance of an explosive charge into the primary cylinder, as thus explained, but sucks out the spent gases of the preceding explosion. This action continues until the piston 3 on its return stroke reaches and closes the port 7 and cuts off communication between the two cylinders, and the remainder of the instroke of the piston 3 is taken up by compression of the indrawn charge. Immediately after the piston has closed the port 7 its pressure, of course, closes the air-valve 23. The stem of this valve and the stem of the valve 29 are preferably provided with springs 36 and 37, tending to lift them to their seats. When the piston 3 reaches and closes the port 7, the rear end of the piston 5 will have uncovered the port 17, so that during the remainder of the outstroke of the piston 5 the opening of this port will permit its free motion without creation of a retarding vacuum. On the instroke of the charging-piston it expels the indrawn gases until it comes to the port 17, after which it compresses the indrawn gases, and such compression opening the valve 14 causes the gases to be expelled during the remainder of the stroke through the port 12 and passage 13 into a suitable exhaust-channel, preferably constituted by the hollow bed-plate of the engine. At the end of the instroke of the piston 3 an igniting device (not shown) ignites the charge of gas in the cylinder 2 and propels the piston, the explosive force being exerted thereon until the rear end of the piston reaches and uncovers the port 7. Thenceforward the cycle of operation of the engine is as described above.

It will be understood that when the speed of the engine exceeds the normal, so that the lever 33 is pulled away from the path of the lever 31, the opening of the air-valve will not open the gas-valve, and the engine will proceed to revolve without explosion until the speed again is reduced to the normal degree.

The advantages of my improvement are that the operation of charging the engine with an explosive mixture is effected by the action of the pistons and the use of specially-constructed cams, and mechanism for operating the valves is dispensed with, the exhaust mechanism is extremely simple, the engine operates with little noise, and the expulsion of the exploded gases and the indraft of the explosive gases is effected accurately and thoroughly.

It will be understood by those skilled in the art that the engine is capable of modification in various ways within the scope of my invention.

The purpose of the passage 19 is to permit a preliminary exhaust of the gases and to cause the cylinder 4 to act solely as a charging-cylinder, not as a motive-cylinder. With suitable modification, however, this passage may be dispensed with.

I claim—

1. A gas-engine having a primary cylinder and a second charging-cylinder, each provided with a piston and being connected, the primary cylinder being provided with a suction-operated valve for the inlet of the explosive charge and the piston of said cylinder being adapted to open and close communication between the two cylinders, whereby when said communication is established a suction is created and the valve opened thereby, substantially as and for the purposes described.

2. In a gas-engine, the combination of the primary cylinder and a second exhaust and charging cylinder connected therewith and provided with a valve opened by outward pressure for the expulsion of the exhaust, said cylinders having pistons, and an inwardly-acting suction-valve in the primary cylinder for the admission of the explosive charge, substantially as and for the purposes described.

3. In a gas-engine, the combination of the primary cylinder and a second exhaust and charging cylinder connected therewith and provided with a valve opened by outward pressure for the expulsion of the exhaust, said cylinders having pistons, said valve communicating with the charging-cylinder through a port at its rear portion and a second port situate at a more forward portion of the charging-cylinder and adapted to be opened by the piston thereof, substantially as and for the purposes described.

4. In a gas-engine, the combination of the primary cylinder and a second exhaust and charging cylinder connected therewith and provided with a valve opened by outward pressure for the expulsion of the exhaust, said cylinders having pistons and said valve communicating with the charging-cylinder through a port at its rear portion and a second port situate at a more forward portion of the charging-cylinder and adapted to be opened by the piston thereof, and a passage 19, extending through the trunk of the piston and adapted to register with said forward port at a portion of the stroke of the piston and at a time when the valve-controlled port is closed by said piston, substantially as and for the purposes described.

5. A gas-engine having a primary cylinder and a second charging-cylinder, each provided with a piston and being connected, the primary cylinder being provided with a suction-operated valve of substantially the cross-sectional area of the primary cylinder for the inlet of

the explosive charge, and the piston of said cylinder being adapted to open and close communication between the two cylinders, whereby when said communication is established a suction is created and the valve opened thereby, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 9th day of February, A. D. 1891.

JOHN STORER CONNELLY.

Witnesses:
M. J. MAWHINNEY,
E. S. ELDREDGE.