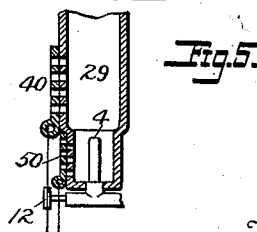
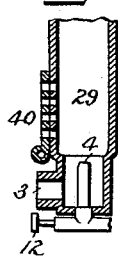
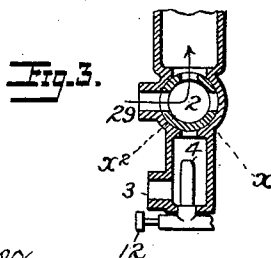
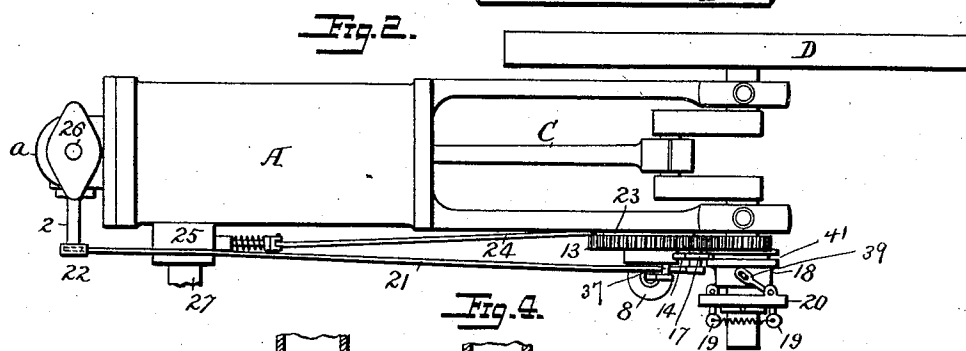
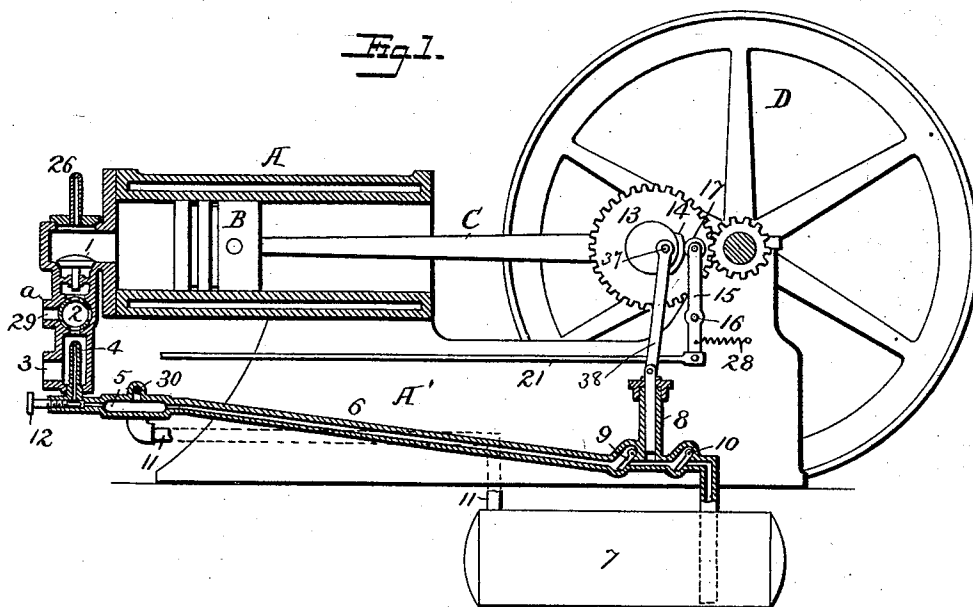


(No Model.)

J. A. CHARTER.
GAS ENGINE

No. 477,295.

Patented June 21, 1892.



Witnesses
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UNITED STATES PATENT OFFICE.

JAMES ADAMS CHARTER, OF STERLING, ILLINOIS, ASSIGNOR OF ONE-HALF
TO JOHN CHARTER, OF SAME PLACE.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 477,295, dated June 21, 1892.

Application filed September 10, 1891. Serial No. 405,264. (No model.)

To all whom it may concern:

Be it known that I, JAMES ADAMS CHARTER, a citizen of the United States, residing at Sterling, in the county of Whiteside and State of Illinois, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

My invention relates to gas-engines; and it has for its object to improve the construction and arrangement of such devices and to simplify and render them certain of operation and not liable to get out of order under varying conditions.

It consists in a gas-engine embodying the general features of arrangement and construction substantially such as are more particularly hereinafter pointed out.

Referring to the accompanying drawings, in which I have illustrated an engine embodying my invention, Figure 1 is a vertical section. Fig. 2 is a plan, and Figs. 3, 4, and 5 are vertical sections, of the valve devices, showing modifications.

I have shown my invention as applied to a typical gas-engine, in which there is the usual cylinder A, mounted upon a base A' and provided with the piston B, connected by a piston-rod C to the crank of the driving-wheel D, which is also mounted on the base. The valve-controlling devices are attached to the end of the cylinder A, being inclosed in a suitable case a, which also forms the explosion-chamber for the engine. The valve-chamber is separated from the explosion-chamber by an automatic valve 1, and in the valve-chamber I arrange a rotary three-way valve 2, it being shown in Fig. 1 in the position to admit gas or air or hydrocarbon and air into the explosion-cylinder.

The valve-case a is provided with a port 3. Opening to the air and arranged in the valve-case is a pipe or nozzle 4 for admission of the gas or hydrocarbon. Connected to this nozzle is a chamber 5, which by means of a pipe 6 is connected to the reservoir 7, and a pump 8, having suitable check-valves, as 9 and 10, is interposed in the pipe between the chamber 5 and reservoir 7. The chamber 5 is provided with an elevated portion 30, which forms an overflow to the chamber and is con-

nected by the pipe 11 to the reservoir 7. The flow of the hydrocarbon from the chamber to the nozzle in the valve-chamber is controlled by a stop-cock 12. In order to operate these valves and their connections at proper times, I provide means which are connected to the shaft of the engine to control them, and in the present instance I have shown a large gear-wheel 13, meshing with the pinion on the shaft, the relative proportions of the pinion and gear-wheel being as two to one, so that the gear-wheel 13 will make one complete rotation at two complete rotations of the shaft and gear-wheel carried thereby.

Mounted on the pinion 13 is a cam 14, and pivoted on the frame of the engine, as at 16, is a lever 15, carrying on its end a friction-roll 17, which is arranged to engage the cam 14 in the manner hereinafter set forth. This lever 15 is provided with a spring 28, which normally holds the friction roll against the cam, and it is connected by means of a rod 21 to the arm 22 of the valve 2 in the valve-chamber.

Loosely mounted on the shaft of the machine is a sleeve 18, which is provided with a groove 41, which engages the friction-wheel 17 of the arm 15 and moves it laterally on its bearing. Also mounted on the shaft is a disk 20, which is fast thereto and which carries the governor-balls 19, which are in turn connected by an arm 39 to the collar 18 and by means of which the collar is slipped laterally on the shaft, in accordance with the position of the governor-balls, and this in turn moves the friction-wheel 17 into and out of the path of the cam 14. When the engine is running at normal speed, the roller 17 is in the line of the cam and the lever 15 is operated at each rotation of the gear-wheel on the induction stroke of the piston. When, however, the speed is increased, the governor-balls expand and draw the sleeve outward, carrying the roller 17 out of the line of the cam, it sliding on the stud at the end of the lever 15, and the lever will not be operated by the cam, but the spring 28 will operate the valve 2 through the medium of the rod 21 to move it into its closed position. (Shown in Fig. 3.) Arranged on the inside of the gear-wheel 13 is a cam or projec-

tion 23, which engages a rod 24, leading to the exhaust-valve 25 in the exhaust-pipe 27.

The engine being thus constructed its operation will be clearly understood, it belonging to what is known as the "alternate-explosion" or "four-cycle" type of engine. The parts are shown in Fig. 1 as being on the stroke to draw in a charge of inflammable or explosive mixture, the roller 17 being on the cam 14, which by its connections opens valve 2, so as to leave an open channel for air to be drawn into the cylinder through the port 3. It will be seen that this air-port extends around the oil or hydrocarbon nozzle 4, and the reduced pressure or suction which draws in the air will also draw a proper quantity of oil or other hydrocarbon through the nozzle and carry it into the explosion-chamber of the engine, the valve 1 rising to admit them. When, however, the piston makes its back-stroke, the valve 1 closes and the charge is compressed within the cylinder and ignited by means of the incandescent tube 26 or other suitable and equivalent means and the piston is driven outward in the usual way. When the piston reaches its farthest outstroke, the cam 23 comes in contact with the rod 24, which opens the exhaust-valve 25 and allows the products of combustion to be expelled through the pipe 27 during the instroke of the piston, and as this is done the spring on the rod 24 immediately closes the exhaust-port. When, however, the speed of the engine exceeds its normal, the governor-balls expand, carrying the sleeve 18 outward, and this moves the roller 17 out of the path of the cam 14 and the spring draws the lever 15 forward and turns the valve 2 to the position shown in Fig. 3, closing the passage to the air-port 3 and the nozzle 4, but opening communication directly with the air through the port 29, and as long as the engine is running above its normal speed this port will remain open and the air alone will be drawn into the cylinder and expelled through the exhaust-port and no explosion will occur. When, however, the speed attains its normal and an explosive charge is required, the roller 17 will be allowed to again come into the path of the cam 14, which will give the valve 2 a turn, so as to open it, being in the position shown in Fig. 1. On the further operation of the engine the charge of air and oil or hydrocarbon or other gas will be drawn into the explosion-chamber, as before, and the engine continue to run in this way until it again exceeds its normal speed. The pump 8 is operated from an eccentric-pin 37 by means of a pitman 38 and operates to supply the reservoir 5 with oil or hydrocarbon from the tank 7, and as this pump will operate at each rotation of the gear-wheel 13 it is necessary to provide some means to prevent forcing the oil into the valve-chamber when no explosion takes place. To obviate this, I connect the chamber 5 by means of the overflow projection 30 and pipe

11 with the reservoir 7, and it will be seen that with this arrangement under all conditions there is a uniform amount of oil in the chamber 5, so that whenever the air is drawn into the engine through the valve 3 there will be a uniform quantity of hydrocarbon supplied to the air to carburet it and render it explosive. Under no circumstances will there be danger of flooding the engine or room where the engine is located, the tank being located, preferably, below the valve-chamber, so that the excess of oil in the reservoir and nozzle will flow by gravity into the tank.

Instead of using the three-way rotary valve 2 I have shown in Fig. 4 a modified valve, the opening 29 being grated and a grated sliding valve 40 being applied thereto in front of the port and being connected to be operated by the rod 21 and the cam and connections in a manner precisely similar to the rotary valve. This arrangement, however, is open to the objection that when the engine is running too rapidly and the valve 40 is open some air might be drawn into the valve-chamber through the port 3, and a slight portion of oil might also flow through the nozzle, which, while not enough to thoroughly carburet the charge, might be an objection and wasteful. This, however, can be readily avoided by providing two sliding valves, and in Fig. 5 I have shown a sliding grated valve 50 covering the port 3 of the valve-chamber, and both of the valves 40 and 50 are connected to be operated by the rod 21 in such a manner that when valve 40 is closed the valve 50 is open, and vice versa. This arrangement effectively overcomes any objections that could be raised to the sliding valve shown in Fig. 4 and makes a somewhat cheaper valve arrangement than the rotary three-way valve shown in Figs. 1 to 3, and which in some cases I have found advantageous to use.

From the above description it will be understood that I do not govern or measure the charge of oil or hydrocarbon drawn into the valve-chamber, but I change the direction or passage of the air through the valve-chamber under the varying conditions, so that when an explosive mixture is to be made the air will pass through the port around the nozzle and a sufficient amount of oil or hydrocarbon to carburet it will be automatically drawn in; but when no explosion is to occur the air will pass through the upper port 29 and will not be carbureted. I thus attain great safety and simplicity of operation and supply the oil to the engine at the proper times without any delicate valve or measuring mechanism which is usually operated by a governor. Furthermore, there is no waste of the oil, the surplus being returned to the tank from the chamber 5 and pumped up over and over again.

All the operative parts of the engine are of simple construction, being cheap to manufacture and not liable to get out of order, and occupy little space, while furnishing means

for the automatic regulation of the engine under varying loads.

While I have thus described and illustrated the preferred embodiment of my invention, it will be understood that the details of construction and arrangement may be varied by those skilled in the art without departing from the principles thereof, and I therefore do not limit myself to the precise construction and arrangement shown, as other equivalent arrangements may be used and operated in accordance with my invention.

What I claim is—

1. In a gas-engine, the combination, with the explosion-chamber, of a valve-casing having two air-ports, a valve controlling the passage of air through the ports, and means for automatically opening communication alternately between the combustion-chamber and one or the other of said air-ports, substantially as described.

2. In a gas-engine, the combination, with the explosion-chamber, of a valve-casing having two air-ports, a valve and its operating devices for opening said air-ports alternately, and an oil-nozzle extending into the casing, so that the air from one of the ports will traverse the nozzle, substantially as described.

3. In a gas-engine, the combination, with the explosion-chamber, of a valve-chamber, an automatic valve between the explosion-chamber and valve-chamber, the valve-chamber being provided with two air-ports and a nozzle extending into the chamber past one of the air-ports, and a valve and its operating devices for opening said air-ports alternately, substantially as described.

4. In a gas-engine, the combination, with the explosion-chamber, of the valve-casing having two air-inlet ports and a three-way

valve and operating devices therefor for opening said ports alternately, substantially as described.

5. In a gas-engine, the combination, with the valve-chamber, of the nozzle extending into the chamber, a pump supplying oil to said nozzle, and an overflow-chamber interposed between the nozzle and pump, substantially as described.

6. The combination, with the valve-chamber and nozzle extending therein, of a reservoir, a pipe leading from the reservoir to the nozzle, a pump located in said pipe, and an overflow-chamber also located in said pipe and connected to the reservoir, substantially as described.

7. In a gas-engine, the combination, with the explosion-chamber, of the valve-chamber having two air-inlet ports, a valve and operating devices therefor for opening said ports alternately, a nozzle extending into the chamber adjacent to one of the ports, a reservoir connected to the nozzle by means of a pipe 6, a pump arranged in the line of said pipe, and a pipe 11, connecting the pipe 6 with the tank, substantially as described.

8. In a gas-engine, the combination, with the valve-chamber having two air-inlet ports, of a valve arranged to open said ports alternately, a gear-wheel connected to the shaft of the engine and carrying a cam, and a lever operated by the cam and connected to operate the valve, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES ADAMS CHARTER.

Witnesses:

M. SCOTT,

W. T. STEWARD.