No Model.)

J. A. CHARTER.

GAS ENGINE.

No. 473,293. Patented Apr. 19, 1892.

Fig. 1.

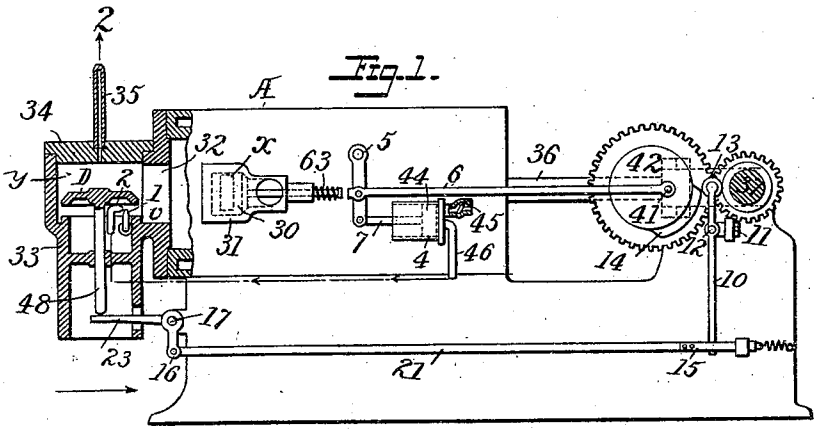


Fig. 2.

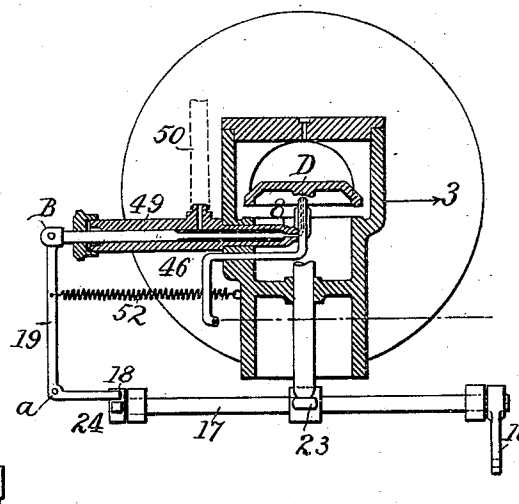


Fig. 3.

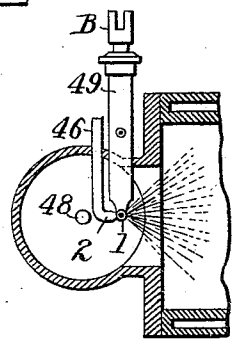
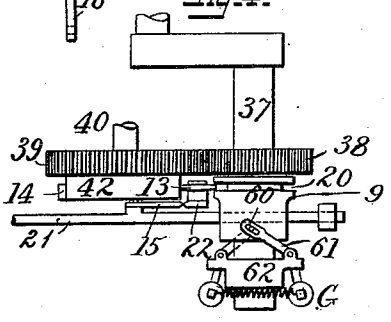


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

JAMES A. CHARTER, OF STERLING, ILLINOIS.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 473,293, dated April 19, 1892.

Application filed May 2, 1891. Serial No. 391,396. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. 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 consists of a gas-engine provided with an atomizer and means, fully set forth hereinafter, whereby to control the flow of the fluids through the atomizer and to the engine.

In the accompanying drawings, Figure 1 is a side elevation, in part section, showing a gas-engine embodying my improvements. Fig. 2 is an enlarged transverse section on the line 2 2, Fig. 1, looking in the direction of the arrow. Fig. 3 is a part section on the line 3 3, Fig. 2. Fig. 4 is an enlarged plan showing the governor and connections.

The power-cylinder A is constructed in any usual or suitable manner, and an exhaust *x*, controlled by a valve 30 in a casing 31, with an inlet-port 32, communicating with a combustion-chamber *y* in a casing 33. The detachable top 34 is provided with an ordinary tube-ignitor 35, and the main piston is connected by a rod 36 with the crank of the crank-shaft 37. Upon the crank-shaft is a pinion 38, gearing with a wheel 39 upon a counter-shaft 40, the sizes being as one to two, so that there will be two revolutions of the shaft 37 to each revolution of the shaft 40. A wrist-pin 41 upon a disk 42 of the shaft 40 is connected by a rod 6 to a lever 5, hung at the side of the cylinder and connected at the lower end by a rod 7 to a piston 44 in a cylinder 4, constituting an air-pump, to which air is admitted through a casing containing an inlet check-valve 45 and from which air is forced through a pipe 46 to an injector-nozzle 2, arranged to point toward the inlet-port 32 and projecting slightly above the seat *v* of a movable hood or cap D, shown as being in the form of an inverted dish covering the nozzle 2 and connected to a vertically-sliding rod 48, the whole arranged within the induction-chamber *y*. Immediately in front of the nozzle 2 is the vertical nozzle 1 of a casing 49, communicating with an oil-inlet pipe 50, leading to a suitable reservoir of oil elevated or under pressure, and in said casing is a valve 8, which may be moved to allow the oil to flow in the nozzle 1 or to cut off the flow. As shown, the valve is the tapering end of a sliding valve-rod adapted to be thrown outward at intervals to permit the flow of the oil and which may be operated in any suitable manner. Thus the valve-rod is connected to a crank-lever 19, drawn inward by a spring 52 and thrown outward by the contact of a stud 24 on a rock-shaft 17, swinging in brackets on the frame and reciprocated by the vibration of the lever 10, swinging on a pivot 12, provided with a roller 13, adapted to make contact with a cam 14 on the disk 42, with means for connecting the lever 10 to a rod 21, sliding in suitable bearings and connected to an arm 16 of the shaft 17. The shaft 17 also carries an arm 23, that extends under the rod 48, carrying the hood D. The lever 10 is capable of rocking upon its fulcrum-pin 11, and the roller 13 enters a groove 20 in a sliding hub 9 on the shaft 37, and pins 60 on said hub enter slots in arms 61 of a governor G, provided with balls and retracting-springs 62, and when the engine moves too fast the governor draws out the hub 9 and carries the lever 10 outward, so that a sharp-edged blade 22 on said lever shall be carried to one side of a similar blade 15, carried by the rod 21, thereby preventing any action of the lever 10 upon said rod and any movement of the hood D or valve 8, so that in such case no oil will be fed to supply the charge of the engine until the speed of the latter so decreases that the edges of the plates 15 22 will make contact. The end of the rod 6 is arranged to make contact with the end of the rod 63, carrying the exhaust-valve, so as to open the latter at every other reciprocation of the piston.

The operations of the above-described parts are as follows: Assuming that an explosion has occurred in the combustion-chamber, the piston is driven forward. On the return stroke the exhaust-valve is open and the spent gases escape. The hood D then rises, and as the piston is then moved forward the exhaust closes, the pump 4 forces a charge of air out of the nozzle 2 across the nozzle 1, the valve 8 opens, and the air-jet sprays the oil, combines it intimately therewith, and enters the cham-

ber and cylinder, while the piston is moving forward. The piston then moves back, the valve 8 is closed, the hood descends and covers the nozzles, the pump takes in a new charge of air, and after the piston reaches its rear position the charge is ignited and the piston is driven forward, as before.

The use of that class of gas-engines in which the explosive gas is formed by mixture of air and volatilized gasoline is objectionable in consequence of the premium required by insurance companies where gasoline is employed. The use of kerosene-oil is, however, but little objected to, and I have found that by acting upon the oil with a strong jet or blast of air I am enabled to preserve the liquid form of the oil until the moment when it is atomized and to secure by such atomizing an explosive mixture which is as effective as one resulting from volatilizing gasoline. While I have described a jet-atomizer of a particular character, any of the usual forms of atomizer which will serve the purpose may be employed either in connection with a pump forcing the air at each stroke or with a reservoir of air periodically put into communication with the nozzle 2. A pump operating at each stroke is, however, less expensive and equally effective. Inasmuch as I act directly upon the liquid oil without vaporizing, there is no condensation, as when vapors are used, while the engine can be started up at any time, which is not the case when a vapor must be first generated, and the delays resulting from generating such vapors, especially in cold weather, are prevented. By arranging the jet to throw the spray directly into the main cylinder I avoid bringing it in contact with surfaces which would condense it, and by covering the atomizer with a hood or cap when the explosion takes place I avoid heating the atomizer unduly or driving the gases back into the channels of the atomizer and clogging them, while the lifting of the hood prevents the jet from being thrown upon the hood. By the use of a governor cutting off the supply of oil when the engine exceeds its proper speed I not only regulate the speed of the engine, but also avoid the necessity of any nice regulation of the air-pump 4, as the air-jet can produce no effect upon the oil so long as the valve 8 is closed. The hood D may be raised by the sucking action of the main piston instead of by the arm 23. The positive action is, however, preferable, and when the hood is a made in a different form, as may be the case, such action is frequently necessary.

While I have described one form of governor whereby the oil-valve is thrown into and out of connection with the operating devices, it will be evident that various forms of governors and connections may be employed with equal efficiency.

Without limiting myself to the precise construction and arrangement of parts shown and described, I claim—

1. The combination of the atomizer, oil-valve, reciprocating-rod for operating the valve and carrying the plate 15, vibrating lever carrying the plate 22 for engaging the plate 15, and governor connected to shift the lever laterally, substantially as described.

2. The combination of the cylinder having an explosion-chamber at the rear end, an atomizer arranged to deliver a spray directly into the cylinder, and a reciprocating valve-cap arranged to cover the atomizer when down, substantially as described.

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

JAMES A. CHARTER.

Witnesses:
JOHN CHARTER,
JOSEPH F. UTLEY.