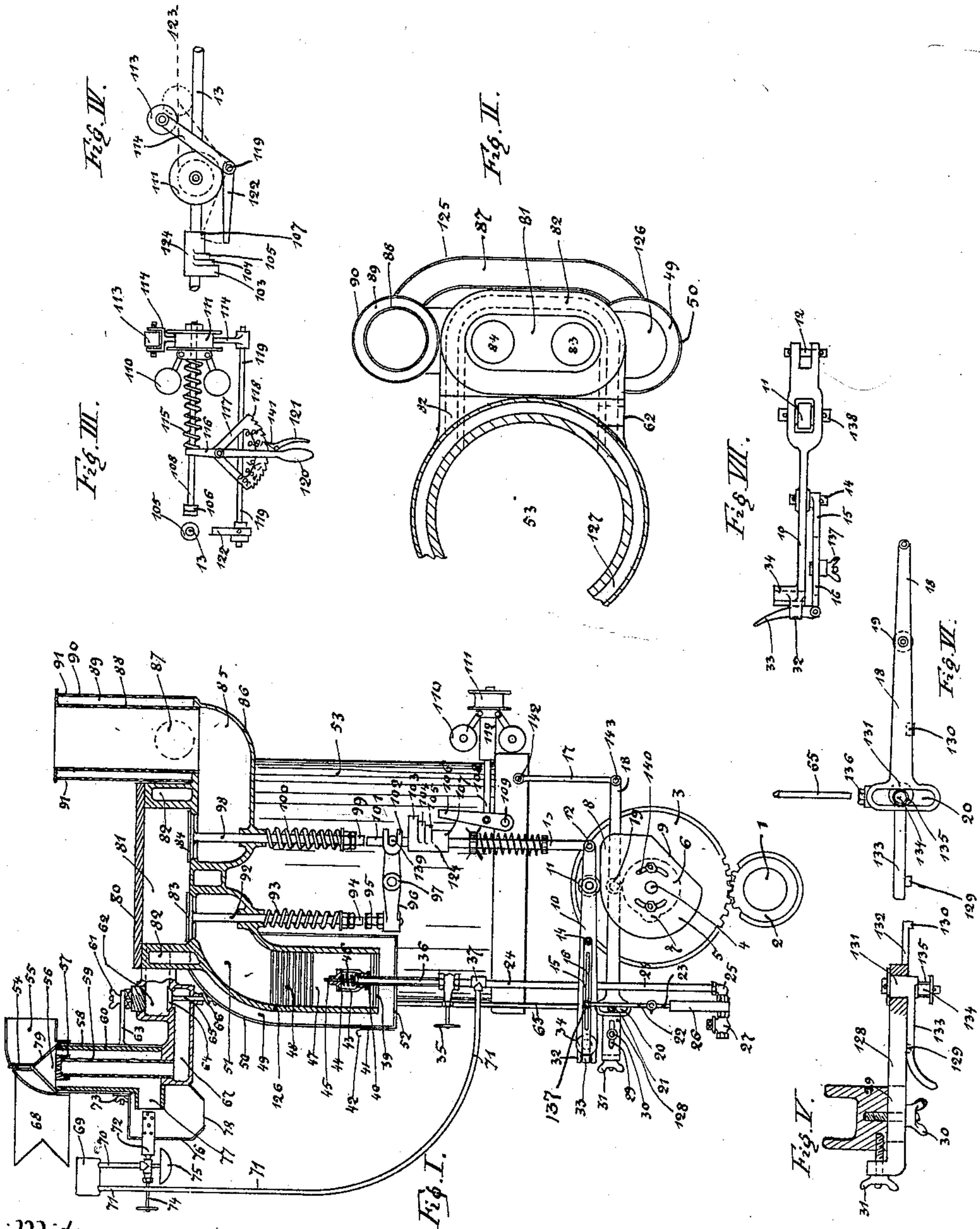


(No Model.)

C. QUAST.
GAS ENGINE.

No. 584,961.

Patented June 22, 1897.



Witnesses:
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UNITED STATES PATENT OFFICE.

CHARLES QUAST, OF MARION, OHIO.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 584,961, dated June 22, 1897.

Application filed November 6, 1894. Serial No. 528,115. (No model.)

To all whom it may concern:

Be it known that I, CHARLES QUAST, a citizen of the United States, residing at Marion, in the State of Ohio, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates particularly to a gas-engine having a vaporizer and fuel-pump and in which the supply of fuel is controlled by a governor which also controls the valve mechanism.

Figure 1 is a section through valves, burner, and igniter-valve. Fig. 2 is a sectional plan through air-conduit and cylinder, showing valve-chest. Figs. 3 and 4 show governor. Figs. 5 and 6 show the igniter mechanism. Fig. 7 shows pump mechanism.

Crank-shaft 1 carries gear 2, which meshes in gear 3. Shaft 4 carries igniter-cam 6, valve-cam 5, and gear 3. Cylinder 53 carries the valve-chest, which contains suction-valve 83 and discharge-valve 84. Beneath suction-valve 83 is vaporizer 126, which is composed of screens 39, chamber 47, screens 48, and chamber 51. Vaporizer 126 is surrounded by hull 50, which forms conduit 49. Hull 50 has a gate 41 and has bottom 52. Hull 50 is connected by pipe 125 with heating-pipe 90. Heating-pipe 90, having openings 91, surrounds exhaust-pipe 88, forming chamber 89. Chambers 89 and 49 are connected by conduit 87. Suction-valve 83 has valve-stem 92 and spring 93.

Discharge-valve 84 has valve-stem 98 and spring 100. Lever 10 fulcrums at 34 and carries roller 11, which rides upon cam 8. Lever 10 carries at 12 stem 13, which carries governor-catch 124, said governor-catch having steps 103, 104, 105, and 107. Stem 13 connects by pin 139 with fork 102, which pivots at 97 and carries regulating-screw 95. Lever 10 carries, fulcrumed at 14, slotted pump-lever 15, which carries handle 33, which is pivotally jointed on said lever and is locked between projections 32 of lever 10. Pump-rod 22 is fastened by bolt and thumb-screw 137 in slot 16 of lever 15 at one end and at the other end connects with pump-piston 23, which fits in pump-barrel 26, which has suction-valve 27 and discharge-valve 25, which connects by

pipe 24, coupling 37, hand-valve 35, and pipe 36 with pressure check-valve 40, and also pipe 71 with reservoir 69. Lever 18 is connected at 143 and hangs on rod 17, which is pivoted at 142 on the cylinder. Lever 18 carries roll 19, which rides on cam 6. Lever 18 has slot 20, which slides over roller 135, which is pivoted on pin 134. Pin 134 is set out of the center of disk 131, which has a handle 133. Lever 18 carries adjusting-bolt 136, which is in line with igniting-rod 65. Support 128 carries pivot 131 and supporting-arm 132, with projections 130 and 129. Support 128 has a slot 29, which is held in position by thumb-screw 30 and 31. Igniting-chamber 62 connects with explosion-chamber 81. Chamber 67 is separated from chamber 62 by igniting-valve 64, which has rod 65 and spring 66. Tube 59 connects with chamber 67 on one end and carries cap 57, with small hole 56 on the other end. Chimney 58 is lined with asbestos 60 and carries on the top elbow 55, which carries wind-blade 68. Elbow 55 is pivotally supported on pin 54. Fuel-tank 69 connects with pipe 70 and needle-valve 74 with burner 72. Opening 77 of chimney 58 and burner 72 is surrounded and incased by casing 76, which has opening 78 in its bottom. Incasing 76 is carried at 73 by chimney 58. Chimney 58 is carried by bracket 63. Governor-dog 106 is pivoted at 109 and connects with governor-rod 108. Governor-rod 108 carries pulley 111, governor-balls 110, and spring 115.

Shaft 119 carries lever 114, which carries roller 113, which rides on belt 123. Shaft 119 carries dog 122. Quadrant 117 has notches 118 and a graduated scale. Quadrant 117 carries lever 116, which has handle 120, which carries latch 141 and latch-piece 121. Pipe 36 carries check-valve casing 44 and check-valve 40. Spring 46 presses upon check-valve 40. Cylinder 53 is surrounded by water-jacket 127, which connects with jacket 82, surrounding the valve-chest.

The operation is as follows: The engine is to suck gas during one stroke, compress it during the second stroke, ignite it and expand it during the third stroke, and expel the waste products during the fourth stroke. The rotating of the crank-shaft 1 and gear 2 will rotate gear 3, shaft 4, valve-cam 5, and

igniter-cam 6. Valve-cam 5 has high part 8 and low part 9. As the cam rotates part 8 will raise roller 11, lever 10, rod 13, governor-catch 124, and lever 96. This raising will cause discharge-valve 84 to rise, will compress spring 100, and allow the burned gases to escape. When roller 11 leaves the high part 8 and comes to the low part 9, then roller 11, lever 10, rod 13, governor-catch 124, and lever 96 will lower and open suction-valve 83 and compress spring 93, thus allowing the gases of chamber 51 to enter into chamber 81 and cylinder 53. During the upward motion of roller 11 pump-plunger 23 is raised and has sucked a charge of oil, which is discharged, when the plunger moves down into pipe 24, into burner-tank 69 and compressed until the pressure raises the pressure-valve 40 during the downward motion of roller 11. The discharging of fuel into chamber 47 begins as soon as the discharge-valve 84 starts its return stroke and continues until suction-valve 83 starts its return stroke. Igniter-cam 6 carries projection 7, which will raise roller 19 and through this the rod 65 and valve 64. The opening of the igniter-valve 64 allows the compressed gases to pass through chambers 62 and 67 into hot tube 59, which is kept hot by burner 72. Burner 72 receives its supply from tank 69 and this through pipe 71 from pump 26. The stroke of the pump is regulated by shoving rod 22 in slot 16 of lever 15, and the point of raising the igniting-valve 64 is adjusted by the thumb-screws 30 and 31 and moving support 128 either from or toward cam 6, which causes roller 19 to meet projection 7 either sooner or later. When the engine has reached the speed for which the governor is set, then governor-dog 106 will move toward governor-catch 124 and catch one of the projections 103, 104, or 105 during the downward stroke of stem 13 after the discharge-valve is seated, thus limiting the stroke of the pump, but leaving the igniter unchanged. This causes the drawing of a lighter charge into the cylinder, and consequently making a lighter explosion. If catches 103, 104, and 105 are not sufficient to diminish the explosion to maintain the right speed of the engine, then governor-dog 106 will come in contact with catch 107, thus holding the exhaust-valve open through the period of an entire revolution until roller 11 will strike projection 8 and relieve governor-dog 106 of the pressure. This will be continued until the governor withdraws the governor-dog. During this time the suction-valve and pump have been at rest.

In starting the engine igniter-lever 133 is laid in position, as shown in Fig. 5. This causes the igniter-valve to raise at a later period of the stroke to prevent too early an explosion and back action of the engine. By freeing hand-lever 33 out of locks 32 oil is pumped by hand into chamber 69 and the burner started. After tube 59 has become hot enough valve 35 is opened and a few strokes

of oil pumped into vaporizer 126. In turning the engine this oil is vaporized, drawn into the cylinder, compressed, and exploded. After the first explosion has taken place the engine will continue its motion, and after a few more explosions have taken place igniter-lever 133 is turned a half-turn and rests upon lug 130 of projection 132. This causes an earlier contact of roller 19 and projection 7. In case governor-belt 123 should break roller 113 will fall and cause lever 114, shaft 119, and catch 122 to turn. Catch 122 will enter under projection 107 of governor-catch 124, thus keeping the exhaust-valve open, stopping the pumping of oil, the sucking of gas, and consequently the action of the engine. Cold air is drawn in through holes 91, and in passing chamber 89 becomes heated and passes through conduit 87 into chamber 49 and heats the vaporizer 126 and enters through screens 39 into chamber 47 and causes an easy evaporation of the oil.

The speed of the engine can be determined by placing lock 141 into respective notches. In this way the speed of the engine can be brought from the lowest-figured notch to the highest speed, corresponding with the highest-figured notch, instantaneously. The speed of the engine will correspond with the figures on the notch in which latch 141 is placed, thus enabling the operator to change the speed of the engine to a positive known speed at any time and at any speed without counting.

I claim—

1. In combination in a gas-engine, the cylinder, the piston, the suction and exhaust valves, the longitudinally-reciprocating rod 13, the lever extending therefrom between the valve-stems and the governor for controlling the said rod 13, the said exhaust-valve being moved the same amount at each action while the movement of the inlet-valve is varied, substantially as described.

2. In combination in a gas-engine, the cylinder, the piston, the suction and exhaust valves, the operating-rod 13 in line with the stem of one valve and reciprocating longitudinally, the lever 96 extending from said rod to the other valve-stem and pivoted at an intermediate point to open the one valve after the other closes, and the governor acting upon the rod 13, substantially as described.

3. In combination in a gas-engine, the cylinder, the piston, the inlet and exhaust valves, the rod 13 extending thereto for operating the exhaust-valve on one stroke and the inlet-valve on the return stroke, the cam-lever 10 connected with the valve-rod, the pump the connection thereto from the cam-lever to operate the pump on the return movement of the valve-rod and the governor acting on the valve-operating rod 13 controlling the valves and the fuel-pump through said cam-lever and valve-rod, substantially as described.

4. In combination, the piston and cylinder, the inlet and exhaust valves, the vaporizer

and fuel-pump with operating means therefor, the pipe leading from the pump to the vaporizer, the burner, the branch pipe leading from the fuel-pipe to the burner, and a check-valve in the fuel-pipe at its discharge end whereby the fuel will be kept under pressure in the fuel-pipe and at each pumping action a portion of the fuel will be forced through the branch pipe to the burner.

5 5. In combination in a gas-engine, the cylinder, the piston, the valve mechanism, the igniter-tube, the elbow covering the same and swiveled, the vane connected therewith, the burner-tube the covering therefor and the fuel connections, substantially as described.

6. In combination in a gas-engine, the cylinder, the piston, the valve mechanism including the valves and the operating means for the same, the governor, the governor-belt and the weighted locking-lever engaging the belt and arranged to engage a part of the valve mechanism to prevent the operation of the valves when the governor is not in action, substantially as described.

7. In combination in a gas-engine, the cylinder, the piston, the valve mechanism including the valves and the operating means therefor, the governor and the locking means arranged to lock the valve mechanism and prevent its action, said locking means being maintained out of locking position by the governor when the same is in action, but to be released when the same breaks down, substantially as described.

8. In combination in a gas-engine, the cylinder, the piston, the valve mechanism including the valves and the operating-rod 13 therefor, the governor-stop on said rod, the governor mechanism arranged to engage the same and hold the valves out of action and the safety-lock 122 arranged to be held out of action by the working governor but to be released to act upon the stop when the governor fails, substantially as described.

9. In combination in a gas-engine, the cylinder, the piston, the valve mechanism, the igniter-valve, the cam, the rod to be moved thereby, the igniter-lever engaging the cam and having two predetermined positions one for an earlier and one for a later explosion, the shifting pivot for the lever the means for shifting the lever in relation to the cam to secure an earlier or later operation of the igniter-valve, and a governor for controlling the speed of the engine independent of the igniter, substantially as described.

10. In combination in a gas-engine, the cylinder, the piston, the inlet and exhaust valves, the igniter-valve, the operating-cam therefor, the cam-lever, the link 17 to which the lever is pivoted, the igniter-valve rod and the means for shifting the lever for an earlier or later explosion consisting of the eccentric-pin entering a slot in the lever and the disk and lever for turning the same to alter the position

of the eccentric-pin, substantially as described.

11. In combination in a gas-engine, the cylinder, the piston, the valve mechanism, the igniter, the igniter-cam and the igniter-lever having a shifting pivot with two predetermined positions for an earlier and later explosion and means for manually shifting the said pivot from one position to the other, said pivot when shifted adjusting the lever longitudinally in relation to its operating-cam, substantially as described.

12. In combination in a gas-engine, the cylinder, the piston, the inlet and exhaust valves, the reciprocating rod arranged to operate one of said valves, the means for operating the rod, the graduated stop-piece on the rod, the governor-dog and the governor for shifting the same into and out of line with the graduated stop, substantially as described.

13. In combination in a gas-engine, the cylinder, the piston, the inlet and exhaust valves means for operating both of said valves, a graduated piece connected with the valves, a contact part connected with the governor and a governor for causing said graduated piece and contact part to be in or out of alignment for controlling the action of the valves and the engine's speed, substantially as described.

14. In combination in a gas-engine, the cylinder, the piston, the suction and exhaust valves, the rod 13 for operating the stem of the exhaust-valve, the lever 96 extending from the rod to the inlet-valve stem and pivoted at an intermediate point, the graduated stop on the rod 13 and the shifting governor-dog and governor, substantially as described.

15. In combination in a gas-engine, the cylinder, the piston, the suction and exhaust valves, the means for operating them to open alternately and the graduated piece and contact part with the governor for placing them in and out of alignment, said graduated piece having its first step arranged to control the open position of the exhaust-valve and its successive steps to control the open position of the inlet-valve, substantially as described.

16. In combination in a gas-engine, the cylinder and piston, the inlet and exhaust valves, the reciprocating operating means arranged to open the exhaust-valve on one stroke while leaving the inlet-valve seated and to open the inlet on the other stroke while the exhaust-valve is seated and the graduated piece and governor for limiting the return stroke to either hold the exhaust-valve open or to limit the opening movement of the inlet-valve, substantially as described.

17. In combination in a gas-engine, the cylinder, the piston, the inlet and exhaust valves, the fuel-pump and the means for operating the fuel-pump and valve mechanism including the rod 13, the graduated piece thereon and the governor for controlling the movement of said rod, substantially as described.

18. In combination in a gas-engine, the cylinder, the piston, the valve mechanism, the igniter, the fuel-supply controlled by a suction-valve 25, the vaporizer, the pressure
5 check-valve within the vaporizer, and a pipe leading to the igniter from a point between the check and suction valves, substantially as described.

19. In combination in a gas-engine, the cylinder and piston, the valve mechanism, the igniter mechanism including the igniter adjustable in relation to the stroke of the piston to determine the point of explosion, and
15 positive adjusting means with limiting-stops whereby the igniter mechanism may be adjusted and limited to secure a later or earlier explosion in relation to the adjustable point of the explosion, substantially as described.

20. In combination in a gas-engine, the cylinder, the piston, the igniter, and means for
20 operating the same to make and break the circuit, said operating means being adjustable as a whole to vary the point of the ex-

plosion and said operating means including an adjusting portion with stops for limiting
25 the movement thereof whereby a later or earlier explosion may be secured in relation to the adjustable point of the explosion, substantially as described.

21. In combination, the cylinder, the piston, the valve mechanism, the igniter, the igniter-cam, the igniter-lever, the adjustable support for the fulcrum of the lever adapted to adjust and hold the lever in its approximate position in relation to the cam, and
35 means for adjusting said lever in relation to the approximate position to the predetermined point on each side thereof, substantially as described.

In testimony whereof I affix my signature
40 in presence of two witnesses.

CHARLES QUAST.

Witnesses:

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W. H. CULP.