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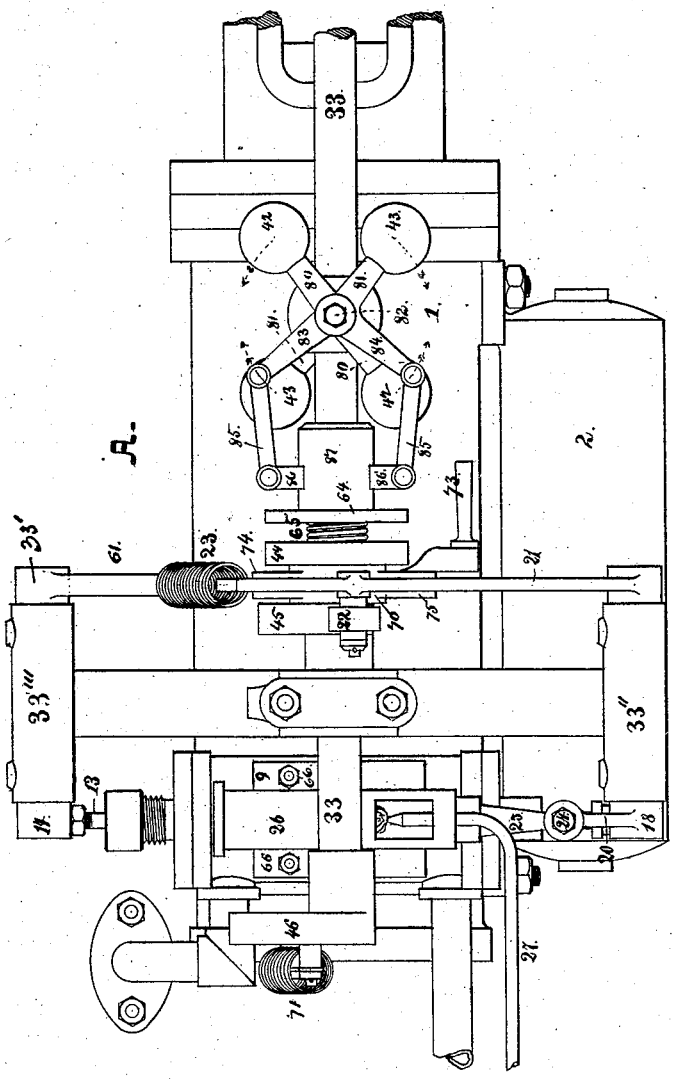
H. WIEDLING.

GAS ENGINE.

No. 259,736. Patented June 20, 1882.



WITNESSES.

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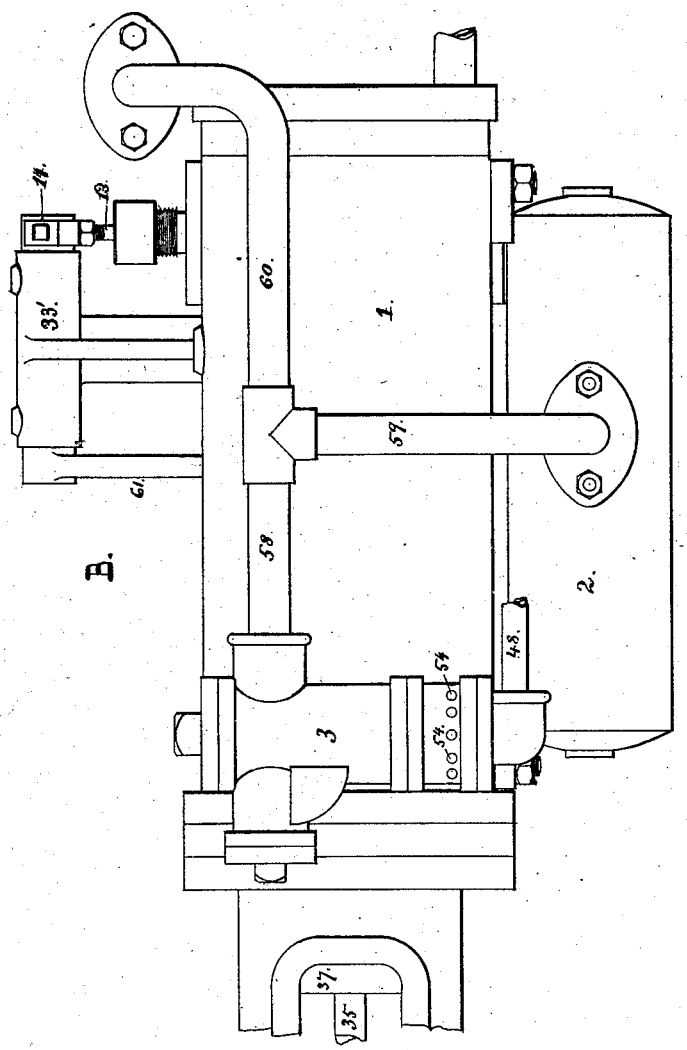

Fig.

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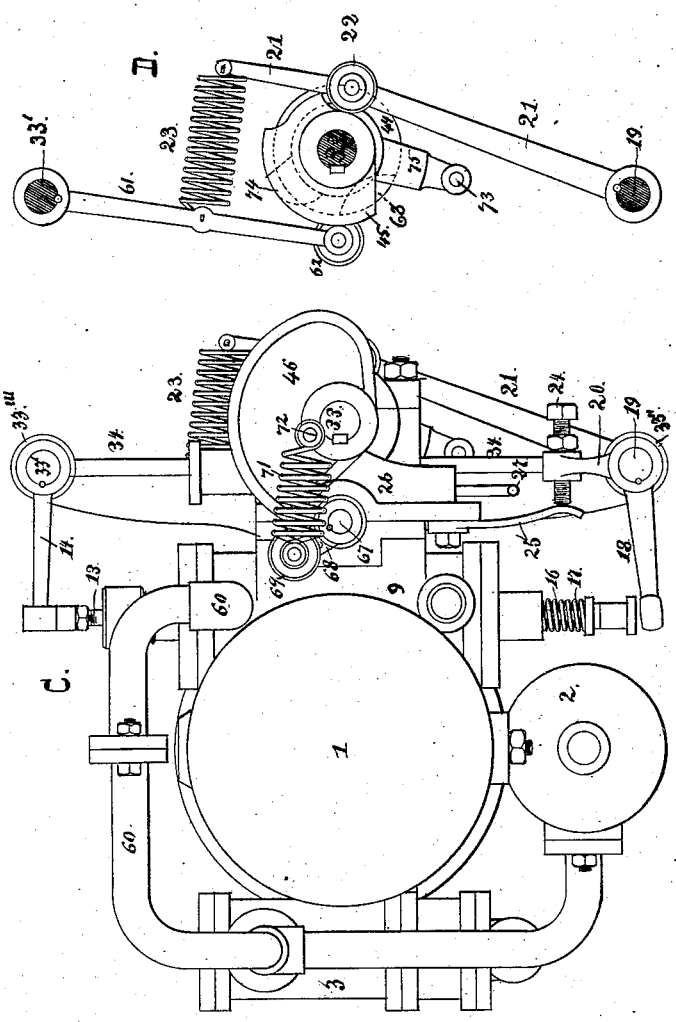
No. 259,736. Patented June 20, 1882.



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(No Model.) 6 Sheets—Sheet 4.

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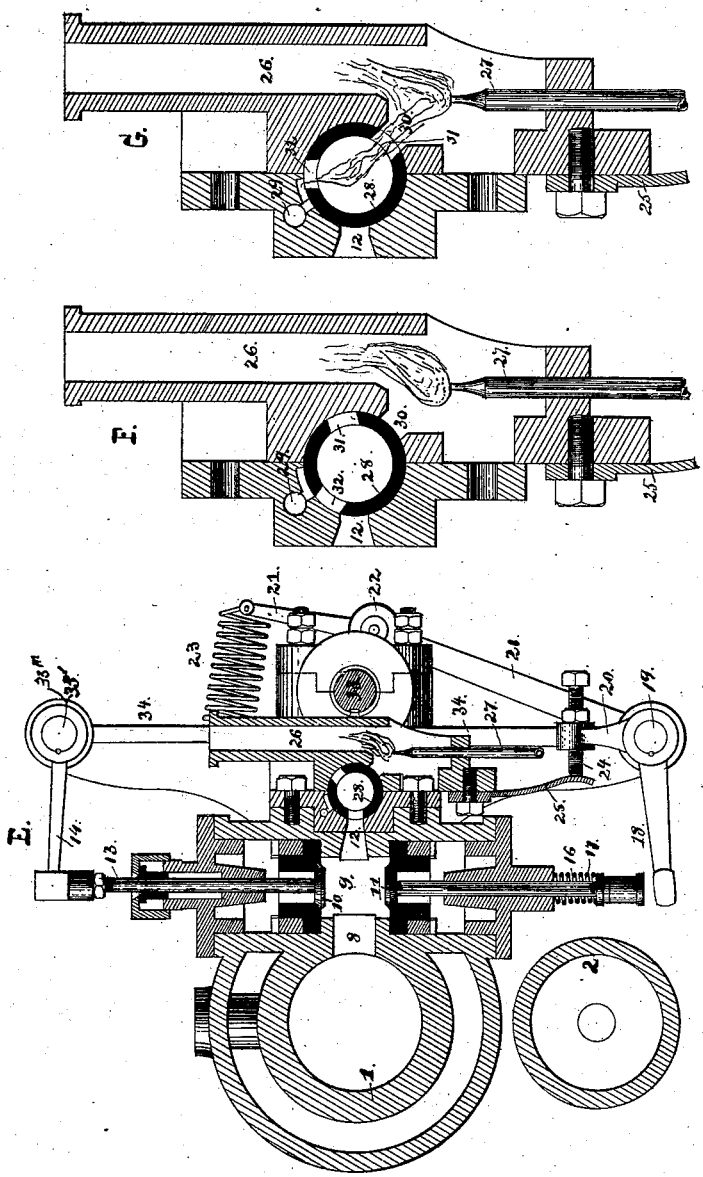
No. 259,736. Patented June 20, 1882.



WITNESSES.

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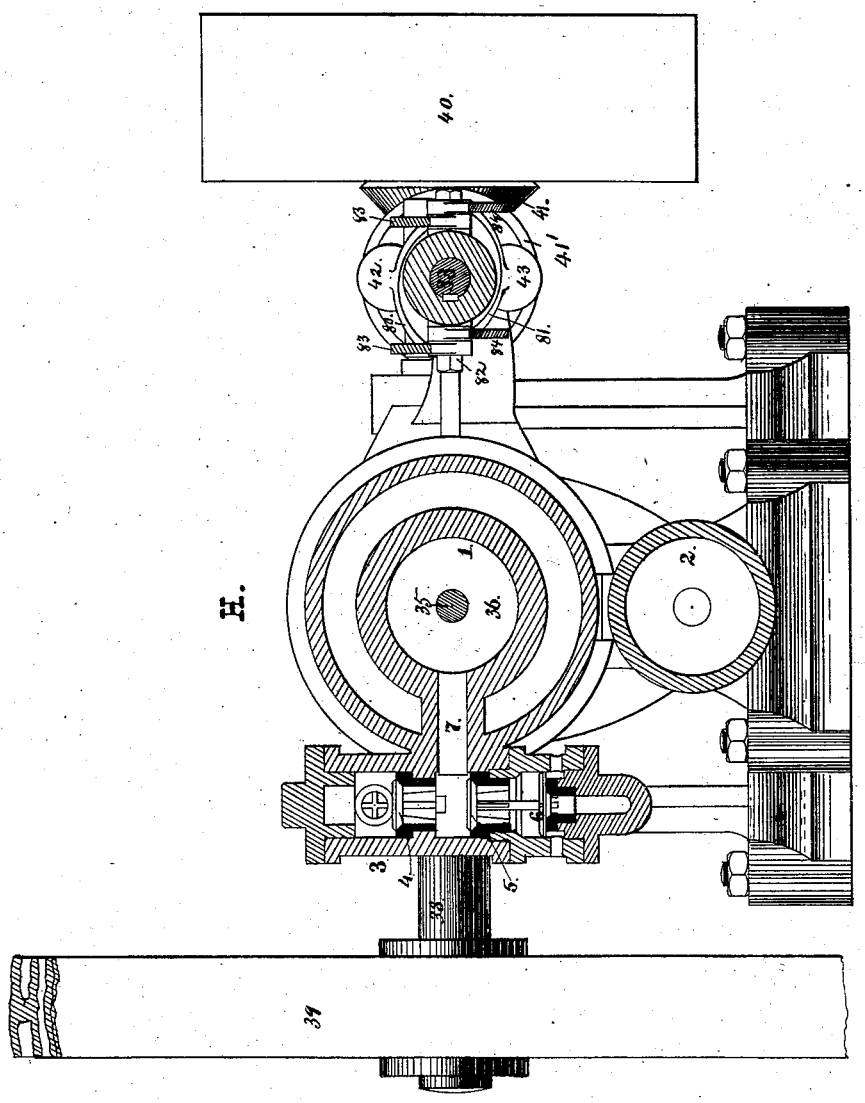
No. 259,736. Patented June 20, 1882.



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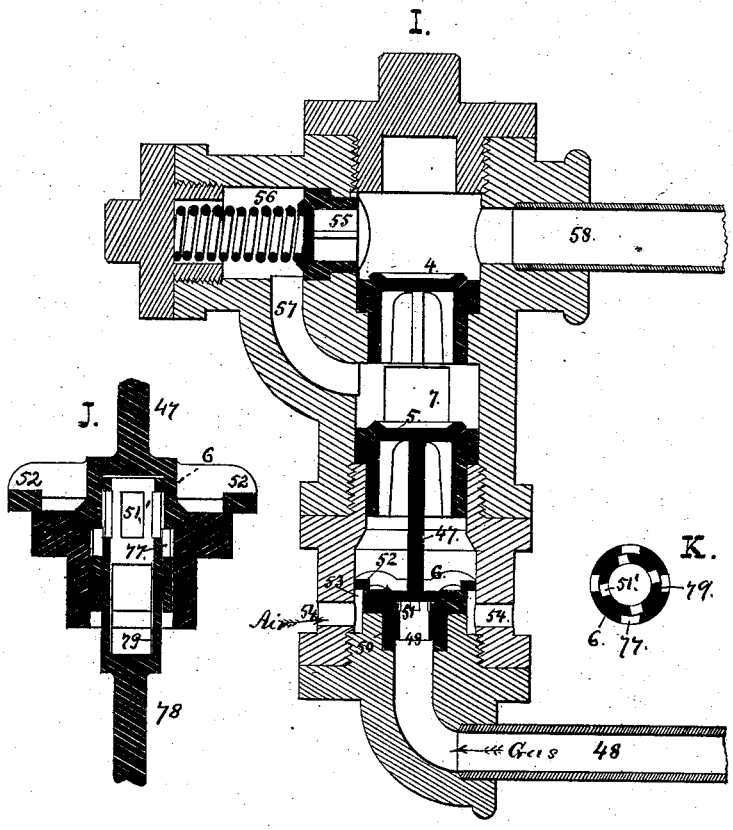

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UNITED STATES PATENT OFFICE.

HERMANN WIEDLING, OF BALTIMORE, MARYLAND.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 259,736, dated June 20, 1882.

Application filed August 1, 1881. (No model.)

To all whom it may concern:

Be it known that I, HERMANN WIEDLING, of Baltimore city, State of Maryland, have invented certain new and useful Improvements in Gas-Engines; and I hereby declare the same to be fully, clearly, and exactly described as follows, reference being had to the accompanying drawings, in which—

Figure A is a top plan view of the engine; Fig. B, a side elevation; Fig. C, an end elevation; Fig. D, a similar view illustrating the action of the valve-cams. Fig. E is a transverse sectional view through the valve-chamber 9 and cylinder. Figs. F and G are similar views, on an enlarged scale, of the firing-valve and casing. Fig. H is a transverse sectional view through the cylinder and valve-chamber 3. Fig. I is a sectional view, on an enlarged scale, of the latter. Fig. J is a similar view of a modified form of gas and air valve, and Fig. K is a horizontal sectional view of the latter.

My invention relates to what are known as "gas-engines," in which the power which drives the piston is derived from the combustion within the cylinder of an explosive mixture of gas or vapor and air; and it has for its object to simplify the construction of the engine, to reduce wear of parts to a minimum, and to increase the general efficiency of the engine by securing a greater uniformity of running than has heretofore been attained in devices of the same class. These results I secure by means of certain novel features of construction and combinations and arrangements of parts, as hereinafter fully set forth and claimed.

In the accompanying drawings, 1 is the cylinder, jacketed as usual, and closed at both ends, and having at either end a valve-chamber, 9 and 3. The piston-rod 35 of the piston 36 moves through a stuffing-box, 37, at the front of the cylinder, and actuates, by means of a crank on the shaft 38, the fly-wheel 39, driving-wheel 40, and cone-wheel 41. In the present instance the momentum of the fly-wheel is depended upon to effect the return-stroke of the engine, though the latter may readily be made double-acting, if desired, as will be readily understood. The wheel 41 engages with a wheel, 41′, on a shaft, 33, parallel to the cylinder, and the wheels 41 and 42 being of the same size, the shafts 33 and 38 turn at the same rate of speed. Upon the shaft 33 is the governor and a series of cams, 44 45 46.

Under the cylinder is a reservoir, 2, for the compressed explosive mixture of gas and air.

Referring now to certain details of construction, and in particular to Figs. B, H, and I of the drawings, 3 is the front valve-chamber, which communicates with the cylinder by means of an opening, 7, and has at its lower end a pipe, 48, communicating with the gas-supply, and at its upper end a pipe, 58, leading through the medium of the pipe 59 to the reservoir 2.

5 is an entrance-valve, opening upward, and 4 is a second valve above the opening 7, also opening upward. A rod, 47, connects the valve 5 with a valve, 6, that closes the gas-pipe 48, and a tube, 49, fitting closely within the tubular seat 50, is attached to the valve 6, and is provided at its upper end with a number of orifices, 51. A ring, 52, is also attached to the valve 6 and closes the annular channel 53, which latter communicates with the outside air by series of holes 54.

Over the valve 4, and at the side, is a valve, 55, seated by means of a spring, 56, and a channel, 57, leads from the rear side of the valve 55 to a point in the casing 3 below the valve 4 and opposite the opening 7.

From the junction of the pipes 58 and 59 (see Fig. B) a pipe, 60, leads to the valve-chamber 9. (See Figs. E, F, and G.) In this chamber, which communicates with the cylinder by a channel, 8, are two valves, 10 and 11, opening respectively downward and upward. The valve 10 is depressed by a lever, 14, which is attached to the stem 13 at one end, and at the other is keyed on a shaft, 33′, which rocks in a sleeve, 33‴. (See also Figs. A and C.) The opposite end of the shaft 33′ is attached to a lever, 61, carrying at its lower end a roller, 62, which runs on the face of the cam-disk 44. The lever 18, which actuates the lower valve, 11, is similarly keyed on a shaft, 19, which rocks in a sleeve, 33″. On the other end of this shaft is attached a lever, 21, having a roller, 22, which turns on the cam-disk 45, and the levers 61 and 21 are connected by a spring, 23. (See Fig. D.)

The disk 44 has a recess, 63, into which the

roller 62 may enter as the disk turns. The disk 64 is susceptible of a sliding motion on the shaft 33, and is of the exact diameter of the cam-disk 44, and truly circular. The disk 64 is actuated in its sliding motion on the shaft 33 against the resistance of a spring, 65, by the governor, and is pushed in contact with the cam 44 when the desired speed of the engine is exceeded, preventing the entrance of the roller 62 in the recess 63, and thereby holding the valve 10 firmly upon its seat.

On the lever 18 is an arm, 20, through which passes a screw, 24, which bears on a spring, 25, secured to the lower end of the part 26. The latter constitutes one half of the bearing for the rotary firing-valve 28, the other half being formed on the valve-chamber 9. At its upper end the part 26 is secured by screws 66 to the valve-chamber in such manner that it may be moved slightly away from the part 9 to facilitate the turning of the valve 28, the parts being normally pressed together by means of the screw 24 and spring 25.

In the part 26 burns a small gas-jet, 27, that serves to ignite the charge in the cylinder. The valve 28 has two openings, 31 and 32, of which the former reciprocates past the port 30 and the latter communicates alternately with the ports 12 and 29, and the valve is mounted on a shaft, 67, (see Fig. C,) which carries an arm, 68, on the end of which latter is a roller, 69. The roller runs on the face of the cam 46, which is keyed on the shaft 33, and is connected by means of a spring, 71, with an eccentric-pin, 72, on the side of the cam. This pin is placed eccentrically, in order to release the tension of the spring as the roller traverses that portion of the cam opposite it while holding the roller closely against the cam at other points, the object being to permit of a light spring being used, the tension of which during the positive motion of the arm 68 by the cam 46 is reduced, while the eccentricity of the pin 72 increases the tension of the spring during that portion of the stroke of the roller on the cam pending the return-stroke or rotation of the valve 28. This stroke of the valve, being dependent upon the action of the spring, is made to occur coincidently with the release of pressure on the spring 25, so that the valve may turn freely in its bearings between the parts 9 and 26.

Between the cams 44 and 45 upon the shaft 33 is a sleeve, 70, having arms 75 and 74 and a handle, 73. Upon retracting the handle the arms are brought to bear against the levers 61 and 21, closing the valve 10 and opening that 11.

The operation of the machine is as follows: As the piston moves backward the valve 5 rises and carries with it the valves 6 and 52. Gas enters thus through the pipe 48 and air through the openings 54 and channel 53. The directions of the currents of gas and air rushing into the space above the valve 6 are substantially at right angles, resulting in an intimate and perfect mixture of the two, and, as the comparative areas of the gas and air openings remain constant during the operation of the machine, the mixture is necessarily uniform. The combustible gas enters the cylinder through the port 7, and on the return-stroke of the piston the valve 4 rises and the gas is forced through the pipes 58 59 to the receiver 2. Should the delivery of gas exceed the consumption, the excess is caused to flow past the valve 55 and through the channel-port 57, the valve 55 being, in effect, the safety-valve. The pipe 59 conducts the compressed gases to the reservoir 2, and the pipe 60 delivers them into the valve-chamber 9 at a point just over the valve 10, which latter is held tightly against its seat by the roller 62, pending its travel on the circular part of the cam 44. As the piston nears the end of its stroke the exhaust-valve closes and a portion of the burned gases are slightly compressed in the end of the cylinder. At the completion of the stroke the roller 62 enters the recessed portion 63 of the cam-disk 44 and the tension of the compressed inflammable gases opens the valve 10, allowing the charge to enter the cylinder. As the piston moves forward the valve 10 closes by the rise of the roller 62 from the recess in the cam and the explosion follows, driving the piston forward. On the return-stroke the valve 11 is opened by the action of the cam 45, levers 21 and 18, and stem 16, as will be readily understood, exhausting in part the burned contents of the cylinder. The exhaust-port is held open for about three-fourths of the return-stroke, the remaining fourth of the contents of the cylinder being compressed in its end, the object being to reduce the pressure of the explosion.

The ignition of the charge is effected as follows: The small jet 27 burns continuously in the chimney 26 and at a point opposite the port 30. When the valve 28 is in the position shown in Fig. C the ports 12 and 30 are closed and 29 opened. This port 29 is a fine hole communicating with the reservoir 2. It is made so small as to preclude (on the Davy lamp principle) the possible ignition of the gas in the reservoir. It may conveniently be formed by driving a number of fine wires tightly in a part of the pipe communicating with the reservoir, similar to the well-known Hemming safety-jet used in connection with oxyhydrogen-burners. The small stream of gas flowing through 29 fills the valve 28 and burns therein. Pending this combustion the valve turns, closing the ports 29 and 30 and opening 12, when the flame is communicated to the cylinder-charge. At this moment the part 26 is, by means of the lever 20, screw 24, and spring 25, firmly pressed against the valve-chamber 9, holding the valve 28 tightly to its seat.

To stop the engine it is only necessary to retract the handle 73, causing the arm 74 to tightly seat the inlet-valve 10 and the arm 75 to unseat the exhaust-valve 11, when the en-

gine comes to rest. To start the machine the handle 73 is returned, and the fly-wheel is turned by hand or otherwise.

Should it be desired to provide for an alteration of the comparative areas of the gas and air valves, so as to change the ratio of ingredients in the combustible charge, the device shown in Figs. J and K may be used. The part 79 fits within the interior of the tubular part of the valve 6, and carries a rod, 78, which projects from the lower end of the valve-chamber. The part 79 has a series of perforations, 51′, which may be made to register more or less perfectly with the openings 77 by turning the stem 78, thereby altering the area of the gas-orifice as may be desired.

The disk 64 is, as heretofore stated, actuated by the governor, so that when the desired speed of the engine is exceeded the disk comes in contact with the cam 44 and closes the valve 10.

The governor (see Figs. A and H) consists of four balls, 42 42 and 43 43, of which the pair 42 is connected by a rod, 80, and that 43 by a rod, 81. These rods are pivoted upon a shaft, 82, which passes through the shaft 33. A lever, 83, is connected with the rod 80, and a second lever, 84, is similarly attached to the rod 81. Arms 85 connect these levers with lugs 86 on the sleeve 87, which latter is integral with the disk 64. As the shaft 33 turns the effect of the centrifugal force is to tend to cause the balls to move away from the shaft, and in consequence to slide the disk 64 against the resistance of the spring 65 toward the cam 44, the tension of the spring effecting the return of the balls as the speed of the engine slackens, in consequence of the gas-supply being cut off.

It will be noticed that the arms 80 and 81 are in planes at right angles to the levers 83 and 84, which feature secures a most important end. It is obvious that were the sleeve 87 connected with the shaft 82 directly—as, for instance, by a rack engaging with a pinion on the shaft—the effect of the centrifugal force to produce an endwise motion of the sleeve would rapidly diminish as the speed of the engine increased, by reason of the approximation of the curved path of the balls to parallelism with the shaft 33. By the mechanism shown, however, the effect of the centrifugal force is rendered absolutely uniform, because precisely as the path of the balls approximates to parallelism with the shaft that of the outer end of the levers 83 and 84 approximates to being at right angles with the shaft.

The governor is obviously equally applicable to other forms of motors—such, for instance, as ordinary steam-engines. I make no claim here, however, to the governor, as it will be made the subject of a separate application for Letters Patent.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a gas-engine, a cylinder and piston, a reservoir for compressed inflammable gas, and suitable inlet and exhaust valves and actuating mechanism, whereby the exhaust-port is closed previous to the completion of the stroke of the piston, and a portion of the burned gases from the previous stroke is compressed in the end of the cylinder, and a charge of combustible gas is introduced into the cylinder and exploded pending the return-stroke of the piston, substantially as set forth.

2. In a gas-engine, a cylinder and piston and a pair of valve-chambers having valves and actuating mechanism, substantially as described, whereby a charge of gas or vapor led from a suitable supply is intimately mingled with air and follows the piston in its stroke, and on the return-stroke is compressed in a suitable reservoir, a portion of the burned gases from a previous stroke being compressed in the cylinder, and on the return-stroke a charge of combustible gas is introduced into the cylinder with the said exploded gas and fired, substantially as set forth.

3. In combination with the disk-valve 6, seating upon the gas-inlet pipe, the annular valve 52, seating upon the air-inlet around the gas-valve and carried by the latter, as and for the purpose set forth.

4. In combination with the cone-faced disk-valve 6, the annular valve 52, carried thereby and located in the plane of the same, as set forth.

5. In combination with the inlet gas-chamber having gas and air valves and a reservoir into which the mixed gases are forced, a spring-seated valve in the passage connecting the said reservoir with the cylinder and subserving the end of a safety-valve to limit the pressure, as set forth.

6. In combination with the valve 6, having ports 77, the cylinder 79, having openings 51′, whereby the flow of gas may be regulated independent of the air-supply, as set forth.

7. In combination with the gas-valve 6 and ring 52, connected therewith, the ports 54 48 51 and the tube 49, having orifices 51′, as set forth.

8. In combination with the cylinder and piston and valve-chamber 9, the inlet and exhaust valves 10 11, cams 44 and 45, and intermediate mechanism for operating the valves, as set forth.

9. In combination with the cylinder and piston, the valve-chamber 9, having valves 10 11 and suitable actuating mechanism, the port 12, tubular valve 28, channel 29, and firing-jet 27, as set forth.

10. In combination with the cylinder and piston, the valves 9 and 10, curves 44 and 45, and shaft 33, combined and operating substantially as described, whereby the exhaust is cut off before the piston reaches the end of its stroke and the incoming compressed inflammable gas is mixed with a portion of the burned gas from the previous stroke.

11. In combination with the valve-chamber

9, having inlet and exhaust valves, the tubular valve 28, piece 26, spring 25, and mechanism for intermittently compressing and releasing the spring, as and for the purpose set forth.

12. In combination with the valve 28 and actuating-cam 46, the spring 71 eccentrically attached to the cam and connected with the valve-lever, as and for the purpose set forth.

13. In combination with the valve-chamber 9 and valves 11 10 28, the cams 44, 45, and 46, mounted upon the shaft 33 and actuating the valves, substantially as described.

14. In combination with the inlet-valve and its actuating cam and roller 62, the circular plate 64, actuated by the governor, as set forth.

15. In combination with the valves 9 and 10, the levers 61 21, connected by a spring, 23, and having rollers 62 22, and the cams 44 45, as set forth.

16. In combination with the valves 9 and 10 and actuating-levers 61 21, the plate 70, having arms 74 75 and handle 73, as set forth.

17. In combination with the cam 44, the disk 64, sliding upon the shaft 33 and actuated by a suitable governor, as set forth.

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Witnesses:
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