(No Model.)

# J. CHARTER.

## GAS ENGINE.

No. 455,388. Patented July 7, 1891.

Fig 1.

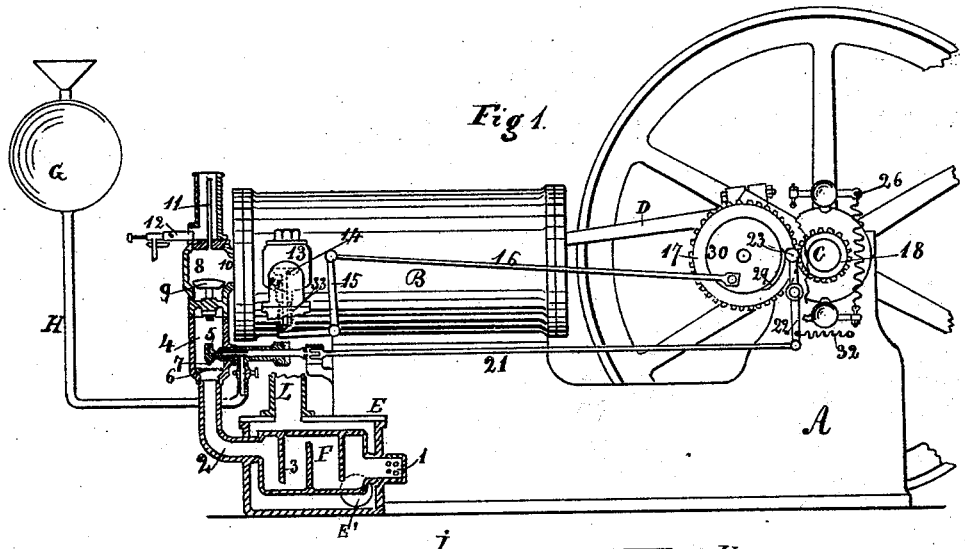



Fig 3

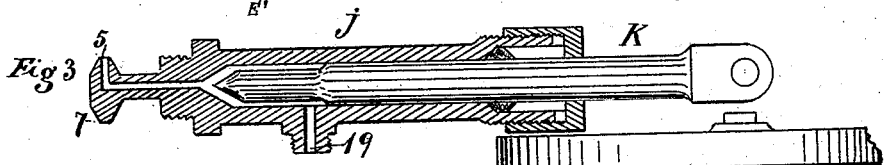
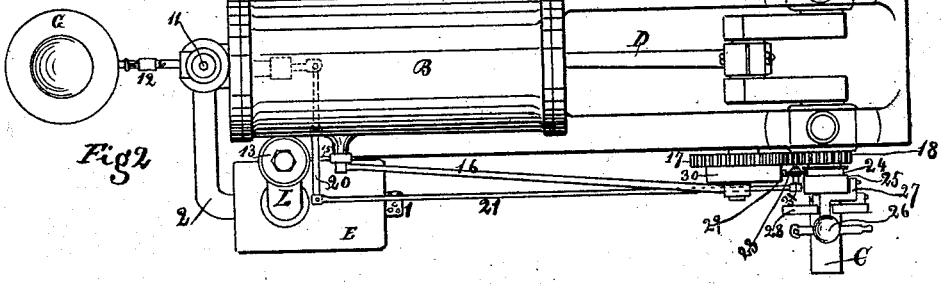



Fig 2

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# UNITED STATES PATENT OFFICE.

JOHN CHARTER, OF STERLING, ILLINOIS.

## GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 455,388, dated July 7, 1891.

Application filed September 16, 1889. Serial No. 324,145. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN 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; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention has reference to improvements in hydrocarbon and gas engines; and it consists, essentially, in novel mechanism for mixing, loading, and igniting the explosive compound, being improvements in that regard upon the construction shown in Letters Patent of the United States No. 370,242, granted to me on the 20th day of September, 1887, and No. 415,446, granted November 19, 1889.

My invention is adapted for use with either gas or an admixture of oil and air.

In my invention the air intended for the explosive compound is drawn through a channel in which it forms a junction with the gas or oil, and finally, when intermixed with the latter, into the power-cylinder. The explosive charge is drawn into the power-cylinder and the products of combustion expelled therefrom by the working or power piston.

In the drawings, Figure 1 is a side elevation of a machine embodying my invention, with the exhaust, charging, and ignition chambers in vertical section. Fig. 2 is a plan of the same. Fig. 3 is an enlarged longitudinal vertical section of the oil-chamber and cut-off.

A is the base of the machine, which, directly under the working-cylinder B, is slightly sloped laterally inward and upward to about the diameter of said cylinder.

C is the driving-shaft, to which the outer end of the power-piston D is attached in the usual manner and from which the power is communicated in any suitable mode to the machinery to be driven thereby.

E is a box seated beneath and at one side of the power-cylinder B, into which in some constructions of my engine the products of combustion are permitted to escape, as hereinafter described. The box E is provided with a suitable exhaust E′.

F is a preliminary air-chamber having the inlet 1 and the outlet-tube 2, and provided internally with partial transverse air-deflecting partitions 3, attached alternately to the top and bottom of said chamber and projected, respectively, to within a short distance of the side opposite their point of attachment. The outlet-tube 2 of the chamber F passes horizontally after leaving said chamber to about opposite the center of the outer end of the cylinder B, as shown in Fig. 2, and is then turned upward and forms a junction with the mixing-chamber 4, as shown in Fig. 1.

The oil or gas, as the case may be, is admitted into the chamber 4 and there intermingled with the heated air by means of the tube 5. (Shown in enlarged form in Fig. 3.) The mode of regulating the admission of the oil or gas into the chamber 4 will be hereinafter described.

A perforated plate 6 is seated transversely over the juncture of the tube 2 with the chamber 4 to catch the oil-drippings from the oil-exit 5 in starting the engine and before the air has sufficient velocity to take the oil from the exit 5. The oil-exit 5 is provided with the pendant 7 to collect the oil-drippings and cause the same to drop about centrally upon the perforated plate 6, where the initial air charge meets and absorbs them.

The explosive mixture is admitted from the mixing-chamber 4 into the ignition-chamber 8 through an automatic valve 9, seated at the bottom of the latter chamber over the ingress therein from tube 2 for said mixture. An inlet-passage 10 is formed through the head of the cylinder B, communicating with the interior of the latter and the ignition-chamber 8. During the outstroke of the power-piston D, caused by the explosion, and until after the return-stroke of said piston has substantially expelled the products of combustion, the ingress of the oil or gas into the chamber 4 is suspended, as hereinafter described. On the next succeeding outstroke of said piston the oil-exit is opened and said piston is permitted

to draw into the cylinder B, through the channels above described, the quantum of the explosive mixture for the next succeeding charge, the valve 9 automatically opening upward for that purpose. When the piston D starts upon its return-stroke, its initial pressure upon the mixture then contained in the cylinder B and the ignition-chamber 8 immediately seats the valve 9, and the residue of the inward stroke of said piston serves to compress said mixture into condition for the next explosion. The last-named instroke of the piston D in the latter stage of compressing the charge forces a portion of the latter up into the ignition-tube 11, seated directly over and communicating with the ignition-chamber 8, when the ignition of the charge takes place, as described in my last-named former patent, through the instrumentality of the Bunsen burner 12, such ignition being communicated through the port 10 to the charge within the cylinder B.

The products of combustion are permitted to escape from the cylinder B during the instroke of the piston D next succeeding the explosion by the following mechanism: An exhaust-chamber 13, having communication with the interior of the cylinder B, is formed externally on the side of the latter near its inner end, and in the bottom of said chamber is seated an upwardly-opening valve 14. A tube L (shown in Figs. 1 and 2) extends downward from the chamber 13 and communicates from the latter to the exhaust-box E aforesaid. The downward movement of the valve 14 is automatic, being caused by the pressure of the contents of the cylinder B. Such downward movement is assisted and assured by a draw-spring 33, suitably attached thereto. Said valve 14 is positively lifted or opened by means of its stem 48, extending down through the bottom of the chamber 14, and being engaged at its lower extremity by the horizontal arm of the bell-crank lever 15, suitably pivoted at its angle to the exterior of the cylinder B or some suitable point on the base A, and adapted to oscillate in a vertical plane. The lever 15 is actuated by the pitman 16, whose inner end is pivoted to the top of the vertical arm of the lever 15, and whose outer end is pivoted to the outer face of the pinion 17, suitably journaled to the base A. The pinion 17 is actuated by the pinion 18, keyed on the driving-shaft C, and shown in dotted lines in Fig. 1. The pinion 18 is but half the circumference of and has but half the number of cogs contained on the pinion 17. Therefore the pinion 17 makes but one rotation to two of the axle C, and the pitman 16 is so attached to the pinion 17 that said pinion draws outward on said pitman and lifts the valve 14, and thereby opens the exhaust-chamber 13 during the instroke of the piston D next succeeding the explosion and each alternate instroke thereof thereafter, and at all other times the horizontal arm of the bell-crank lever 15 is out of engagement with the stem 48 of the valve 14 and permits the pressure within the cylinder B and the spring 33 aforesaid to hold said valve in a closed condition.

G is the oil-receptacle, placed at an altitude above the oil-ingress 5, so that the oil may flow to the latter by means of its own gravity. A tube H communicates from the oil-receptacle G to the oil-chamber J, having its ingress within the latter through the inlet 19. A plunger K reciprocates in the oil-chamber J and intermittingly opens and closes the inner end of the oil-exit 5. The plunger K is circumferentially reduced at that portion of its inner end which extends from the inlet 19 to the inner end of the chamber J, and has its inner extremity tapered to conform to the like conformation of the interior of the inner end of said oil-chamber. The flow of the oil through the inlet 19 into the chamber J is uninterrupted, but the discharge of the oil through the inlet 5 is intermittingly suspended by the plunger K, being forced against the inner end of the oil-exit 5. The plunger K serves to suspend the ingress of the oil not only during the explosion within the chamber B and the subsequent escape of the products of combustion therefrom, but is also utilized to suspend the inflow of the oil at such times as the engine shall attain more than its normal velocity, and thereby acts as a governor of the speed of the latter.

The plunger K is actuated and governed as follows: A lever 20 is about centrally pivoted transversely upon the frame A and is attached at its inner end to the outer end of the plunger K. This attachment is shown in dotted lines in Fig. 2, the plunger being directly under the cylinder B. To the outer end of the lever 20 is pivotally connected the longitudinal pitman 21, which is pivoted at its outer end to the vertical lever 22, pivoted centrally to the base A and provided at its upper end with the friction-pulley 23. The friction-pulley 23 is loosely held laterally within an annular groove 24, formed in a sliding collar 25, which is adapted to slip loosely upon the axle C, and the tread of said pulley is held adjustably on the periphery of the wheel or collar 30 by means of the draw-spring 32. The governors 26 are seated, respectively, upon angular levers 27, which are pivoted in the collar 28, rigidly affixed to the axle C. The inner ends of the levers 27 are pivotally attached to the sliding collar 25, and when the rotations of the axle C exceed the normal the centrifugal force causes such governors to recede from said axle and draw the collar 25 outward. Intermittent motion is imparted to the pitman 21 by means of a segmental cam 29, formed on the periphery of the wheel or collar 30, integral with the pinion 17, which cam intermittently engages the pulley 23 and thereby actuates the lever 22, and when said governors draw the collar 25 outward on the shaft C the pulley 23 is also drawn out, so as to escape engagement with

the cam 29. The action of the cam 29 is to withdraw the plunger K and permit the oil or gas to escape. A short horizontal pin 31 extends inward from the upper end of the lever 22 and serves as the pivotal seat of the pulley 22, and in the outward movement aforesaid of the collar 25 said pulley slides outward on said pin 31.

I believe I am the first to deliver the oil or gas in measured quantities into the air-feed passage so that each charge of oil or gas is separate and complete, and in case of oil no residuum remaining.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. The combination, with the oil-chamber, of a plate 6 and an oil-pipe having an oil-orifice and tapering pendant 7, substantially as set forth.

2. The combination, in a gas-engine, with the cylinder, ignition-chamber, mixing-chamber, and automatic valve separating said chambers, of an air-supply passage entering the mixing-chamber, a perforated plate 6 in said passage, and an oil-supply passage also entering said chamber and having its delivery-orifice above the perforated plate, substantially as described.

3. The combination of the cylinder and piston, a mixing-chamber communicating with the cylinder and with an air-inlet port, an oil-pipe communicating with said chamber and with a reservoir, a valve constructed to open and close the communication between the chamber and reservoir, and means for automatically and positively shifting the valve to open the same as the piston moves forward, whereby the oil is drawn into the chamber by and in proportion to the exhausting action of the main piston, as set forth.

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

JOHN CHARTER.

Witnesses:
JOHN G. MANAHAN,
HENRY C. WARD.