(No Model.)

2 Sheets—Sheet 1.

C. S. HISEY.

GAS ENGINE.

No. 514,713. Patented Feb. 13, 1894.

Fig. 2.

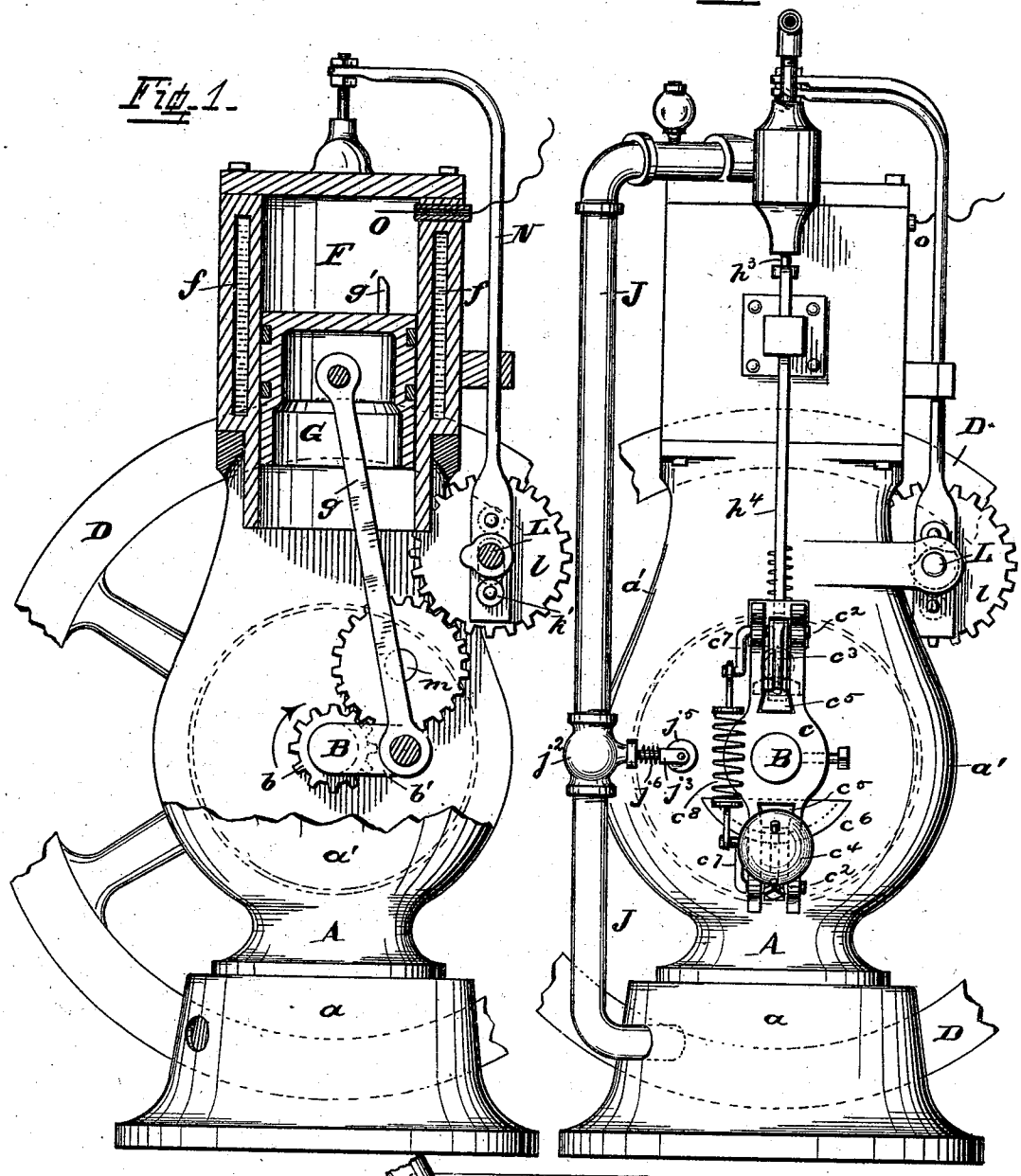
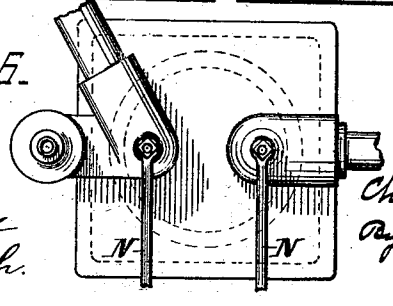


Fig. 1.

Fig. 6.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

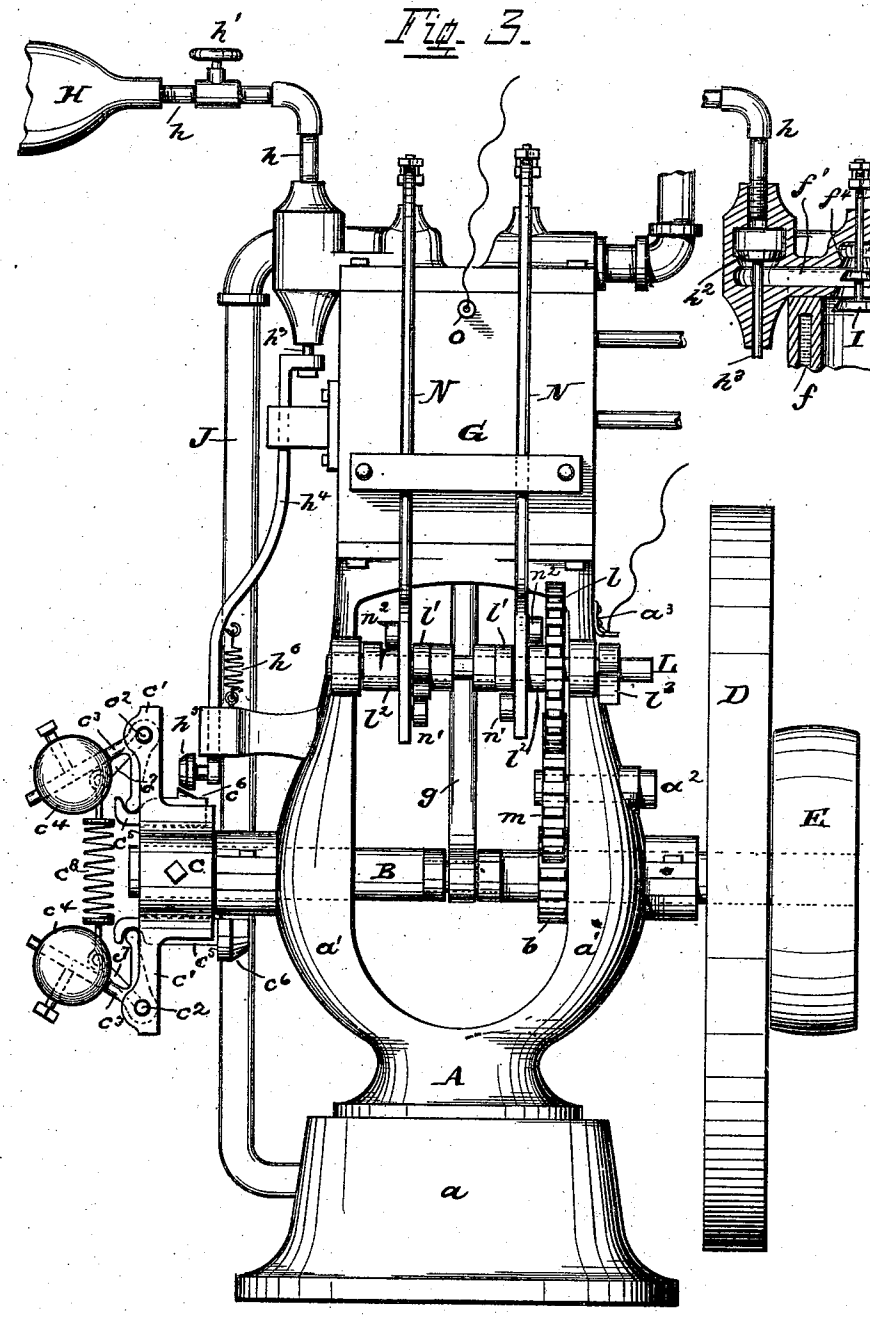


Fig. 4.

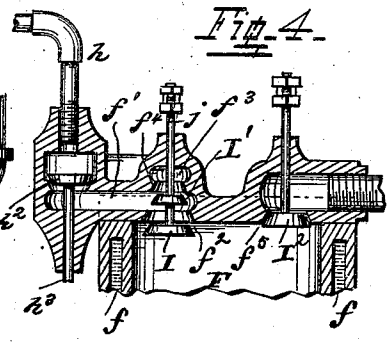
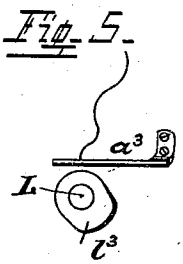


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES SELBY HISEY, OF AURORA, INDIANA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 514,713, dated February 13, 1894.

Application filed September 17, 1892. Serial No. 446,128. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SELBY HISEY, a citizen of the United States, residing at Aurora, in the county of Dearborn and State of Indiana, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

My invention pertains to that class of motors in which a piston is reciprocated within a cylinder by means of force generated by the explosion of gas, or a mixture of gas and air, commonly known as gas engines. These engines are so arranged that the explosions which furnish the motive power for the piston take place at the end of every other revolution, the momentum of a fly-wheel being relied upon to carry the engine through between the explosions.

Gas engines are usually actuated by means of a force generated by the explosion of a mixture of gas and air. For successful and economical operation it is essential that the proportion of gas and air admitted should be substantially constant.

The object of my invention is to provide improved means for operating the valves that control the admission of the air and gas, and means for making and breaking the electrical connections for igniting the gas in the piston cylinder.

In the drawings: Figure 1 is a side-elevation of a gas-engine embodying my invention, the upper part and piston being shown in section and the latter in a position midway of its travel. Fig. 2 is a complete side elevation, complementary to Fig. 1. Fig. 3 is a front-elevation of the engine as it appears from the right of Fig. 1. Fig. 4 shows the upper part of Fig. 3 in section, the line of the latter running through the center of the cylinder and the point of view being the same as in the preceding figure. Fig. 5 is a detail side-view of contact pieces which may be used for effecting the ignition electrically. Fig. 6 is a top-view of the cylinder.

A is the frame, a its base and a' a' standards extending therefrom and carrying in suitable bearings the main shaft B. This shaft extends beyond its bearings on each side and carries on one end a governor C and on the other end a fly wheel D and driving pulley E.

F is the piston cylinder which is surrounded by a water jacket f.

G is the piston which is connected with a crank b' on the main shaft by a connecting rod g.

H is a gas reservoir from which the gas passes through a pipe h, controlled by a valve h', a passage f' and port f^2 to the cylinder, its admission being regulated by valve I. The air is admitted through a pipe J, preferably having its intake within the base a, a passage f^3 and the port f^4 its admission being regulated by the valve I′ preferably carried by the stem which carries valve I.

I^2 is the exhaust valve and f^5 the exhaust port. For operating these valves I provide a counter shaft L driven from the main shaft by a train of gearing b, m, l, the intermediate gear m being mounted upon a stud a^2 upon the frame and the train being so arranged as to revolve shaft L once for two revolutions of the main shaft. Upon shaft L are fixed cones l' l' and l^2 l^2.

N N are rods connected with and adapted to actuate the stems of valves I, I′ and I^2, slotted at n, and taking over shaft L. These rods are provided with rollers n' n^2 adapted to ride respectively upon the cams l' and l^2. As the shaft L is rotated the cams l' contact with rollers n' and pull the rods N downward thereby opening the valves and the cams l^2 contact with rollers n^2 and lift the rods N thereby closing the valve, the cams being so placed that the inlet valves open as the exhaust closes and vice versa.

It will be observed that the valve operating mechanism is positive being directly controlled by the cams and that springs and other less reliable machine elements are dispensed with. As the piston moves downward valves I and I′ open, the engine acting like a suction pipe and drawing in gas and air through ports f^2 and f^3, the gas and air being mixed in their passage to the cylinder. On the up-stroke the piston compresses the mixture which is ignited and explodes as the piston starts upon its downward stroke and while the mixture is substantially at its greatest density. The piston is driven down by the impulse of the explosive and in the next upward stroke expels the exhausted gases through the exhaust port which has remained

closed during the two preceding strokes. For the purpose of automatically regulating the gas and air supply I place a valve h^2 in the passage between the gas reservoir and the inlet valve and a valve j^2 in the air pipe between the intake and the inlet valve and connect them with a governor in such manner that as the speed of the engine increases beyond the normal the cylinder supply is diminished and as the speed of the engine decreases the cylinder supply is increased. The valve stem, h^3 of valve b^2 is provided with an extension h^4 mounted in suitable guides and carrying at its free end a roller h^5. The valve stem j^3 of valve j^2 is also provided with a roller j^5. The preferred form of governor consists of a hub c secured to the main shaft. From this hub project arms c' in which are bearings for the pivots c^2 of angle levers c^3. One limb of each of these angle levers carries a ball or weight c^4 and the other limb of each lever engages with and actuates a plate c^5 arranged to slide in ways in the hub c and carrying a cam c^6, the cam surface of one of the sliding plates being arranged to contact with roller h^5 and actuate valve stem h^3 while the cam surface if the other is adapted to engage with roller j^5 and actuate valve stem j^3. The pivots c^2 upon which the angle levers c^3 are rigidly mounted carry arms c^7 the outer ends of which are connected by a spring c^8 tending to draw the free ends of the arms toward each other. Springs h^6 and j^6 may be employed to hold the rollers h^5 and j^5 in constant contact with the cams on the sliding plates. The cams and rollers are so placed that the valves h^2 and j^2 will be actuated concurrently. It will be seen that an acceleration of speed and the consequent departure of the balls from the axis of rotation draws the sliding plates outwardly thereby permitting the rollers to contact with the lower portion of the cam surface and the regulating valves to approach their seats while a decreasing speed and the consequent approach of the balls to the axis of rotation forces the cams inward and the valves apart from their seats. In this manner the gas and air supply is automatically regulated in proportion to the speed of the motor.

I have illustrated electrical connections for igniting the gas. Upon shaft L is a cam l^3 adapted to engage with a contact a^3 upon the frame. Projecting from the piston is a contact g' adapted to engage with a contact O which takes into the piston cylinder through an insulating bushing o. Contact a^3 is connected with one of the conductors and contact O with the other. The cam l^3 is so adjusted upon the shaft that it contacts with a^3 at the second up stroke of the piston while contact g^8 engages with O as the piston reaches its highest position. Connection is then made, the engine serving as part of the conductor. As the piston starts on its downward stroke the circuit is broken and the spark ignites the gas.

I have illustrated my invention as applied to an upright engine but it may be embodied with but formal changes in an engine of the horizontal type.

I claim—

1. The combination in a gas engine of a gas inlet pipe, an air inlet pipe, valves in each of the pipe valve-stems whereby the valves may be actuated, rollers carried by the valve stems, a governor consisting of a hub, ball carrying angle levers pivoted thereto, sliding plates adapted to be reciprocated by the levers, and segmental cams upon the sliding plates adapted to engage with the rollers on the valve stems, substantially as and for the purpose specified.

2. The combination in a gas engine of the gas inlet pipe h, a valve located therein and provided with a valve stem h^3 having an extension h^4 carrying a roller h^5, the air inlet pipe J, a valve located therein having a valve stem j^3 carrying a roller j^5 and the governor C provided with movable cams adapted to engage with the rollers, substantially as and for the purpose specified.

3. The combination in a gas engine, of a cylinder, an electrical contact situated therein, a piston carrying a contact adapted to engage with said contact in the cylinder, a gas inlet pipe, an air inlet pipe, valves in each of said pipes, rods connected with the valve stems, a counter shaft, an electrical contact in close proximity thereto, cams mounted on the shaft adapted to engage with the rods and the contact, substantially as and for the purpose specified.

CHARLES SELBY HISEY.

Witnesses:
ARTHUR GAMBELL,
JAMES N. RAMSEY.