(No Model.) 3 Sheets—Sheet 1.

M. W. WEIR.

GAS ENGINE.

No. 569,694. Patented Oct. 20, 1896.

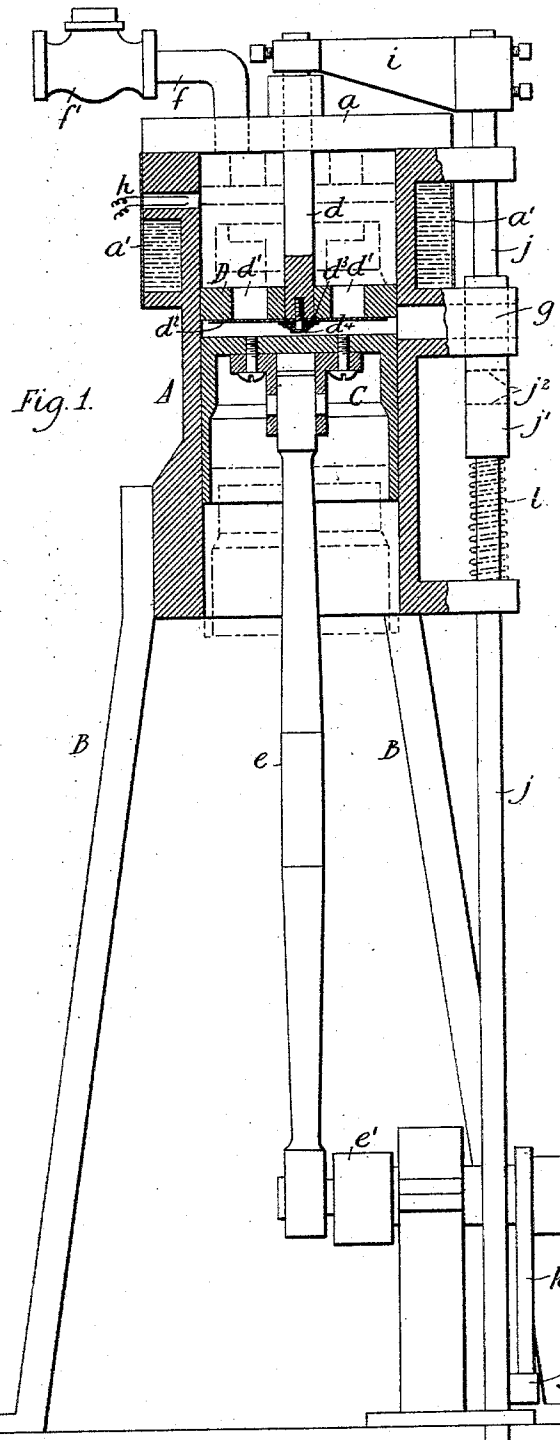

Fig. 1.

Witnesses
S. E. Zimmerman
W. J. Norton

Inventor
Max W. Weir
By Coyne Bressler
his Attorneys.

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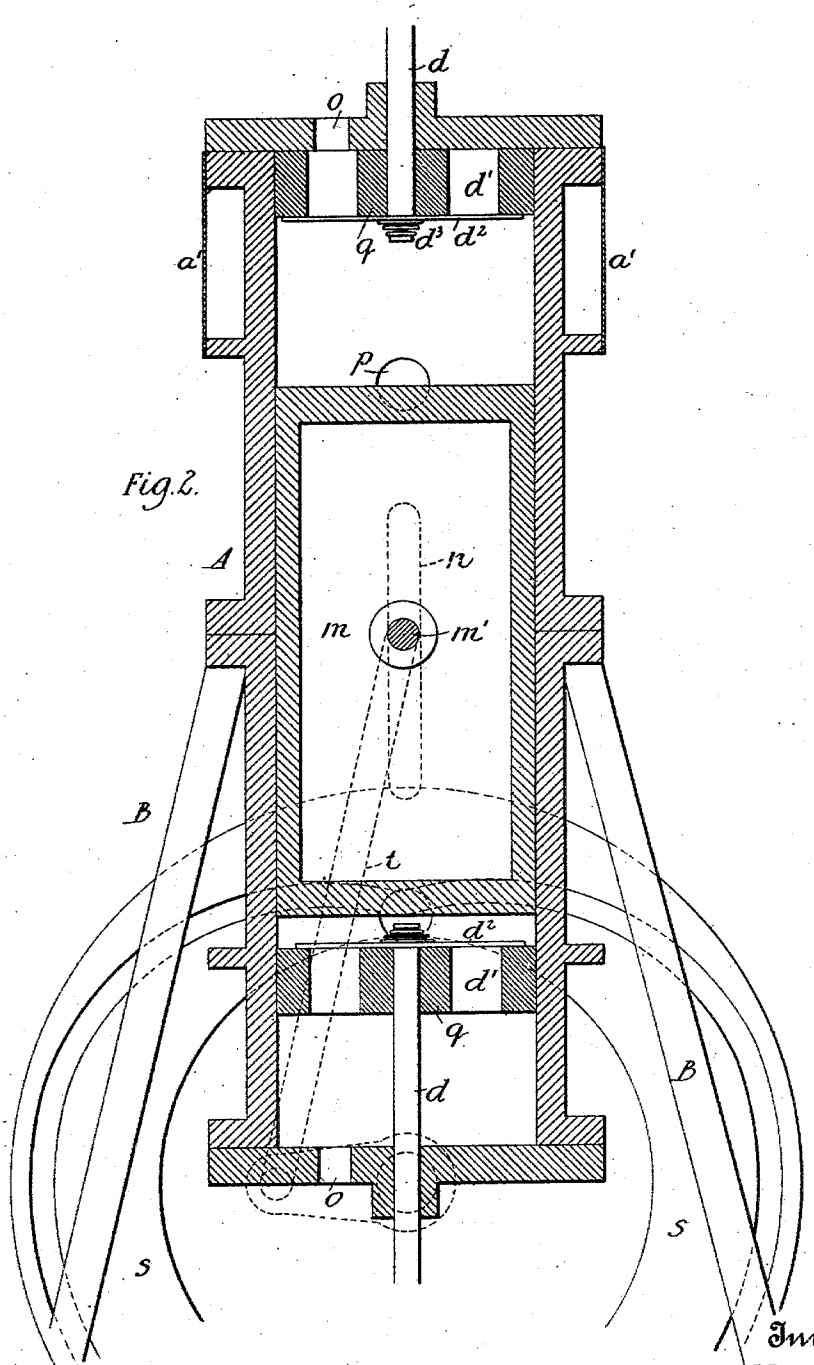
Fig. 2.



Witnesses

S. E. Zimmerman

W. J. Norton

Inventor

Max W. Weir

By Coyne & Bennett

his Attorney

(No Model.) 3 Sheets—Sheet 3.

M. W. WEIR.

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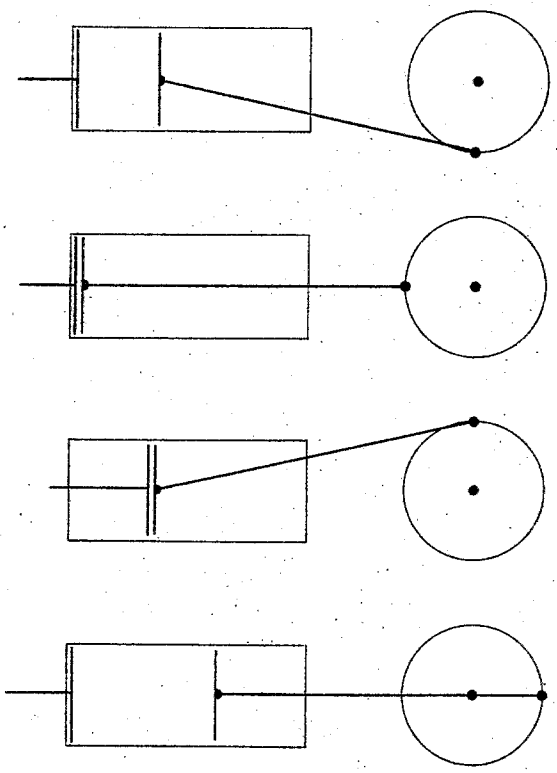

Fig. 4.

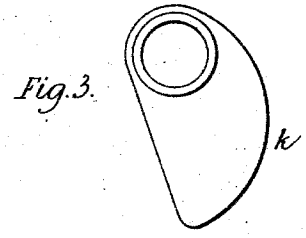

Fig. 3.

Witnesses
S. E. Zimmerman
W. J. Norton

Inventor
Max W. Weir
By Coyne Bracey
his Attorney

UNITED STATES PATENT OFFICE.

MAX WAKEMAN WEIR, OF NEWARK, NEW JERSEY.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 569,694, dated October 20, 1896.

Application filed November 29, 1895. Serial No. 570,459. (No model.)

To all whom it may concern:

Be it known that I, MAX WAKEMAN WEIR, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Gas-Engines; and I do 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 the letters of reference marked thereon, which form a part of this specification.

This invention relates to that type of gas-engines in which the motive power is effected by the explosion of mixed gas and air under pressure, and has for its object the production of an engine of this class possessing advantages in point of extreme simplicity of construction, as compared with existing engines, and durability, and added to these the results attained render the engine superior in the direction of precision and effectiveness of operation.

The nature of the invention will be fully understood by reference to the following detailed description, when taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section, of a gas-engine embodying my invention, said engine being of the single-acting type. Fig. 2 is a sectional view of enough of a double-acting engine with my invention embodied to show the application. Fig. 3 is a detail view showing a form of cam employed with my improved engine. Fig. 4 represents in diagrammatic views four relative positions of the essential features of my invention.

Referring to the said drawings by letter, attention being called first to Figs. 1 and 3, A denotes the cylinder, which in the instance shown is vertically disposed and supported on a frame B. In this cylinder are arranged two pistons, one of which, C, may be termed the "working piston" and the other, D, the "compression-piston," the former having connection through a rod e with the crank e' on the driving-shaft e^2 in the usual manner. The working piston is inverted-cup shape and fits the cylinder closely and has the length of stroke indicated by the dotted lines in Fig. 1. The compression-piston is in the form of a disk and fits the cylinder closely and is connected to a rod d, which extends without the cylinder-head a, where connection is made with its operating means, the construction and operation of which will shortly be made apparent. The inlet-pipe for the gas and air is shown at f, the same being controlled by a valve f', said pipe passing through the head a and admitting the fluid to the cylinder above the compression-piston. At g is shown the exhaust, which is in the nature of a perforated extension of the cylinder, controlled by the means for operating the compression-piston. Surrounding the cylinder is a casing a', which is formed partly by flanges on the cylinder, thereby providing a chamber or passage for the circulation of water to control the temperature of the cylinder. At a point h in the cylinder are arranged the terminals of an electric circuit by which there is formed intermittently an electric igniting-spark for producing the explosion of the mixed gas and air.

The compression-piston is provided with a plurality of apertures d' d', which are normally closed by a disk valve d^2, arranged in the under side of the piston and seated by the action of a coiled spring d^3, interposed between said disk valve and a regulating-screw d^4. To the upper exposed end of the compression-piston rod d is secured by a set-screw one end of an arm i, which has its other end connected by set-screws to a rod j, supported and movable in brackets on the cylinder. At j' on said rod j is an enlargement working in an aperture in the exhaust extension and provided with a slot or perforation j^2, by which on the movement of the rod the exhaust is opened or closed. A downward movement is imparted to the rod j and in turn to the compression-piston by the action of a cam k, which is keyed on the driving-shaft and engages during a portion of its revolution a pin or lug j^3, carried by the rod j. To restore the movement of the rod and compression-piston, I employ a coiled spring l, preferably interposed between the enlargement j' and one of the supporting-brackets, as shown. Instead, however, of employing the spring the cam may obviously be of the double-acting type.

Referring to Fig. 4, it will be noted that I have illustrated four possible relative positions for the two pistons. The first view shows the positions at half-expansion, the second at the position of explosion, the third at the end of the exhaust, and the fourth at the end of the expansion. In Fig. 1 the relative positions of the two pistons is indicated when the working piston is at half-rising stroke. A slight movement further releases the compression-piston, which, rising suddenly, causes its valve to open and the mixed gas and air to enter between the two pistons. The compression-piston is now stationary, but the working piston moves upward until it assumes the position coincident with the second view of Fig. 4. The gas and air are now at their greatest pressure, and by an automatically-controlled means (not here shown) the electric circuit is completed and the explosion takes place. At the end of the downward stroke of the working piston the cam operates to move downward the compression-piston and to open the previously-closed exhaust, and the next quarter-turn brings the parts into the position previously described, and shown in Fig. 1, and the operation is repeated, an impetus being given at every downstroke.

Referring now to Fig. 2, in which I have shown my invention as embodied in a double-acting engine, m denotes the working piston, which is in the form of a cylinder closed at both ends and transversely apertured to receive a trunnion-rod m', which passes through and extends beyond vertical slots n in the cylinder. Air and gas inlets are provided at o o, and p p are the exhausts. Two compression-pistons q q are provided, one at each end of the working piston, and are constructed and operate similarly to the compression-piston previously described with reference to Fig. 1. For operating the lower compression-piston I employ a cam, (not shown,) and preferably arrange said cam on the fly-wheel s. The other compression-piston is operated by the same cam in a manner similar to the lower compression-piston. The connecting-rod t is interposed between a crank on the driving-shaft and the trunnion-rod, its position being indicated by dotted lines in the figure now referred to. For convenience in assembling the machine the cylinder is formed in two parts flanged and bolted together.

I claim as my invention—

1. An explosive gas-engine comprising a cylinder provided with an inlet for the gas and air, an exhaust, and spark-producing means, a working piston, a compression-piston having valve-controlled openings, and means for operating said compression-piston and controlling the exhaust comprising a rod having connections at its upper end with said piston and having a valve connection with the exhaust and controlled by cam connection with the driving-shaft.

2. An explosive gas-engine comprising a cylinder provided with an air and gas inlet, an exhaust and a spark-producing device, a working piston having crank connection with the driving-shaft, a compression-piston having a plurality of apertures normally closed by a spring-controlled disk-valve, and having a rod extending without the cylinder, and a rod for operating the compression-piston and controlling the exhaust having connection at its upper end with the piston-rod and having a slotted portion moving across the exhaust-passage, said rod being normally raised, and a cam on the driving-shaft for intermittently depressing said rod.

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

MAX WAKEMAN WEIR.

Witnesses:

ANSON BURLINGAME COLE,

W. E. CORTELYOU.