No. 661,865. Patented Nov. 13, 1900.

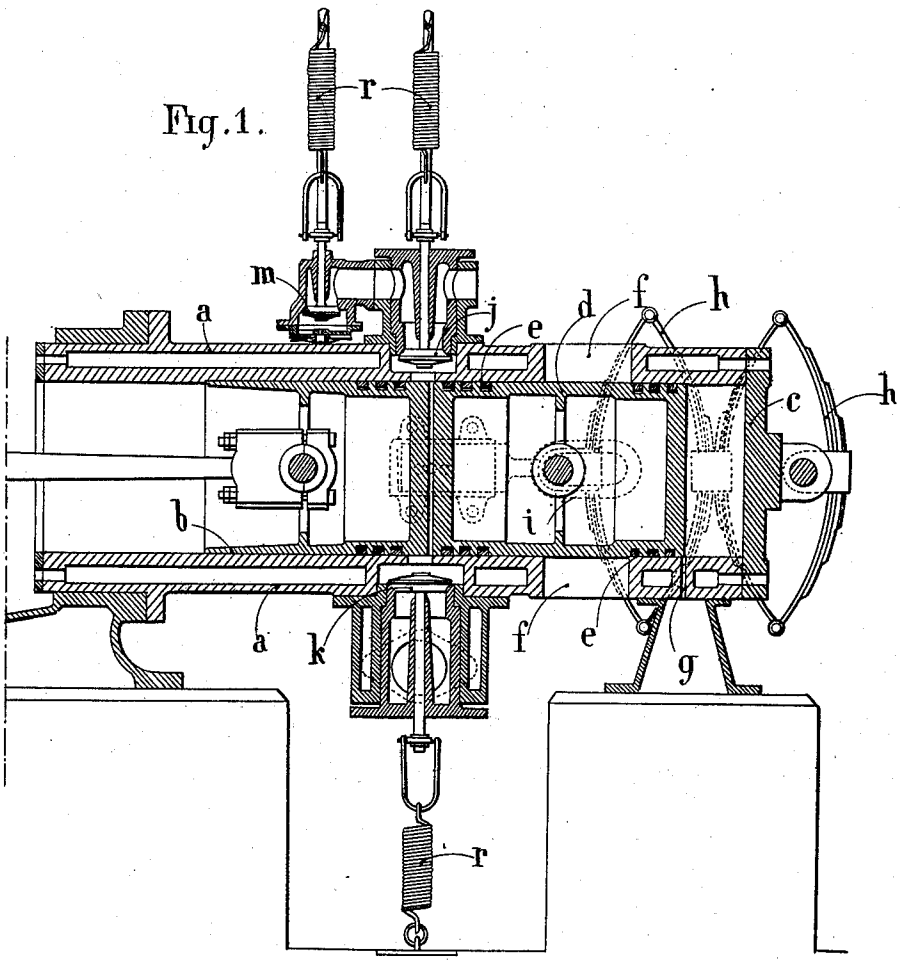
N. A. GUILLAUME.

GAS MOTOR.

(Application filed Jan. 5, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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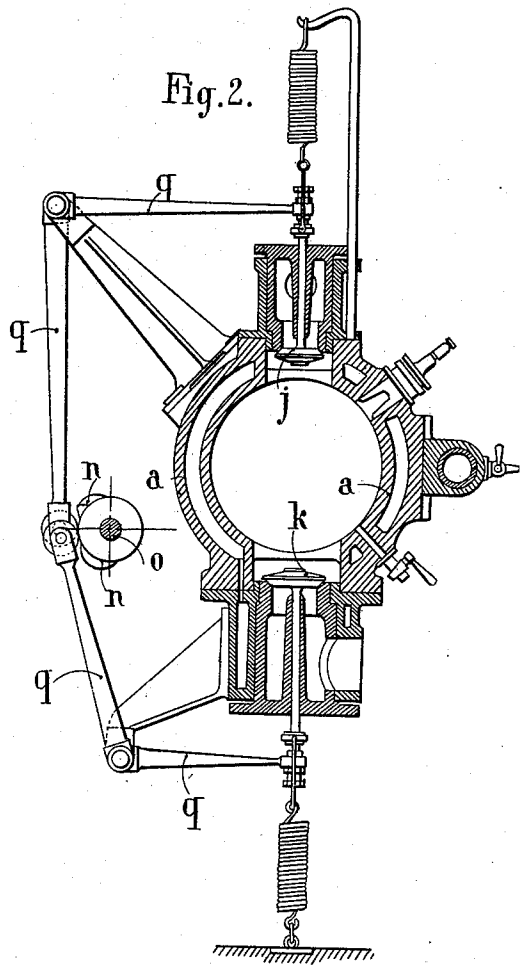
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Fig. 2.



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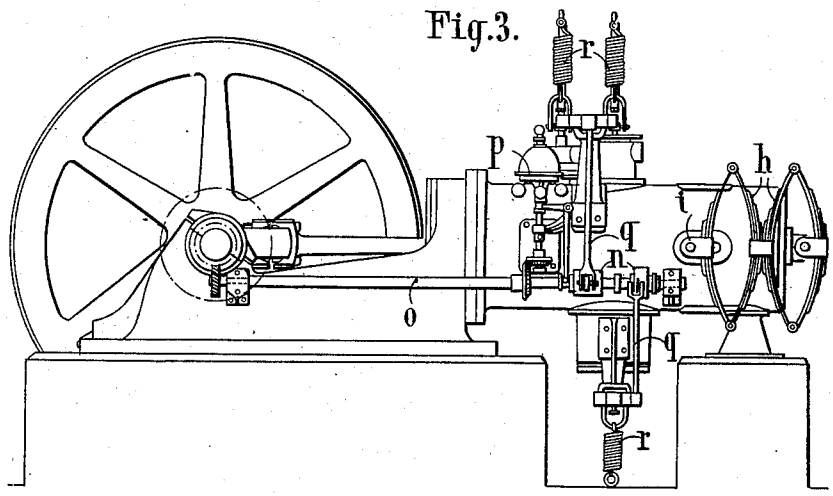
N. A. GUILLAUME.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

NARCISSE ALEXANDRE GUILLAUME, OF PARIS, FRANCE.

GAS-MOTOR.

SPECIFICATION forming part of Letters Patent No. 661,865, dated November 13, 1900.

Application filed January 5, 1900. Serial No. 497. (No model.)

To all whom it may concern:

Be it known that I, NARCISSE ALEXANDRE GUILLAUME, a citizen of France, residing at Paris, France, have invented certain new and useful Improvements in Gas-Motors, of which the following is a specification.

The object of this invention is to provide improvements in explosion-engines, and more especially in four-stroke engines, whereby the whole of the burned gases at the termination of the fourth stage of the cycle are expelled.

The improvement mainly consists in the interposition between the driving-piston and the bottom of the cylinder of a separate movable bottom in the form of a double piston adapted to compress the air between it and the stationary bottom of the cylinder during the second stage and at the beginning of the third stage of the cycle. In the course of the third stage, during the expansion of the explosion-gases, and during the fourth stage of the cycle the said movable bottom is driven forward by the expansion of the air which it has previously compressed. The combustion-chamber is reduced to minimum capacity, and the entire expulsion of the burned gases is insured.

In order that my invention may be fully understood, I will describe the same with reference to the accompanying drawings, in which—

Figure 1 shows my invention applied to a four-stroke explosion-engine, said view being a longitudinal section of the engine. Fig. 2 is a cross-section of the same. Fig. 3 represents, on a reduced scale, an elevation of the whole engine.

The engine comprises a double-cased cylinder *a*, in which casing or jacket water is caused to circulate, while a driving-piston *b* is adapted to move within the cylinder. Between this piston and the stationary bottom *c* of the cylinder is a double piston *d*, which is also adapted for moving freely within the said cylinder and constitutes a movable bottom to the cylinder. Upon this movable bottom there are arranged segments *e*, serving to cut off all connection between the combustion-chamber formed by the rear or bottom surface of the driving-piston and the front surface of the double piston or movable bottom *d* and the air-chamber formed between the rear surface of the double piston and the surface of the stationary bottom *c* of the cylinder. In the portion of the cylinder-wall between the combustion-chamber and the air-chamber apertures *f* are provided for connecting the interior of the cylinder with the atmosphere in the event of a gas-escape toward the air-chamber taking place. These apertures *f* or chambers also facilitate lubrication, while two lateral stops *i* serve to arrest the movable bottom in the event of an escape occurring in the compressed-air chamber. The movable bottom when in its central position in the cylinder, Fig. 1, uncovers a channel *g* or port provided in the cylinder-casing and serving to connect the air-chamber with the atmosphere.

In order to accurately time the return stroke of the movable bottom to its normal position, the said movable bottom may be connected to springs *h*, arranged on either side of the cylinder, the said springs being compressed at the same time as the air is compressed in the air-chamber during the second phase and at the beginning of the third. During the latter period of the third phase and during the fourth phase these springs restore the said movable bottom to its exact initial position. A stop *i*, arranged on either side of the cylinder, serves to limit the rearward stroke of the movable bottom and to prevent it from moving past its normal position.

It will be understood that in view of the provision of the springs *h* the stationary cylinder-bottom *c*, and consequently the air-chamber, might be dispensed with altogether, it being sufficient in that case to secure the springs *h* at convenient points of the cylinder-casing.

The inlet-valve *f* for the explosive mixture and the exhaust-valve *k* are arranged practically opposite each other in the longitudinal center of the outer cylinder-wall and are controlled, as is also the gas-inlet valve *m*, by cams *n*, rigidly mounted upon the same shaft *o* that operates the governor *p*, the said cams *n* acting upon bell-crank levers *q*, which operate the rods of the said valves, while springs *r* serve to draw them back to their seats.

The ignition device may be of any suitable kind; but electric ignition is that preferred, as shown in Fig. 2.

At the beginning of the cycle the driving-piston *b* and the movable bottom *d* are approximately close to each other and are placed in the positions shown in Fig. 1. During the second stage or phase and at the commencement of the third compression and explosion the movable bottom compresses the air against the stationary bottom *c*. The air thus compressed will at the termination of the third phase and during the fourth force the movable bottom-piece forward, the driving-piston in the meantime performing its return stroke. Inasmuch as the combustion-chamber is thereby reduced to a minimum of space, the burned gases will be wholly expelled after the fourth phase.

As before stated, the return of the movable bottom-piece to its normal position may be accurately timed by means of springs *h* and stop *i*, the movable bottom-piece being at the same time prevented from impinging on the driving-piston.

To insure an even motion of the engine and avoid concussion, the movable bottom may be connected with a dash-pot. (Illustrated by dotted lines in Fig. 1.)

Having now particularly described and ascertained the nature of my invention and the manner in which it may be performed, I declare that what I claim is—

1. In engines of the character described, the combination of a cylinder, a driving-piston, a spring-actuated auxiliary piston, and an air-chamber arranged between said auxiliary piston and the bottom of said cylinder, and communicating with the external air through air-inlets uncovered by said auxiliary piston, said auxiliary piston having lateral stops engaging elongated slots in said cylinder, substantially as described.

2. In engines of the character described, the combination of a cylinder, a driving-piston, a spring-actuated auxiliary piston, an air-chamber between said auxiliary piston and the bottom of said cylinder, said cylinder having lateral outlets arranged intermediately of the combustion and air chambers, and stops connected to said auxiliary piston and engaging elongated slots in said cylinder, substantially as set forth.

3. In engines of the character described, the combination of a cylinder or chamber, a driving-piston, a spring-actuated auxiliary movable bottom arranged between said driving-piston and the bottom proper, said auxiliary movable bottom or piston having lateral stops engaging elongated slots in said cylinder or chamber, substantially as set forth.

4. In engines of the character described, the combination of a cylinder or chamber, having an air-chamber next to its bottom, an air-inlet therefor, a driving-piston and an auxiliary movable bottom, adapted to uncover said air-inlets and serve as a supplemental piston and arranged between said driving-piston and said air-chamber, substantially as set forth.

5. In engines of the character described, the combination of a cylinder or chamber having an air-chamber next to the bottom, a driving-piston, and an auxiliary movable bottom, adapted to act as a supplemental piston, and arranged between said driving-piston and air-chamber said cylinder or chamber also having a lateral outlet or opening between said air-chamber and the combustion-chamber, substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

NARCISSE ALEXANDRE GUILLAUME.

Witnesses:

EDWARD P. MACLEAN,

HIPPOLYTE JOSSE.