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C. & W. HIBBARD.

GOVERNOR FOR EXPLOSIVE ENGINES.

APPLICATION FILED MAR. 8, 1904.

NO MODEL.

Fig. 4.

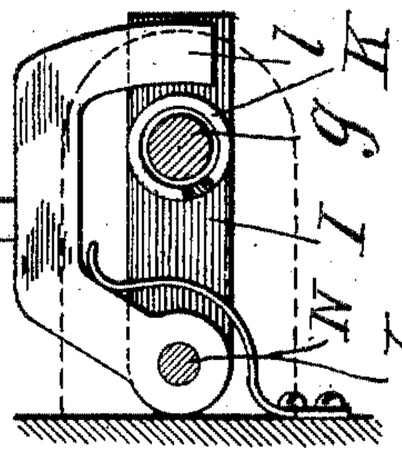


Fig. 2.

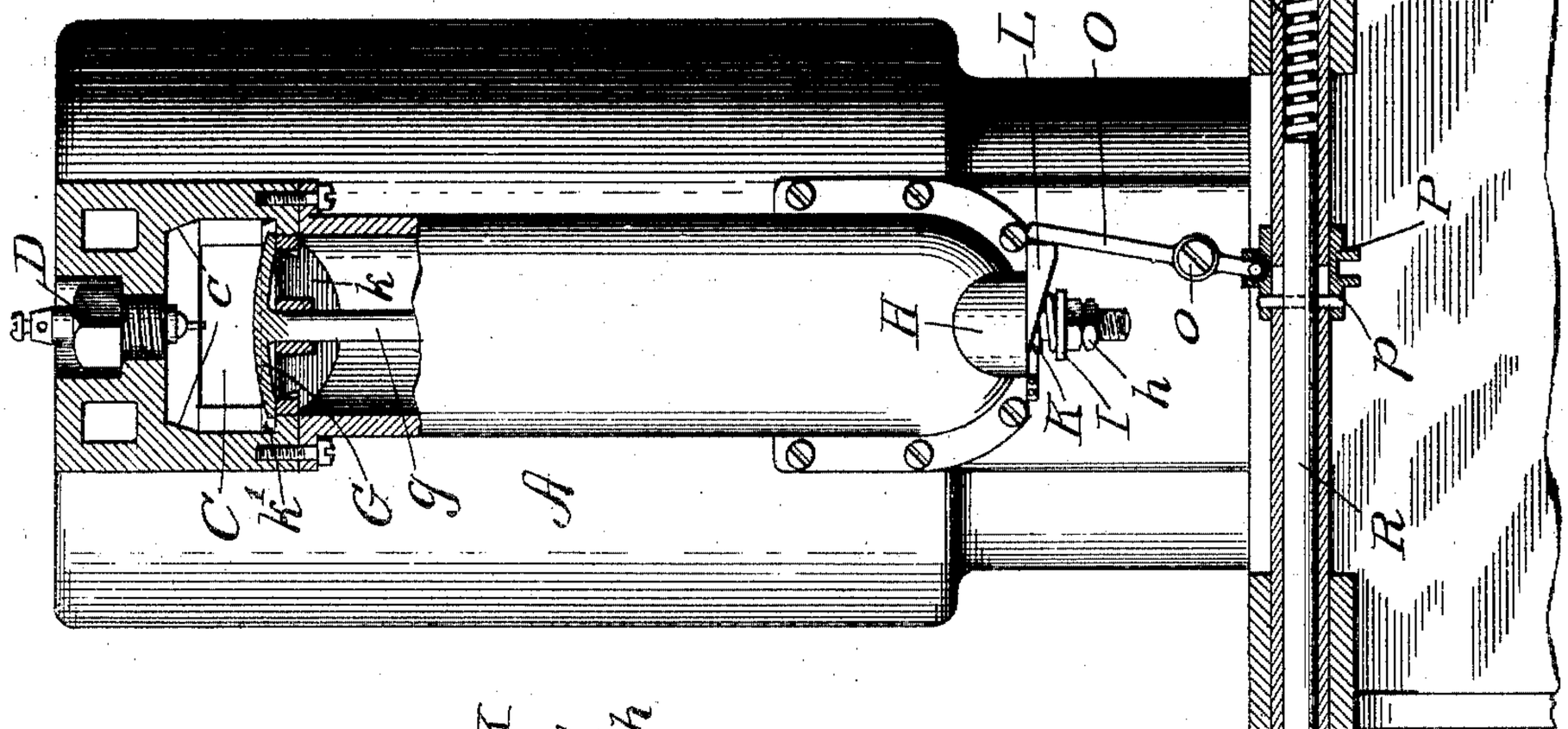
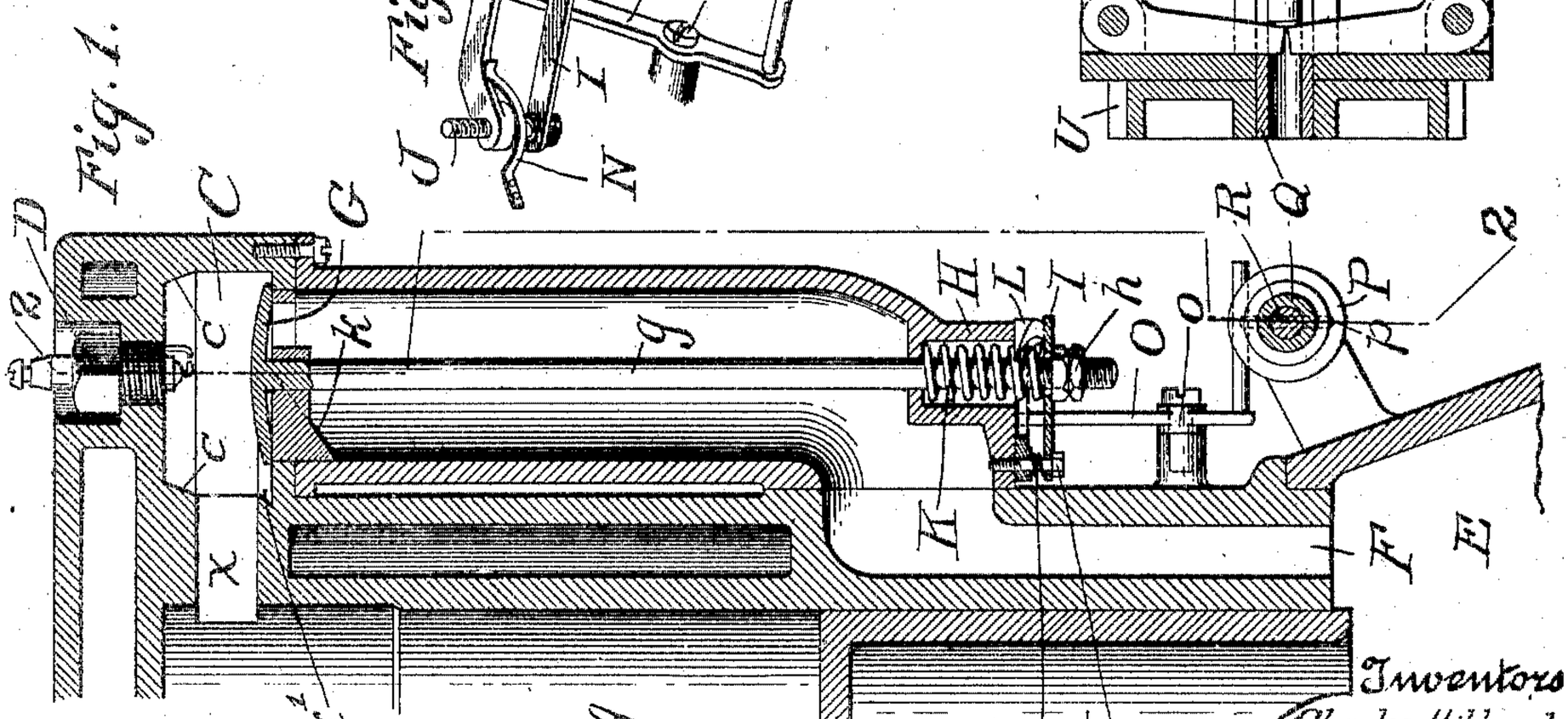


Fig. 3.

Fig. 1.



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No. 775,820. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

CHARLES HIBBARD AND WARREN HIBBARD, OF SANDYHILL, NEW YORK.

GOVERNOR FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 775,820, dated November 22, 1904.

Application filed March 8, 1904. Serial No. 197,114. (No model.)

To all whom it may concern:

Be it known that we, CHARLES HIBBARD and WARREN HIBBARD, citizens of the United States, residing at Sandyhill, in the county of Washington and State of New York, have invented certain new and useful Improvements in Governors for Explosion-Engines, of which the following is a specification.

The object of our invention is to provide a simple but very sensitive and delicate governor for explosion-engines which is so constructed and operated as to accurately regulate the lift or inward movement of the admission-valve, and thus control the force of the explosions, and consequently the speed of the engine.

Our improved governor devices comprise certain connections with the stem of the admission-valve which contain, among other things, a stop and an inclined surface, the relative position of the stop and inclined surface being changed as the speed of the engine increases and decreases.

In carrying out our invention we preferably form a screw-thread on the lower end of the valve-stem, and on this screw-thread place adjustable nuts. Above the nuts is located a plate which is supported by the engine-frame, and between the plate and frame we interpose a spring which is preferably made to encircle the valve-stem. Pivotally connected with the engine-frame is an arm having an inclined surface and adapted to move between said plate and the frame, and this arm is held in place by a bolt which also attaches the plate to the frame. Between the arm and the plate is interposed a spring which surrounds the bolt and holds the parts in proper position and prevents rattling. The arm having the inclined surface is pressed in one direction by a spring and in the opposite direction by a lever connected with a sliding rod which is moved in one direction by a spring and in the opposite direction by governor-balls.

While we prefer to embody our invention in devices such as above described, the details of construction may be varied, as will hereinafter appear.

The ignition devices of the engine are located in a valve-chamber immediately over the admission-valve. This valve-chamber is so constructed that it tends to retard the passage of the explosive mixture to the working cylinder and to detain it in the valve-chamber, so that while a free passage of the mixture to the cylinder is permitted when the supply is plentiful, as when running at high speed or where the engine is set to run with a heavy load, the passage of mixture is retarded at other times, as when the speed is slow or the valve is set to give small admissions and reduce the horse-power.

In the accompanying drawings, Figure 1 is a vertical section of so much of an explosion-engine as is necessary to illustrate our improvements. Fig. 2 shows a vertical section taken at right angles to that shown in Fig. 1 on the line 2 2 of Fig. 1. Fig. 3 is a detail view in perspective of the governor devices. Fig. 4 is a detail view in plan of these devices.

We preferably embody our invention in a single-acting simple two-cycle engine in which the explosive mixture compressed in the crank-chamber by the working piston is admitted to the working cylinder through a valve-chamber containing igniting devices and having a port through which the mixture is delivered radially to the working cylinder.

In the drawings, A indicates the working cylinder, and B the piston.

C is the chamber of the admission-valve, and D electrical igniting devices.

E is the crank-chamber, and F the passage which conveys the explosive mixture from the crank-chamber to the chamber C of the admission-valve G. This valve opens inward or upwardly, and its stem *g* extends through the passage F and through a hollow boss H. The lower end of the valve-stem is screw-threaded and carries adjustable nuts *h*, on which rests a plate I, which is also supported by a bolt J, attached to the engine-frame. A spring K, seated in the boss H, bears against the top of the plate I and tends to close the admission-valve and also hold the plate on the top of the nuts.

L indicates an arm which is pivotally connected with the bolt J and held away from the plate I by a small helical spring M. The arm L has a wedge-shaped portion *l*, as clearly

illustrated in Fig. 3. The upper side of the wedge-shaped portion *l* is preferably straight or horizontal, while the under side thereof is inclined, as indicated in Figs. 1, 2, and 3. A spring N, attached to the frame of the engine, bears against the arm L and tends to withdraw the wedge-shaped portion from the plate I.

O indicates a lever pivoted at *o* to the main frame and connected with a sleeve P on a tubular shaft Q. Within this shaft is a rod R, to which the sleeve P is connected by a pin *p* passing through a slot in the tubular shaft Q. The rod R is pressed in one direction by a spring S, and it is moved in the opposite direction against the force of the spring by governor-balls T.

U indicates a gear-wheel attached to the tubular shaft Q and which may be connected up with the crank-shaft of the engine. The arrangement is such that as the wheel U is rotated the governor-balls are rotated with it, and as the speed of the engine increases or decreases the rod R is moved endwise and correspondingly moves the lever O. As the speed increases the spring N withdraws the arm L from the plate I to a greater or less extent. When the speed decreases, the lever O is operated to move the arm L to a greater or less extent across the plate I, and thus control the lift of the admission-valve. By this mechanism the movements of the admission-valve may be controlled with great delicacy and the speed of the engine correspondingly regulated. This action is automatic; but a positive adjustment may be given to the governor devices by means of the nuts *h* and the screw-bolt J. The openings in the plate I, through which the valve-stem and the screw-bolt extend, are widened, as indicated, so that the valve-stem may move freely, and the plate may, if desired, be tilted slightly while being adjusted. The valve-chamber C is so constructed as to retard the passage of the explosive mixture to the working cylinder. The valve-seat is located below the plane of the admission-port *x* and just below the electrodes D. The top wall of the valve-chamber is above the plane of the admission-port *x*, and where the top walls join the side walls the chamber is beveled or inclined on all four sides, as indicated at *c*. The upper part of the passage F, just below the valve-head, has an inclined wall *k*, which slopes upwardly in an inclined direction toward that part of the valve-chamber opposite the admission-port *x*, by which formation the inflowing gases are directed toward that end of the chamber and are prevented from passing directly to the admission-port. On that part of the valve-chamber where the admission-port is located and just below the plane of the port a rib *k'* is formed, which has an undercut wall sloping from its lower edge upwardly toward the ignition devices. The purpose of thus forming the walls of the valve-chamber is to prevent the direct passage of the explosive mixture through the admission-port to the working cylinder and to detain these gases in the valve-chamber close to the ignition devices. The formation of the valve-chamber which we have specifically described has been found to successfully perform these functions; but we do not confine ourselves to the precise formation shown and described, as these may be somewhat varied and yet accomplish the same result. When the engine is running at high speed and there is a free lift of the valve, so that a plentiful charge is admitted at each reciprocation of the engine, the cylinder, as well as the valve-chamber, will always be filled with sufficient explosive mixture to perform the operations in regular order continuously or without interruption; but when the admissions are light, as when the engine is running at low speed, the valve is given only a slight lift to admit only a small quantity of mixture at each operation. It is important that enough of the mixture should be detained close to the ignition devices to effect an explosion even though none or only a small quantity of the mixture be admitted to the cylinder, as an explosion in the valve-chamber will cause an expansion the force of which will be communicated to the cylinder and effect the reciprocation of the piston.

The construction and organization which we have shown has been found to be efficient under all circumstances, working well when the supplies of the mixture are plentiful and also when they are very light. If the ignition devices were located in the cylinder itself and the charges were light, they would become so diffused in the cylinder as to prevent explosions under many conditions. In fact, where the ignition devices are thus arranged the valve mechanism could not be adjusted to admit very light charges and obtain successive explosions at regular intervals; but by our improvements where the ignition devices are located in a separate valve-chamber of small area the admission-valve can be set to admit a mere puff of the explosive mixture which in any such case will be confined to the valve-chamber and concentrated close to the ignited devices, and hence will always be exploded at the proper time.

A valve-chamber constructed in the manner above described is especially suitable for use in connection with our improved governor, because explosions may be caused even when the speed of the engine is very much reduced and the admissions of explosive mixture are small. By the use of such a valve-chamber in connection with our improved governing devices we can adjust the plate I in such manner as to admit small charges under all circumstances, it being clear that the more the plate I is adjusted upwardly the smaller will be the charges admitted at each operation, and yet even though these charges be very

small by reason of the peculiar valve-chamber explosions will always occur at proper times. This would not be the case if the mixture were admitted directly to the working cylinder or were not detained in the manner above specified close to the ignition devices.

We do not herein claim the particular form of the chamber for the admission-valve, as this is claimed in our application for patent, Serial No. 183,212, filed November 30, 1903.

We claim as our invention—

1. The combination with the stem of the admission-valve, of a plate through which the valve-stem extends and which is supported by the main frame and by a nut on the valve-stem, a spring interposed between said plate and the main frame, an arm pivoted to the main frame and having an inclined end adapted to enter between the plate and the frame, and means for operating said arm.

2. The combination with the stem of the admission-valve, of a plate supported on the stem and by the main frame, a spring interposed between the frame and the plate and serving to hold the admission-valve closed, an arm having a wedge-shaped end adapted to enter between the plate and the frame, a lever engaging said arm and means governed by the speed of the engine for operating said lever.

3. The combination with the stem of the admission-valve, of a plate through which the stem of said valve extends and which is supported at one end by the stem and at the opposite end by the main frame of the engine, a spring surrounding the valve-stem and bearing on said plate, a spring pressing against the opposite end of the plate, an arm pivoted to the main frame and pressed in one direction by a spring and a lever for moving the arm in the opposite direction into the space between the plate and the frame.

In testimony whereof we have hereunto subscribed our names.

CHARLES HIBBARD.
WARREN HIBBARD.

Witnesses:
RUSSEL C. PARIS,
THEODORE D. CROSS.