No. 685,152. Patented Oct. 22, 1901.

L. A. C. LETOMBE.

SPEED REGULATOR FOR EXPLOSIVE ENGINES.

(Application filed Aug. 25, 1900.)

(No Model.)

Fig. 1.

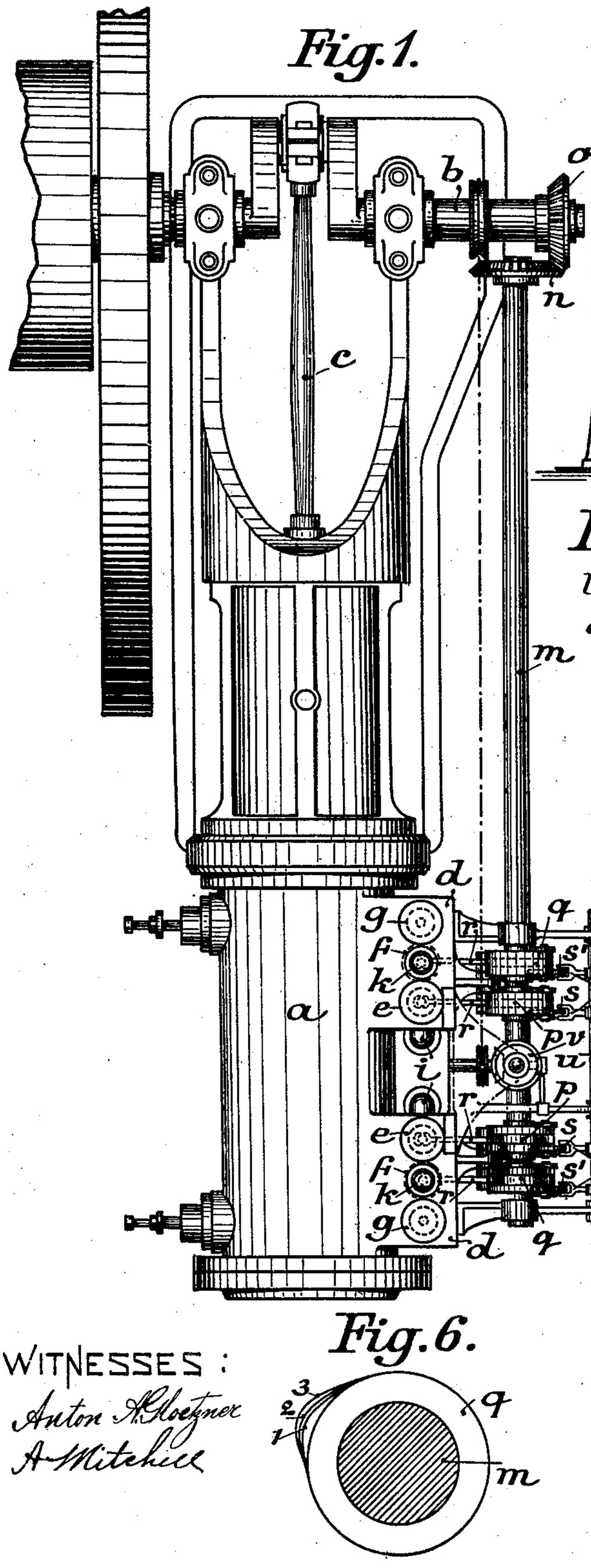


Fig. 2.

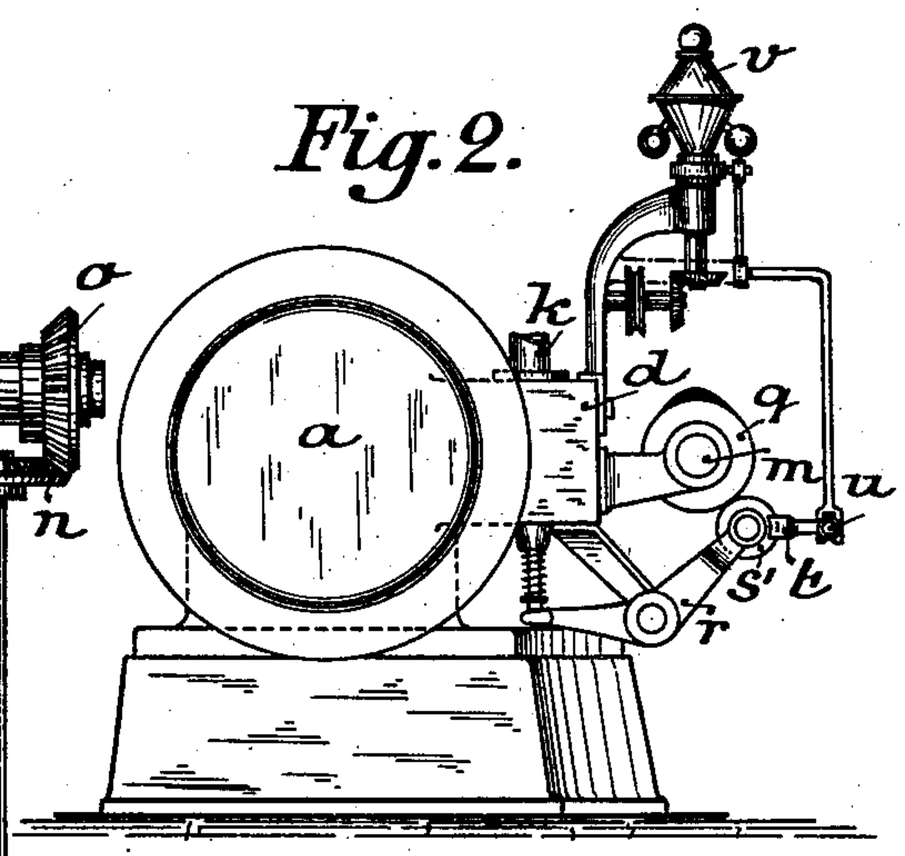


Fig. 4.

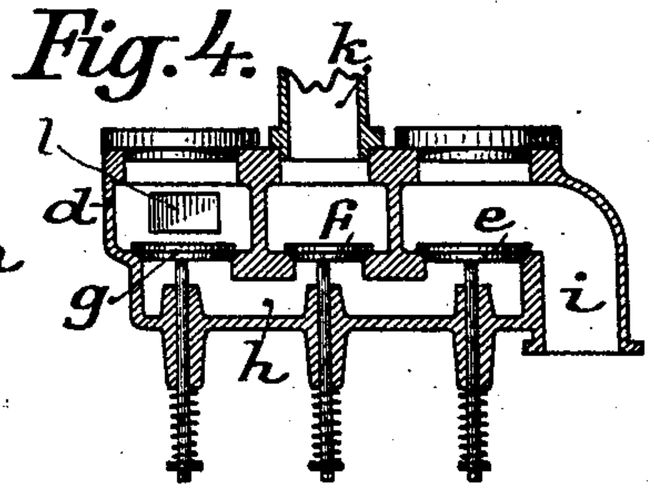


Fig. 3.

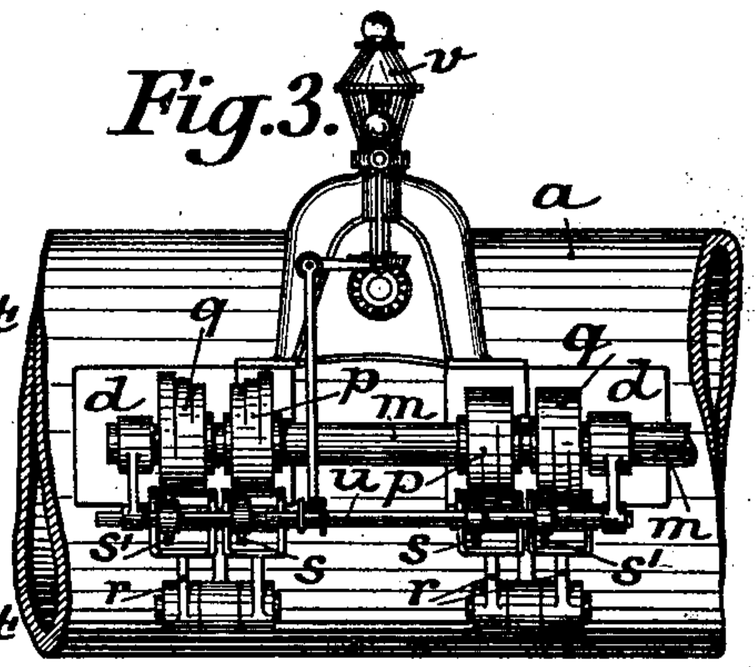
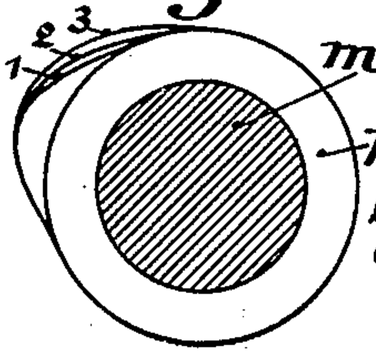


Fig. 6.

Fig. 5.



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LÉON ABEL CELER LETOMBE, OF LILLE, FRANCE.

SPEED-REGULATOR FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 685,152, dated October 22, 1901.

Application filed August 25, 1900. Serial No. 28,011. (No model.)

To all whom it may concern:

Be it known that I, LÉON ABEL CELER LETOMBE, engineer, a citizen of the Republic of France, residing at 3 Place de Rihour, Lille, France, have invented a certain new and useful Improvement in Explosive Motor-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.

My invention relates to improvements in explosive motor-engines of the kind in which the controlling mechanism is arranged in such a manner that if the load of the motor is diminished a larger amount of the explosive mixture with a less contents of fuel is sucked in in order to regulate the work done by the engine by means of an additional compression.

In order that my invention should be better understood, I shall describe it with reference to the accompanying drawings, in which—

Figure 1 is a plan view of a gas-engine constructed according to my invention. Fig. 2 is an end view of the same. Fig. 3 is a side view of the controlling mechanism. Fig. 4 is a longitudinal section through the valve-casing. Figs. 5 and 6 show the controlling-cams provided for governing the valves.

a is the cylinder of the engine, in which a piston moves in the usual well-known manner, and *b* is the main shaft, rotated by the rod *c*, connected with the piston-rod. The cylinder *a* is provided at each end with a valve-casing *d*. As will be seen from Fig. 4, each of these casings *d* contains three valves *e*, *f*, and *g*, normally pressed by springs to their seats and closing the passage *h*. A tube *i* leads from the open air to the valve *e* and a tube *k* from a gas-tank to the valve *f*, while from the valve *g* a channel *l* leads into the cylinder *a* behind the piston.

At the length side of the machine and opposite to the valve-casings *d* a shaft *m* is supported in suitable bearings and provided with a crown-wheel *n*, engaging a crown-wheel *o*, fastened on the main shaft *b*. On the shaft *m* are fastened disks *p* (separately shown by Fig. 5) opposite to the valves *e*, and disks *q* (separately shown by Fig. 6) opposite to the valves *f*. The disks *p* and *q* are provided with a number of cams of different length, in the drawings three cams 1 2 3 being shown by way of example. Under each of these disks a lever *r*, Figs. 2 and 3, is fulcrumed at a suitable part of the frame of the machine and provided at its upper forked end with a roller *s* or *s'*, adapted to move longitudinally on its pivot. The levers *r* abut with the other arm against the rods of the valves *e* and *f*, respectively, and are pressed down by the valve-springs so as to bring the rollers *s* and *s'* in close contact with the disks *p* and *q*, respectively.

The rollers *s* and *s'* are embraced by forks *t*, fastened on a rod *u*, which can be moved longitudinally by a governor *v* of any known type by means of suitably-connected rods and levers, as may be seen from Figs. 2 and 3.

The operation of the mechanism is as follows: If the piston begins its stroke at the end of the machine, the valves *e* and *f* at the same end are opened by their levers *r*, moved by one of the cams of the disks *p* and *q*, respectively. By the sucking action of the piston the valve *g* opens by itself and a mixture of gas and air will enter the cylinder from the tubes *k* and *i* and works on the piston in the usual manner, the valves *e* and *f* being closed as soon as the cams of the disks *p* and *q* have fully moved over the rollers *s*. Assuming the engine were highly loaded, then the governor produces such a motion of the rod *u* that the roller *s* runs on the shortest cam 1 of the disk *p* and the roller *s'* on the longest cam 3 of the disk *q*. Therefore the valve *e* is kept open during a short time and the valve *f* during a longer time. If now the load of the machine is diminished, the governor moves the rod *u* to the right of Fig. 3, thereby bringing the roller *s* on to a longer cam (2 or 3, as the case may be) of the disk *p* and the roller *s'* to a shorter cam of the disk *q*. Thereby the inlet-valve *e* is kept open during a longer time and the gas-valve *f* during a shorter time. At the same time the duration of the opening of the air and gas valves is so proportioned that a greater total amount of mixture will enter the cylinder than previously, while, furthermore, the said mixture will contain a smaller percentage of fuel-gas. Consequently the amount of the whole mixture is enlarged, but the contents of fuel therein is diminished, and in such manner the work done by the en-

gine is regulated by an additional compression.

I am aware that gas-engines regulated in the said manner are known, (for instance, from my German Patent No. 94,887;) but in those machines the gas-valve is governed by the air-valve, while according to my present invention the gas-valve is arranged independently from the air-valve and is governed by a special cam. Therefore the gas can enter in a large amount the cylinder even when under a low pressure, as is the case with the gases of high furnaces and the like.

Notwithstanding I have described my invention in connection with a double-acting gas-engine it is self-evident that it may be applied with the same result to single-acting engines and to all explosive power-engines operated by other fuels than gas.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an explosive-engine, the combination, with a valve-casing having a passage-way, and an air-inlet and a fuel-inlet each of which opens into said passage-way, of an air-inlet valve located in the air-inlet, a fuel-inlet valve located in the fuel-inlet, said valves being arranged to be closed by the suction action of the piston, means for opening the air-inlet valve, independent means for opening the fuel-inlet valve, and mechanism for varying the length of time during which said opening means act on their respective valves.

2. In an explosive-engine, the combination, with a valve-casing having a passage-way and an air-inlet and a fuel-inlet, each of which opens into said passage-way, of an air-inlet valve located in the air-inlet, and a fuel-inlet valve located in the fuel-inlet, said valves being arranged to be closed by the suction action of the piston, means for opening the air-inlet valve, independent means for opening the fuel-inlet valve, mechanism for varying the length of time during which said opening means act on their respective valves, and a third valve arranged to be opened by the suction action of the piston, said third valve being located between the cylinder and the passage-way.

3. In an explosive-engine, the combination, with a valve-casing having a passage-way, and an air-inlet and a fuel-inlet, each opening into said passage-way, of an air-inlet valve arranged to control the air-inlet, a fuel-inlet valve arranged to control the fuel-inlet, said valves being arranged to be closed by the suction action of the piston, of positive means for opening the air-inlet valve, independent positive means for opening the fuel-inlet valve, and variable mechanism for operating said opening means.

4. In an explosive-engine, the combination, with a valve-casing having a passage-way, and an air-inlet and a fuel-inlet, each opening into said passage-way, of an air-inlet valve arranged to control the air-inlet, a fuel-inlet valve arranged to control the fuel-inlet, said valves being arranged to be closed by the suction action of the piston, of positive means for opening the air-inlet valve, independent positive means for opening the fuel-inlet valve, variable mechanism for operating said opening means, and a third valve arranged to be opened by the suction action of the piston and located between the cylinder and the passage-way.

5. In an explosive-engine, the combination, with a valve-casing having a passage-way and an air-inlet and a fuel-inlet, each of which opens into said passage-way, of an air-inlet valve located in the air-inlet, a fuel-inlet valve located in the fuel-inlet, said valves being arranged to be closed by the suction action of the piston, cam-operated means for opening the air-inlet valve, independent cam-operated means for opening the fuel-inlet valve, and means for adjusting both of said cam-operated mechanisms, whereby the time and amount of opening of said valves may be varied.

6. In an explosive-engine, the combination, with a valve-casing, an air-inlet valve, and a fuel-inlet valve, said valves being arranged to be closed by the suction action of the piston, of a plurality of different sizes of cams arranged to open each valve, and means for determining the particular cams which act on the valves.

7. In an explosive-engine, the combination, with a valve-casing, an air-inlet valve, and a fuel-inlet valve, said valves being arranged to be closed by the suction action of the piston, of a set of cams for each valve, each set comprising a plurality of cams, means for transmitting motion from the respective cams to the respective valves, and mechanism for shifting said transmitting means whereby any desired cam of a set may be brought into action to open its respective valve.

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

LÉON ABEL CELER LETOMBE.

Witnesses:
RENÉ FRANÇOIS LELEUX,
LOUIS JOSEPH HOREMANS.