



No. 875,378.

PATENTED DEC. 31, 1907.

O. PODHAJSKY.

REGULATING DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED NOV. 6, 1906.

2 SHEETS—SHEET 2.

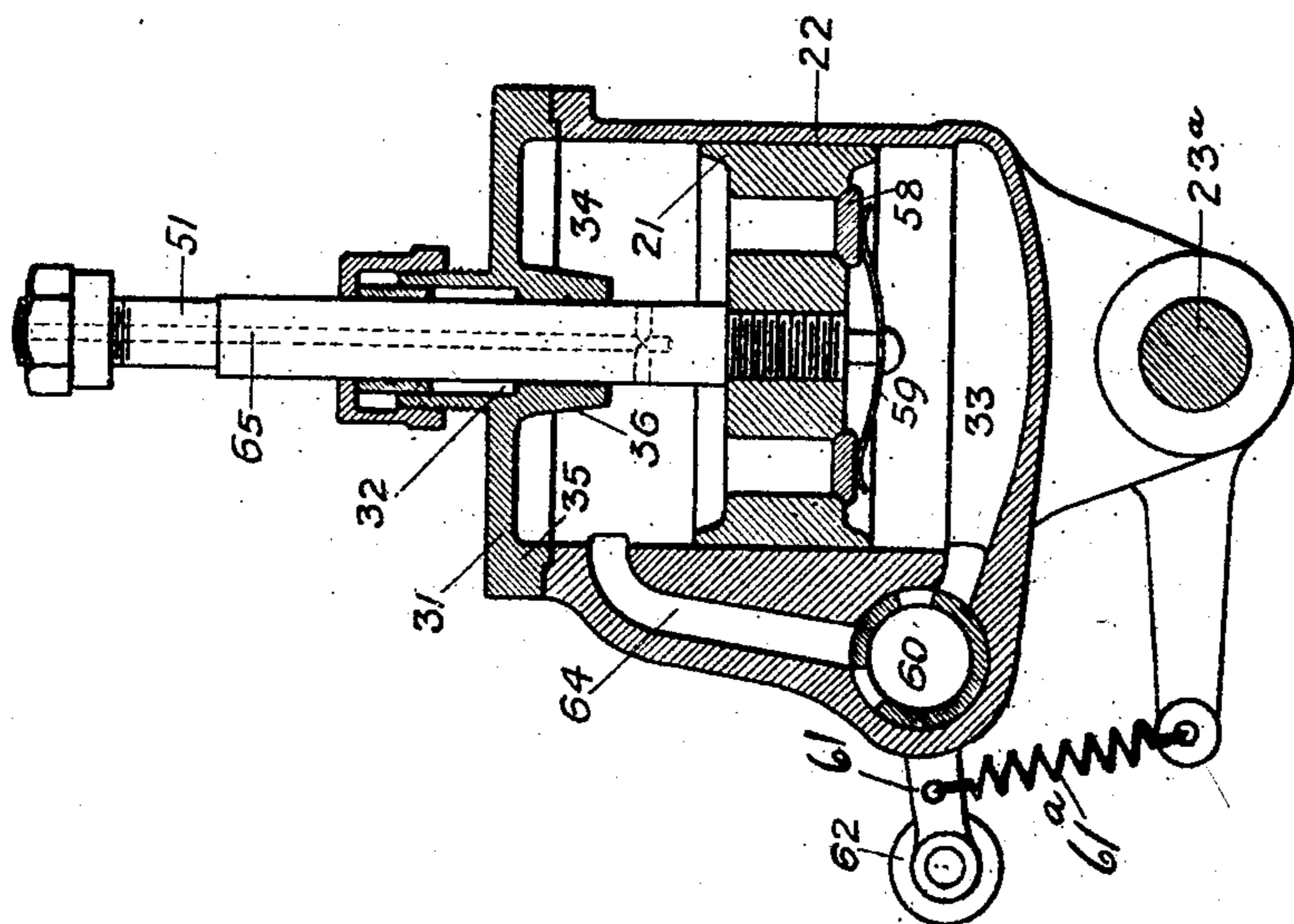


Fig. 2.

Witnesses:  
R. L. Alexander  
R. L. Alexander

Inventor:  
Oskar Podhajsky

# UNITED STATES PATENT OFFICE.

OTAKAR PODHAJSKÝ, OF WARREN, PENNSYLVANIA.

## REGULATING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

No. 875,878.

Specification of Letters Patent.

Patented Dec. 31, 1907.

Application filed November 6, 1906. Serial No. 342,199.

*To all whom it may concern:*

Be it known that I, OTAKAR PODHAJSKÝ, a subject of the Emperor of Austria-Hungary, residing at Warren, Warren county, Pennsylvania, have invented a new and useful Improvement in Regulating Devices for Internal-Combustion Engines, of which the following is a specification.

The object of my invention is to provide means for controlling and regulating the operation of internal combustion engines; and to this end it consists in a novel regulating apparatus, by means of which the lift of the admission valve as well as its point of closure or cut off may be varied quickly and accurately according to the load on the engine; the movement of said valve being at all times a positive one and controlled easily by the governor; and the entire mechanism being as simple, compact, and effective as possible. I attain these objects by the mechanism shown in the accompanying drawings, in which

Figure 1 is a section through a gas engine cylinder, and showing also my improved regulating mechanism in section. Fig. 2 is an enlarged longitudinal section through the cylinder of the regulating mechanism.

Like symbols of reference indicate like parts in each of the figures.

The regulating mechanism is shown and described in connection with a horizontally-acting engine, and with an admission valve controlling the gas and air mixture supply; but this presentation of the invention is not intended as a limitation to engines and valves of any particular type or form.

Referring to Fig. 1 of the drawings:—1 is a cylinder provided with an inlet opening 2, above which is bolted to the cylinder a valve-casing 3, inclosing the valve-cage 4. The interior of the valve-casing is divided into two chambers, the upper chamber 5 being suitably connected to the gas supply and the lower chamber 6 being connected in appropriate manner to the air supply. The valve-stem 8 is provided at its lower end with a disk-valve 9, and has also rigidly mounted on it a cylindrical valve 10, for controlling the gas supply to the cylinder. The valves 9 and 10 are held closed by means of a spring 11, one end of which bears against the top of the valve-cage 4, and the other end against a disk 12, fixed on the valve-stem 8 by means

of the extension 56, to which the lever 14 is pivotally connected by means of the pin 15. To the right-hand end of the lever 14, by means of the pin 19, is pivotally connected a rod 20, the lower end of which is provided with a pin 23 on which is loosely mounted the roller 24. The roller 24 and the rod 20 are moved by means of a cam 28, rigidly mounted on a shaft 29, which is rotated as usual from the main shaft of the engine, the roller 24 and the rod 20 being held in proper relation to the cam by the link 25, rocking on pin 26, which is suitably supported on any fixed part of the engine frame, the roller 24 being kept in contact with the cam by the spring 27.

For actuating the mechanism an eccentric could be used instead of a cam, in which case the guiding link 25, spring 27, and pin 26 would be omitted.

A piston 52 is suitably fastened to the valve-stem extension 56 and fits snugly but can slide freely in the cylinder 53, the walls of which are provided with openings 54, permitting a certain amount of air to enter the cylinder during the downward stroke of the admission valve. The air outlet is controlled by an adjusting screw 55<sup>a</sup>, by means of which certain resistance to the emission of the air can be secured for a purpose hereinafter described.

The admission-valve actuating lever 14 is fulcrumed on the pin 23<sup>a</sup>, supported on the cylinder 22.

Referring to Fig. 2, the cylinder cover 31 is provided with a stuffing-box 32, forming a tight joint around the rod 51 which passes through it. The piston 21 fits snugly to the walls of the cylinder 22, but can slide freely in the cylinder, and it divides the interior of the cylinder into two independent compartments. The lower compartment 33 is filled completely with any desired incompressible liquid, and the upper compartment 34 is partially filled with the same liquid, provision, however, being made for a cushion of air at the top for a purpose which will be hereinafter explained. The cylinder cover 31 is provided with projections 35, 36.

The cylinder 22 is provided with a by-pass opening 64, which is controlled by the valve 60, held normally closed by means of a spring 61<sup>a</sup>. A lever 61, carrying at its end a roller 62 is suitably connected to the valve 60.

The piston 21 is provided with an automatic relief valve 58, pressed to its seat by a spring 59.

The piston 21 is provided with a piston-rod 51, so connected to the engine frame by means of the flaring openings 51<sup>a</sup> in the frame, as to permit the cylinder 22 to move laterally when the pivot 23<sup>a</sup> is subjected to a lateral movement by the lever 14 due to the movement of the pivot 15 following the movement of the admission-valve.

Referring to Fig. 1, the admission valve is controlled by the lever 63, pivotally connected to the admission-valve lever 14, the other end of the lever 63 being connected in an appropriate manner to the governor of the engine.

The operation of my improved regulating device is as follows:—Corresponding to the position of the governor, the lever 63 opens the valve 60 sooner or later, and the liquid is forced from the compartment 33 past said valve, the cylinder 22 sliding upwards on the piston 21, thus changing the lift and point of cut-off of the admission valve. During the period that the valve 60 remains open, the piston-rod 51 will enter more deeply into the cylinder 22, thus increasing the amount of the piston-rod inclosed by the cylinder. To prevent any excessive pressure and resulting leakage of the liquid through the stuffing-box 32 and around the stem of the valve 60, the cushion of air hereinbefore referred to is provided at the upper end of the compartment 34 of the cylinder.

In the operation of the device, the pivot 15 moves downwardly while the pivot 23<sup>a</sup> is moving upwardly, the purpose of such construction being to assure a constant point of opening of the admission valve which would not be realized if the pivot 15 began to move down only after the pivot 23<sup>a</sup> has come to rest. When full lift of the admission valve is required, the pivot 23<sup>a</sup> naturally does not move vertically at all.

Due to the form of the cam, the admission valve would strike its seat with increased velocity when closing earlier. To avoid this objection and to assure a smooth seating of the admission valve at all times, the cushioning device, consisting of the piston 52, dashpot cylinder 53, adjusting screw 55<sup>a</sup>, and openings 54, 55, hereinbefore referred to, is provided. After the admission valve closes, the cylinder 22 follows the movement of the rod 20, the liquid passing through the automatic relief valve 58, and also through the valve 60 should the same still remain open.

In the operation of the device, the pressure in the cylinder 22, due to the opening of the admission valve 9, is confined to the lower or imperforate end of said cylinder, and consequently the leakage of the liquid in said cylinder is not lost but merely transferred to the upper end of the cylinder, the pressure being

substantially destroyed in the narrow passage connecting the two compartments of the cylinder.

It is obvious that my invention is susceptible of modifications in form, construction, and arrangement of the parts, without departing from the principle thereof; and consequently I do not limit myself to the particular details of construction and arrangement illustrated and described, nor to any particular type of governor and its attachment to the mechanism.

I claim:—

1. A regulating device for internal combustion engines, comprising in combination an admission-valve actuating mechanism, a cylinder closed at both ends one of said ends being imperforate, said cylinder containing a substantially incompressible liquid and being provided with a piston dividing the interior thereof into compartments and with a device controlled by the governor for permitting the liquid to pass from one side of the piston to the other for the purpose of changing the lift and the cut-off of the admission-valve, said cylinder being connected to said admission-valve actuating mechanism and the piston thereof being connected to the engine frame, whereby the pressure due to the opening of the admission valve of the engine is exerted between said imperforate head and the piston substantially as described.

2. A regulating device for internal combustion engines, comprising in combination an admission-valve, a cylinder containing a substantially incompressible liquid, a piston in said cylinder connected to the engine frame and dividing the interior of the cylinder into two compartments, an automatic relief valve adapted to open communication between said compartments, a device controlled by the governor of the engine for permitting the liquid to pass from one compartment to the other for the purpose of changing the lift and the cut-off of said admission-valve, a member for operating the admission-valve pivotally connected to said cylinder and mechanism actuated by the engine for imparting movement to said member, substantially as described.

3. A regulating device for internal combustion engines comprising in combination an admission-valve, a device for securing a smooth seating of said valve, a cylinder closed at both ends containing a substantially incompressible liquid, a piston in said cylinder connected to the engine frame and dividing the interior of the cylinder into two compartments, a device controlled by the governor of the engine for permitting the liquid to pass from one compartment to the other, a lever for operating the admission-valve fulcrumed to said cylinder, mechanism actuated by the engine for

imparting movement to said lever, and an automatic relief valve adapted to open communication between the said two compartments of the cylinder, substantially as described.

4. A regulating device for internal combustion engines comprising in combination an admission-valve, a cylinder closed at both ends containing a substantially incompressible liquid, a piston in said cylinder connected to the engine frame and dividing the interior of the cylinder into two compartments, a device controlled by the governor of the engine for permitting the liquid to pass from one compartment to the other, a device by means of which the amount of the incompressible liquid may be kept constant, a lever for operating the admission-valve fulcrumed to said cylinder, and mechanism actuated by the engine for imparting movement to the lever, the piston or the cylinder being equipped with an automatic relief valve adapted to open communication between the said two compartments of the cylinder, substantially as described.

5. A regulating device for internal combustion engines comprising in combination an admission-valve, a cylinder closed at both ends containing a substantially incompressible liquid, a piston in said cylinder connected to the engine frame and dividing the interior of the cylinder into two compartments, a device controlled by the governor of the engine for permitting the liquid to pass from one compartment to the other, an elastic

cushion in one of the compartments, a lever for operating the admission-valve fulcrumed to said cylinder, and mechanism actuated by the engine for imparting movement to said lever, the piston or the cylinder being equipped with an automatic relief valve adapted to open communication between the said two compartments of the cylinder, substantially as described.

6. A regulating device for internal combustion engines comprising in combination an admission-valve, a piston fixed on the spindle of said valve, a dash-pot cylinder inclosing said piston, a cylinder closed at both ends and containing a substantially incompressible liquid, a piston in said last-named cylinder connected to the engine frame and dividing the interior of the cylinder into two compartments, a valve in said cylinder held normally closed by a spring, a member for operating the admission-valve fulcrumed to said cylinder, mechanism actuated by the engine for imparting movement to said member, and a valve operated by a lever fulcrumed to said member for permitting the liquid to pass from one compartment to the other, said lever being controlled by the governor of the engine, substantially as described.

In testimony whereof I have hereunto set my hand.

OTAKAR PODHAJSKÝ.

Witnesses:

S. H. BURKHART,  
R. L. ALEXANDER.