Jan. 28, 1930. R. MEYER 1,745,266

THROTTLING GOVERNOR FOR ROTARY ENGINES

Filed May 12, 1925

Fig.1.

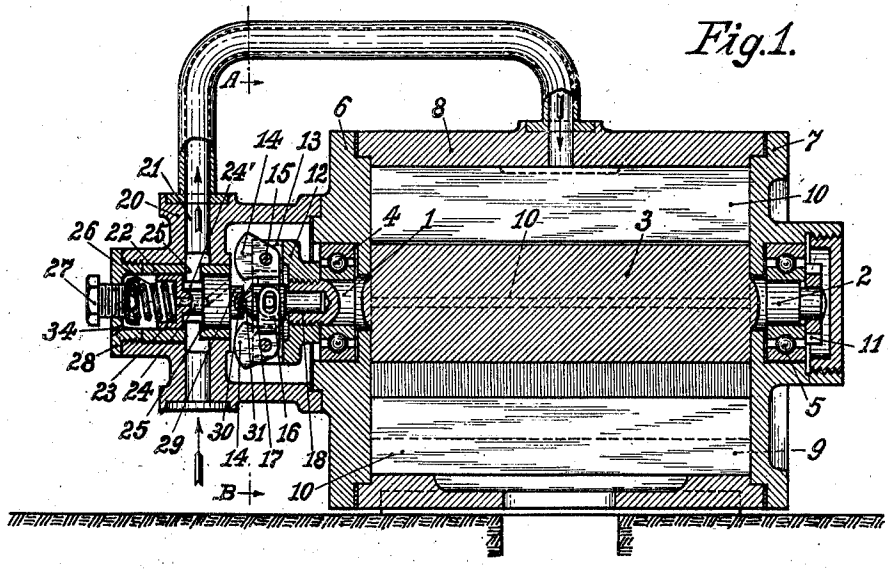


Fig.3.

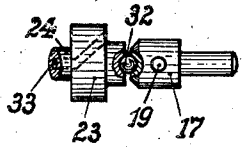
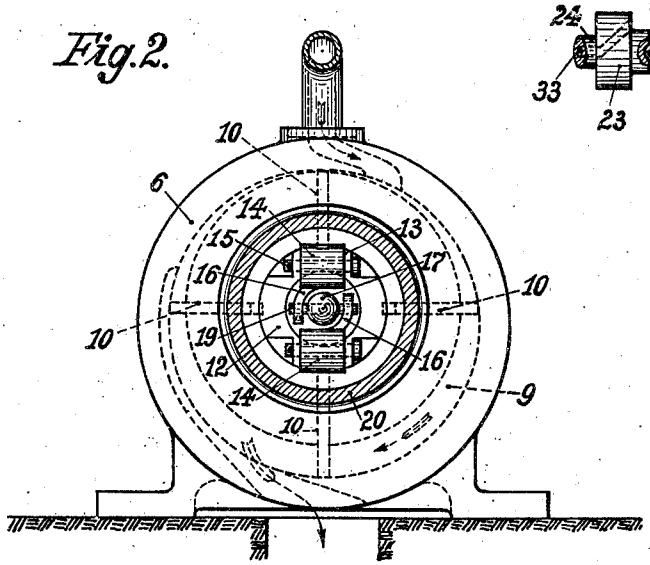


Fig.2.



Witness:
Almina V. Edgar

Inventor:
Robert Meyer
by Lowe, Kehlenbeck & Farley
Attorneys

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UNITED STATES PATENT OFFICE

ROBERT MEYER, OF GELSENKIRCHEN, GERMANY

THROTTLING GOVERNOR FOR ROTARY ENGINES

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My present invention relates to a throttling governor for rotary engines with sickle-shaped working chambers. This throttling governor is provided with heavy fly-weights—governor-weights—by means of which the position of the throttling-body is at all times strictly regulated in accordance with the velocity of rotation of said governor-weights. To attain this, the governor-weights are arranged in a governor-housing to which the motive fluid has no access and wherein the governor-weights and the throttling-body are related with each other in such a manner as to utilize the rotary motion of the governor-weights for the linear motion of the throttling-body. This is accomplished by the aid of a shifter, an element interposed between said governor-weights and said throttling-body and slidingly seated in the inner trunnion of the rotary piston in order to transmit its linear motion, received from the slotted arms of said governor-weights, directly to the throttling-body for throttling the motive fluid to a degree to effectively re-establish the normal speed of the engine. To prevent the throttling-body from rotation the shifter is provided with a friction-reducing centering-element with which the throttling-body is kept in uninterrupted yielding contact.

In the accompanying drawing:—

Figure 1 is a vertical longitudinal sectional view of a rotary engine provided with a throttling governor according to my present invention.

Figure 2 is an end view of said rotary engine partly shown in section taken on line A—B of Figure 1.

Figure 3 shows a modification of the means employed for the transmission of the linear motion of the rotating shifter to the stationary throttling-body, on a larger scale.

The trunnions 1 and 2 of the rotary piston 3 are journalled in ball-bearings 4 and 5 arranged in the covers 6 and 7 of the cylinder 8 in which the rotary piston is mounted eccentrically, as usual, to produce the sickle-shaped working-chamber 9. Into the latter the radial blades 10 are projected by centrifugal force to a depth determined by their position in the cylinder 8, as indicated in Figure 2. The trunnion 2 is provided with a pinion 11 by means of which the rotary motion of said piston may be transmitted in any suitable manner to a secondary shaft, a train of gearing, and the like.

The trunnion 1 is externally threaded for the reception of a rotary head 12 in whose facial central slot 13 governor-weights 14 are pivoted on pins 15. Each of said weights is provided with a slotted lateral arm 16 bent to conveniently approach a shifter 17 seated in a centrally arranged longitudinal bore 18 of the trunnion 1. The shifter is provided with pintles 19 adapted to simultaneously engage said slotted arms 16. The head 12, the governor-weights 14 and the shifter 17 are enclosed in a two-chambered governor-housing 20 provided with a section of the inlet-channel 21 of the motive fluid, such as compressed air, steam and the like. This section of the inlet-channel 21 is crossed at right angles by a bushing 22 in which a throttling body 23 is arranged coaxially with the centre-line of said shifter and the piston-trunnion 1 carrying it. The throttling body 23 here has the shape of a cylindrical valve provided intermediate its ends with a short narrow neck 24. The annular groove 24′ which surrounds said neck registers under normal conditions with the top- and bottom-notches 25 of the bushing 22, as indiacted in Figure 1. The outer end of the throttling-body is made hollow for the reception of a pressure spring 26 adapted to be put under different degrees of pressure by means of a cup-bearing screw 27 seated in a cover 28 of the governor-housing 20. The inner end of said throttling-body carries a projection 29 provided with a centre-mark 30 for the reception of a friction-reducing centering-element 31 of the shifter 17 to reduce to a minimum the friction created between the stationary throttling-body 23 and the shifter 17 which rotates at a high speed. The same result can, of course, be obtained by the mechanical equivalent shown in Figure 3, wherein an anti-friction ball 32 is interposed between said shifter and said throttling- body.

The improved throttling-governor operates as follows:—

The piston 3 is as usually rotated by means of the radial blades 10 in the direction of the arrows shown in Figure 2. This rotation is transmitted by the trunnion 1 to the head 12 and to the governor-weights 14 pivoted therein, and thence to the shifter 17 coupled with said weights as explained above. Under the normal load of the engine the cooperating parts of the governor will practically retain the position indicated in Figure 1. When, however, the load of the engine is reduced and the revolutions of the engine increase in consequence thereof, the centrifugal force will instantly cause said governor-weights to fly energetically outward and thus effect a proportional movement of the shifter 17 toward the left. Since this movement of the shifter is in a direct ratio to the increase of the piston speed, the left edge of the right-hand portion of the throttling-body 23 will be projected to a corresponding extent across the top- and bottom-notches 25 of the bushing 22. In the ratio the free area of the inlet-channel 21 hereby is diminished, the volume of the motive fluid now permitted to pass through said inlet-channel per unit of time will of course be smaller than formerly, with the result that the speed of the engine will be compelled to become normal again.

In order to aid the governor in its work the neck 24 of the throttling-body is provided with an equalizing-channel 33 and in addition to this the cover 28 has a vent-hole 34 to assure at all times in all parts of the governor-housing a pressure which shall never exceed atmospheric pressure.

I claim:—

1. In combination with a rotary engine, a casing located adjacent to one end of said engine, the shaft of the engine having a trunnion extending into said casing, a head mounted on said trunnion and within said casing and held to rotate with the trunnion, fly-weights pivoted to said head to swing about axes transverse to the axis of the engine shaft, and provided with slotted arms extending toward said shaft, a shifter slidable lengthwise of said shaft and provided with pins extending into the slots of said arms, and held to rotate with said shaft, a conduit through said casing for conveying the motive fluid to said engine, a non-rotary slide valve controlling said conduit and in loose engagement with said shifting member so that the latter may rotate while the valve slides without rotation, and means for holding the valve and the shifter in contact with each other.

2. In combination with a rotary engine, said engine having a trunnion provided with an axial recess and extending into said casing, a head held to rotate with said trunnion, fly-weights pivoted to said head to swing about axes transverse to the axis of said trunnion, a shifter held to rotate with said head and extending into the axial recess of the trunnion, means for moving the shifter lengthwise of the trunnion when the fly-weights swing on their pivots, a conduit through said casing for conveying the motive fluid to said engine, a non-rotary slide valve operated by the movement of the shifter and controlling said conduit, and adjustable means for holding the valve and the shifter in contact with each other.

3. In combination with a rotary engine, a casing located adjacent to one end of said engine, one end of the engine shaft extending into said casing, a fly-weight governor housed in said casing and operatively connected with the engine shaft, a shifter held to turn with said shaft and operatively connected with said governor to be moved thereby lengthwise in axial alignment with the shaft, a conduit through said casing for conveying the motive fluid to said engine, a non-rotary valve controlling said conduit and movable axially adjacent to said shifter, and means for pressing said valve against said shifter lightly, so that the latter may rotate without rotation of the valve, said means being located on the side of the valve opposite to that on which the shifter is arranged, and pressure-adjusting means located externally so as to be accessible without disturbing any part of the engine, for varying the amount of pressure keeping the valve against the shifter.

4. In combination with a rotary engine, a casing located adjacent to said engine, one end of the engine shaft extending into said casing, a fly-weight governor housed in said casing, a shifter held to turn with the engine shaft and operatively connected with said governor to be moved thereby lengthwise of the shaft, a conduit through said casing for conveying the motive fluid to said engine, a non-rotary valve controlling said conduit and engageable by the shifter and movable lengthwise of the shaft in axial alignment with the shifter, the adjacent portions of the valve and of the shifter being provided with friction-reducing elements, and means for pressing the valve toward the shifter so that both will move lengthwise in unison while allowing the shifter to rotate without rotation of the valve.

5. In combination with a fluid operated rotary engine, a closed casing located adjacent to said engine, one end of the engine shaft extending into said casing, a fly-weight governor pivoted on said shaft and housed in said casing, the weights of said governor being so pivoted at their upper ends as to oscillate away from said engine upon increase in the engine speed, a shifter extending beyond said end of the shaft and engageable by said governor to be moved thereby, a conduit passing through said casing at the side of

the governor opposite the engine shaft for conveying the motive fluid to said engine, and a valve controlling said conduit and operatively associated with said shifter at the end thereof further removed from the engine shaft.

Signed by me at Cologne, Germany, this 28th day of April, 1925.

ROBERT MEYER.