J. L. OSBORNE.

ENGINE GOVERNOR.

APPLICATION FILED MAY 29, 1913.

1,087,818. Patented Feb. 17, 1914.

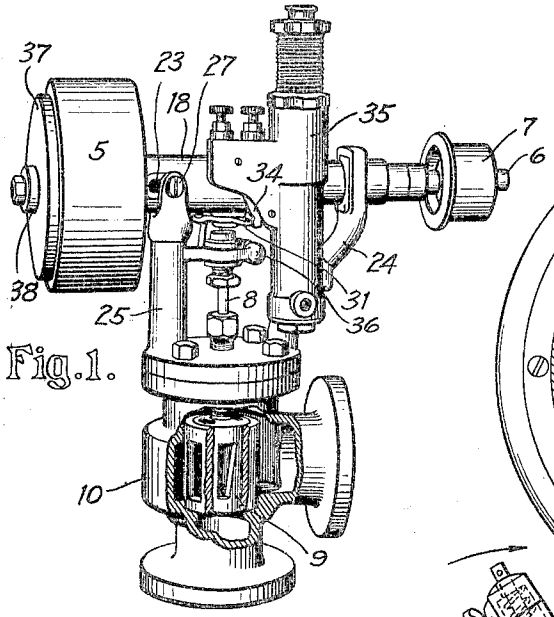
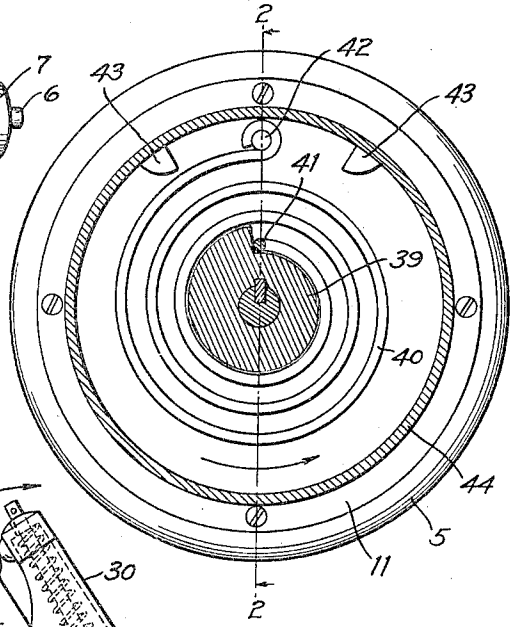


Fig. 1.

Fig. 3.



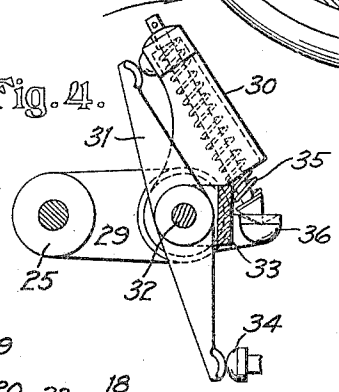


Fig. 4.

Fig. 2.

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ENGINE-GOVERNOR.

1,087,818. Specification of Letters Patent. Patented Feb. 17, 1914.

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To all whom it may concern:

Be it known that I, JOHN L. OSBORNE, a citizen of the United States, and resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Engine-Governors, of which the following is a specification.

This invention relates to engine-governors of the centrifugal type.

The object of the invention is to produce a governor in which simple and effective means are employed to minimize or prevent sudden or rapidly recurrent changes in the speed of rotation of the centrifugal mechanism, due to similar changes in the speed of the engine with which the governor coöperates. Such changes occur during each rotation of the engine-shaft, particularly where the engine is heavily loaded and is not provided with a fly-wheel of great weight. It has been previously proposed to interpose a spring-connection between the engine and the centrifugal mechanism of a governor for this purpose. In the present invention such a spring is combined with the other parts of the governor-mechanism in a novel manner, so as to produce a compact and simple arrangement of parts. I have discovered further that, in connection with such a spring, it is desirable to employ means, such as coöperating friction-surfaces, for checking or damping the action of the spring to prevent oscillatory action, and the invention further comprises, therefore, the combination, with the spring-connection, of frictional means for the purpose aforesaid.

In the accompanying drawings:—Figure 1 is a perspective view of a governor embodying the present invention, together with a throttle-valve actuated thereby, the throttle-valve being shown partly in section; Fig. 2 is a side-elevation of the governor, partly in vertical section, and on a larger scale than Fig. 1; Fig. 3 is a vertical section, on the line 3—3 in Fig. 2, of a portion of the governor including the yielding connections between the driving-shaft and the casing which contains the centrifugal mechanism; and Fig. 4 is a detail-view, in horizontal section on the line 4—4 in Fig. 2, showing the lever-connections between the throttle-valve, the centrifugal mechanism and other parts of the governor.

As the present invention is particularly useful in connection with a governor for an engine employed to drive an air-compressor, I have illustrated it as embodied in a governor of that type, the illustrated governor having the general arrangement and operation of the governor disclosed in Letters Patent of the United States No. 963,803, granted to me July 12, 1910, although the present governor has certain modifications, in the form and construction of the pressure-controlled element, which are not particularly described in the present application, as they have no bearing upon the present invention, and as they are covered by a co-pending application filed by me of even date herewith.

The illustrated embodiment of the invention is provided with a horizontal drive-shaft 6, which is provided with a pulley 7 adapted to receive a belt by which the governor may be connected, in the usual manner, with the engine with which it coöperates. The governor is connected, by means including a vertical valve-stem 8, with a rotary throttle-valve 9, seated in a valve-chamber 10 which may be connected, in the usual manner, with the pipe by which the engine is supplied with steam. As in the governor disclosed in my said patent, the centrifugal mechanism of the present governor is supported and inclosed within a casing 5 coaxial with the shaft 6, and rotatable in unison therewith. This casing is closed, at the front or left-hand end, by a removable plate 11 upon which are two diametrically opposite inward projections 12. Two centrifugal weights 13 are pivoted on these projections, so as to swing outwardly, in consequence of their centrifugal action, about parallel axes lying in a plane normal to the axis of the drive-shaft 6. This movement is resisted by spring-controlled mechanism hereinafter described. Each of the weights 13 is provided with an arm 14 which is bifurcated to receive a roller 15, the roller being pivoted in the arm on an axis normal to the plane of movement of the arm. The rotary casing is supported by means of a hub 45, integral with the plate 11, which is mounted loosely upon the drive-shaft 6.

A sleeve 17 is mounted loosely upon the hub 36, this sleeve being peripherally grooved, as shown in Fig. 2, so as to provide a recess in which the rollers 15 are seated. The right-hand wall 16 of this groove con-

stitutes a bearing-surface, normal to the axis of the sleeve 17, against which the rollers are pressed in consequence of the centrifugal movement of the weights, so that the weights tend to force the sleeve to the right with a force proportionate to their speed of rotation. This movement of the sleeve is constantly opposed by a helical compression-spring 19, which is coiled about the sleeve and which is seated, at its right-hand end, against the rear wall 20 of the casing as shown in Fig. 2. The sleeve 17 is confined to axial movement on the hub 45, and is caused to rotate in unison with the hub and the centrifugal mechanism, by means of a roller 21, which is journaled on a pin 22 fixed in the sleeve and is seated in a longitudinal slot in the hub 45. The longitudinal movement of the sleeve is transmitted, through suitable connections, to the throttle-valve 9, by the engagement of the right-hand end of the sleeve with the end of a sleeve 18. This sleeve is mounted loosely upon a third sleeve 23, which constitutes the bearing and support for the drive-shaft 6. The bearing-sleeve 23 is supported, in the manner described in my said patent, upon two columns 24 and 25 projecting upwardly from the valve-casing 10, the forward end of the bearing-sleeve being engaged by pivot-studs 27, which are mounted in a forked head 26 pivoted upon the upper end of the column 25. The sleeve 18 is slotted, as shown in Figs. 1 and 2, for the passage of the pivot-studs, and by this arrangement the sleeve 18 is prevented from rotating, while free to move longitudinally, in consequence of the thrust imparted to it by the movement of the sleeve 17, as above described.

As in the governor of my said patent the upper end of the valve-stem 8 is fixed to a short shaft 28 which is journaled vertically in a bracket 29 on the column 25. An arm 30 is fixed to the upper end of the shaft 28, and the free end of this arm engages one end of a lever 31. This lever is pivoted, at its middle, on a pin 32 fixed in a bracket 33 on the bottom of the sleeve 18. The opposite end of the lever 31 abuts against an arm 34, which constitutes a part of the pressure-controlled mechanism of the governor. As this mechanism is not essential to the present invention it is not particularly illustrated and described, the arm 34 being indicated merely as an abutment necessary to the operation of the lever 31 in coöperatively connecting the centrifugal mechanism with the throttle-valve.

A spring-pressed plunger 35, mounted in the arm 30, engages a bearing 36 on the bracket 29 and maintains the arms and the lever above described in constant engagement with each other, while it also tends to move the throttle-valve to open position. When the governor is in operation the centrifugal force of the weights 13, transmitted through the sleeve 17, causes a sliding movement of the sleeve 18 toward the right, and this movement is transmitted, through the lever 31, to the arm 30, so as to swing this arm to the right or clockwise as shown in Fig. 4, and thus close the throttle-valve to a greater or less degree, according to the speed of rotation of the centrifugal mechanism.

The yielding connections between the centrifugal mechanism and the engine-actuated drive-shaft 6, which constitute the principal feature of the present invention, are shown particularly in Figs. 2 and 3. The drive-shaft is not connected, as in my said patent, directly and rigidly with the rotary casing of the governor, but it is provided, at its left-hand end, with a cover-plate 37 which has a hub 38 keyed to the shaft. The hub 38 is provided, at its inner end, with a portion 39 of volute form, which provides a seat for the inner coil of a spiral spring 40. The inner end 41 of this spring is bent to engage a perforation in the hub, as shown particularly in Fig. 2, the spring being thus anchored or fixed to the hub. The outer end of the spring is fixed to a stud 42 which projects from the front-plate 11 of the casing.

The spring 40 constitutes the means by which the rotary movement of the drive-shaft is transmitted to the casing, and to the centrifugal mechanism. Accordingly, any momentary acceleration or retardation in the rotation of the drive-shaft, consequent upon a similar variation in the engine-speed, does not produce a corresponding variation in the speed of the centrifugal mechanism, since the substantial inertia of this mechanism and of the casing causes such variation to be absorbed by the spring. Owing to its resiliency, therefore, the spring imparts a substantially uniform torque to the parts driven thereby, so that momentary fluctuations in the speed of the engine do not cause any substantial effective movement of the governor-mechanism and of the throttle-valve. To limit the action of the spring within a suitable range, the cover-plate 37 is provided, as shown in Fig. 3, with two stop-lugs or abutments 43, which are normally located equidistant from the stud 42, but which may be engaged, by the end of the spring surrounding this stud, to limit the torsion of the spring in each direction. The normal fluctuations in the engine-speed, which the spring-mechanism is designed to absorb, do not cause such engagement, however.

To prevent any oscillatory action which might result from regularly recurrent expansions and contractions of the spring 40, I employ a damping-device in the form of a frictional connection between the drive-shaft and the rotary casing. To this end

the cover-plate 37 is provided with a peripheral flange 44, which engages the front-surface of the cover-plate 11 as shown in Fig. 2. The thrust between the sleeves 17 and 18 constantly forces the hub 36 and the casing along the drive-shaft 6 in a direction to press the plate 11 against the flange 44, resulting in a friction which resists relative movement of the cover-plate and of the casing sufficiently to damp the action of the spring 40 and prevent any such oscillatory action, but which is not sufficient to prevent the substantial absorption by the spring of irregularities in the rotative speed of the drive-shaft.

While I have illustrated my invention as embodied in a governor adapted for employment in connection with an air-compressor engine, it will be understood that it may be embodied in governors of other types, and that, in general, the invention is not limited to the embodiment thereof hereinbefore described, but may be embodied in various other forms within the nature of the invention as it is defined in the following claims.

I claim:—

1. An engine-governor having, in combination, a rotary member adapted to be connected with, and rotated by, the engine to be governed; rotary centrifugal governing-mechanism; a spring connecting said rotary member with said mechanism and yieldingly transmitting rotary movement from the former to the latter; and frictional connections between said member and said mechanism for damping the relative movements permitted by the spring.

2. An engine-governor having, in combination, a rotary member adapted to be connected with, and rotated by, the engine to be governed; rotary centrifugal governing mechanism; a spring connecting said rotary member with said mechanism and yieldingly transmitting rotary movement from the former to the latter; frictional connections between said member and said mechanism, for damping the relative movements permitted by the spring; and means for limiting said movements positively.

3. An engine-governor having, in combination, a rotary shaft; a casing loosely mounted on the shaft; centrifugal governing-mechanism inclosed within and actuated by the casing; a cover-plate fixed to the shaft and having a peripheral flange engaging the end of the casing; and a spiral spring inclosed between the cover-plate and the casing and attached, at its ends, to these parts respectively.

4. An engine-governor having, in combination, a rotary shaft; a casing loosely mounted on the shaft; centrifugal governing-mechanism inclosed within and actuated by the casing; a cover-plate fixed to the shaft and having a peripheral flange engaging the end of the casing; a spiral spring inclosed between the cover-plate and the casing and attached, at its ends, to these parts, respectively; and means for holding the casing yieldingly in frictional engagement with said flange on the cover-plate.

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