

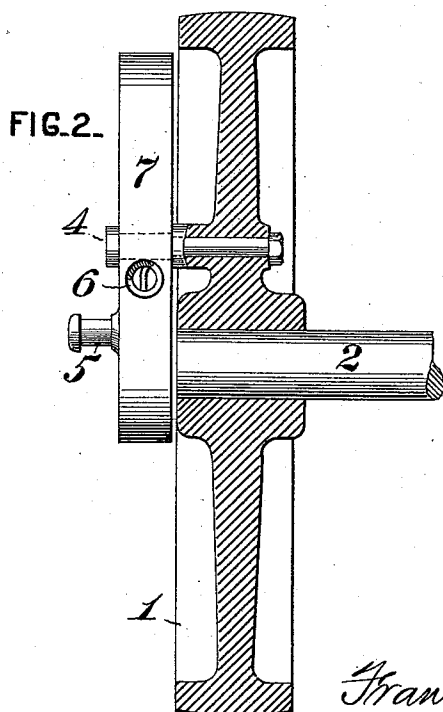
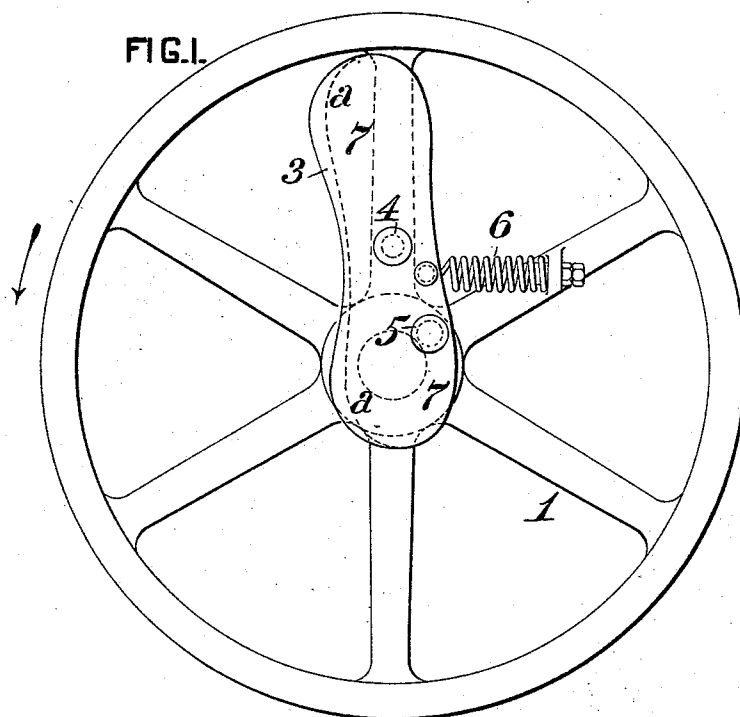
(No Model.)

4 Sheets—Sheet 1.

F. M. RITES.
GOVERNOR.

No. 534,579.

Patented Feb. 19, 1895.



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(No Model.)

4 Sheets—Sheet 2.

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FIG. 3.

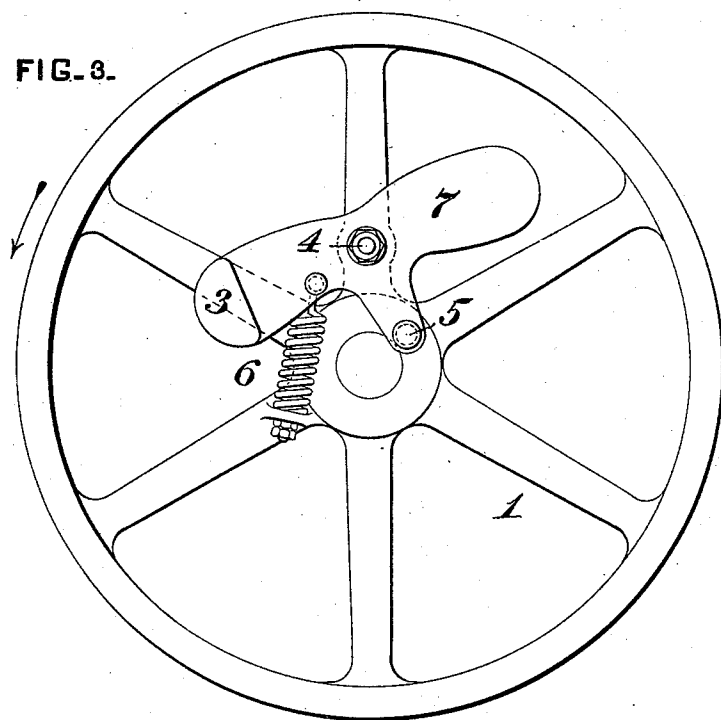
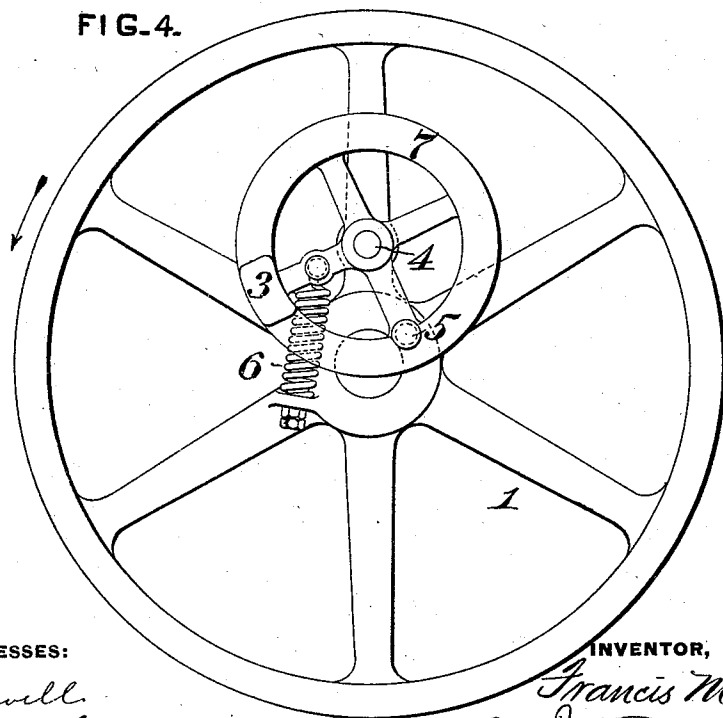


FIG. 4.



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FIG. 5.

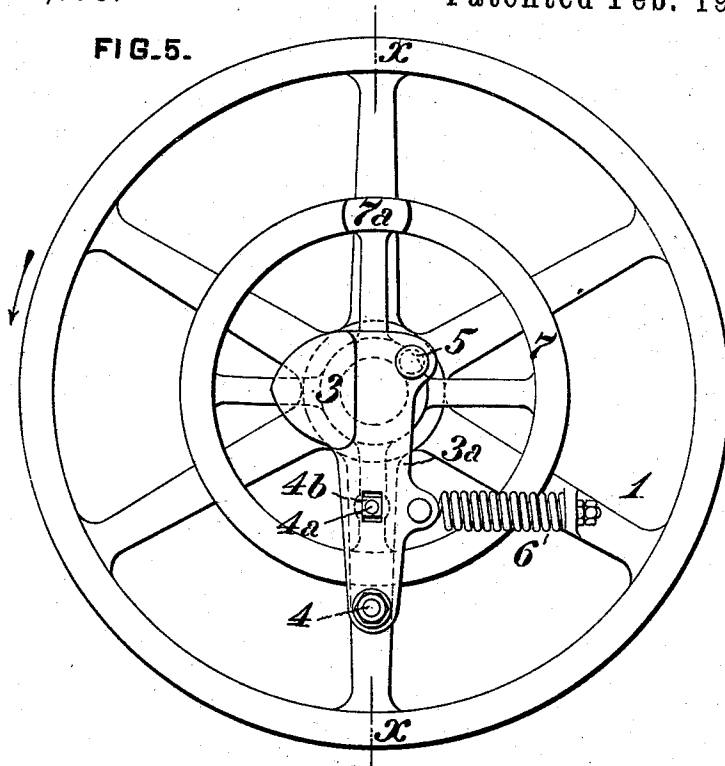
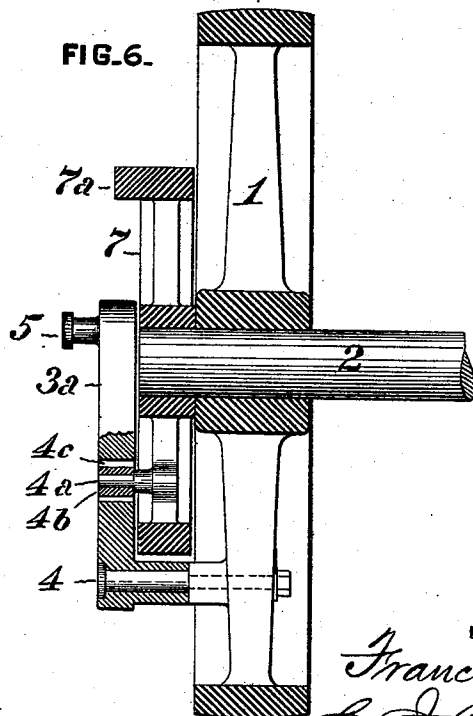


FIG. 6.



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(No Model.)

4 Sheets—Sheet 4.

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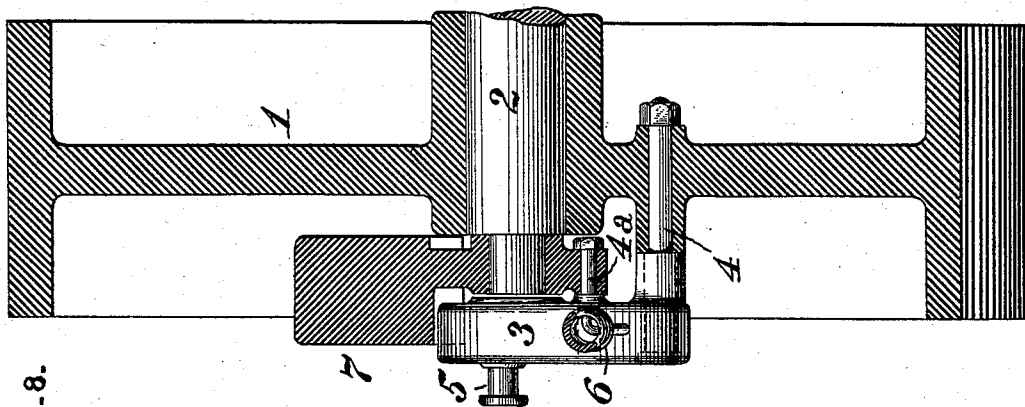


FIG. 8.

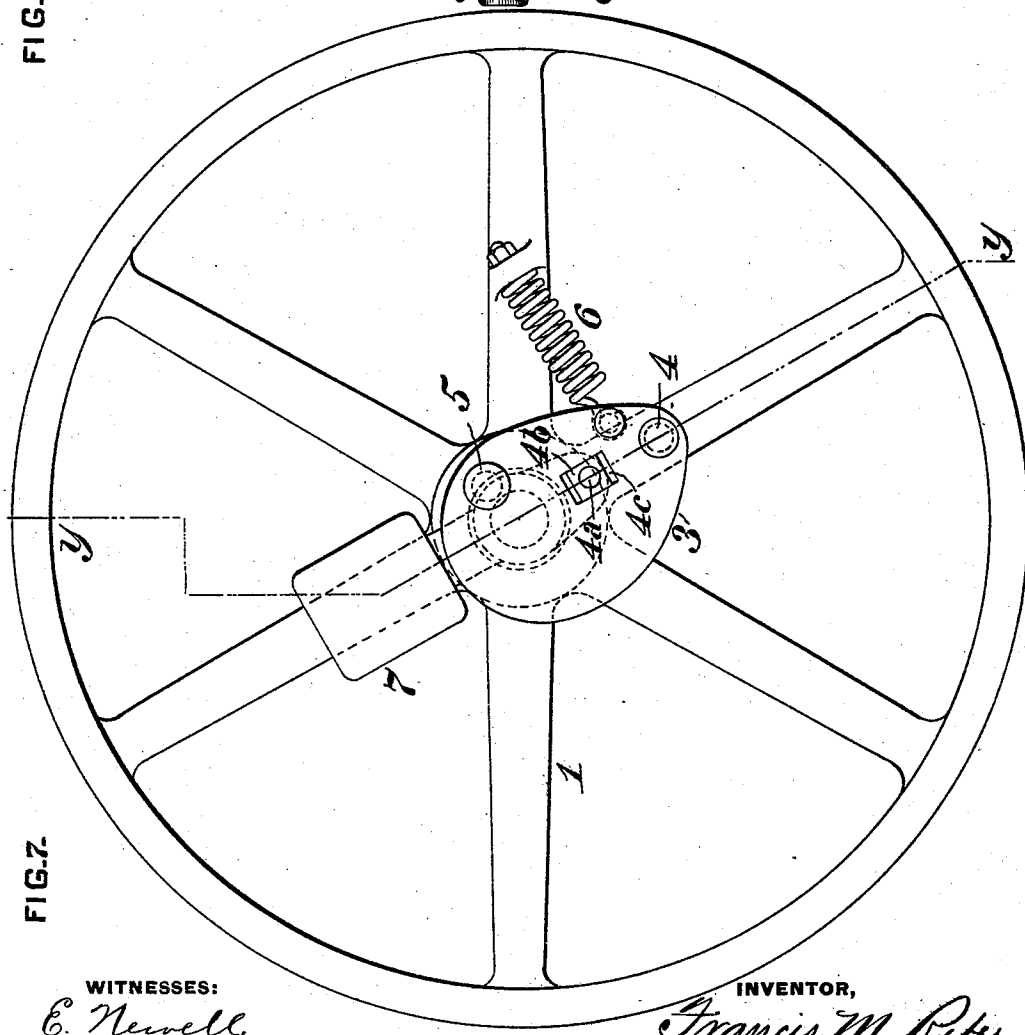


FIG. 7.

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UNITED STATES PATENT OFFICE.

FRANCIS M. RITES, OF ALLEGHENY, PENNSYLVANIA.

GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 534,579, dated February 19, 1895.

Application filed September 17, 1892. Serial No. 446,213. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS M. RITES, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Governors, of which improvement the following is a specification.

My invention relates to centrifugal governors of the class or type ordinarily termed shaft governors, which are located upon the crank shaft or countershaft of an engine, and act to effect automatic regulation thereof by varying the position of a valve actuating eccentric or crank pin.

The object of my invention is to simplify the construction and increase the operative efficiency of governors of the above type, by effecting a substantial reduction in the number of working parts, and by utilizing the force of inertia as a governing agent, thereby attaining more rapid and accurate adjustments than are practicable under the ordinary constructions of this type.

To this end, my invention, generally stated, consists in the combination of a movable eccentric or eccentric pin, a primary weight adapted to effect the movement of the eccentric by centrifugal force, and a secondary weight, inoperative as to centrifugal force, and operative by its inertia or its gravity, or both, upon the primary weight, to resist the disturbing influence of gravity upon the latter, and co-operating by its inertia, with the primary weight, to effect rapid adjustment of the governor elements. The improvement claimed is hereinafter set forth.

The essential elements of a shaft governor may be stated as a weight moving from a center of rotation under the action of centrifugal force, a spring which resists the outward movement of the weight, and a movable eccentric which, by attachment to the weight, is adjusted in position in and by the movements of the latter resultant upon variations of pressure or load, or both. In practice, however, and at ordinary engine speeds, the action of gravity causes a single weight to alternately approach and recede from the center of the shaft, and to thereby induce a vibratory action detrimental to the normal and effective operation of the governor. To neu-

tralize this action it is necessary either to duplicate the weight, upon the opposite side of the shaft, and so connect the two weights that the disturbing action upon one is balanced by an equal and opposing action upon the other, or to apply an external linear force to counteract that of gravity upon a single weight. In either case, the employment of additional mechanism is required, which imposes proportionate liability to derangement while reducing the efficiency of the combined members.

Under my present invention, the centrifugal force requisite to move the eccentric is generated by a single primary weight, and the disturbing action of gravity upon the primary weight is resisted by the inertia or gravity, or both, of a secondary weight, which likewise imparts additional strength to the governor to oppose the reactionary forces of the valve gear, and acts as a positive force in effecting the rapid adjustments of the governor under sudden variations of load or pressure.

In the accompanying drawings: Figure 1 is a face view of a governor illustrating an embodiment of my invention; Fig. 2, a side view, partly in section through the supporting wheel; Figs. 3, 4, and 5, face views of governors, illustrating, respectively, modifications in detail and arrangement of the operative members; Fig. 6, a transverse section, at the line x, x , of Fig. 5; Fig. 7, a face view, illustrating a further modification in detail and arrangement, and Fig. 8, a transverse section, at the line y, y , of Fig. 7.

In the practice of my invention, as herein exemplified, the governor is, as heretofore, mounted and supported on a suitable disk or wheel 1, fixed upon the crank shaft 2 of the engine, or upon a counter shaft deriving motion therefrom. A primary weight 3 is pivoted, as by a bearing pin 4, to the supporting wheel 1, at a suitable distance from its center, so as to be subject to the rotative effect of centrifugal force about its bearing pin, and is connected to a movable eccentric or eccentric pin 5, from which, through the usual connections, the distribution valve of the engine is actuated. The primary weight 3 is connected to a spring 6, the tension of which acts, as in the ordinary constructions,

in opposition to the action of centrifugal force upon the weight 3, the mechanism, so far as described, consisting of the essential elements of a shaft governor, as hereinbefore indicated, and being similarly subject to the disturbing action of gravity upon a single weight. In order to resist and substantially neutralize such disturbing action, as well as to supplement the action of centrifugal force, in effecting regulation, by that of inertia, I provide a secondary weight 7, which is connected to and moves coincidently with the primary weight 3, and is so connected to the supporting wheel, (as by being journaled thereon either concentric with its own center of gravity or with the center of the shaft,) as to be subject only to the radial action of centrifugal force, without tendency to motion due thereto about its axis of motion, centrifugal force being, in other words, inoperative upon the secondary weight. As a result of such construction, the action of gravity upon the primary weight is resisted by that of the inertia of the secondary weight, and, also, the action of centrifugal force upon the primary weight, in effecting adjustments of the governor, that is to say, variations of the position of the eccentric or eccentric pin 5, is increased and aided by the action, as a positive force, of the inertia of the secondary weight.

The distribution of the particles of the secondary weight about its center of vibration, which is the center of its supporting pin or the center of the shaft, as the case may be, being such that it is unaffected by centrifugal force, the inertia of the secondary weight, while acting as a resisting force to that of the gravity of the primary weight, and also acting in the same direction as, or in unison with, centrifugal force, upon the primary weight, as above stated, also, by reason of the reactionary varying angular velocity of the supporting wheel, acts independently of centrifugal force as a regulating agent to effect adjustments of the eccentric, or in other words, is not dependent, for such action, upon prior movement of the primary weight due to centrifugal force.

It will be obvious that within the operative conditions of a governing mechanism as above described, the secondary weight may be either balanced about its own center of gravity and vibration, in which case its inertia only acts to resist or retard the action of gravity upon the primary weight, or may be unbalanced for gravity, in which case such resistance or retardation is effected both by its inertia and its gravity.

In each of the instances illustrated in the drawings, the essential elements of a governor in accordance with my invention are combined, and operate in combination, as above described, the several instances being relatively modified only in detail, form, or arrangement of the operative members, and not

involving, in either case, any departure from the essence or governing principle of my invention.

As shown in Figs. 1 and 2, the primary weight 3 and secondary weight 7 are connected by being formed in an integral casting, and are separated only by an imaginary line, which is indicated by the dotted line *a, a*, Fig. 1. The secondary weight 7, which is the portion of the casting to the right of the line *a, a*, is disposed symmetrically on opposite sides of its longitudinal center line, which intersects its coincident centers of gravity and of vibration at the center of the pin 4. The primary weight 3, which is the portion of the casting to the left of the line *a, a*, is unbalanced about its center of vibration and is therefore subject to the action of gravity as well as to that of centrifugal force, tending to move it about its center of vibration, while the secondary weight 7 is subject only to radially acting, and consequently, inoperative centrifugal force.

In the form shown in Figs. 3 and 4, the primary weight 3 and secondary weight 7 are also shown as integral or secured rigidly one to the other. The secondary weight 7 of Fig. 3, is of substantially similar form to that of Fig. 1, except that it is provided with a lateral arm for the eccentric pin 5, and the primary weight is connected to its end instead of its side. The secondary weight 7 in Fig. 4 is in the form of a wheel journaled on the pin 4, and having the primary weight 3 and eccentric pin 5 connected at different points to its periphery, and the centripetally acting spring 6 connected to one of its arms.

In Figs. 5 and 6, the secondary weight 7 is also in the form of a wheel, but is journaled upon the shaft 2 of the supporting wheel, instead of upon the pin 4. The primary weight 3 and eccentric pin 5 are fixed to an arm 3^a, which is journaled on the pin 4, and is coupled to the secondary weight 7 by a pin 4^a fixed to the secondary weight and carrying a pin 4^b, which slides in a slot 4^c in the arm 3^a. The secondary weight 7 is also, in this instance, unbalanced for gravity, a supplemental weight 7^a being formed on or fixed to its rim, and acting, together with the inertia of the secondary weight, in opposition to the action of gravity upon the primary weight.

Figs. 7 and 8 show another form, in which, as in the previous instance, the secondary weight 7 is unbalanced for gravity and is journaled on the shaft 2. The primary and secondary weights are coupled in the same manner as in Figs. 5 and 6, and the secondary weight differs from that of said figures only in being in the form of a single weighted arm, instead of a wheel provided with a supplemental weight on its rim.

Further modifications of form and detail, involving the same essential elements and operative principle, will readily occur to and

be within the ordinary skill of a mechanic familiar with the art to which my improvement relates, without departure from my invention as exemplified by the instances herein shown and described.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, in a governor, of a movable eccentric, a primary weight connected to and adapted to effect the movement of the eccentric by centrifugal force, toward a shorter cut off and a secondary weight, inoperative as to centrifugal force and so connected to the primary weight, as to resist the action of gravity thereon, substantially as set forth.

2. The combination, in a governor, of a movable eccentric, a primary weight connected to and adapted to effect the movement of the eccentric by centrifugal force, toward a shorter cut-off and a secondary weight, inoperative as to centrifugal force and unbalanced as to gravity and so connected to the primary weight, as to resist the action of gravity thereon substantially as set forth.

3. The combination, in a governor, of a supporting wheel, a primary weight journaled eccentrically thereon, an eccentric fixed to said primary weight, a secondary weight journaled concentrically with the supporting wheel, and acting to resist the action of gravity on the primary weight and a connection coupling the primary and secondary weights, substantially as set forth.

4. The combination, in a governor, of a supporting wheel, a primary weight journaled eccentrically thereon, an eccentric connected to said primary weight, an unbalanced secondary weight journaled concentrically with the supporting wheel and acting to resist the action of gravity on the primary weight, and a connection coupling the primary and secondary weights, substantially as set forth.

5. In an engine governor, the combination, substantially as set forth, of a wheel or carrier, a valve moving part, as an eccentric, and an inertia weight and centrifugal weight integrally formed and connected with said valve moving part.

6. In an engine governor, the combination, substantially as set forth, of a carrier, a valve moving part, as an eccentric, and a rigidly formed structure forming a combined inertia weight and centrifugal weight.

7. In an engine governor, the combination, substantially as set forth, with a carrier, a pivot carried thereby, and an inertia weight

and centrifugal weight mounted for oscillation in common upon said pivot.

8. In an engine governor, the combination, substantially as set forth, of a carrier and a rigidly formed structure pivoted thereto and comprising a centrifugal weight an inertia weight and an eccentric.

9. In an engine governor, the combination, substantially as set forth, of a carrier, a pivot carried thereby, and an inertia weight centrifugal weight and eccentric mounted for oscillation in common upon said pivot.

10. In an engine governor, the combination, substantially as set forth, of a rotary carrier, a pivot carried thereby eccentric to the axis of rotation of the carrier, an inertia weight mounted for oscillation on said pivot and having its center of gravity located at one side of a line cutting said pivot and the center of rotation of the carrier, and an adjustable valve gear part, as a shifting eccentric, connected with said inertia weight.

11. In an engine governor, the combination, substantially as set forth, of a carrier, a pivot carried thereby eccentric to the axis of rotation of the carrier, and a rigidly united inertia weight and eccentric mounted for oscillation on said pivot, the center of gravity of said combined inertia weight and eccentric being located to one side of a line cutting its supporting pivot and the center of rotation of the carrier, so as to cause the center of gravity of said inertia weight to move away from the center of the rotation of the carrier under the action of unbalanced centrifugal force.

12. In an engine governor, the combination, substantially as set forth, of a rotary carrier, a pivot carried thereby eccentric to the center of rotation of the carrier, an inertia weight mounted upon said pivot and having its mass distributed on both sides of said pivot and having its center of gravity located to one side of a line cutting said pivot and the center of rotation of the carrier, so that said center of gravity shall not within its proper limits of movement cross to the other side of said line, and an adjustable valve gear part, as a shifting eccentric, connected with said inertia weight.

In testimony whereof I have hereunto set my hand.

FRANCIS M. RITES.

Witnesses:

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F. E. GAITHER.