(No Model.)

2 Sheets—Sheet 1.

F. M. RITES.

PRESSURE ENGINE.

No. 582,232. Patented May 11, 1897.

FIG. 1.

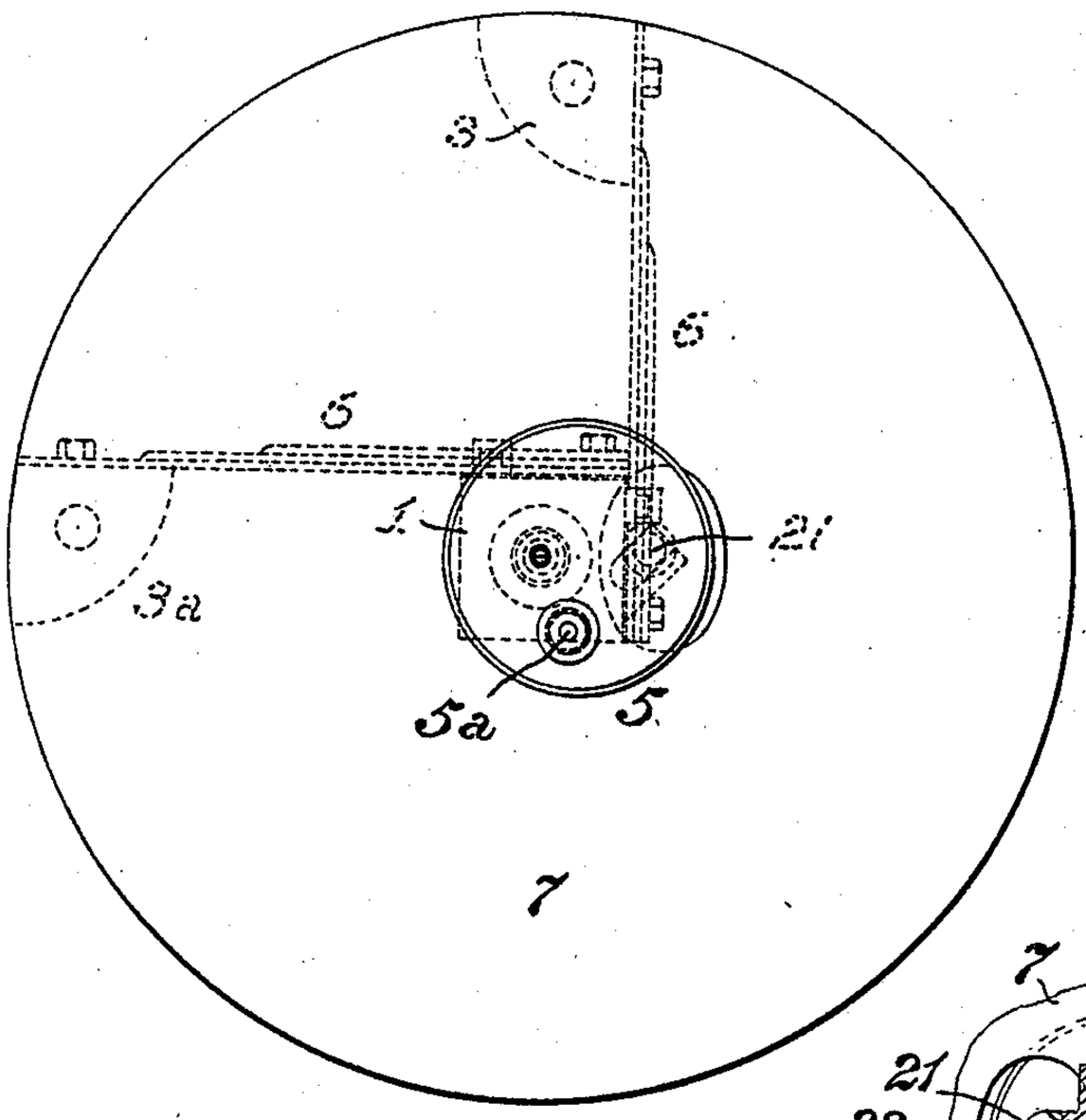


FIG. 4.

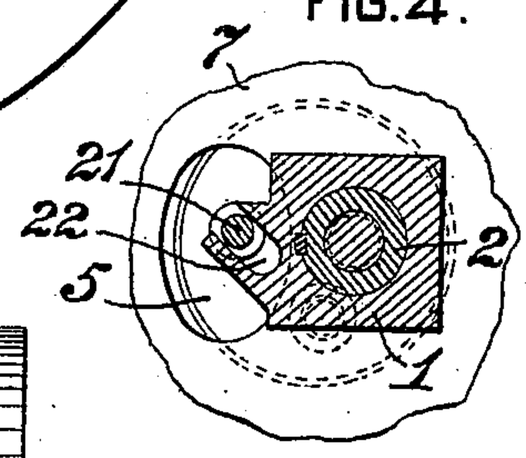


FIG. 2.

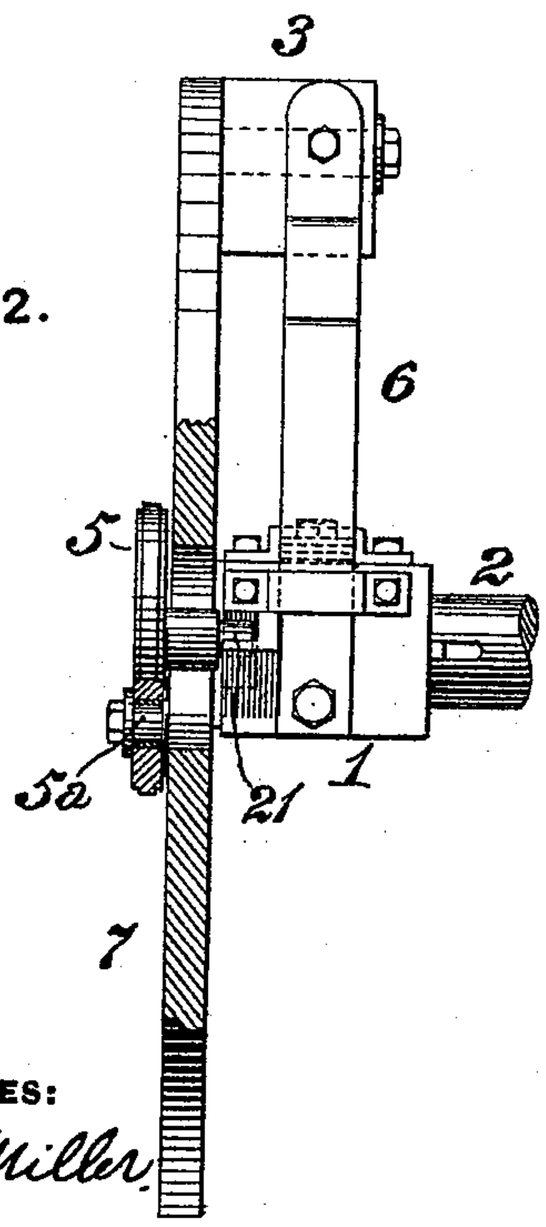
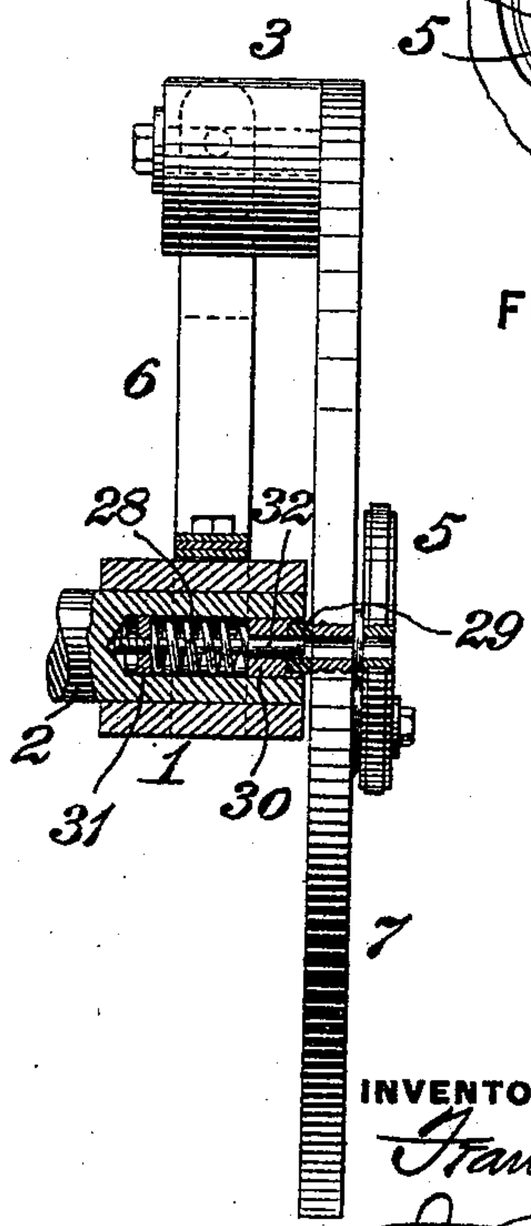


FIG. 3.



WITNESSES:

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(No Model.)

2 Sheets—Sheet 2.

F. M. RITES.

PRESSURE ENGINE.

No. 582,232. Patented May 11. 1897.

FIG. 6.

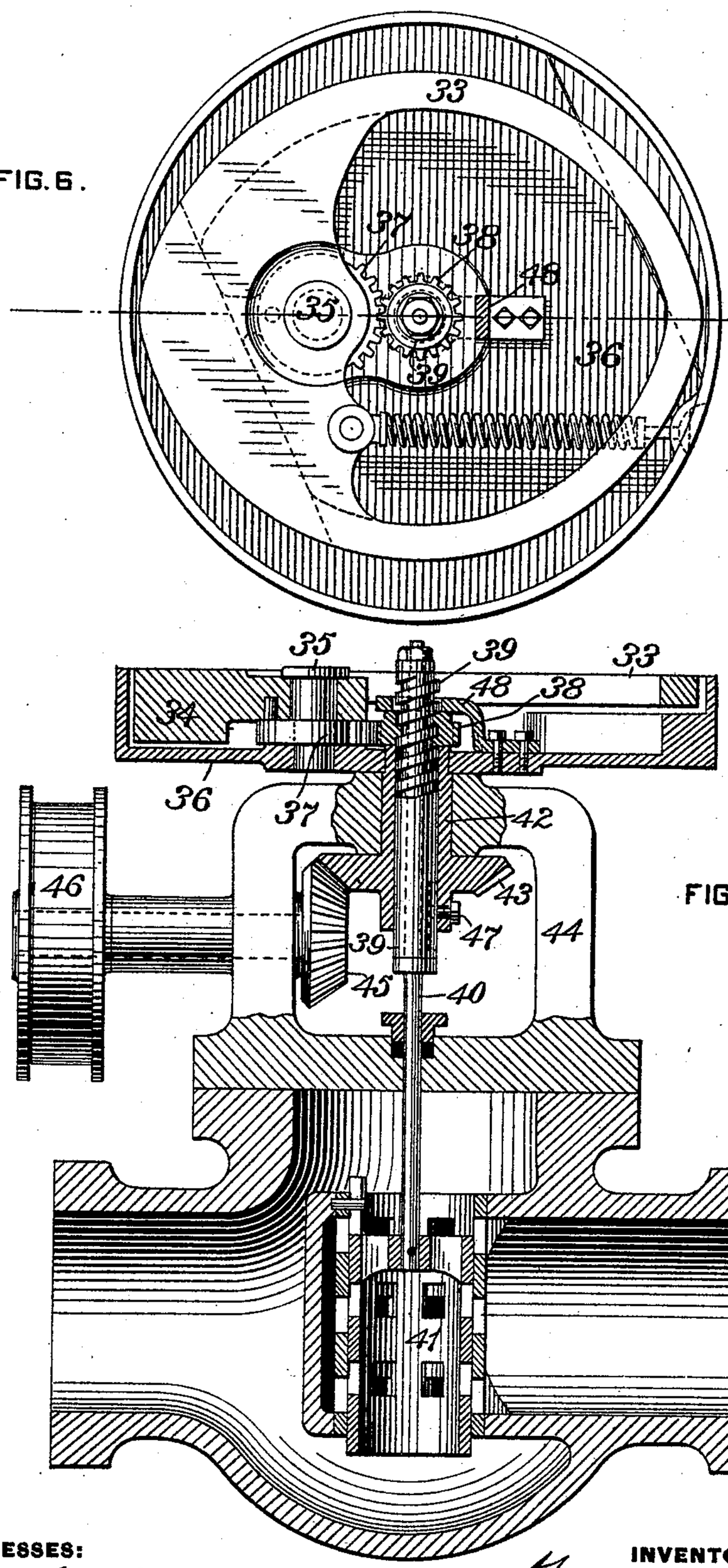

FIG. 5.

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UNITED STATES PATENT OFFICE.

FRANCIS M. RITES, OF ITHACA, NEW YORK.

PRESSURE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 582,232, dated May 11, 1897.

Application filed August 18, 1896. Serial No. 603,138. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS M. RITES, a citizen of the United States, residing at Ithaca, in the county of Tompkins and State of New York, have invented or discovered a certain new and useful Improvement in Governors for Fluid-Pressure Engines, of which improvement the following is a specification.

My present invention relates generally to centrifugal governing mechanism, and more particularly to governing mechanism for fluid-pressure engines of the general class or type set forth in Letters Patent of the United States No. 534,579, granted and issued to me under date of February 19, 1895, and No. 526,856, to Rolla C. Carpenter, assignor of one-half to C. M. Giddings, dated October 2, 1894.

The objects of my invention are to increase the efficiency of a centrifugal governing mechanism, to maintain a minimum degree of structural cost and complication, to neutralize all objectionable strains by equivalent opposing efforts, and to advantageously utilize those forces which should be effective in governor adjustment.

To this end my invention, generally stated, consists in the combination of a rotary carrier and a governor-weight structure having the particles of its mass disposed on opposite sides of the axis of the carrier and subject to both centrifugal and inertia action, said weight structure being movable about a single axis on the carrier; also, in the combination of a governor-weight structure, as above specified, an elastic medium interposed between the weight structure and the carrier and an eccentric or eccentric-pin connected to the weight structure; also, in certain novel structural details and combinations, all as hereinafter fully set forth.

The improvement claimed is hereinafter fully set forth.

It is well recognized that in order to be commercially effective a centrifugal governor should be reduced to the lowest number of parts practicable, for the reason that comparatively trifling friction, which in other mechanisms might be immaterial, becomes a source of serious difficulty with a speed-regulator, and the liability to objectionable binding or cramping increases as the parts are multiplied. Even under the most favorable conditions, when several members of a governor are subjected to heavy pressures through their connected bearings, the element of friction becomes active in producing irregularities of speed, while the abnormal friction which is encountered in practice increases the opportunities for failure of lubrication as the parts increase in number, so that, generally speaking, it may be said that in many instances the present shaft-governor is the weak feature of the steam-engine.

The strains which are injurious in their relation to the governor are centrifugal force in imparting pressure to supporting-bearings and the effect of impact of some reciprocating portion of the engine transmitted through the bearings, so as to wear them under what is momentarily an enormous increase of pressure. Ordinarily the centrifugal force is applied at the center of gravity and the resistance at some other point of the combination, which application, although apparently effective so far as relates to balance of forces, subjects the connecting parts to variations of original pressure, which introduces considerable friction, depending on the number of parts intermediate and the leverage exerted on them. Even when centrifugal force and spring resistance are applied on the same piece it is generally the case that they are so applied at different points that instead of making an exact balance they more often react, so as to increase the pressure on the supporting-pin, and increase instead of reduce the faults attending such conditions, with a corresponding reduction of efficiency in service.

Another important objection in ordinary governing mechanisms is the effect of the impact of reciprocating parts—say in the connecting-rod bearings, which are often run extremely loose—which in its transmission through the governor-bearings produces a momentary immense increase of pressure thereon.

Under my invention the strains of impact and centrifugal force are resisted by spring-pressure; and the essential feature of my invention, generally speaking, consists in a disposition of the mass of what is substantially a single-piece weight moving about a single center on both sides of the axis of rotation, or even entirely around the axis, certain parts of the weight being subject to a centrifugal

strain inverse to that to which other parts are subjected, elastic material to absorb strains of impact being interposed between the weight structure and its support, and the action of spring resistance being in line with but opposed to that of centrifugal force.

In the accompanying drawings, Figure 1 is a side view in elevation of a governor illustrating an application of my invention; Fig. 2, a view, partly in section, of the same as seen from the right; Fig. 3, a similar view as seen from the left; Fig. 4, a transverse section at the line *z z* of Fig. 2; Fig. 5, a central section through a throttle-valve and a governing device, showing a modification of my improvement; and Fig. 6, a plan view of the governing device shown in Fig. 5.

Figs. 1 to 4, inclusive, illustrate an application of my invention in which a unitary-weight structure and connected eccentric member are movable about a single center on a rotary carrier, but in which a supporting-pin or journal mechanism is dispensed with and the support is provided by a system of springs at angles one to the other, the combination being such that movement of the weight structure is a substantially circumferential one. The movement is therefore similar to that which is effected by the employment of a pin-support without the disadvantages attendant thereon.

The rotary carrier which is secured upon the crank-shaft or counter-shaft 2 of the engine has in this instance the form of a square block, and the unitary-weight structure is composed of a plate or disk 7 and two weights 3 and 3ª, which are secured to the plate at or near its periphery and on radial lines at an angle of ninety degrees one to the other. The weight structure is connected to the rotary carrier by two plate or leaf springs 6 6, also at an angle of ninety degrees one to the other, said springs being bolted to two sides of the carrier, the line of junction of which coincides with the axis about which the weight structure moves in the operation of the governor. The eccentric 5 is journaled by a pin or bolt 5ª to the plate 7 of the weight structure and is provided with a pin 21, which passes through an elongated opening in said plate and fits freely in a guide slot or groove 22 in the rotary carrier.

The central portion of the plate 7 abuts against a friction plate or block 29, which is formed of or faced with leather, rubber, or analogous material, and fits in a central bore in the shaft, said plate being pressed against the plate 7 by a pressure plate or block 30, subject to the pressure of a helical spring 28. The block 30 and spring 28 are shown as fitted in the bore of the shaft 2 on the inner side of the pressure plate or block 30, but one or more similarly-operating friction devices may, if preferred, be fitted in the adjacent end of the carrier without difference of operative principle or result, the object of the construction in this particular being to interpose a frictional resistance between the weight structure and a rotary member upon which it is supported and with which it rotates.

It may be desirable from time to time to vary the degree of friction between the weight structure and its support, and to this end I have shown a means of adjustment which is suitable and conveniently applicable. A plate 31 is inserted in the bore of the shaft at the inner end of the spring 28, and an adjusting-screw 32 bears against the inner end of the bore and engages an internal thread on the plate 31. By the application of a screw-driver to the head of the adjusting-screw, which may be effected through openings provided for the purpose in the plate 7 and eccentric 5, the spring 28 may be compressed to a greater or less degree and the frictional resistance of the block 29 to the plate 7 be correspondingly increased or diminished as desired.

Where the slight irregular friction of the supporting-pin is minimized or wholly removed, as in my invention, it is desirable to substitute some other positive restraint which can be regulated and maintained within proper limits. Dash-pots have ordinarily been employed for this purpose, but these are objectionable not only on account of their cost, but also because of the cumulative effect of the restraint as the speed of adjustment increases with rapid and extreme changes of load. By the simple mechanism provided under my invention a frictional resistance is afforded, which is invariable with rapid action, and may be adjusted to the minimum necessary for the purpose without the possibility of such excess as would effect a slow adjustment of the governor.

It will be obvious that the specific form of the governor-weight structure is not of the essence of my invention, and it may, for example, consist of an entirely-inclosing case covering the supporting-carrier and its pin or springs, or, again, be in the form of a disk or of a bar. Furthermore, its application is not limited to a connection with an adjustable eccentric, and it may be applied with the same governing effect to any speed-regulator, such as a throttling-governor which does not adjust an eccentric, or to electric governing, where the element of speed is a factor, or in a water-wheel governor as the guide of application of power to control the flow of water, or in connection with the familiar Corliss cut-off gear, in which the tripping mechanism only is in connection with the governor, and the connection between the eccentric and weight may be by means of a link or otherwise. In short, the leading and essential feature of my invention is applicable, without change of operative principle, to mechanisms in general which effect regulation of speed by the action of centrifugal force.

In order to illustrate the wide range of applicability of my invention, I have shown one

form of it in Figs. 5 and 6 connected with and adapted to operate a throttling-valve device. The weight structure in this instance comprises the frame, ring, or plate 33, formed integral with a centrifugal weight 34 and mounted on a pin 35, secured to the casing 36. A toothed sector 37, fixed to the weight structure, gears with a toothed pinion 38, which is mounted on a sleeve 39, surrounding the stem 40 of a valve 41.

The rotary carrier 36 of the governor-weight structure is secured to a sleeve 42, mounted in the frame 44 and which surrounds the sleeve 39 and is formed integral with or secured to a bevel gear-wheel 43, meshing with another bevel gear-wheel 45, receiving motion through a pulley 46 by a belt from the engine. On the upper outer portion of the sleeve 39 is formed a screw-thread with which the pinion 38 engages. The sleeve 39 is adapted to move longitudinally in the sleeve 42, but is prevented from turning therein by the pin 47, which extends through the sleeve 42 into a groove in the sleeve 39. When the bevel gear-wheel 43 is being rotated at a constant speed, the two sleeves 42 and 39, the rotary carrier 36, the weight structure, the toothed segment 37, and the pinion 38 all turn together without any motion relative to one another, but when any variation in the speed occurs the weight structure makes a slight movement about the pin 35. The toothed sector 37 moves on its axis relative to the rotary carrier and in so doing moves the pinion 38 on its axis relative to the carrier and to the sleeve 39. The movement of the pinion 38 relative to the sleeve 39 by the engagement of the pinion with the screw-thread on the sleeve 39 moves the sleeve 39 and the rod 40 longitudinally, so as to vary the opening of the ports controlled by the valve 41.

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

1. The combination, of a rotary carrier, an integral governor-weight structure, comprising a centrifugal weight and an inertia-weight, the inertia-weight having its mass symmetrically disposed on opposite sides of the axis of the carrier, and means by which the governor-weight structure may be connected with, or adapted to actuate or adjust an eccentric, or valve, or other controlling member, substantially as set forth.

2. The combination of a rotary carrier, a governor-weight structure subject to centrifugal action, and springs set at an angle one to the other and connecting the weight structure to the carrier with the capacity of movement of the weight structure about an axis on the carrier exterior to the axis of rotation thereof, substantially as set forth.

3. The combination of a rotary carrier, a centrifugally-acting weight connected thereto, and a frictional resistance device interposed between the carrier and the weight, substantially as set forth.

4. The combination of a rotary carrier, a centrifugally-acting weight connected thereto, a frictional resistance device interposed between the carrier and the weight, and mechanism for adjusting the degree of resistance between the weight and the carrier, substantially as set forth.

5. The combination of a rotary carrier, an integral governor-weight structure, comprising a centrifugal weight and an inertia-weight, the inertia-weight having the particles of its mass symmetrically disposed on opposite sides of the axis of the carrier, an elastic medium interposed between the weight structure and the carrier, and an eccentric, or eccentric-pin, connected to the weight structure, substantially as set forth.

6. The combination of a rotary carrier, an integral governor-weight structure comprising a centrifugal weight and an inertia-weight, the inertia-weight having the particles of its mass symmetrically disposed on opposite sides of the axis of the carrier, springs interposed between the weight structure and the carrier and exerting tension in opposite direction to the action of centrifugal force on the weight structure, and an eccentric, or eccentric-pin, connected to the weight structure, substantially as set forth.

7. The combination of a rotary carrier, a governor-weight structure having the particles of its mass disposed on opposite sides of the axis of the carrier, springs set at an angle one to the other and connecting the weight structure to the carrier with the capacity of movement of the weight structure about a single axis on the carrier, and an eccentric or eccentric-pin connected to the weight structure, substantially as set forth.

8. The combination of a rotary carrier, a governor-weight structure having the particles of its mass disposed on opposite sides of the axis of the carrier and subject to both centrifugal and inertia action, said weight structure being movable about a single axis on the carrier, an elastic medium interposed between the weight structure and the carrier, an eccentric or eccentric-pin connected to the weight structure, and a connection between the eccentric or eccentric-pin and the rotary carrier, substantially as set forth.

9. A governor-weight structure symmetrically disposed about the axis of a carrier and integrally formed with a preponderating mass subject to centrifugal force, and means by which the governor-weight structure may be connected with, or adapted to actuate, or adjust, an eccentric, or valve, or other controlling member, substantially as set forth.

In testimony whereof I have hereunto set my hand.

FRANCIS M. RITES.

Witnesses:
J. SNOWDEN BELL,
T. J. HOGAN.