(No Model.) 3 Sheets—Sheet 1.

F. M. RITES.

GOVERNOR FOR FLUID PRESSURE ENGINES.

No. 582,231. Patented May 11, 1897.

FIG. 1.

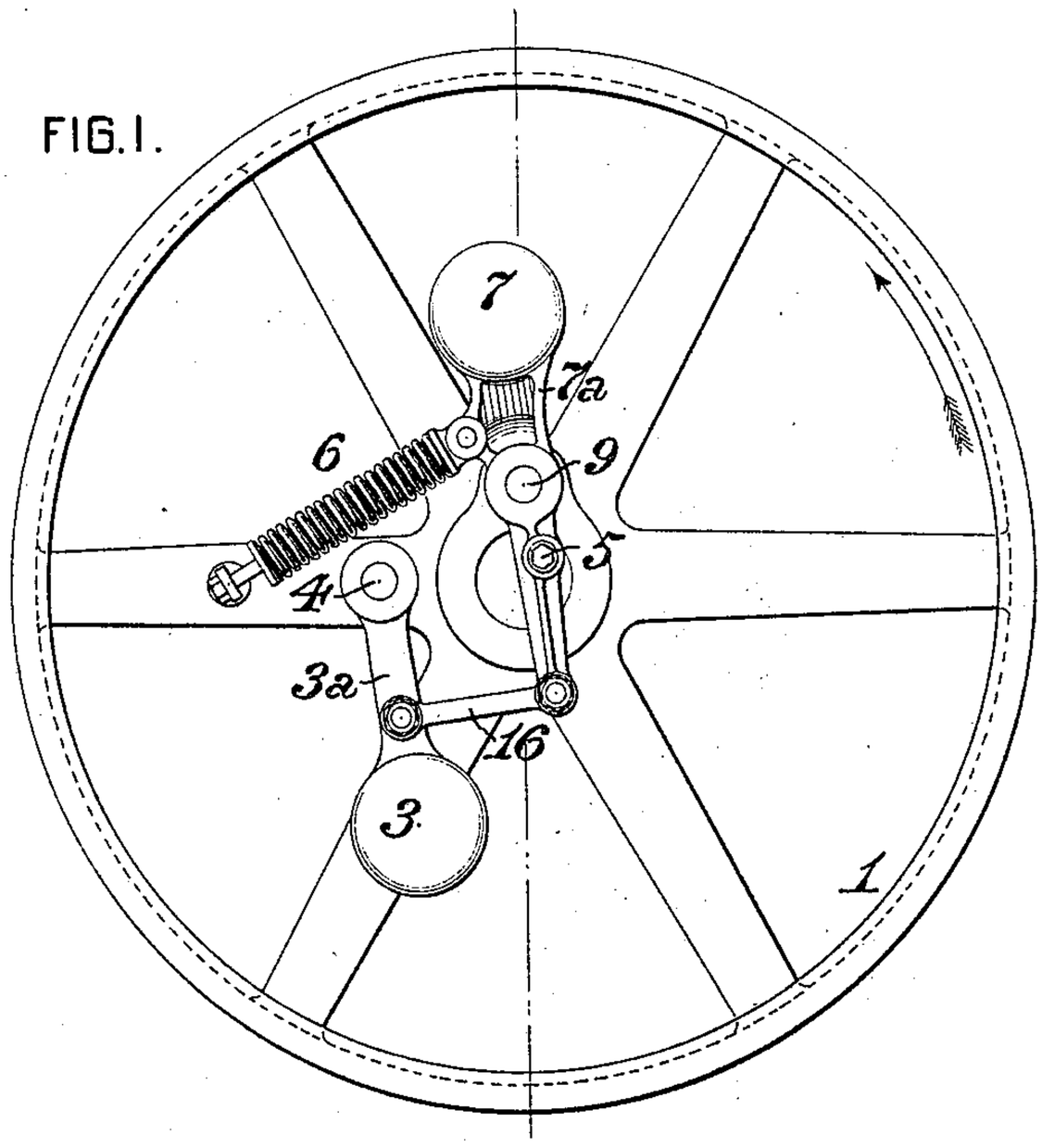


FIG. 2.

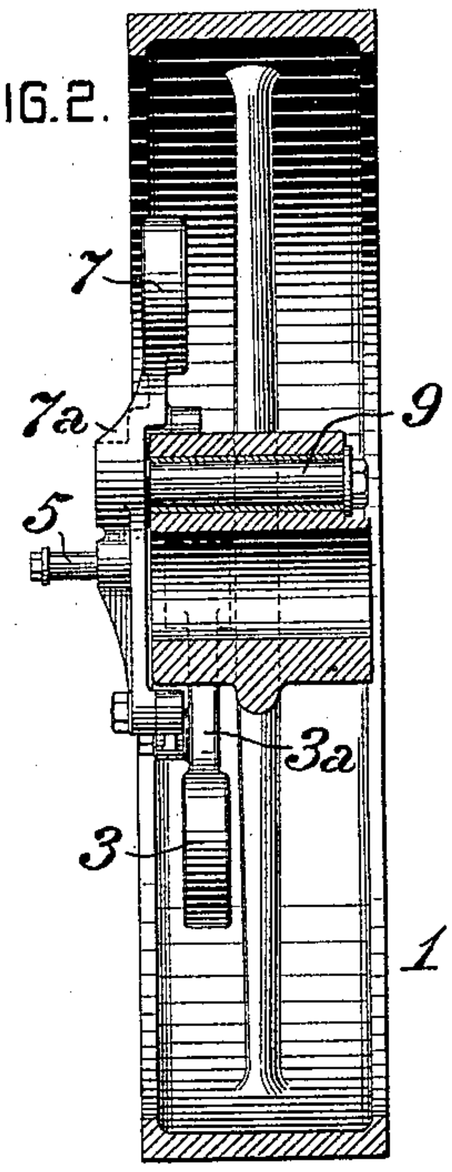


FIG. 3.

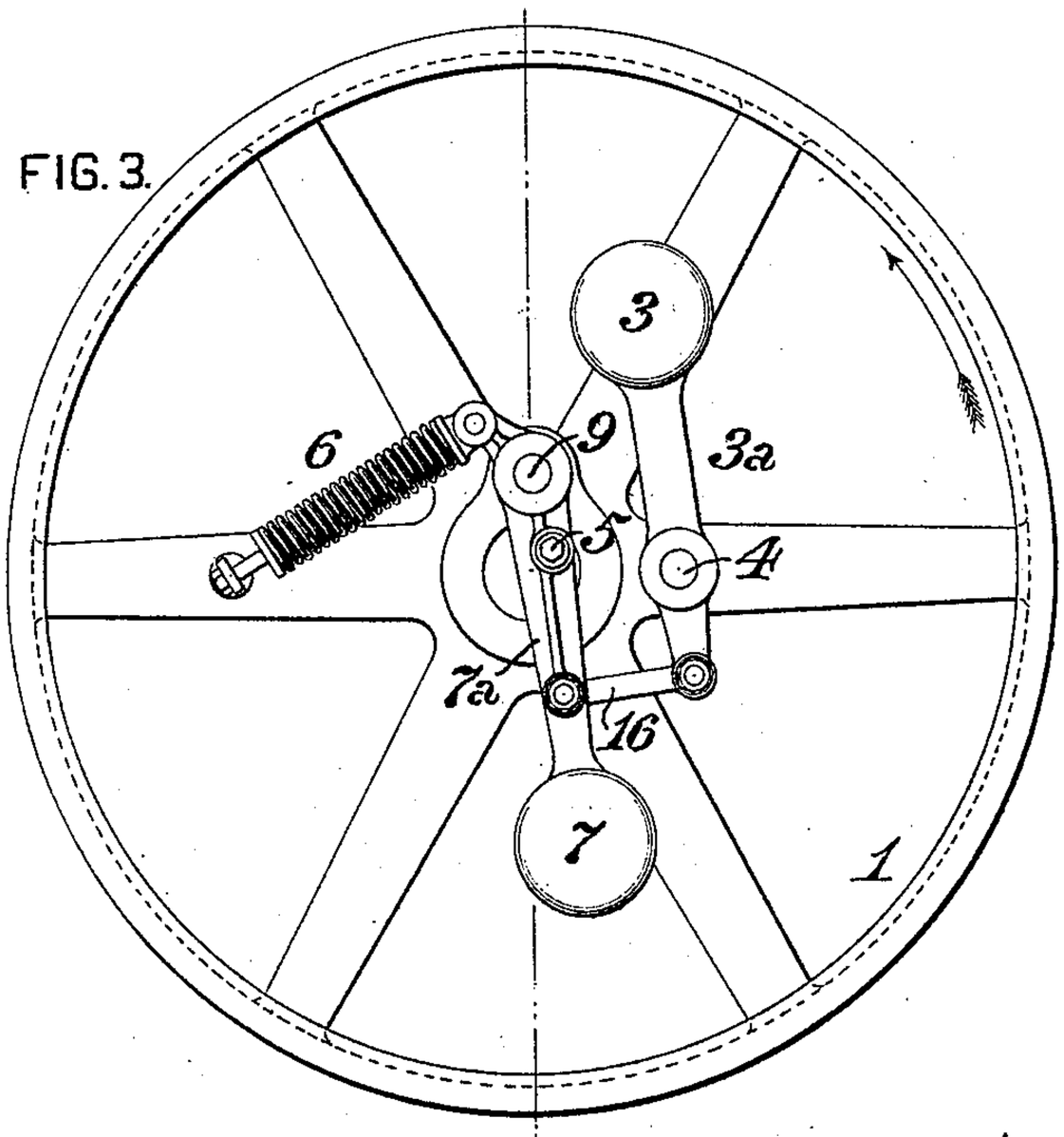
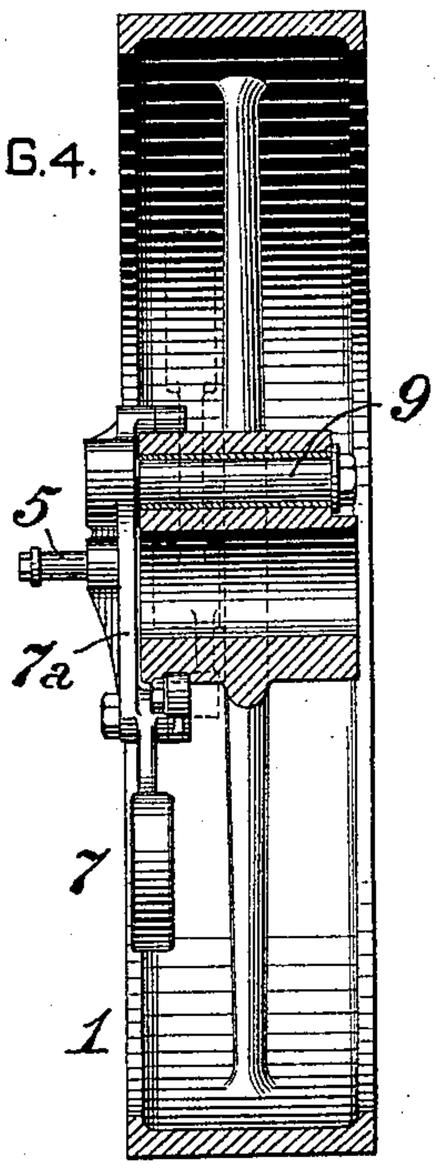


FIG. 4.



WITNESSES:

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Att'y.

(No Model.) 3 Sheets--Sheet 2.

F. M. RITES.

GOVERNOR FOR FLUID PRESSURE ENGINES.

No. 582,231. Patented May 11, 1897.

FIG. 5.

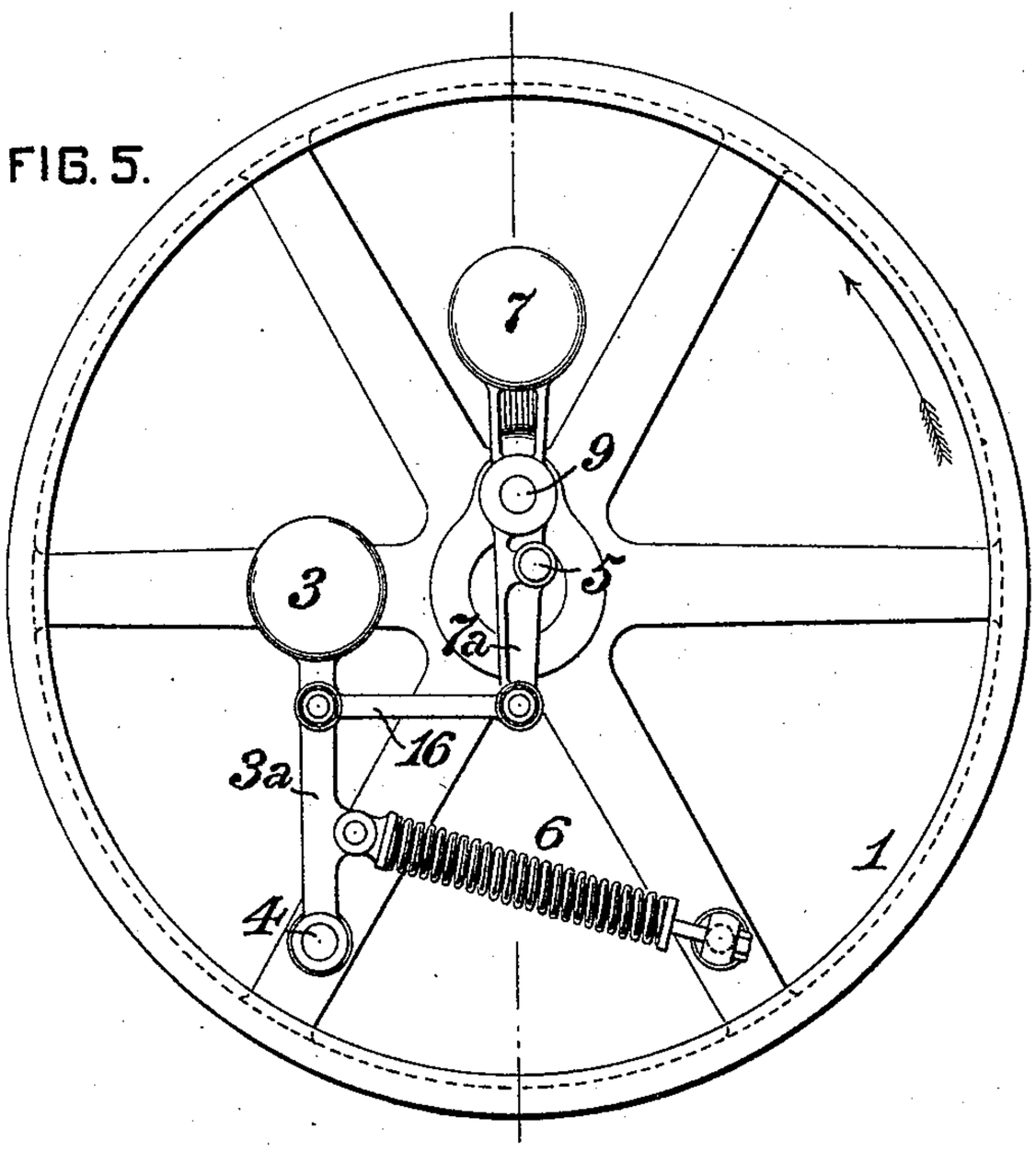


FIG. 6.

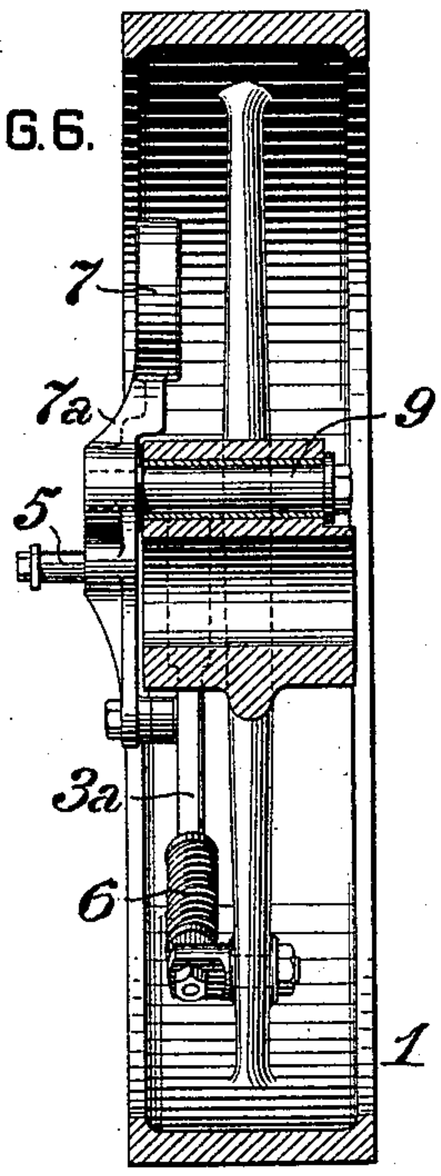


FIG. 7.

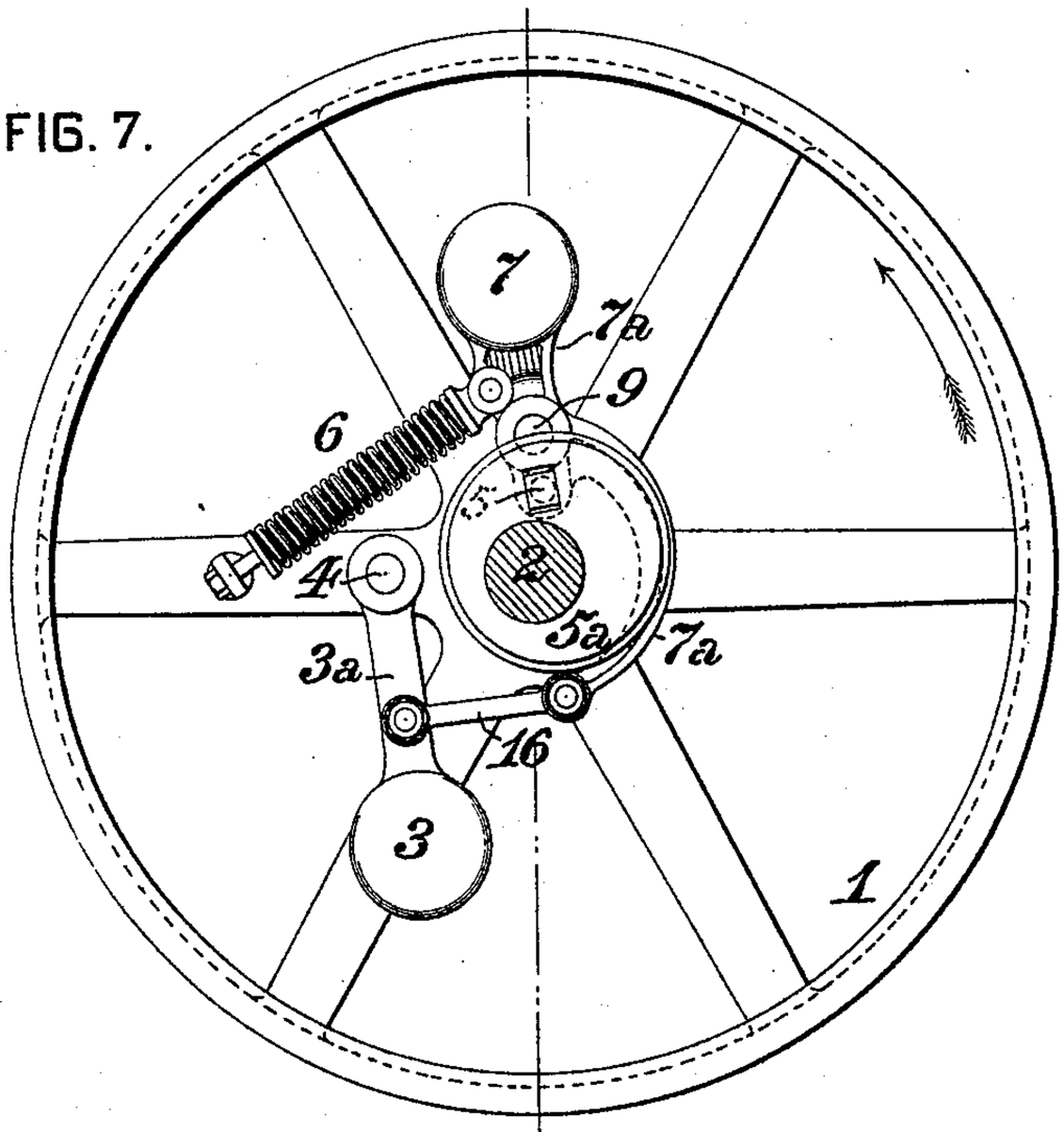
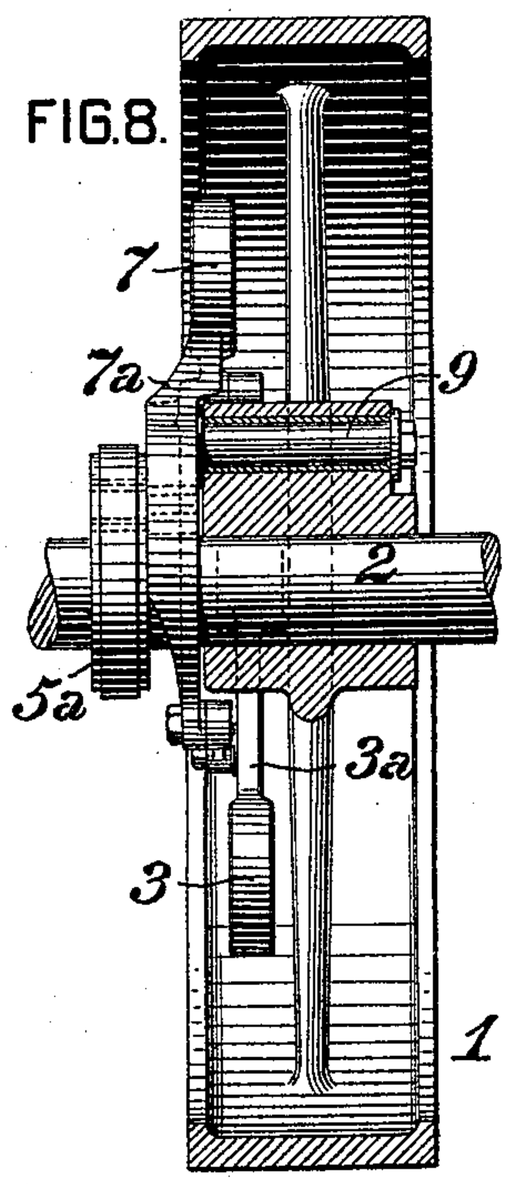


FIG. 8.



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(No Model.) 3 Sheets—Sheet 3.

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GOVERNOR FOR FLUID PRESSURE ENGINES.

No. 582,231. Patented May 11, 1897.

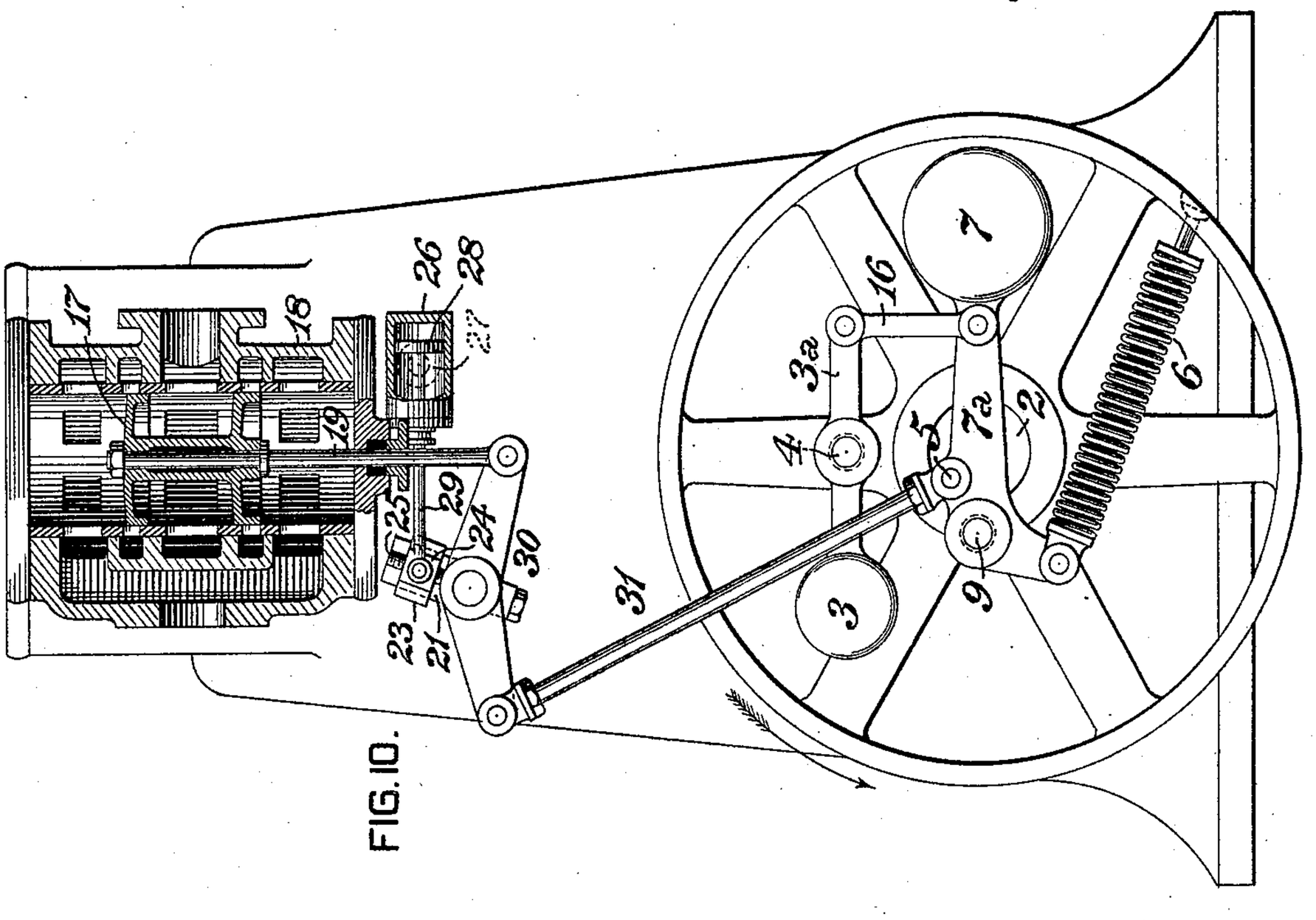

FIG. 10.

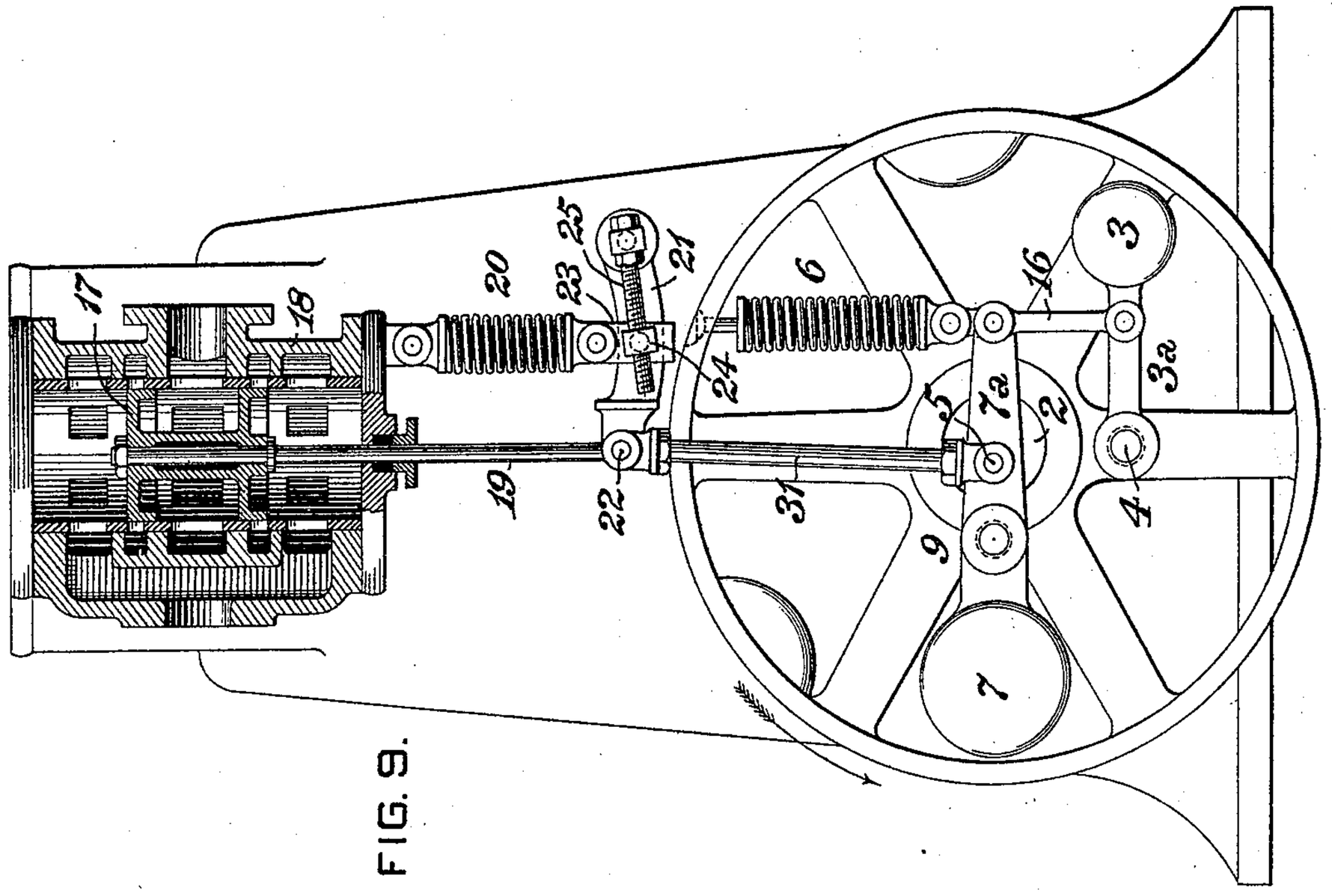

FIG. 9.

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UNITED STATES PATENT OFFICE.

FRANCIS M. RITES, OF ITHACA, NEW YORK.

GOVERNOR FOR FLUID-PRESSURE ENGINES.

SPECIFICATION forming part of Letters Patent No. 582,231, dated May 11, 1897.

Application filed June 13, 1896. Serial No. 595,380. (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 to governing mechanism for fluid-pressure engines of the general class or type set forth in Letters Patent of the United States Nos. 342,307, 355,717, and 527,720, granted and issued to me under dates of May 18, 1886, January 11, 1887, and October 16, 1894, respectively, and is an improvement upon certain features of the inventions therein claimed.

The object of my invention is to simplify and perfect the mechanism of Patent No. 527,720 aforesaid, and to provide simple and effective means for resisting the forces acting, through the reciprocating members of the valve-gear, upon the governor, and, by varying the degree of resistance, to modify, indirectly, the relation of the centrifugal and centripetal forces of the governor, so as to modify the action of the governor.

To this end my invention, generally stated, consists in the combination of a rotary carrier, a primary centrifugal weight journaled thereon, a secondary weight balanced as to gravity by the primary weight and journaled on the carrier so as in normal position to be unaffected by radially-acting force, and a shifting eccentric connected to the secondary weight; also, in the combination of a distribution-valve mechanism, a shifting eccentric connected thereto, a governing device effecting adjustment of the shifting eccentric, and a yielding pressure device adjustably connected to the valve mechanism.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figures 1, 3, 5, and 7 are side views in elevation of governors, illustrating, under variations of structural detail, applications of my invention; Figs. 2, 4, 6, and 8, transverse sections through the governors of Figs. 1, 3, 5, and 7, respectively; and Figs. 9 and 10 views, partly in elevation and partly in section, of steam-engines, illustrating combinations of a governing mechanism and distribution-valve embodying my invention.

In the practice of my invention, referring first more particularly to Figs. 1 and 2, the governing mechanism is, as heretofore, mounted upon a suitable rotary carrier, consisting of a wheel, case, or disk 1, which is bored out centrally to be fixed upon the crank-shaft 2 of an engine or upon a counter-shaft deriving motion therefrom. A primary centrifugally-adjustable weight 3, which may be either formed on or fixed to an arm 3^a, is pivoted, as by a bearing-pin 4, to the rotary carrier 1 at a suitable distance from its center, so as to be subject to the rotative effect of centrifugal force, by which it is moved about the axis of its bearing-pin 4. The arm of the primary weight 3 is connected either directly, as in Figs. 5, 6, and 10, or through the intermediation of a linkage, as in the construction shown in the other figures, to one end of a spring 6, the opposite end of which is connected to the rotary carrier 1, the tension of said spring acting, as in the ordinary constructions, in opposition to the action of centrifugal force upon the primary weight.

A secondary weight 7 is formed on or fixed to an arm 7^a, which is pivoted by a pin 9 to the rotary carrier in such manner as to be, when in normal position, substantially unaffected by radially-acting force, it being connected in such relation to the other members of the governing mechanism that when in its normal position its center of gravity and the center of its pivot-pin 9 will be in or nearly in line with a point in the axis of the rotary carrier 1—that is to say, the center line of the arm 7^a would be radial, or nearly so, to the circle of the rotary carrier 1. This normal, mean, or neutral position of the secondary weight 7 is illustrated in each of the constructions shown, and is that from which centrifugal force is inactive to effect its displacement. The spring 6, before specified, is connected to the arm 7^a of the secondary weight 7, between said weight and its pivot-pin 9, and the arm 7^a is connected by a link 16 on the opposite side of its pivot 4 from the weight with the arm 3^a of the primary weight 3.

A shifting eccentric-pin or eccentric 5, from

which, through the usual connections, the distribution-valve of the engine is actuated, is fixed to the arm 7^a of the secondary weight.

The relation of the link 16 to the pivots of the primary weight 3 and secondary weight 7 is such that said weights are balanced as to gravity one by the other, as they are so coupled together that movement of either of them in the direction due to the action of gravity is opposed by the coincident action of gravity upon the other.

The governing mechanism above described is especially desirable for application in engines which run at comparatively low speeds, as in such case the centrifugal force will be correspondingly light, and therefore the secondary weight, the inertia effect of which is materially increased by reason of its exemption from the disturbing action of centrifugal force, will assist the action of the primary centrifugal weight. An increase in the latter would increase its force in proportion to the increase of mass and resistance, while in the case of the secondary weight the force of inertia is made available, proportionately to its mass, to a much greater degree than would otherwise be practicable by reason of the manner in which it is supported and the path in which it is caused to move, in addition to its performance of the function of a gravity-balance for the primary centrifugal weight.

It will be obvious that the details of location and connection of the members of the governing mechanism may be varied in many particulars within the discretion of the constructor without departure from the essential structural and operative features above described, and instances of modifications of such character are illustrated in the drawings. Thus, as shown in Figs. 3 and 4, the spring 6 is connected to the arm 7^a on the opposite side of the pivot from the weight, and the link 16 is similarly connected to the arm 3^a. In Figs. 5, 6, and 10 the spring 6 is connected directly to the arm 3^a. Figs. 7 and 8 show a construction in which the connections of the members are substantially as in Figs. 1 and 2, except that the eccentric-pin 5 is fitted in an opening in a secondary eccentric 5^a, journaled on the shaft, and acts to move the same around the shaft 2 as a pivot.

The governing mechanism shown in Figs. 9 and 10, which in and of itself is similar in all essential particulars to those of the preceding figures, is combined with a distribution-valve gear, the reciprocating parts of which are balanced as to gravity by the secondary weight and a yielding pressure device connected adjustably to the valve-gear, so that its leverage of resistance to the momentum of the reciprocating parts thereof may be varied to permit desired changes of speed of the engine. Two forms of the adjustable pressure device are shown in the drawings, the pressure member of the construction shown in Fig. 9 being a spring and the corresponding member in Fig. 10 being a fluid-pressure cylinder and piston.

A yielding pressure device combined with a distribution-valve gear and governing mechanism is set forth in Letters Patent No. 342,307 aforesaid, and such combination is not, therefore, broadly claimed as of my present invention. The adjusting mechanism through which the pressure device is connected to the valve-gear, and by means of which the new result of effecting desired modifications in the action of the governor while running is accomplished, is, however, an essential feature of novelty and advantage in my present invention.

Referring to Fig. 9, the distribution-valve 17 of the engine on which the governing mechanism is applied is fitted to reciprocate vertically in a valve-chest 18, and its stem 19 is coupled by a rod or link 31 to the eccentric-pin 5 on the arm 7^a of the secondary weight 7, which weight is made of greater amount than in the constructions previously described, inasmuch as it performs the function of a gravity-balance for the reciprocating members of the valve-gear, in addition to its function of balancing the primary weight 3 as to gravity. The inertia of the reciprocating members of the valve-gear is balanced by a yielding pressure device, which in this instance consists of a helical spring 20, one end of which is secured to the framing of the engine and the other end of which is connected adjustably to the valve-stem 19. The connecting and adjusting device of the pressure device and valve-stem consists of a curved lever-arm 21, which is pivoted at one end to the engine-frame and coupled at the other by a pin 22 to the valve-stem. The spring 20 is connected to an adjusting-block 23, fitted to slide longitudinally on the lever-arm 21 and carrying a nut 24, engaging an adjusting-screw 25, journaled on said arm. By the rotation of the screw 25 in one or the other direction the adjusting-block 23 may be moved away from or toward the pivot of the lever-arm and the leverage through which the spring acts upon the valve-gear be correspondingly increased or diminished, as the case may be.

The construction shown in Fig. 10 differs from that last described in the particulars that in the pressure device the resistance of a fluid-pressure is employed instead of that of the spring 20 of Fig. 9 and the distribution-valve is actuated through the intermediation of a rocker, so that the connection of the valve-stem to the arm of the secondary weight is made between said weight and its pivot instead of on the opposite side of the pivot from the weight, as in Fig. 9. The pressure device in this instance consists of a cylinder 26, fixed to the frame below the valve-chest 18, to which cylinder steam or other fluid under pressure is supplied by a pipe 27, and which cylinder is fitted with a piston 28,

fixed upon a rod 29. The stem 19 of the distribution-valve 17 is connected to one of the arms of a rocker 30, journaled on the frame, the opposite arm of which is coupled by a rod or link 31 to the eccentric-pin 5 on the arm 7^a of the secondary weight 7, between said weight and its pivot 9. The weight 7 is, as in the preceding case, made sufficiently heavy to serve as a gravity-balance for the reciprocating members of the valve-gear, as well as for the primary weight 3. A lever-arm 21 is formed on the rocker 30, and an adjusting-block 23, to which the piston-rod 29 is coupled, is fitted to slide longitudinally on the lever-arm. The adjusting-block is, as in the previous instance, moved away from or toward the center of vibration of the lever-arm—*i. e.*, the center of the journal of the rocker 30—by an adjusting-screw 25, journaled on the lever-arm and engaging a nut 24 on the adjusting-block, and the leverage through which the fluid-pressure on the piston 28 acts upon the valve-gear is correspondingly increased or diminished.

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

1. The combination of a distribution-valve mechanism, a shifting eccentric connected thereto, a governing device effecting adjustment of the shifting eccentric, and a yielding pressure device, adjustably connected to the valve mechanism.

2. The combination of a distribution-valve mechanism, a shifting eccentric connected thereto, a yielding pressure device, and adjustable connections between said pressure device and the valve mechanism, for increasing or decreasing the action of the former upon the latter in alternately assisting and resisting the momentum of the reciprocating members thereof.

3. The combination of a distribution-valve mechanism, a shifting eccentric connected thereto, and a yielding pressure device connected to the valve mechanism, and acting through a variable leverage thereon.

4. The combination of a distribution-valve mechanism, a shifting eccentric connected thereto, a pivoted lever-arm coupled thereto, a yielding pressure device; and a block coupled to said pressure device and adjustable longitudinally on the lever-arm.

5. The combination of a distribution-valve mechanism, reciprocating in a substantially vertical plane, a rotary carrier, a primary centrifugal weight journaled on the carrier, a secondary weight journaled on the carrier, so as, in normal position, to be unaffected by centrifugal force, and balancing the gravity of the primary weight and of the reciprocating members of the valve mechanism, a shifting eccentric connected to said secondary weight and to the valve mechanism, and a yielding pressure device connected to the valve mechanism, and acting thereon through a variable leverage.

In testimony whereof I have hereunto set my hand.

FRANCIS M. RITES.

Witnesses:

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HATTIE L. HOLLISTER.