No. 646,315. Patented Mar. 27, 1900.

F. M. RITES.

GOVERNOR.

(Application filed Mar. 8, 1898. Renewed Dec. 21, 1899.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 2.

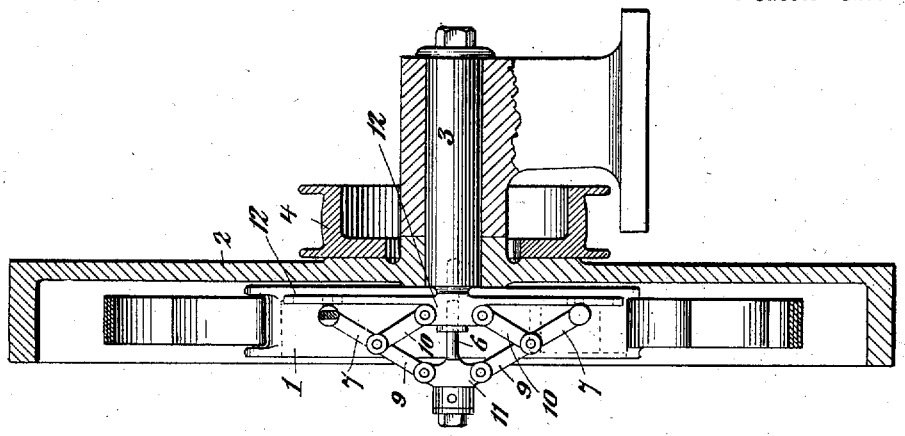

Fig. 1.

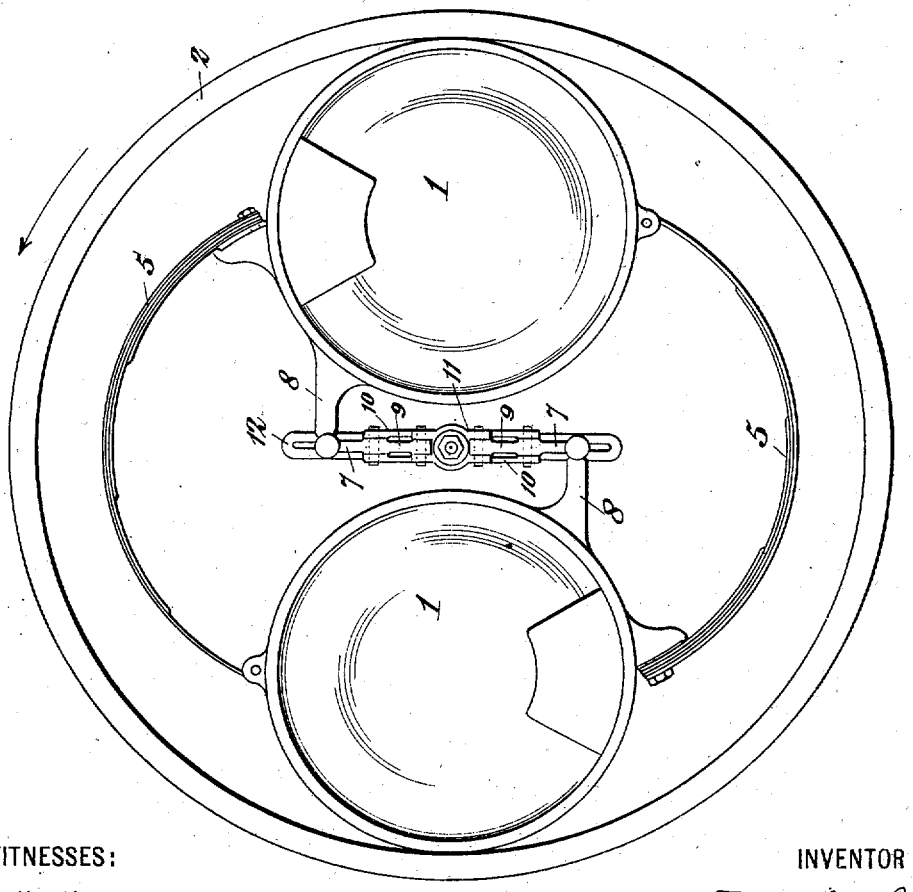

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Fig. 4.

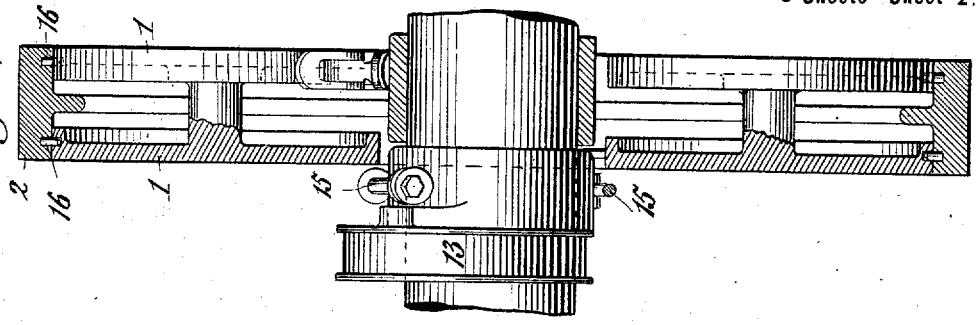

Fig. 3.

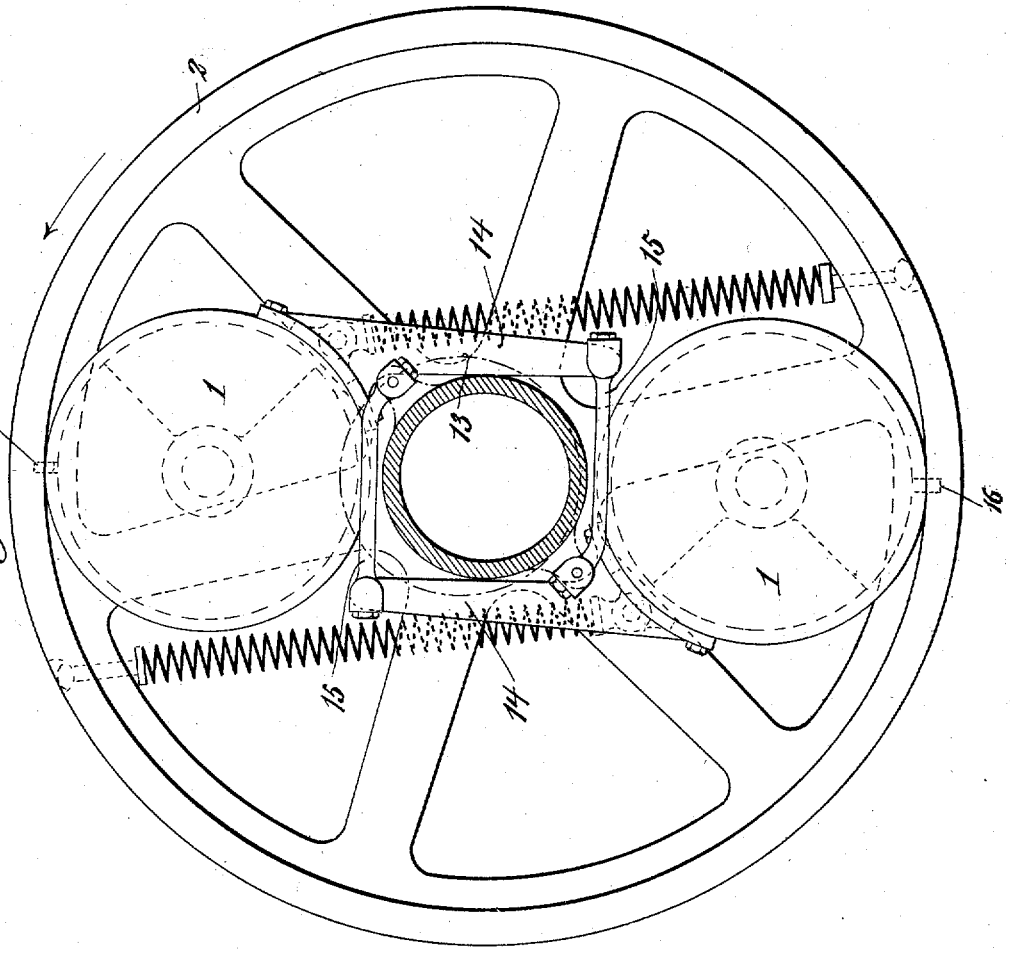

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Fig. 6.

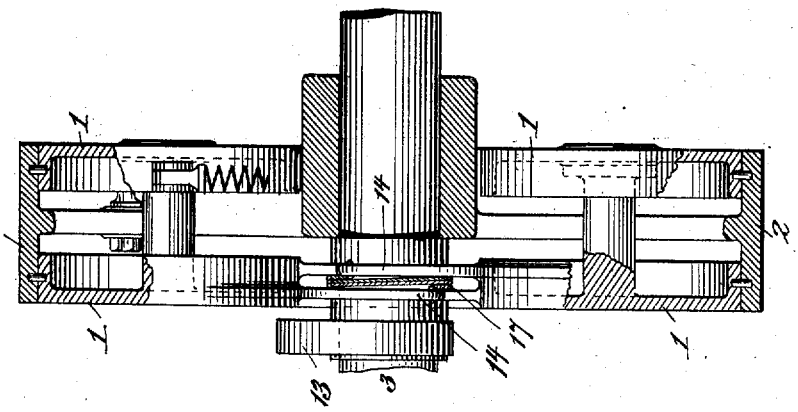
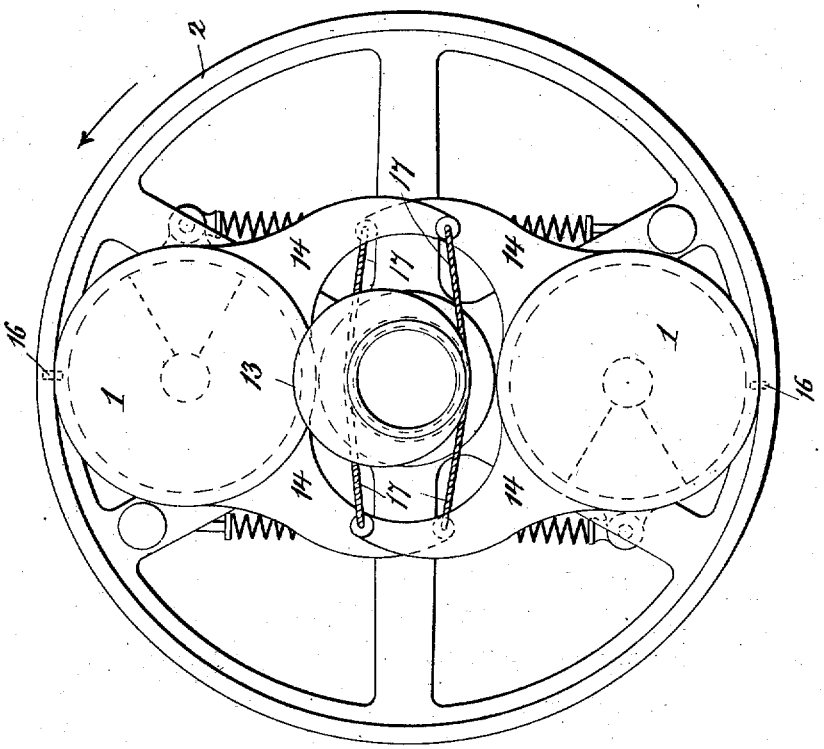


Fig. 5.



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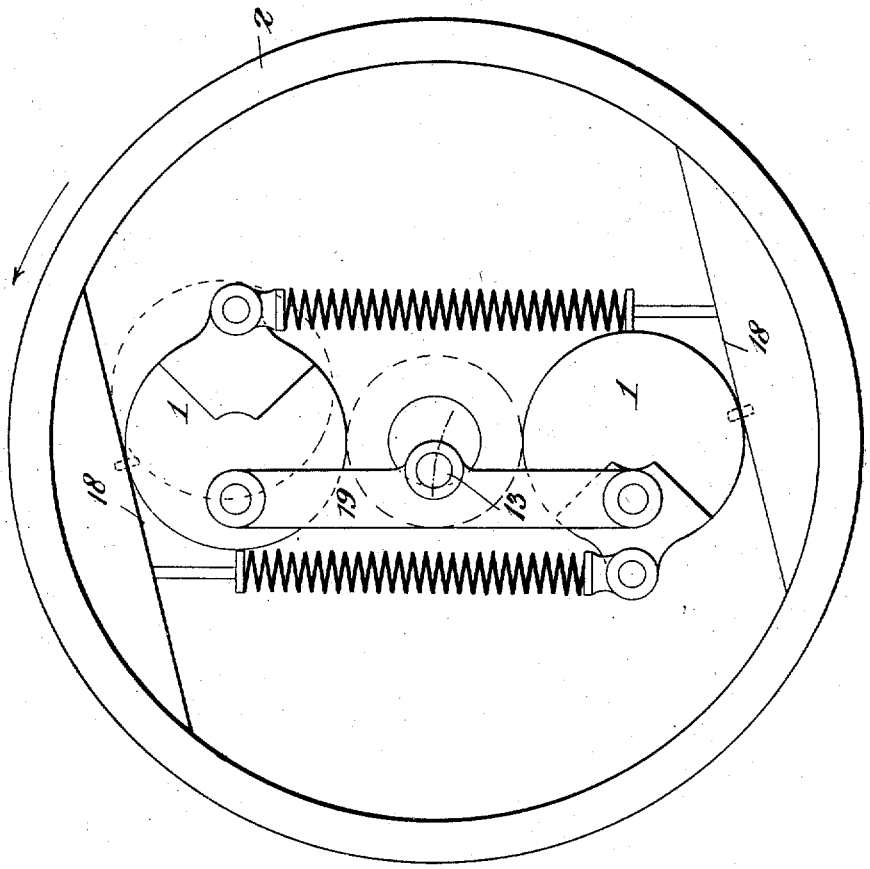
(Application filed Mar. 8, 1898. Renewed Dec. 21, 1899.)

(No Model.) 5 Sheets—Sheet 4.

Fig. 7.



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GOVERNOR.

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(No Model.) 5 Sheets—Sheet 5.

Fig. 9.

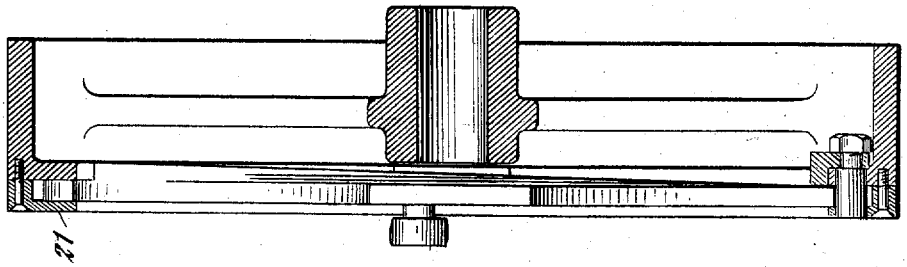
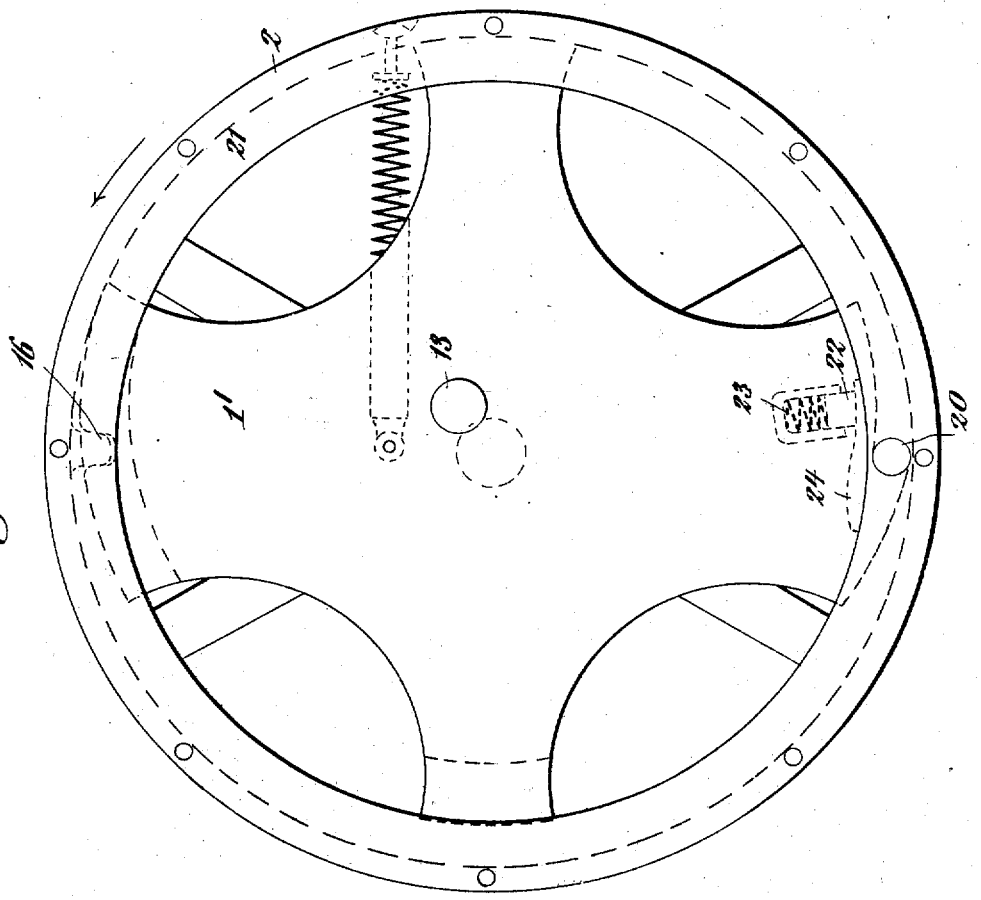


Fig. 8.



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UNITED STATES PATENT OFFICE.

FRANCIS M. RITES, OF ITHACA, NEW YORK.

GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 646,315, dated March 27, 1900.

Application filed March 8, 1898. Renewed December 21, 1899. Serial No. 741,187. (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 certain new and useful Improvements in Governors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in governors, and is applicable both to automatic cut-off and to throttling governors of steam-engines, including engines having valve-gears of the Corliss type, to water-wheel governors, and to all purposes for which governors are used.

My invention consists in the novel arrangement of one or more governor weights or masses upon a revolving carrier, in the use of rolling governor-weights confined to motion in definite paths which roll upon the carrier when the speed changes, and in the novel combination, construction, and arrangement of the parts.

The objects of my invention are, first, to provide a governor applicable to all purposes for which governors are used and having few parts and few joints at which friction can take place or which can become stiff through long continuous use and lack of care, which shall be capable of maintaining substantially the same speed through wide variations in load, and shall embody to a high extent both inertia and centrifugal action, and, second, to so construct and arrange the parts of this governor that it shall be strong, simple, not liable to derangement, and comparatively inexpensive. These objects are attained in the governor herein described, and illustrated in the drawings which accompany and form a part of this specification, in which the same reference-numerals indicate the same or corresponding parts, and in which—

Figure 1 is an elevation of one form of my governor, and Fig. 2 is a central transverse section thereof, this form of governor being adapted to operate a valve, such as a throttle-valve or tripping mechanism of a Corliss valve-gear. Fig. 3 is an elevation, and Fig. 4 a transverse section, of a governor operating upon the same principle as that shown in Fig. 1, but arranged to adjust the position of a twisting eccentric, to which it is connected by links. Fig. 5 is an elevation, and Fig. 6 a transverse section, of the same governor, connected to the eccentric by flexible cables instead of by links. Fig. 7 is an elevation of a governor operating upon the same principle as the preceding governors, but arranged to adjust an eccentric by moving it transversely across the main shaft. This governor is therefore of the type known as "swinging eccentric" governors. Fig. 8 is an elevation, and Fig. 9 a transverse section, of a governor operating upon the same principle as the preceding governors, but having only one weight, and which moves an eccentric transversely across the engine-shaft.

In all of the governors herein described the governor-weights are not pivoted to the carriers, but are arranged to roll upon suitable guiding-surfaces of the carriers under the combined influence of centrifugal and inertia forces and against the tension of springs. Since these weights are not pivoted, friction and wear are almost entirely eliminated in this governor, and the governor is not liable to become so gummed up after it has been in use for a time that it will not operate as sensitively as when new.

Referring first to Fig. 1, 1 1 are the governor weights or masses, and 2 the carrier, which is or may be in the form of a wheel and is mounted upon a shaft 3, having suitable bearings. The wheel 2 is arranged to be rotated by a belt-wheel 4. The weights 1 1 are not pivoted in any way to the wheel 2, but are free to roll on the inner surface of the rim of said wheel under the influence of centrifugal and inertia forces as the wheel rotates against the tension of springs 5 5, each connected to both of said weights at points which move with respect to each other when the governor is in use in such manner as to place the springs under strain. The rim of the wheel therefore forms a guide for the weights. The surfaces of the rim and weights where they come in contact being cylindrical, the weights are confined to motion in a plane at right angles to the axis of rotation of the wheel. The center of gravity of each governor-weight is so

located that it is always out of line with the center of rotation of the wheel and the point of contact of the weight with the rim, and the centers of gravity of the two weights are diametrically opposite, so that under the influence of centrifugal force the weights tend to roll upon the inner surface of the rim of the wheel 2 in such directions that they are always diametrically opposite to each other. This motion is transmitted to a stem 6, located in line with the axis of the shaft 3 and adapted to be moved longitudinally by links 7 7, pivotally connected to ears 8 8, projecting from the weights, and to toggle-links 9 9 and 10 10, connected to a collar 11 on the spindle 6 and longitudinally movable therewith, and to another collar 12, revolubly but not longitudinally movable. This collar 12 carries guides engaged by the ears 8 8, so as to keep the weights 1 1 accurately diametrically opposite each other. The stem 6 forms an actuating device for operating a valve, regulating a tripping device, or performing any other function desired. The operation of this governor is as follows: When the wheel 2 is revolved, the weights 1 tend to roll upon the inner surface of the wheel under the influence of centrifugal force toward that position at which their centers of gravity are farthest from the center of the wheel. This motion is resisted by the springs 5, and the centrifugal action of the weights and retractile action of the springs balance each other at some position of the weights. The motion of the weights causes a corresponding longitudinal motion of the stem 6, thus operating the valve or other device controlled by the governor. If a sudden change of speed takes place, not only do the weights change position under the influence of the change in centrifugal force, but by their inertia they tend to lag behind the wheel 2 if the speed has increased or to move forward with reference to the wheel 2 if the speed has decreased, and this motion of the weights is in harmony with the motion produced by the change in centrifugal force. This inertia action exists, however, only at the instant when the change of speed takes place. It therefore hastens the adjustment of the governor to the new conditions, but prevents "hunting."

In the form of governor shown in Figs. 3 and 4 the arrangement of the weights and their action is precisely the same as in the governor shown in Fig. 2. The construction of the weights is slightly different, however, each weight being composed of two disks connected by a central axle, so as to load each side of the wheel equally. Spiral springs are used as retractile devices for opposing centrifugal force instead of flat springs. The difference between this governor and that shown in Figs. 1 and 2 is that this governor is arranged to adjust the position of a shifting eccentric, which is the actuating device, so as to vary the point of cut-off instead of adjusting an axial stem, as in the form shown in Figs. 1 and 2. 13 is this eccentric. It is revolubly mounted upon the engine-shaft, and the cut-off is varied by changing the angular advance of the eccentric. The weights are each provided with an arm 14, connected to the eccentric by a link 15. They also engage studs 16 in the rim of the wheel, which insure their return to a definite initial position and hold the weights in place when the wheel is stationary.

The governor shown in Figs. 5 and 6 differs from that shown in Figs. 3 and 4 in that the connection between the governor-weights and the eccentric is made by means of cables secured to arms projecting from the weights and wrapped about the eccentric. Each weight is provided with two arms 14 and two cables 17, wrapped about the eccentric in opposite directions, so that the weights may move the eccentric in either direction.

My governor may also be used to adjust the position of an eccentric or eccentric-pin which is adjusted transversely across the engine-shaft instead of revolving about it. Such governors are usually termed "swinging eccentric" governors. Such a governor is shown in Fig. 7. The weights 1 1 are connected by a link 19, connected to corresponding points of the weights which are upon the same side of the engine-shaft and are not diametrically opposite. At or close to the center of this link is the eccentric 13, which in this case is a crank-pin. The path through which this eccentric travels when the weights move after a change in speed is indicated by a dotted line. This governor, it will be seen, operates by varying the throw of the eccentric. This governor also differs from the governors illustrated in the previous figures in that the weights do not roll on the inner surface of the rim of the wheel 2, but on guides 18, which form chords of the rim. Such guides may be provided in the other governors, if preferred, and the guides need not be straight or of curves concentric with the axis, but may have any form or curvature desired in any one of the forms of governors shown. A transverse section of the governor shown in Fig. 7 is not shown, as the arrangement of the weights may be in general the same as that shown in any of the previous figures.

In the governors so far described two similar governor-weights are employed upon opposite sides of the shaft. The purpose of this is to balance the governor as to gravity. Each of the weights, in fact, has its independent action on the actuating device or member of the governor, such as the stud 6 of Figs. 1 and 2 or the eccentric shown in the other figures.

Instead of employing two weights upon opposite sides of the supporting-shaft which balance each other as to gravity a single weight may be used. Such a governor is shown in Figs. 8 and 9. 1' is the weight.

That portion of the weight which is uppermost in the figure has a face which is the arc of a circle struck from a point within the wheel, so that the weight may roll upon the wheel under the influence of centrifugal force and inertia, as is the case with the other governors. The weight engages a stud 16, which holds the weight in place when the wheel is stationary and insures its return to a definite initial position. It also engages upon its opposite side a limiting-stud 20. 13 is the eccentric. The weight 1' has its center of gravity so located that it is always out of line with the center of rotation and the point of contact with the rim, so that under the influence of centrifugal force it tends to roll upon the inner surface of the wheel 2 against the tension of the spring. The weight is held in place in the wheel by an annular ring 21, secured to the rim of the wheel. The weight may have upon it a socket for a friction-pin 22 and spring 23, as indicated in dotted lines. The pin bears against the face of the curved guide 24, carried by the rim of the wheel. The object of this construction is to provide sufficient friction to insure stability of the governor. It is well known that governors may be so frictionless as to be unstable. It is desirable sometimes, therefore, to provide a special friction device which because of its construction will not cause increased friction as the governor becomes worn, but can be relied upon to furnish at all times the amount of friction desired and which can be regulated as desired. Such a friction device is usually termed a "drag." A similar device may be applied to any of the preceding forms of governor.

Having thus completely described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a governor, the combination, with a revoluble carrier having a guide for a rolling governor-weight, of a governor-weight which rolls upon said guide when the speed of the carrier changes, and is confined to motion in a definite path, a retractile device for said weight, and an actuating device adjusted by the movement of the weight, substantially as described.

2. In a governor, the combination, with a revoluble carrier having a guide for a rolling governor-weight, of a governor-weight which rolls upon said guide in a plane at right angles to the axis of revolution of the carrier, when the speed of the carrier changes, a retractile device for said weight, and an actuating device adjusted by the movement of the weight, substantially as described.

3. In a governor, the combination, with a revoluble carrier having a guide for a rolling governor-weight, of a governor-weight having a curved face in proximity to said guide, and having its mass so disposed that it rolls upon said guide under the influence of centrifugal action and inertia, when the speed of the carrier changes, said weight being restricted to motion in a definite path, a retractile device opposing the motion of the weight due to centrifugal action, and an actuating device adjusted by the movement of said weight, substantially as described.

4. In a governor, the combination, with a revoluble carrier having a guide for a rolling governor-weight, of a governor-weight having a curved face in proximity to said guide, the center of gravity of said weight not being in line with the center of rotation of the carrier and the point of contact of the weight with the guide, whereby when the speed of the carrier changes the weight rolls upon said guide under the influence of centrifugal action and inertia, said weight being restricted to motion in a definite path, a retractile device opposing the motion of the weight due to centrifugal action, and an actuating device adjusted by the movement of said weight, substantially as described.

5. In a governor, the combination, with a wheel revolubly mounted, of a governor-weight having a curved face in proximity with the inner rim of said wheel and free to roll upon said rim, the center of gravity of said weight not being in line with the center of rotation of the carrier and the point of contact of the weight with the rim, whereby when the speed of the wheel changes the weight rolls upon said rim under the influence of centrifugal action and inertia, said weight being restricted to motion in a definite path, a retractile device opposing the motion of the weight due to centrifugal action, and an actuating device adjusted by the movement of said weight, substantially as described.

6. In a governor, the combination, with a revoluble carrier having a guide for a rolling governor-weight, of a governor-weight which rolls upon said guide when the speed of the carrier changes, said weight being restricted to motion in a definite path, a retractile device for said weight, and means for transforming the motion of said weight with respect to said carrier into motion in line with the axis of the carrier, substantially as described.

7. In a governor, the combination, with a revoluble carrier having guides upon diametrically-opposite sides for rolling governor-weights, of two rolling governor-weights upon diametrically-opposite sides of said carrier, which roll upon said guides when the speed of the carrier changes, said weights being restricted to motion in definite paths, means for opposing the motion of the weights due to centrifugal action, and an actuating device adjusted by the movement of the weights, substantially as described.

8. In a governor, the combination, with a revoluble carrier having guides upon diametrically-opposite sides for rolling governor-weights, of two rolling governor-weights upon diametrically-opposite sides of said carrier, which roll upon said guides when the speed of the carrier changes, said weights being re-

stricted to motion in definite paths; means for opposing the motion of the weights due to centrifugal action, connecting means between said governor-weights which keep the same diametrically opposite, and an actuating device adjusted by the movement of the weights, substantially as described.

9. In a governor, the combination, with a revoluble carrier having guides upon diametrically-opposite sides for rolling governor-weights, of two rolling governor-weights upon diametrically-opposite sides of said carrier, which roll upon said guides when the speed of the carrier changes, means for opposing the motion of the weights due to centrifugal action, toggles and links connecting said weights with an actuating device adapted to be moved in line with the axis of the carrier by the movement of said weights, and means for keeping the weights diametrically opposite, substantially as described.

10. In a governor, the combination, with a revoluble carrier having guides for rolling governor-weights, of two rolling governor-weights which roll upon said guides when the speed of the carrier changes, a spring connecting said weights and attached thereto at points which move with respect to each other and place the spring under strain during the operation of the governor, and an actuating device adjusted by the movements of the weights, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRANCIS M. RITES.

Witnesses:
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P. S. KARSHNER.