No. 611,619. Patented Oct. 4, 1898.

A. FISCHER.

GOVERNING DEVICE.

(Application filed Dec. 15, 1897.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

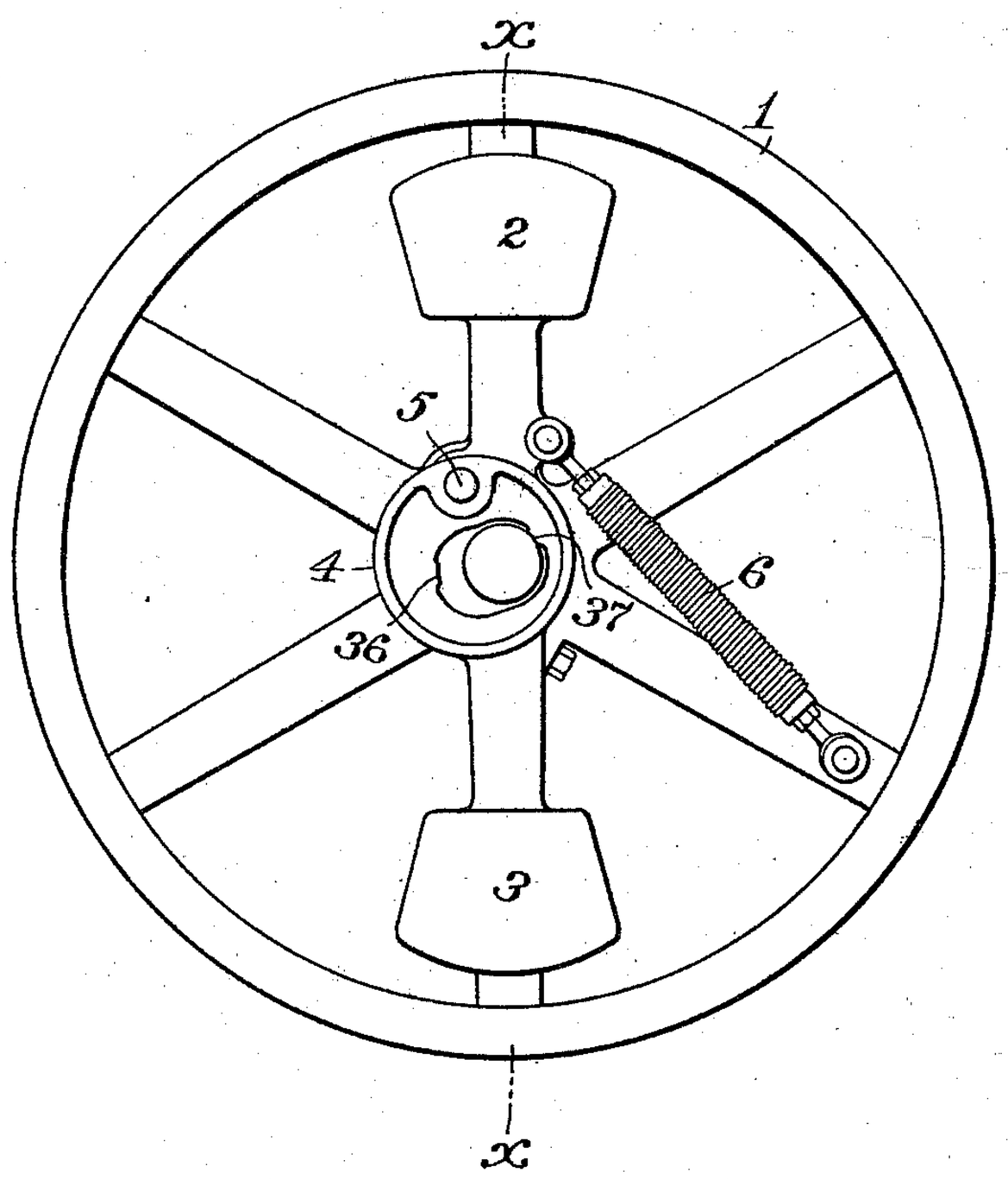
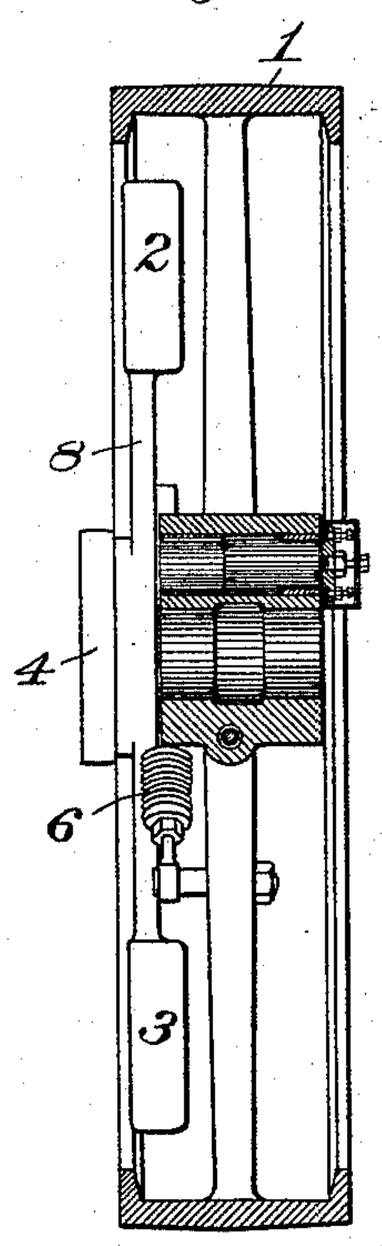


Fig. 2



WITNESSES

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Fig. 3.

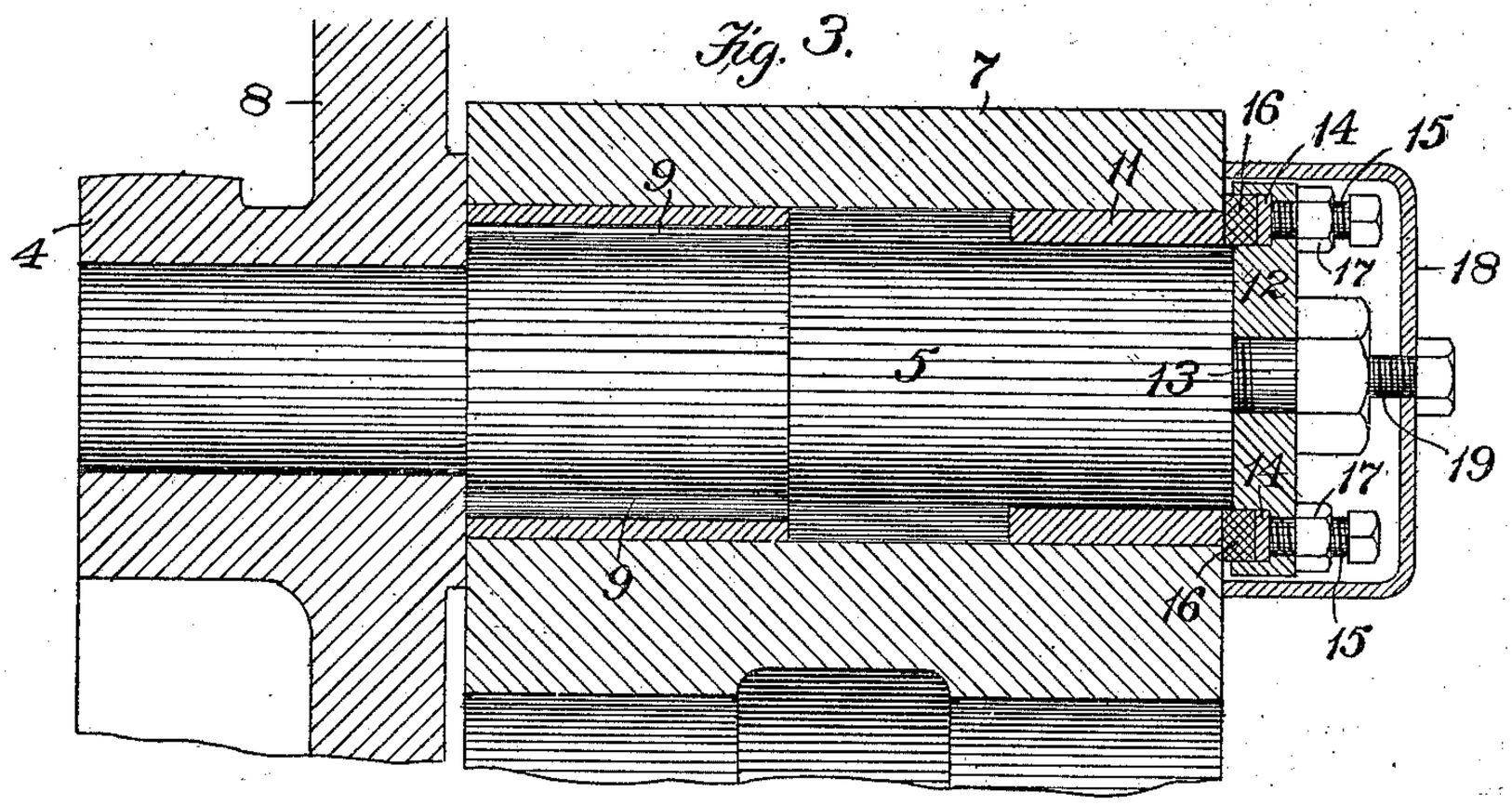

Fig. 4.

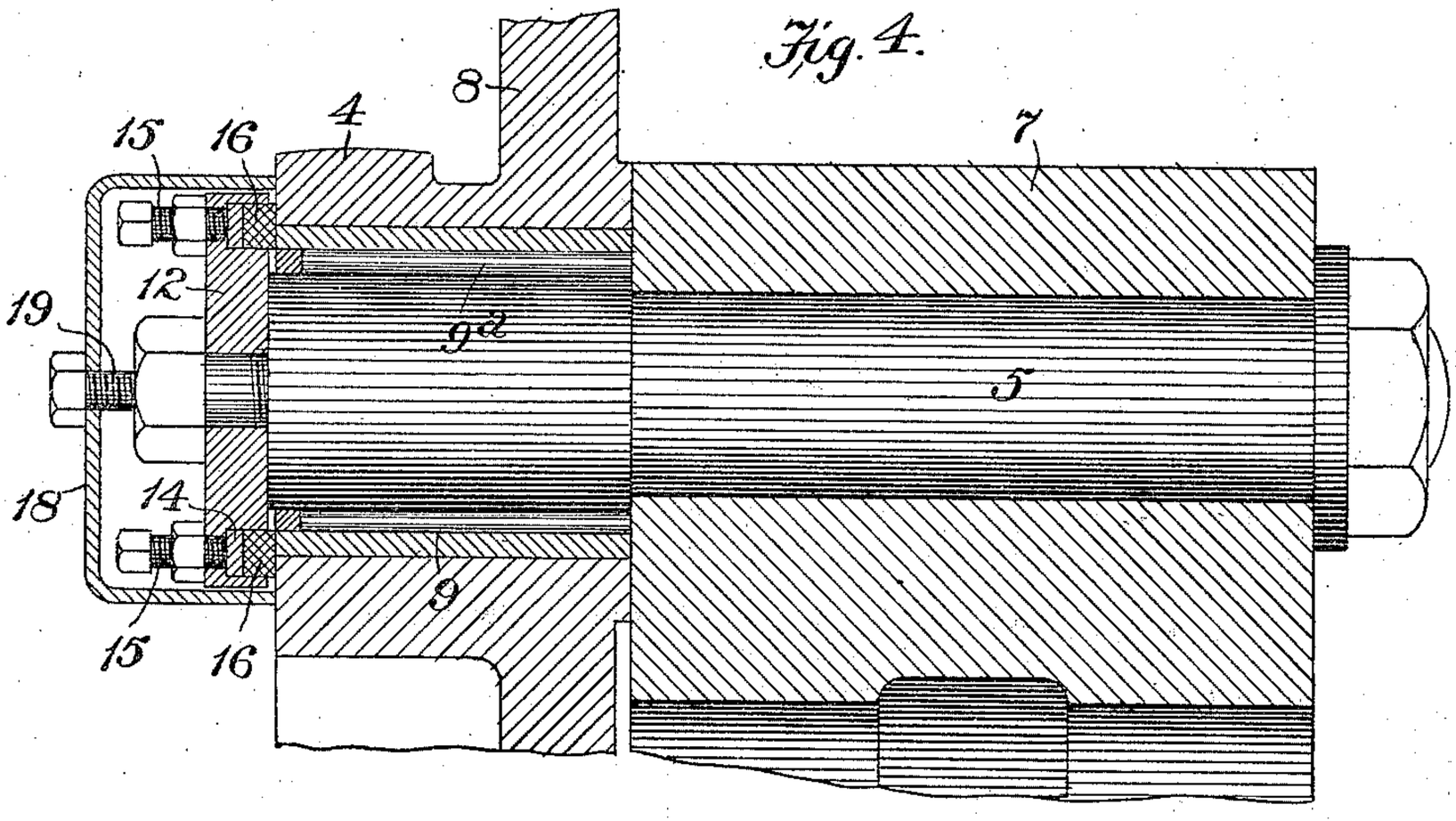

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Fig. 5.

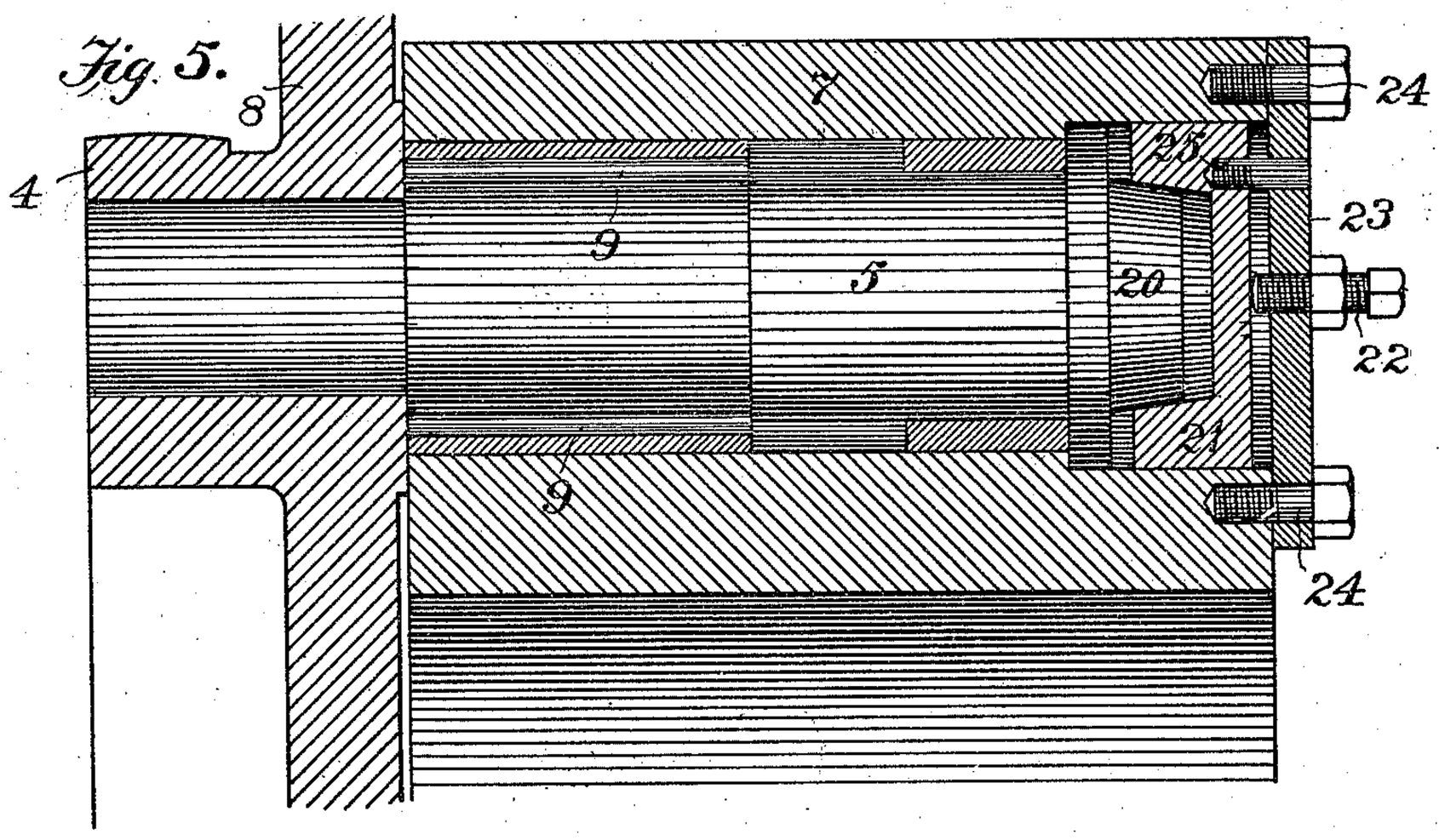
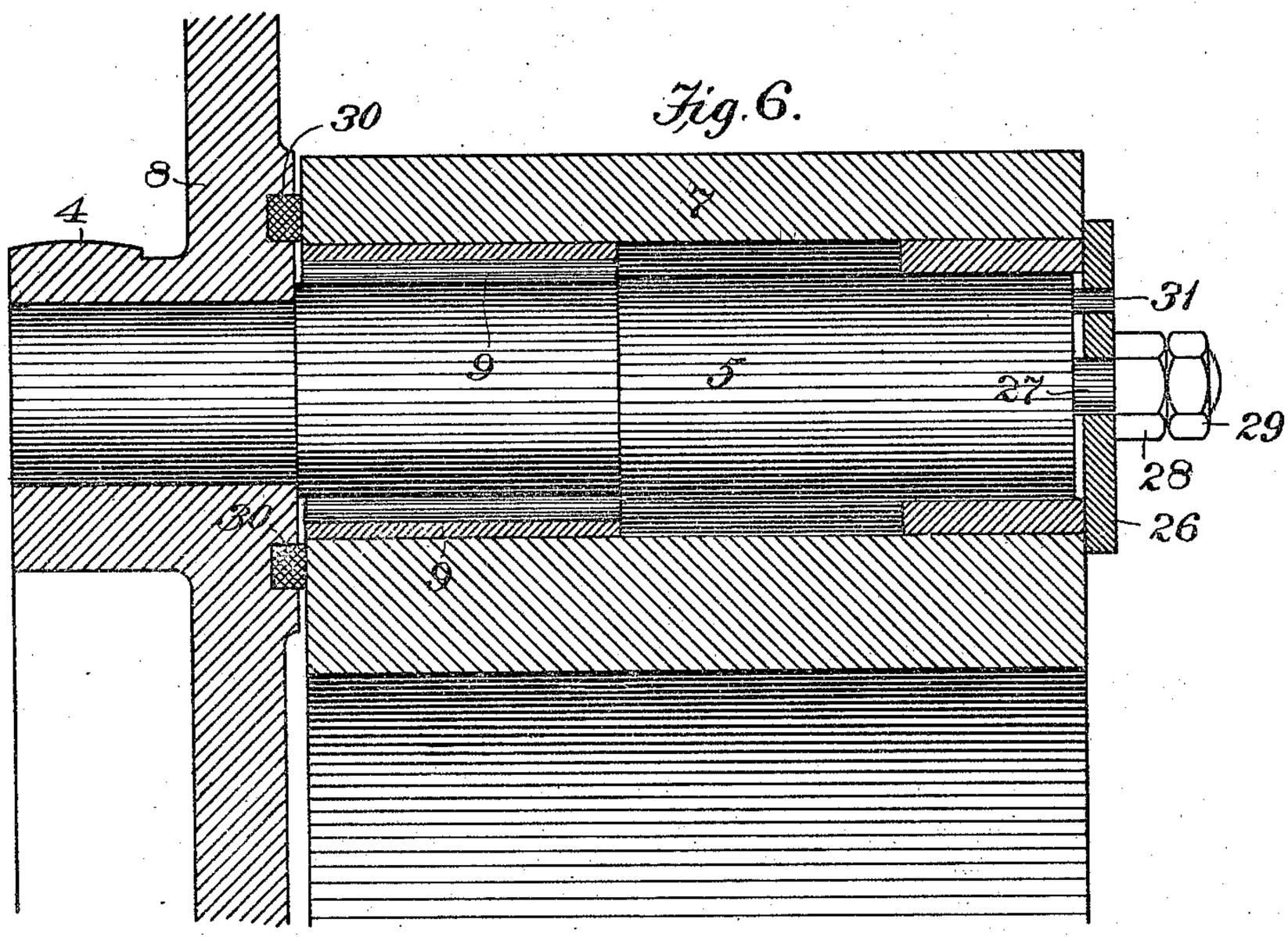


Fig. 6.



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(No Model.) 4 Sheets—Sheet 4

Fig. 7.

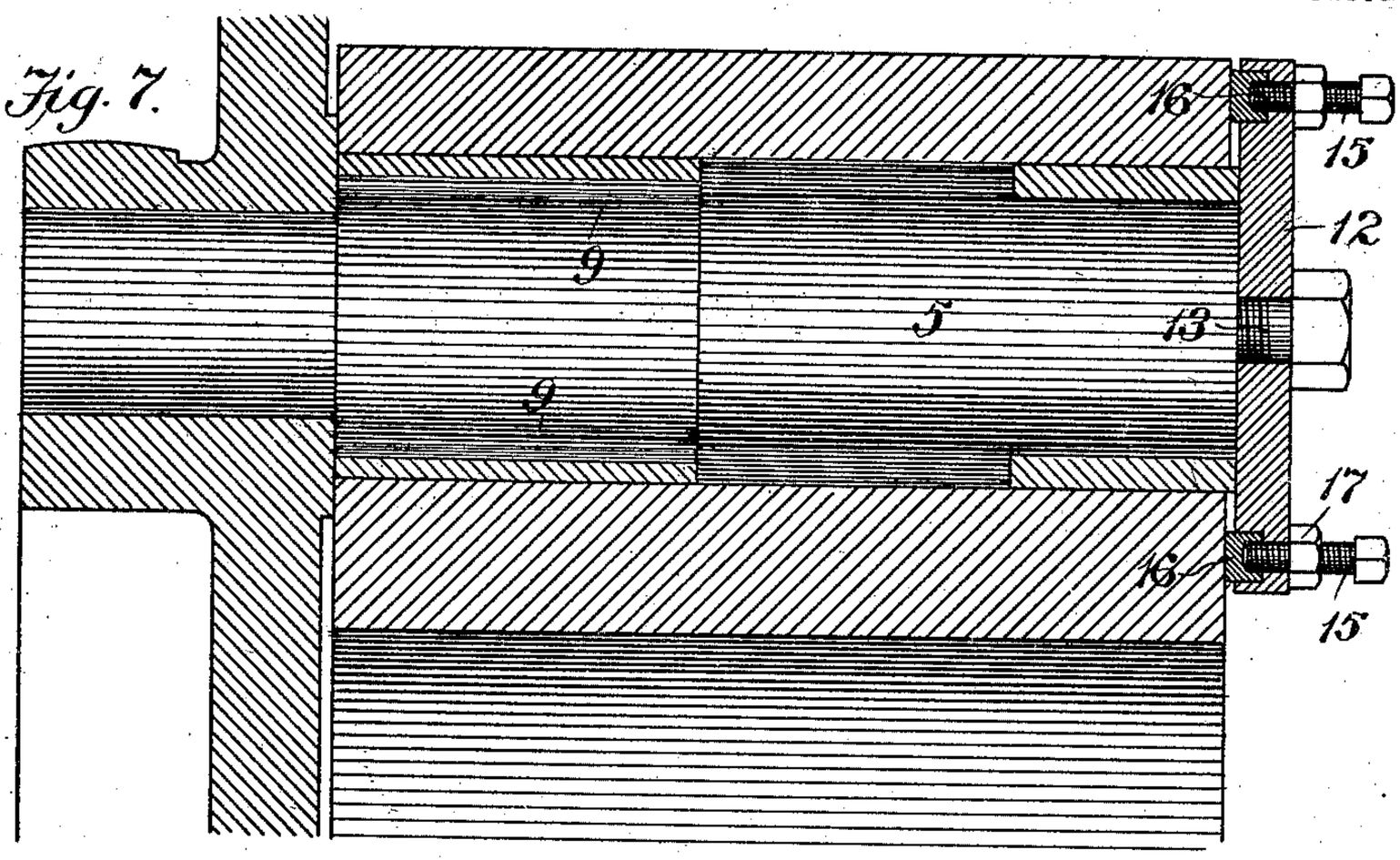


Fig. 9.

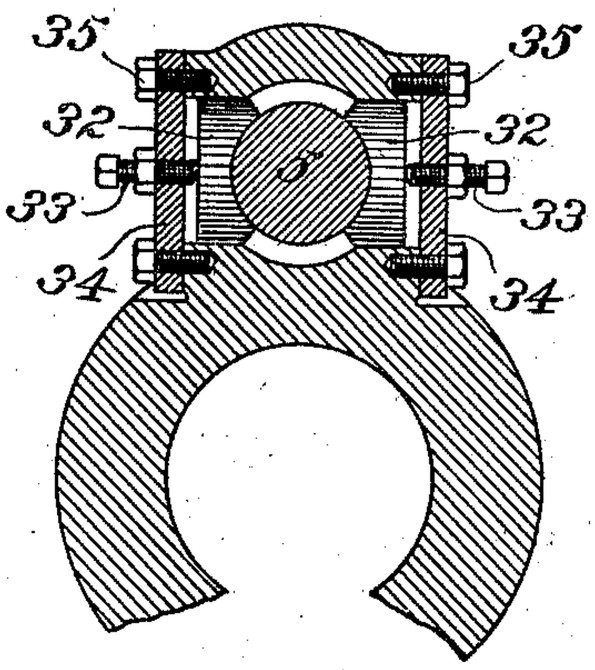
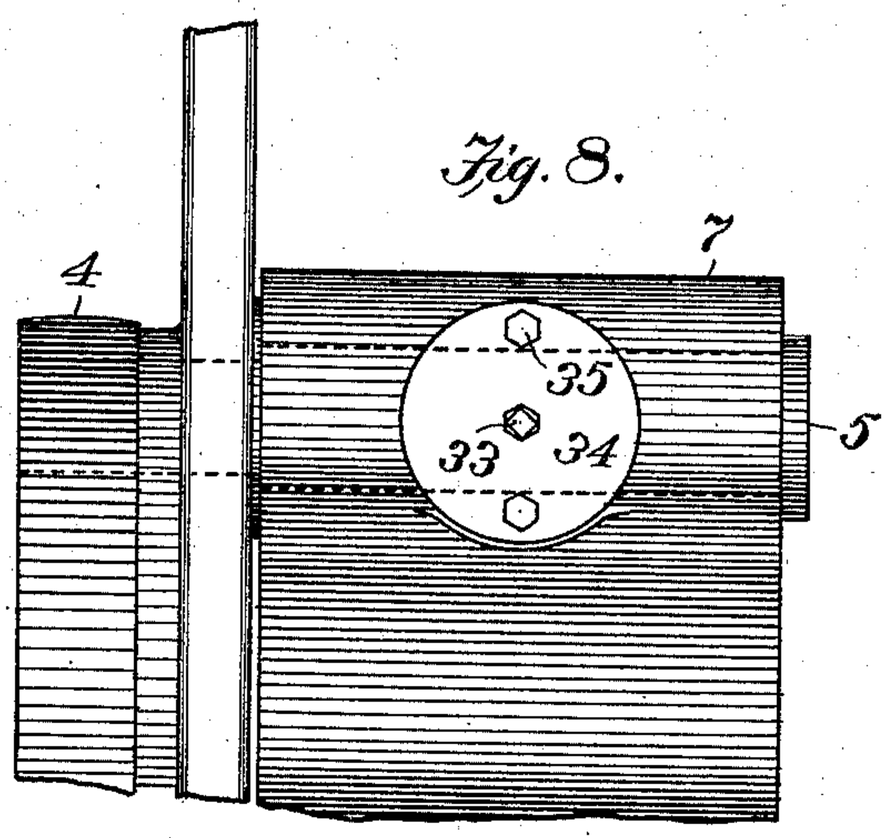


Fig. 8.



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UNITED STATES PATENT OFFICE.

ALBERT FISCHER, OF PITTSBURG, PENNSYLVANIA.

GOVERNING DEVICE.

SPECIFICATION forming part of Letters Patent No. 611,619, dated October 4, 1898.

Application filed December 15, 1897. Serial No. 661,945. (No model.)

To all whom it may concern:

Be it known that I, ALBERT FISCHER, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Governing Devices, of which improvement the following is a specification.

The object of my invention is to provide an improvement in governing devices for engines; and to this end my invention consists in new and improved means for securing a more perfect adjusting action of the governor than heretofore and in certain combinations and features of construction, all as hereinafter fully set forth.

In the accompanying drawings, which illustrate applications of my invention, Figure 1 is an elevation showing a governing device of the class to which my invention is specially adapted to be applied; Fig. 2, a view, partly in section, on the plane of the line *x x* of Fig. 1, showing an application of my invention; Fig. 3, an enlarged view of a portion of the construction shown in Fig. 2, showing an embodiment of my invention; and Figs. 4, 5, 6, 7, 8, and 9 are views showing modifications.

My invention is specially applicable to governing devices in which a shifting eccentric is adapted to be adjusted by the action of a weight or weights mounted on and rotating with a rotary carrier driven by the engine which is controlled by the governor; but my improvement is not limited in its application to the particular form of governor shown nor to a governor for adjusting a shifting eccentric.

In nearly all governing devices in which the member to be adjusted is shifted by the action of one or more weights under the influence of centrifugal or inertia forces the tendency of the mass or weight is at first to move in one direction beyond the proper position for any variation in the speed or load, and then to make a return movement of too great an extent in the opposite direction, whereby the eccentric or other member to be adjusted is kept continually moving from one side to the other of its proper position and the power applied is correspondingly varied. Even where there is no considerable fluctuation after the first movement on a change of speed the initial movement of the weight is usually too great in extent and the variation in the position of the adjusted part is excessive. This effect may sometimes be due to oversensitiveness to the action of the forces on the weight or it may be due to irregular or variable resistances to the movement of the parts, such as variable frictional resistances between the parts which move relatively to one another. My invention is specially intended to obviate these difficulties; and to this end I provide a construction in which the friction of the relatively-movable parts is, so far as possible, reduced to a minimum, and the consequent irregularities due to uncontrollable variations in the friction are eliminated. The purpose in reducing or entirely avoiding friction of the parts is not so much to prevent resistance to the operation of the parts as to prevent the undesirable effects of irregular resistances, and, having removed such irregular resistances, my invention provides practical and efficient means for applying at will any desired resistance to the movement of the parts which are operative by the action of centrifugal or inertia forces.

It is not possible to so construct a governor that the relative proportions of the centrifugal and inertia forces will be such as to have the desired effect at all speeds and under all variations of speed; and my improvement provides means whereby corresponding variations in the resistance to those forces may be effected at will to correspond with the variations in the forces at different speeds.

In accordance with my invention a positive resistance is applied in such a manner as to avoid any objectionable strains on the parts and so as to prevent any accidental variation, and the construction is such that while the resistance may be adjusted to any desired degree it will require a very considerable variation in the adjustment of the resistance device to cause any undesirable accidental or irregular variation in the moment of the resistance.

In the governing device shown in Figs. 1 and 2 the weights 2 and 3 are formed integral with one another and with an eccentric 4, and the whole integral structure is mounted on the wheel or rotary carrier 1 and adapted to

oscillate or partially rotate relatively to the carrier about the axis of a pin 5. The movements of the weight structure relative to the carrier 1 are effected by the action of centrifugal and inertia forces acting in opposition to the resistance of the spring 6, and by shifting the position of the eccentric they effect variations in the cut-off of the motive fluid of the engine.

As shown in Figs. 2 and 3, the governor-weight structure is rigidly fixed on the pin 5, and the pin is mounted on a roller-bearing formed in the hub 7 of the wheel or rotary carrier 1. The purpose of this roller-bearing is to eliminate as far as possible the frictional resistance to the turning or oscillating movement of the pin and of the weight structure 8 relative to the rotary carrier 1.

In Fig. 3 the pin 5 is surrounded by the rollers 9, which are in contact with and are adapted to roll on the bushing 10, fixed in the hub 7 of the rotary carrier. One end of the pin 5 is fitted in a bushing 11, and has secured to it a plate or bar 12 by means of a bolt 13, whereby the plate or bar 12 will be caused to move with the pin and weight structure relatively to the carrier when the position of the eccentric is being shifted. Symmetrically with the axis of the pin 5 the plate or bar 12 is grooved or recessed, so as to contain material which is adapted to be pressed against the hub 7 or bushing 8, or both, for the purpose of creating a frictional resistance to the movement of the pin relative to the hub. As shown in Fig. 3, a plate 14 is fitted in the groove in position to be engaged by a screw-bolt 15 to force the friction material 16 against the hub. By turning the adjusting-screws 15 the friction material 16 may be forced against the hub with any desired degree of pressure in order to produce the necessary frictional resistance, and the clamping-nuts 17 may then be tightened to prevent movement of the screws. A cap or cover 18 for excluding dust and dirt and preventing interference with the friction device is secured in place by a screw-bolt 19, which screws into the head of the bolt 13.

It will be seen that my improvement provides a frictional resistance that is substantially constant and invariable except at the will of the operator or engineer after the device is once adjusted. The friction device or brake is applied by a positive pressure, and therefore the resistance is not liable to irregular or rapid accidental variations, such as might occur if the resistance should be caused by a yielding pressure or by a pressure between two parts which are liable to yield, one to the other, or to be distorted or forced from their proper positions by the pressure of the friction device.

In my improvement the moment of the frictional resistance about the axis of the pin 5 may be varied to any desired degree by varying the degrees of pressure with which the friction device is applied, but as the leverage of the resistance is comparatively small no accidental or slight variation in the friction can have any considerable undesirable effect on the action of the governor. This is an important feature of my invention, as it provides means whereby the effect of the frictional resistance on the governor is entirely within the control of the operator or engineer and liable to variation only by considerable corresponding variations in the degree of pressure. These variations in the degree of pressure are not liable to occur accidentally, since the pressure is positive and adjustable to any desired degree, and the surface acted on is of such small extent that it may be prepared for the purpose with the greatest accuracy. In other words, it may be said that the effect of the frictional resistance is dependent upon the pressure only which is within the control of the operator or engineer and is not liable to any considerable variation in its effects on account of any other element, as would be the case if the lever-arm were relatively very great.

Since the frictional resistance in my improvement is caused by pressure acting in lines or on surfaces symmetrically disposed relatively to the axis of the pin 5, there is no unbalanced pressure acting laterally on the pin or on any other part tending to cause uncontrollable friction or distortion or displacement of any of the parts, and the application of the friction device does not, therefore, cause any increase in the friction of the pin in the roller-bearing.

In Fig. 4 of the drawings I have shown a construction in which the pin 5 is fixed in the hub 7 of the rotary carrier, and the weight structure 8 is adapted to oscillate on the rollers 9^a, forming a roller-bearing between the weight structure and the pin. In this construction the friction device is of substantially the same construction as that shown in Fig. 3, but is secured to the opposite end of the pin 5, and instead of bearing directly on the hub of the rotary carrier it bears on the weight structure or on the lateral face of the eccentric 4.

By the provision of a roller-bearing the friction of the bearing on which the weight structure is supported may be reduced to such a small quantity that it is inappreciable, and the advantage of this is not only that practically the whole of the resistance may be produced by the action of the friction device and that the resistance may therefore be controllable, but the employment of the roller-bearing dispenses with the use of oil on the bearing, and the surfaces which rub on one another to cause the frictional resistance will always remain dry and in the same condition without danger of accidental oiling, which would cause variations in the frictional resistances.

In Fig. 5 of the drawings I have shown a modification in which the weight structure 8 is rigidly secured to the pin 5, and the pin is

mounted in a roller-bearing in the hub 7 of the rotary carrier; but the friction device differs from that shown in Figs. 3 and 4. In Fig. 5 the end 20 of the pin 5 is tapered, and fitting over this tapered portion is a shoe or plate 21, which is adapted to be pressed against the pin by an adjusting screw-bolt 22. The adjusting-screw 22 is mounted in a plate 23, which is secured to the hub of the rotary carrier by the bolts 24, and the desired frictional resistance between the plate 21 and the pin 20 is secured by varying the pressure of the screw 22 on the plate 21. A pin 25 is fixed in the shoe or plate 21 and passes into an opening in the plate 23 in order to prevent the plate 21 from turning relatively to the hub 7.

In the construction shown in Fig. 6 a plate 26 is movably mounted on a bolt 27 and is adapted to be forced against the end of the hub 7 by setting up on the nuts 28 and 29. The weight structure is grooved to contain frictional material 30, which is pressed against the hub by the action of nuts 28 and 29. The plate 26 is prevented from turning relatively to the pin 5 by means of a pin 31, which is secured in the end of the pin 5 and projects into an opening in the plate 26.

The construction shown in Fig. 7 of the drawings is similar to that shown in Fig. 6, but shows the adjustable friction material placed at a somewhat greater distance from the axis of the shaft and acted on directly by the adjusting-screws 15.

Figs. 8 and 9 show a construction in which the frictional resistance is produced by lateral pressure on the pin 5. Fig. 8 is an elevation of a portion of the hub and weight structure of a governor provided with my improvement, and Fig. 9 is a section on the line $x\,x$ of Fig. 8. In this construction movable shoes or friction-blocks 32 are fitted in holes formed in the hub 7 on opposite sides of the pin 5 and are adapted to be pressed against the pin by adjusting-screws 33, which are screwed into the plates 34. The plates 34 are secured to the hub by the bolts 35.

It will be seen that my invention provides a simple, efficient, and inexpensive means by which any desired constant resistance to the oscillation of the weight structure may be obtained. The friction device and the surface on which it acts are both easily accessible for inspection, repair, or adjustment, and there is no danger of any considerable variation in the effect produced by the friction device—such, for instance, as might be caused by even very slight variations of pressure if the pressure should be applied at a much greater distance from the axis of oscillation of the weight.

In the constructions which I have shown in Figs. 2, 3, 4, 7, 8, and 9 the means by which the pressure is applied and varied for the purpose of producing or varying the frictional resistance may be removed from or put in place without disconnecting the weight structure from the carrier, and in all of the constructions shown the friction device tends to hold all of the parts in their proper relative positions by pressures symmetrically applied relatively to the axis of the pin.

My improvement provides a resistance device which is unaffected by the action of gravity and is therefore not liable to have its effect varied as the position of the parts are changed by the rotation of the governor, and the pressure of the resistance device is not liable to variation by the varying action of centrifugal force, but is a constant though adjustable continually-acting force which acts as a uniform resistance to the oscillation of the weight throughout the whole of its movement.

In governors of the kind shown in Fig. 1 of the drawings the movement of the weight structure relative to the carrier and shaft is limited by the stops 36 and 37, which come in contact with the shaft when the weight structure is at either extremity of its movement. The impact of these stops against the shaft in starting and stopping the engine is often very violent on governors to which my improvement is not applied, and the shock may be so great as to cause serious damage to the structure. This objectionable action is most noticeable in stopping the engine, and the shocks are usually repeated in such rapid succession and accompanied by such noise as to make it objectionable on account of the sound, even if there were no danger of injury to the parts. By means of my improvement this objectionable action is altogether prevented, as the friction device resists the rapid vibratory movements by which the battering action would otherwise be effected, and the resistance is as great and as effective when the governor is rotating at a comparatively low speed as it would be at higher speeds.

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

1. In a governor, the combination with a rotary carrier, of a weight pivotally mounted thereon, and adapted to oscillate relatively to the axis of its pivot or support, and a means for producing a frictional resistance to the automatic adjustment of the weight by pressure applied on opposite sides of the axis of the pivot or support, substantially as set forth.

2. In a governor, the combination with a rotary carrier, of a weight mounted on the carrier, and adapted to oscillate relatively to the axis of a pin by which the weight is supported on the carrier, and means for causing frictional resistance by pressure acting at symmetrically-disposed points on opposite sides of the axis of the pin, substantially as set forth.

3. In a governor, the combination with a rotary carrier, of a weight, a pin by which the weight is supported on the carrier, an anti-friction-bearing surrounding the pin, and a

friction device adapted to act by pressure on opposite sides of the pin to produce a frictional resistance, substantially as set forth.

4. In a governor, the combination with a rotary carrier, of a weight mounted thereon and adapted to oscillate relative to the axis of a pin by which it is connected with the carrier, and means for creating a frictional resistance to the movement of the weight relative to the carrier by a pressure tending to hold the parts together in their normal and proper positions, substantially as set forth.

5. In a governor, the combination with a rotary carrier and a connected weight pivotally mounted thereon which are adapted to move in parallel planes, of means for creating a frictional resistance to movement of the weight and tending to maintain the parallelism of the weight and carrier, substantially as set forth.

6. In a governor, the combination with a rotary carrier and a weight mounted thereon of a pin by which the weight is supported and a frictional-resistance device interposed between the pin and a relatively-movable part of the governor, substantially as set forth.

7. In a governor, the combination with a rotary carrier and a weight mounted thereon, of a pin by which the weight is supported, and a frictional-resistance device interposed between the pin and the hub of the carrier, substantially as set forth.

8. In a governor, the combination, with a rotary carrier, of a governor-weight mounted on the carrier by means of a pin and adapted to oscillate about the axis of the pin, a stop for limiting the movement of the governor-weight, and a friction device adapted to resist the movement of the weight about the pin so as to prevent shock at the limit of the movement, substantially as set forth.

In testimony whereof I have hereunto set my hand.

ALBERT FISCHER.

Witnesses:
M. S. MURPHY,
W. G. DOOLITTLE.