

(No Model.)

2 Sheets—Sheet 1.

A. S. F. ROBINSON.
ENGINE GOVERNOR.

No. 549,020.

Patented Oct. 29, 1895.

Fig. 2.

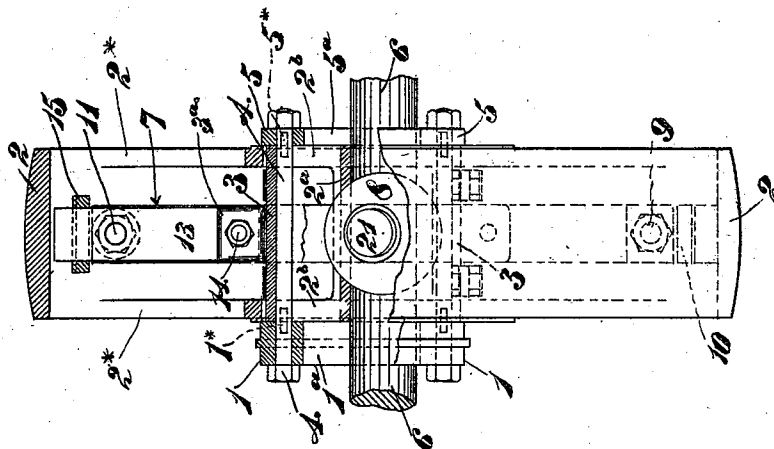
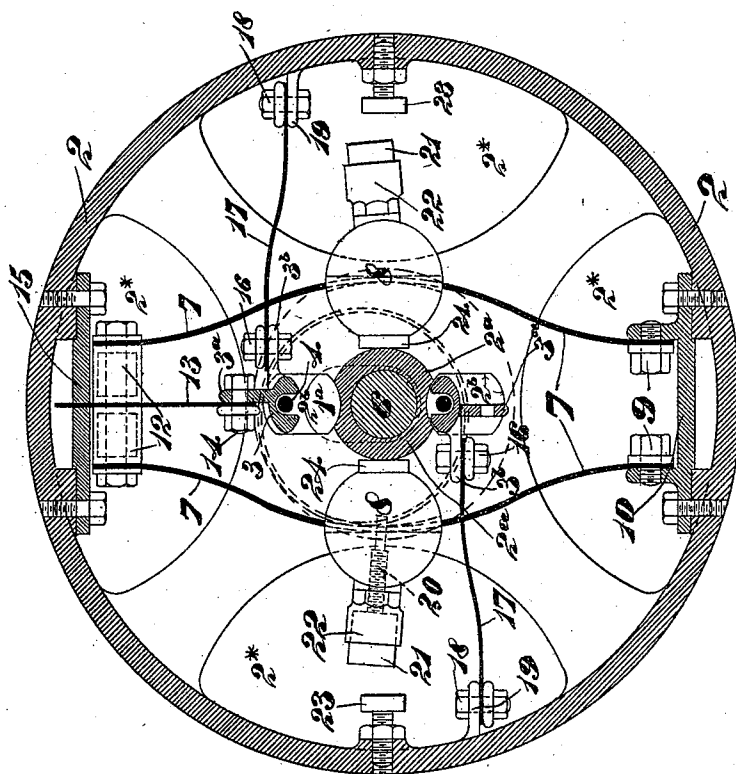


Fig. 1.



Witnesses.

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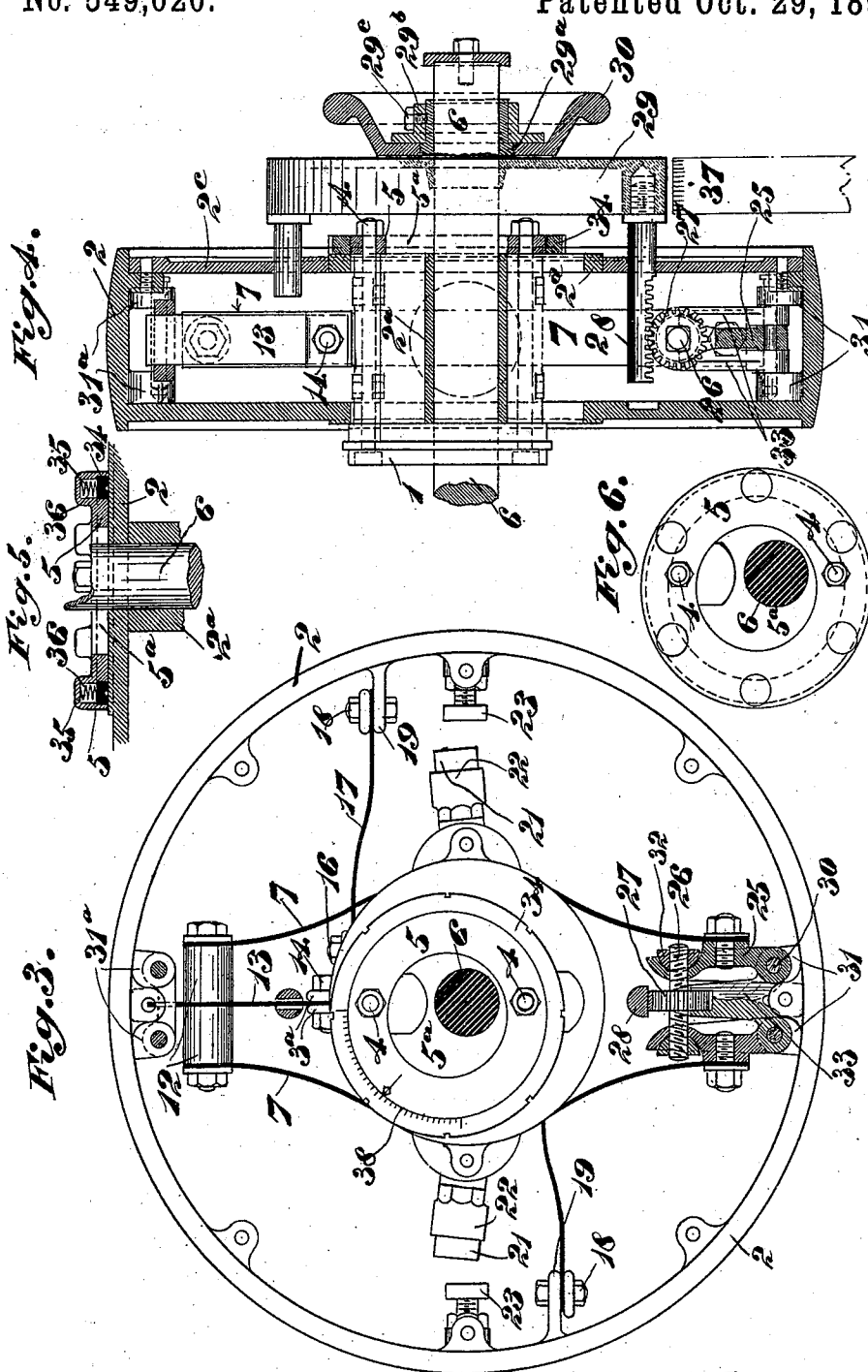
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C. M. Werle
C. C. Duffey

Inventor.
A. S. F. Robinson
per C. C. Duffey
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UNITED STATES PATENT OFFICE.

ARTHUR SAMUEL FRANCIS ROBINSON, OF WANTAGE, ENGLAND.

ENGINE-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 549,020, dated October 29, 1895.

Application filed December 1, 1894. Serial No. 530,545. (No model.) Patented in England June 27, 1894, No. 12,496; in France December 19, 1894, No. 243,782, and in Belgium December 20, 1894, No. 113,274.

To all whom it may concern:

Be it known that I, ARTHUR SAMUEL FRANCIS ROBINSON, a subject of the Queen of Great Britain and Ireland, residing at Wantage, in the county of Berks, England, have invented Improvements in Engine-Governors, (for which I have obtained Letters Patent in France, No. 243,782, dated December 19, 1894; in Belgium, No. 113,274, dated December 20, 1894, and in Great Britain, No. 12,496, dated June 27, 1894,) of which the following is a specification.

My invention has reference to a construction of engine-governor of the type known as a "wheel" or "drum" governor, such as enables me to dispense with working joints and the consequent lubrication thereof, and such as can be run silently and with practically no wear and tear.

In my governor the position of the shifting eccentric is controlled by weights carried by flexible or spring arms or blades each fixed at one end to the fly-wheel, drum, or disk in or on which the governor is mounted and at the other end to a connector, preferably in the form of a flexible or spring plate or blade that is fixed to the eccentric, other flexible or spring blades fixed at their ends and serving practically as a parallel motion being preferably provided to guide the eccentric practically parallel with itself when its position is varied by the centrifugal action of the weights.

In the accompanying drawings, Figure 1 shows, partly in cross-section and partly in end elevation, and Fig. 2 partly in end elevation and partly in longitudinal section, an engine-governor of the kind referred to constructed according to this invention. Figs. 3 and 4 are corresponding views to Figs. 1 and 2, respectively, showing the governor provided with speed-regulating mechanism and with an adjustable brake according to this invention. Figs. 5 and 6 show, respectively, in longitudinal section and end elevation a modified construction of adjustable brake.

Referring to Figs. 1 and 2, 1 is a shifting eccentric arranged at one side of a drum 2 and connected through distance-pieces 3 and bolts 4 with a guide-plate 5, arranged at the opposite side of the drum, the said eccentric and plate being slotted at 1^a and 5^a, respectively,

to permit of their being shifted across the driving-shaft 6, which they encircle and to which the drum is fixed by its boss 2^a, the opposite sides of the drum being also slotted at 2^b to permit of the corresponding movement of the distance-pieces 3 and bolts 4, respectively. The arrangement is such that the eccentric and guide-plate are a sliding fit on the sides of the drum.

5* and 1* are stop-pins between the distance-pieces 3 and the guide-plate and eccentric, respectively, to prevent twisting or straining of the distance-pieces.

7 are flexible or spring arms or blades (hereinafter called for brevity "spring-blades") carrying the governor-weights 8. They are each fixed at one end to the drum 2 by set-screws 9, preferably through the interposition of a detachable bracket or plate 10. Their other ends are connected together by a bolt 11 and distance-pieces 12 to a flexible or spring plate or blade 13, which is fixed by a screw-bolt 14 to a lug 3^a on one of the aforesaid distance-pieces 3 and constitutes the connection between the governor-arms 7 and the eccentric 1. This connection may advantageously be guided in a plate 15, detachably fixed to the adjacent part of the drum, and which serves to keep the adjacent connected ends of the spring-blades 7 in proper position laterally while permitting them to move toward the shaft 6. The two distance-pieces 3 are provided with other lugs or projections 3^b, by which they are attached through any suitable means, such as bolts and nuts 16, to the ends of two pairs of spring plates or blades 17, which are arranged approximately at right angles to the general direction of the spring-blades 7, extend laterally in opposite directions from the distance-pieces 3, and are fixed at their outer ends by bolts and nuts 18 to lugs 19 on the interior of the drum, the whole forming a parallel motion without working joints. As will be seen, the arrangement is such that the eccentric 1 is suspended by the spring-blades 7 and 17, so as to become in effect a floating eccentric.

The spring-blades 7 and 17 may each consist of one or more strips of spring-steel, according to the stiffness of spring desired, the strip or strips which is or are normally

straight being bent approximately to the form shown and retained in a bent condition by fixing it or them at the ends, as shown. In a governor for an eight-to-ten brake horsepower engine designed to run normally at four hundred and fifty revolutions per minute I have obtained satisfactory results by making each spring-blade 7 of seven laminations or strips of spring-steel, each one-thirty-second of an inch thick and one and three-fourths inches wide, each of the spring-blades 17 consisting of three strips of spring-steel of one-thirty-second-inch thickness and one inch wide, and each weight 8 weighing about seven pounds. The weights 8 may conveniently be each fixed to its spring-blade 7 by a screw 20, the inner end of which passes through a hole in the blade, as shown.

21 is a piece of yielding material, such as india-rubber, carried by a socket-piece 22 on the outer end of the screw 20 and serving, in conjunction with an adjustable stop 23 on the drum, as a buffer to limit the outward movement of the weight under the action of centrifugal force.

24 is another piece of yielding material, such as india-rubber, carried by the weight to serve as a buffer between the said weight and the boss 2^a of the drum when the governor comes to rest.

By securing the fixed ends of the spring-blades 7 to a bracket or plate 10, detachably connected to the drum, as shown, such bracket or plate and the detachable guide-plate 15 can be caused to change places for the purpose of adapting the governor to be run in a reverse direction, in which case the plate or blade 13 is detached from the lug 3^a on the one distance-piece 3 and secured to that on other distance-piece.

To enable a governor such as hereinbefore described to be readily adjusted from time to time to enable the engine to which it is applied to be run at approximately the same speed for different engine-loads or at different speeds for a practically constant load, it is provided, according to this invention, with regulating mechanism whereby the stiffness of the spring-blades carrying the weights or the resistance to motion of the weights or a part or parts connected thereto under the action of centrifugal force can be adjusted from time to time, the arrangement being such that by increasing the stiffness of the springs or the resistance to motion of the connected parts of the governor the point of cut-off for a given speed of engine will be delayed and the governor thus adjusted for a heavier engine-load, and by decreasing the stiffness of the springs or the resistance to motion of the said connected parts the point of cut-off will be earlier for a given engine speed and the governor thus adjusted for a light engine-load, or if the engine-load be maintained practically constant the engine speed will be increased and decreased, respectively, under the two different conditions mentioned.

The construction and arrangement of the regulating apparatus are preferably such that it can be conveniently operated while the governor to which it is applied is in motion.

Regulating mechanism for the purpose mentioned can be constructed in various forms.

Figs. 3 and 4 show a governor of the kind hereinbefore described provided with an arrangement of regulating mechanism according to this invention. In this arrangement the normally-fixed ends of the spring-blades 7 are connected to adjustable supports 25, mounted on the drum 2 and capable of being moved toward or away from each other by a right and left handed screw 26, that carries a toothed wheel 27 (or it may be a segment) in gear with a rack 28, which may conveniently be operated, through a sliding disk 29 on the governor-shaft 6, from a hand-wheel 30, that is mounted to move endwise on the said shaft, but is preferably not keyed or otherwise fixed thereto, so that it can be held in the hand while adjusting the stiffness of the said spring-blades 7. In the example shown the hand-wheel is mounted to turn upon an extension 29^a of the disk 29, on which it is retained endwise by a ring 29^b, fixed to the extension by a set-screw 29^c. The movable supports 25 may conveniently be each in the form of a lever-arm, as shown, pivoted at one end by a pin 30 to a lug 31 on the drum and recessed at the other end to receive a nut 32, having a convex bearing-surface and with which the adjusting-screw 26 engages, endwise movement of the said screw being prevented by a bifurcated piece 33, mounted on the said pins 30 and in which works the toothed wheel 27. As will be seen, the arrangement is such that by moving the hand-wheel 30 along the shaft 6 toward the drum the lever-supports 25 will be caused to turn away from each other and so reduce the stiffness of the spring-blades 7, and upon moving the hand-wheel in the opposite direction the said lever-supports will be caused to turn toward each other, so as to stiffen the said spring-blades for the purposes hereinbefore mentioned. The drum is provided with additional lugs 31^a, arranged opposite to the lugs 31, so that the governor and speed-regulating mechanism can be reversed in position on the drum to enable the engine to be run the reverse way.

The drum 2 (shown in Figs. 1 and 2) is provided with openings 2^b to admit of the parts of the governor being inserted in place and removed or reversed in position. The drum shown in Figs. 3 and 4 is for a like purpose provided with a removable annular portion 2^c, arranged between the drum-rim and the slotted flange 2^d at one end of the drum-boss 2^a.

To enable the resistance to motion of the eccentric and connected parts under the action of the governor to be varied to suit the particular type of cut-off valve used, there is combined with the said eccentric and con-

nected parts an adjustable device adapted to act as a brake. Thus in the arrangement hereinbefore described the guide-plate 5, connected with the eccentric 1, is made of circular form and screw-threaded at its outer periphery, and upon it is screwed an adjustable friction-ring 34, as shown in Fig. 4, that can be caused to bear against the adjacent side of the drum with any desired degree of pressure for the purpose mentioned, and the sliding face of which can be readily lubricated, if desired.

In another arrangement (shown in Figs. 5 and 6) the friction-ring 34, which may be continuous, split, or in segments, is arranged in a recess 5^a in the guide-plate 5 and is forced into frictional contact with the adjacent side of the drum 2 by springs 35, that may conveniently be arranged in spring-boxes 36, carried by the said guide-plate, and the action of which may, if desired, be made capable of adjustment—as, for example, by set-screws. In each case suitably-arranged oil-holes may be formed in the friction-ring to enable lubricant to be fed to the working face thereof.

Suitable indicating means may, if desired, be provided to facilitate accurate adjustment of the speed-regulating mechanism or brake device, or both. Scales suitable for this purpose are shown at 37 and 38 in Figs. 4 and 3, respectively.

As will be obvious, engine-governors constructed according to my invention can be variously modified; also, some of my improvements may be used without the others. Thus it will be evident that a governor comprising weights carried by spring-blades 7 in the manner herein described may be used for adjusting the shifting eccentric in wheel or drum governors of various constructions, and also that the carrying of the shifting eccentric 1 by means of flat flexible spring-plates 17, arranged to impart an approximately parallel motion to the eccentric, may be applied to wheel or drum governors which in other respects differ from my improved engine-governor.

Although I prefer to make the connection between the free ends of the spring-blades 7 and the eccentric and also the parallel motion arms or bars in the form of flexible or spring plates or blades 13 and 17, respectively, fixed at their ends, as hereinbefore described, because in this way all working joints are obviated, such parts may be connected up by pin-joints; but this would not be so advantageous a construction as the former.

Engine-governors according to my invention may be constructed with a single weight and spring-blade, if desired; but I do not consider this construction so advantageous as that in which two weights and spring-blades are used which balance each other.

What I claim is—

1. In a wheel or drum governor, one or more weighted spring blades connected at one end to the wheel or drum and at the other end to

a sliding part, arranged to work in a guide way on said wheel or drum and adapted to be connected with a shifting eccentric, substantially as herein described.

2. A wheel or drum governor comprising a rotary carrier provided with a guide-way, a shifting eccentric, and one or more weighted spring blades connected at one end to said carrier and at their other end with said eccentric and retained and guided in position by said guideway, substantially as herein described.

3. In a wheel or drum governor, the combination with a rotary carrier and a shifting eccentric of a pair of weighted spring blades connected together at one end and to said eccentric and arranged to extend past and on opposite sides of the axis of said carrier and connected at their opposite ends to said carrier substantially as described.

4. An engine governor comprising a rotary carrier, a shifting eccentric, weighted spring blades connected at one end with said carrier and at the other end with each other and with said eccentric, and means for guiding the eccentric practically parallel with itself.

5. An engine governor comprising a rotary carrier, a shifting eccentric, one or more weighted spring blades arranged between and connected to said carrier and eccentric, and regulating mechanism whereby the movement of said weighted spring blades can be varied, substantially as herein described for the purpose specified.

6. The combination with a wheel or drum governor, of an adjustable brake adapted to control the regulating movement of said governor and consisting of an adjustable body arranged to be pressed against and to work in frictional contact with a relatively fixed part of said governor substantially as herein described for the purpose specified.

7. An engine governor comprising a rotary carrier, a shifting eccentric, and weighted spring blades connected at their respective ends to said carrier and eccentric, and a friction brake adapted to control the resistance to movement of the connected parts of said governor, and consisting of a friction body arranged to be pressed against and to work in frictional contact with a relatively fixed part of the governor, substantially as herein described for the purpose specified.

8. In a wheel or drum governor, the combination with a shifting eccentric and governor weight or weights connected thereto, of an independent parallel motion consisting of flexible connections rigidly fixed at their ends to said eccentric and to a relatively fixed part of said governor and adapted to guide the eccentric practically parallel with itself when its position is varied by said weight or weights.

9. An engine governor comprising a rotary carrier, a shifting eccentric, weighted spring blades each connected at one end to the carrier, a connection between said eccentric and the other ends of said spring blades, and

spring connections arranged between and connected to said eccentric and carrier so as to guide said eccentric practically parallel with itself when its position is varied by the governor, substantially as herein described.

10. An engine governor comprising a rotary carrier, a shifting eccentric, weighted spring blades connected at one end to said eccentric, and at the other end to said carrier, and means for varying the stiffness of said spring blades, for the purpose specified.

11. An engine governor comprising a rotary carrier, a shifting eccentric, weighted spring blades connected at one end to said eccentric, adjustable supports mounted on said carrier and to which the other ends of said spring blades are secured, and means for moving said supports to and from each other substantially as herein described.

12. The combination with a wheel or drum governor, of a shifting eccentric, and spring blades extending in opposite directions from said eccentric and connected to the governor wheel or drum and to said eccentric so as to support and guide the latter substantially as herein described.

13. The combination with a wheel or drum governor having weighted spring blades and a shifting eccentric connected thereto, of supports pivoted to the wheel or drum and connected to said spring blades, a screw and nut arrangement adapted to move said supports toward and from each other, a toothed wheel fixed on said screw, a rack in gear with said toothed wheel and a centrally arranged hand wheel mounted to move endwise on the drum shaft and connected with said rack substantially as herein described for the purpose specified.

14. An engine governor comprising a drum, a slotted eccentric and guide plate arranged to slide against opposite sides of said drum and connected together by distance pieces and bolts passing through slots in the sides of said drum, spring blades connected at one end with said drum and each provided with a weight, a plate or blade fixed to one of said distance pieces and to the other ends of said spring blades, a guide wherein said plate or blade works, and flexible or spring plates or blades extending laterally in opposite directions from said distance pieces and approximately at right angles to the general direction of the weighted spring blades and connecting said distance pieces with said carrier, substantially as herein described.

15. An engine governor comprising a drum, a slotted eccentric and guide plate arranged to slide against opposite sides of said drum and connected together by distance pieces and bolts passing through slots in the sides of said drum, weighted spring blades connected at one end to said drum and at the opposite end to one of said distance pieces, means for guiding said eccentric when moved by the governor, and a friction ring carried by said guide plate and adapted to be forced against the adjacent side of said drum substantially as herein described for the purpose specified.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

ARTHUR SAMUEL FRANCIS ROBINSON.

Witnesses:

PERCY EMA HOCKS,
EDMUND S. SNEWIN.