(No Model.)

W. H. JENKS.

ENGINE GOVERNOR.

No. 417,728. Patented Dec. 24, 1889.

Fig. 1.

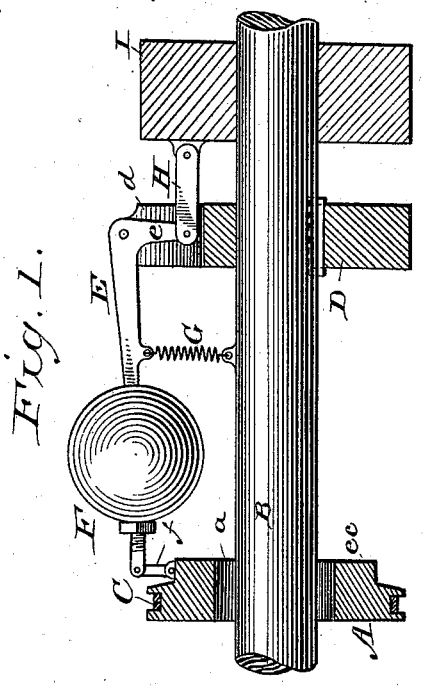


Fig. 2.

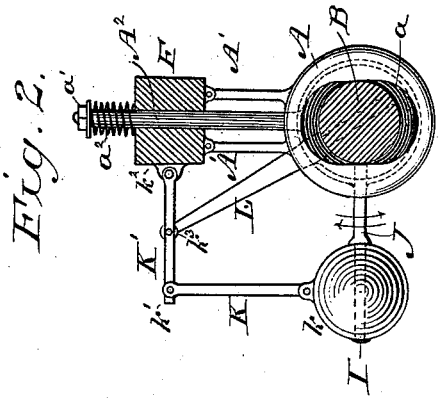


Fig. 3.

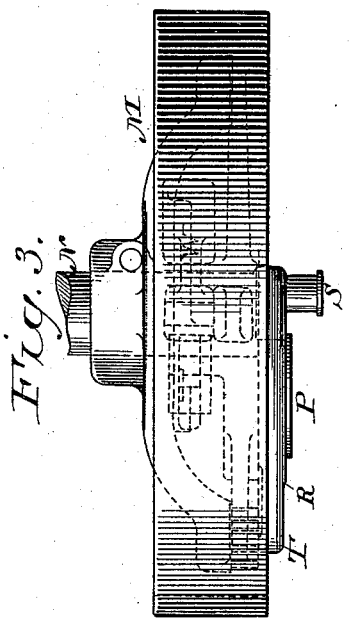
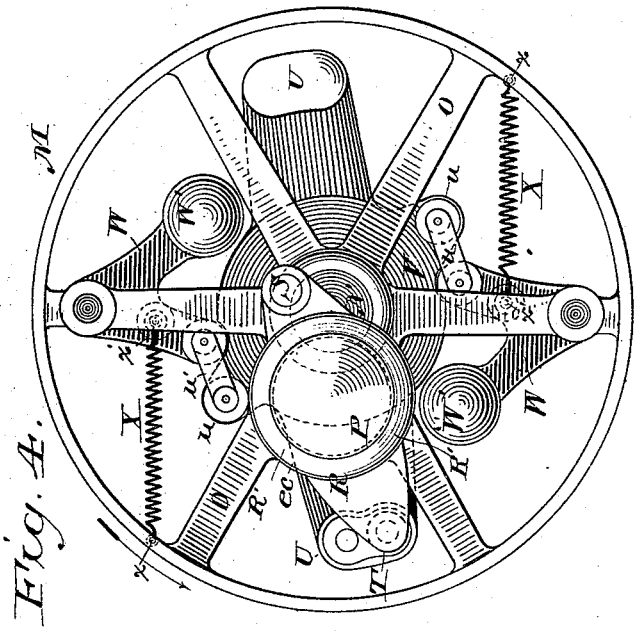


Fig. 4.



Witnesses

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ENGINE-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 417,728, dated December 24, 1889.

Application filed April 11, 1889. Serial No. 306,882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. JENKS, a citizen of the United States, residing at Brookville, in the county of Jefferson and State of Pennsylvania, have invented certain new and useful Improvements in Engine-Governors, of which the following is a specification.

My invention relates to governors for engines of all classes—such as steam-engines, gas-engines, water-engines, and fluid-pressure engines generally—and more especially to that class of engines in which centrifugal weights rotating with a driving-shaft are connected with an eccentric crank or similar device from which the admission-valves of the engine are driven.

My invention consists, mainly, in so connecting a secondary or steadying weight to the centrifugal weight or weights that it will act on them, by virtue of its inertia, to steady their motion, itself being in equilibrium, or nearly so, in all positions that the governor-weights may take or at whatever speed the governor may be running.

My invention is especially designed for steam-engine governors, and will herein be described specifically as applied to this class of engines; but it should be distinctly understood that my invention is not thus limited in its application.

In the accompanying drawings, Figure 1 is a diagram view showing the manner of applying my invention in one of its simplest forms. The shaft and governor-weight are shown in elevation, the remaining parts in section. Fig. 2 shows diagrammatically a modified way in which my invention may be applied to a centrifugal governor. Fig. 3 is a plan, and Fig. 4 a side elevation, of a steam-engine governor properly organized and embodying my improvements.

As shown in Fig. 1, the eccentric A is provided with an elongated opening *a* and is mounted on the shaft B in the usual way. The eccentric-strap C is connected with the eccentric A, as is usual, and communicates with the engine-valves in the usual way. The collar D is keyed to the shaft B, and in a recess *d* of the collar D is hinged a bell-crank lever E, the longer arm of which carries a weight or ball F. The end of the lever-arm extends through the ball F and is connected by a link *f* with the eccentric A. A spring G, secured to the shaft B and to the lever-arm, tends to draw the weight or ball F toward the shaft. The shorter or downwardly-projecting end *e* of the bell-crank lever E is connected by means of a link H with a weight I, which in this instance is shown as a cylindrical block mounted on the shaft B and free to slide parallel therewith. As will be seen, the links H and *f* are hinged or flexibly connected to the weight-block I and bell-crank lever E, and to the bell-crank lever E and the eccentric A, respectively.

As the shaft B revolves, the weight or ball F will be thrown out by centrifugal force as the speed increases, or will be drawn in as the speed diminishes, thus varying the position of the eccentric A on the shaft, and thereby varying or regulating the throw of the admission-valves of the engine; but in this class of governors the movement of the centrifugal governor-weights has been more or less irregular and affected by variations in the resistance offered by the admission-valves. In proportion as the governor is made more sensitive this irregularity becomes greater, often leading to a more or less violent jumping of the governor-weights and consequent irregularity in the admission of steam to the engine; but by my improvement, which consists in connecting a steadying-weight with the governor-weights, this jogging or irregular movement is avoided. For instance, as shown in Fig. 1, if the weight F is thrown out by centrifugal force in moving, it must slide the weight I toward the collar D, or in moving toward the shaft it must slide the weight I in an opposite direction. The inertia of the steadying-weight I tends to steady the movement of the governor-weight, as for every movement of the governor-weight there must be a corresponding movement of the steadying-weight.

It should be particularly noted that the steadying-weight is not directly influenced by centrifugal action, nor by gravity. It is in equilibrium at all times, does not itself tend to move the governor-weight, and only acts to retard or restrain the movement of the governor-weight.

The organization shown in Fig. 1 is not deemed the most practicable, but illustrates diagrammatically one way of embodying the fundamental features of my invention. In Fig. 2 I have also shown diagrammatically, without attempting to show a practically organized engine-governor, another way of embodying my invention. In this instance an eccentric A, provided with an elongated opening a, and operating to vary the throw of the admission-valves in the usual way, is connected by means of rods A′ with a weight F, which slides on a laterally-projecting arm A^2, secured to the driving-shaft B. The outer end of the arm A^2 is provided with a nut a', between which and the outer end of the weight F is interposed a spring a^2. In this instance a spiral spring is shown, as it is preferred. The tendency of the spiral spring is of course to move the weight F toward the shaft B.

An arm J, projecting laterally from the shaft B and pivoted thereon, carries on its outer end a weight I. The weight I is connected by means of rods K and K′ with the weight F. The rod K is flexibly connected to the weight I at k and to the rod K′ at k'. The rod K′ is hinged to the weight F at k^2 and at k^3 to an arm L, rigidly secured to the shaft B. As thus organized, for every movement of the centrifugal governor-weight F there is a corresponding movement of the steadying-weight I. Jogging or irregular movement of the weight F is thus avoided. The idea or underlying principle is the same in this organization as that referred to in Fig. 1.

In Figs. 3 and 4 I have shown my invention embodied in a practical form of governor and that which I prefer. In this instance a wheel M is loosely mounted on the driving-shaft N, and is provided with a spider or spokes O, on which is formed or to which is secured a bearing-block P. An arm R is mounted on the bearing-block and free to vibrate thereon. The inner end of this arm carries a wrist-pin S, to which the valve-rod may be connected in the usual way. In cases in which the shaft N is required to project through the governor the wrist-pin S is enlarged, so as to form an eccentric encircling the shaft and provided with an elongated opening which permits it to swing across the shaft, as is usual. The outer end of the eccentric arm R is connected by means of a link T to a yoke U, firmly secured to the shaft N and projecting equally from each side thereof.

A disk or plate V, mounted on the shaft N and clamped or secured to the yoke U, is provided on opposite sides of the shaft with ears or extensions u, to which are hinged links u', that are in turn hinged to the inner ends of the bell-crank levers W, pivoted to the wheel M in any suitable way. The opposite ends of the bell-crank levers W carry weights W′, which under the influence of centrifugal force fly outwardly from the shaft.

Springs X, flexibly connected at x to the rim of the wheel M and to the inner ends of the bell-crank levers at x', tend to draw the weights towards the shaft.

I have described the organization of the governor as illustrated, but it is obvious that the arrangement of many of the parts may be varied. In operation the yoke U and plate V, being rigidly secured to the shaft, revolve coincidentally with it. The wheel M, being loose on the shaft, but connected flexibly with the yoke U and plate V, also revolves with the shaft, but is free to move independently thereof through a limited distance. By this organization it will be seen that as the governor-weights W′ are moved outward or inward by centrifugal and centripetal forces the relative position of the wheel M to the yoke U and plate V is changed and the bearing-block P is moved, thereby changing the position of the arm R and crank-pin S relatively to the axis of the shaft, and so varying the throw of the admission-valves of the engine. In this instance it will be seen that the wheel M is the secondary or steadying weight, and that it tends not only to steady the motion of the governing-weights directly, but also acts as a fly-wheel to absorb the irregularities in the resistance offered by the regulating valve or valves.

In a governor so organized the objects to be gained by the use of the secondary weight are, first, to steady the movements of the governing-weights themselves; second, to lessen the effect on the governing-weights of irregularities in the resistance offered by the regulating mechanism, and, third, to render the governor more powerful, as well as sensitive, by using the inertia of the secondary weight to help overcome the resistance (frictional and otherwise) of the regulating mechanism.

Having thus described the organization and operation of my improved engine-governor, I declare that what I claim as my invention is—

1. The combination, substantially as hereinbefore set forth, of a centrifugal governor-weight and a secondary or steadying weight connected therewith and moved correspondingly with the governor-weight, but having itself little or no tendency to move the governing-weight.

2. The combination, substantially as hereinbefore set forth, of the centrifugal governor-weight and a secondary or steadying weight connected therewith and movable simultaneously with the governor-weight, without itself changing its position concentric with the shaft.

3. The combination, substantially as hereinbefore set forth, of a centrifugal governor-weight, a non-centrifugal secondary or steadying weight, and flexible connections between the governor-weight and the secondary-weight.

4. The combination, substantially as here-

inbefore set forth, of the shaft, the eccentric, the centrifugal governor-weight connected therewith, the secondary or steadying weight supported on the shaft independently of the centrifugal governor-weight, and flexible non-elastic connections between the centrifugal governor-weight and the secondary or steadying weight.

5. The combination, substantially as hereinbefore set forth, of the shaft, the wheel or steadying-weight loosely mounted on the shaft, the yoke rigidly secured to the shaft, the eccentric arm pivoted eccentrically on the wheel, the governor-weights pivoted to the wheel, and flexible connections between the governor-weights and the yoke and between the yoke and the eccentric arm.

In testimony whereof I have hereunto subscribed my name.

WILLIAM H. JENKS.

Witnesses:
JOHN M. VAN VLIET,
ALLAN E. HALL.