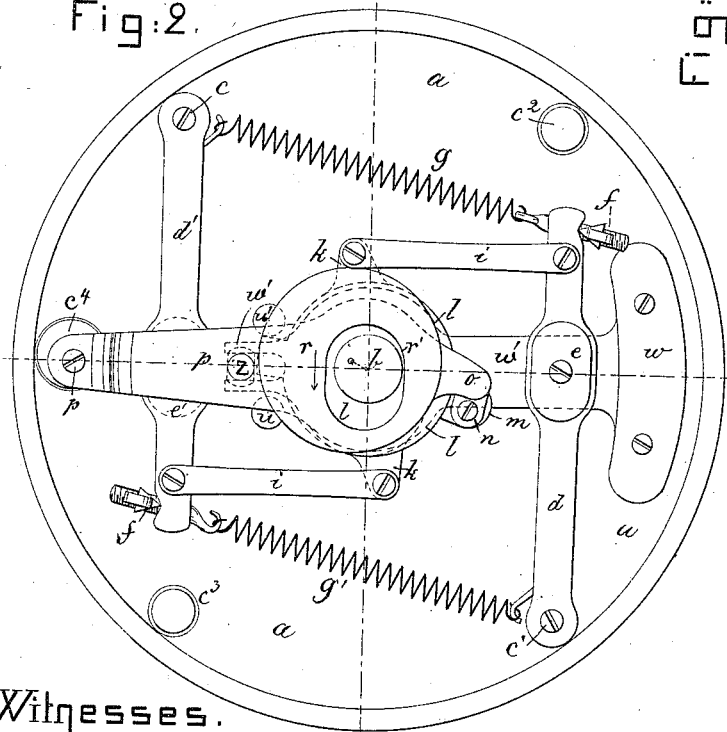
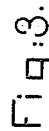


Governor for Steam-Engines.

Fig:1.



Frederick Fosdick
by Crosby Gregory Atty

UNITED STATES PATENT OFFICE.

FREDERICK FOSDICK, OF FITCHBURG, MASSACHUSETTS.

IMPROVEMENT IN GOVERNORS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **221,296**, dated November 4, 1879; application filed September 29, 1879.

To all whom it may concern:

Be it known that I, FREDERICK FOSDICK, of Fitchburg, county of Worcester, State of Massachusetts, have invented an Improvement in Governors for Steam-Engines, of which the following description, in connection with the accompanying drawings, is a specification.

My invention relates to governors for steam-engines, and is shown embodied in that class of governors which are connected to and rotate with the main shaft of the engine, and, by connections with the eccentric which actuates the cut-off valve of the engine, regulate the supply of steam allowed to enter the cylinder.

The object of my invention is to produce a governor more delicate in action and simple and cheap in construction than those now in use; and it consists in part in a supporting case or disk, governor-arms pivoted at one end to said case, intermediately-attached centrifugal weights, and springs attached to the free ends of said arms to act in opposition to the centrifugal force of said weights, combined with the valve-controlling eccentric and connections between said eccentric and governor-arms, whereby the said eccentric is oscillated across the main shaft of the engine, a slot in said eccentric permitting it to do so.

My invention also consists in providing stops to limit the motion of the governing mechanism, and in providing a counter-balance for the weight of the eccentric, and in a novel adjusting device for regulating the tension of the springs.

I am aware that a governor has been made with pivoted arms, weights, and springs; but the springs were necessarily attached to the arms near their pivots, the free ends of said arms being weighted and attached by links to the eccentric, which was rotated about the main shaft to change its angular relation to the crank of the engine, such arrangement, however, necessitating an independent cut-off valve and special valve-gear, and as a considerable range of motion must be given to the eccentric, the connecting-links must be at the free ends of the arms, and the springs attached near the pivots are stiff and have a short motion, and, consequently, do not regu-

late the speed of the engine with great delicacy.

In my improvement the eccentric is hung on one end of an arm pivoted at its other end to the rotating case near its circumference, and its motion across the main shaft alters the amount of its throw at the same time that it changes its angular position, and may, consequently, have the usual direct connections with any usual valve.

Figure 1 is a front view of my improved governor with parts broken away; Fig. 2, a similar view with the parts in a different position; and Fig. 3, a top view of Fig. 1, the case being shown in section on line *x x*.

The case or rotating disk *a* is secured to the main shaft *b* of the engine, and is provided with suitable projections *c c' c² c³ c⁴* to sustain the working parts.

The governor-arms *d d'*, (shown as two in number,) symmetrically placed with relation to the main shaft, pivoted at *c c'*, and provided with weights *e e'*, are connected at their free ends, by the adjusting devices *f f'*, with one end of the springs *g g'*, the other ends of said springs being attached to some point which has no motion relative to the case *a*, here shown as the pivoted ends of the opposite governor-arms.

The free ends of the governor-arms *d d'* are connected, by links *i i'*, with the ears *k k'* on the ring *l*, fitted to the main shaft *b*, so as to rotate freely thereon. Another ear, *m*, on the ring *l* is connected, by a short link, *n*, with a lug, *o*, on the end of the eccentric arm *p*, pivoted at *p'* to the case *a*.

The eccentric-arm *p* has attached to it the eccentric *r*, which, together with the arm *p*, is slotted, as shown at *r'*, to permit it to swing across the main shaft *b*.

The ring *l* is provided with a block or projection, *t*, which, by coming in contact with the stops or pins *u u'*, attached to the case *a*, limits the motion of the governing parts in either direction.

The counter-weight *w* is supported at one end of an arm, *w'*, pivoted upon the main shaft *b*, and forked at its other end to embrace a pin, *z*, on the eccentric-arm *p*, the arm *w'* thus acting as a lever between the weight

w and the weight of the eccentric r and its arm p , the downward tendency of the eccentric being thus overcome and balanced by the downward tendency of the weight w in all positions.

The adjusting devices $f f'$ are shown as rods provided at one end with hooks to engage the ends of the springs $g g'$, said rods passing through holes in the governor-arms $d d'$, and being screw-threaded to engage thumb-nuts, by which they may be drawn through the arms $d d'$ to give the desired tension to the springs $g g'$. The nuts are provided with means to keep them from turning when placed in the desired position, (here shown as a knife-edge, which engages a slot or notch in the governor-arm;) but a pin on either nut or arm, to engage a corresponding hole, or any other obvious equivalent, may be used.

The operation is as follows: If the engine is retarded the weights $c c'$ will exert less centrifugal force to overcome the springs $g g'$, and the parts will approach the position shown in Fig. 1, the links i turning the ring l , and it, through the link n , swinging the eccentric r in the direction of the arrow 1, such motion moving the center thereof farther from the center of the shaft b and increasing the throw (indicated by the dotted line) of the eccentric, and consequently the travel of the valve. Such motion of the parts is stopped when the block t meets the stop u , the valve then having its greatest travel and admitting the maximum of steam to the cylinder.

If the motion of the engine is accelerated, as by reduction of its load, the parts move toward the position shown in Fig. 2, and the throw of the eccentric is diminished, this movement being stopped by the block t and pin w' when the travel of the valve just equals its lap, or lap and lead, and consequently the least possible amount of steam is admitted to the cylinder.

It will be observed that as the parts move from the position shown in Fig. 1 to that shown in Fig. 2 the angular advance of the eccentric is increased and its throw diminished, the lead-opening, if any be allowed, remaining practically the same in all positions.

I do not confine myself to the exact arrange-

ment and construction of the eccentric and connections thereof with the governor-arms, as the eccentric, instead of oscillating on its pivoted arm, may be attached to a suitable block or carriage, which may slide in suitable guides across the main shaft, and its arm may be dispensed with. In such an arrangement the pin z , engaged by the counterbalance-lever, may be seated in the eccentric or its block, or any other equivalent arrangement may be used.

The counter-weight may be sufficiently heavy to balance also that portion of the weight of the eccentric strap, rod, valve, &c., which may come on the eccentric in a vertical or horizontal engine.

When desired to run the engine in the reverse direction the governor-arms may be pivoted at $c^2 c^3$.

I claim—

1. In a governor for steam-engines, the combination, with the governor-arms pivoted at one end and weighted and springs attached to the free ends of said arms, of the links $i i$, the ring fitted loosely on the main shaft and provided with suitable points to attach the links, the link n , and the eccentric-arm pivoted to the case and its eccentric, both slotted to enable them to swing across the main shaft, substantially as described.

2. The combination, with a movable eccentric, of a counter-weight and its carrying-lever and connections between said lever and eccentric, whereby said counter-weight is adapted to balance the weight of the eccentric and parts actuated thereby, substantially as described.

3. The herein-described adjusting device to regulate the tension of the springs, consisting of a screw-threaded rod provided with a hook and a thumb-nut provided with a point to engage a notch in the governor-arm to prevent rotation of said nut, substantially as described.

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

FREDERICK FOSDICK.

Witnesses:

W. J. CLIFFORD,
CHAS. FOSDICK.