

(No Model.)

2 Sheets—Sheet 1.

W. A. BOLE.

STEAM ENGINE GOVERNOR.

No. 343,430.

Patented June 8, 1886.

Fig. 2.

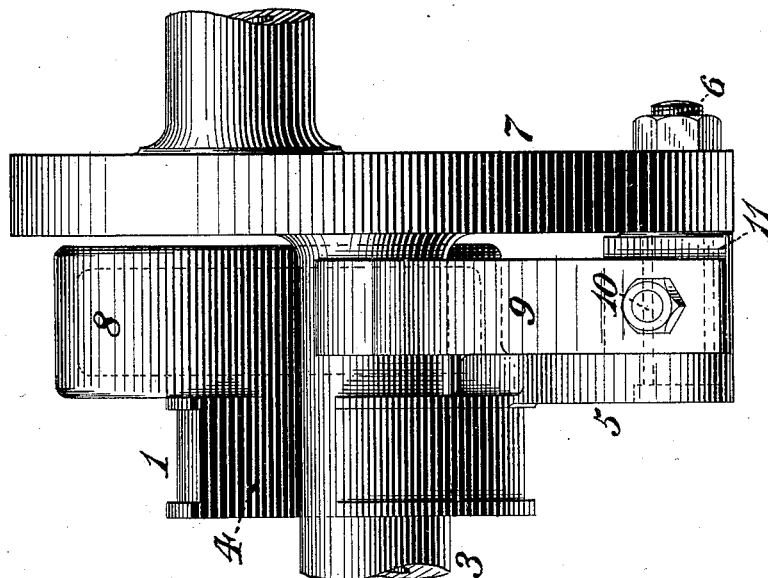
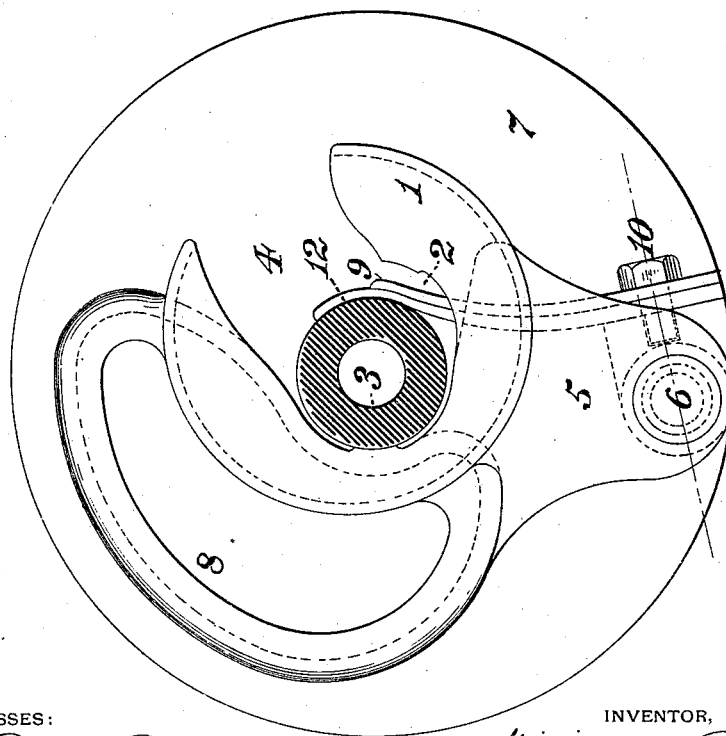


Fig. 1.



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2 Sheets—Sheet 2.

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Fig. 4.

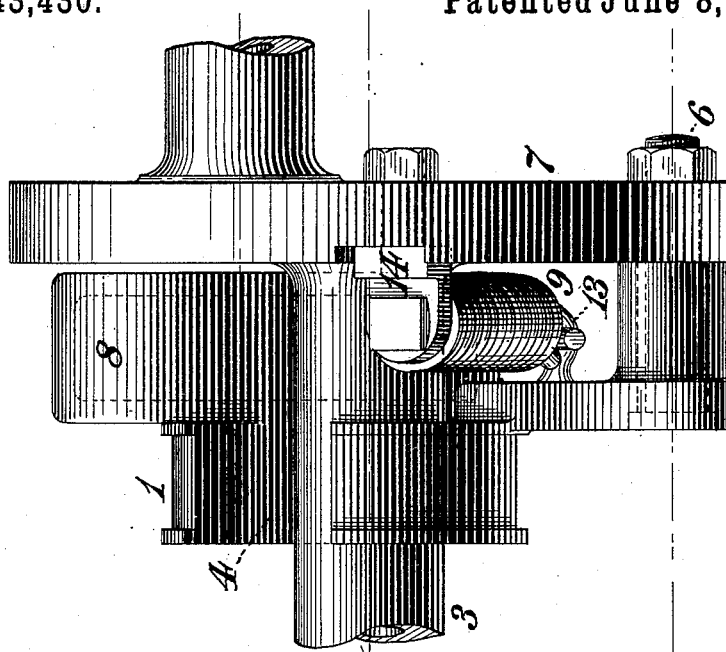
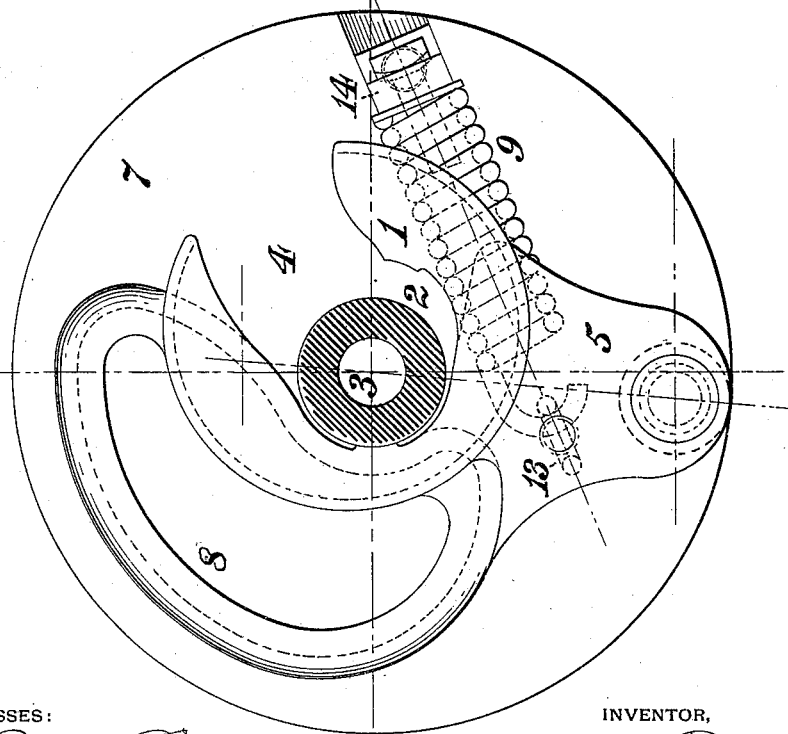


Fig. 3.



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# UNITED STATES PATENT OFFICE.

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## STEAM-ENGINE GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 343,430, dated June 8, 1886.

Application filed April 19, 1886. Serial No. 199,384. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM A. BOLE, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Steam-Engine Governors, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a face view in elevation of a steam-engine governor embodying my invention; Fig. 2, a side view in elevation of the same; and Figs. 3 and 4 face and side views, respectively, of a governor, illustrating a modification of the spring.

My invention relates to steam-engine governors of that class which are mounted upon the crank-shaft of the engine or upon a counter-shaft rotated therefrom, and in which regulation is effected by variations of the position of a valve-operating eccentric, induced in opposite directions by the centrifugal force of a weight and the tension of a spring, respectively.

The object of my invention is to simplify and economize in a material degree the construction of a governor of such type, and to enable the same to be readily and quickly connected to and detached from its support upon the shaft.

To this end my invention, generally stated, consists in the combination, with a crank-arm or disk, of an eccentric formed in a single piece and having a lateral passage extending from its periphery to a transverse shaft-opening; also, in the combination of a crank-arm or disk, an eccentric having a lateral passage and a transverse shaft-recess, and formed integral with a centrifugally-acting weight and a pivot-arm, a pivot coupling the eccentric arm to the crank-arm, and a spring connected to the eccentric-arm and exerting tension thereon in opposite direction to the action of the weight.

The improvements claimed are hereinafter fully set forth.

In governors of the class to which my invention relates it is ordinarily necessary to divide the movable eccentric diametrically into two sections in order to fit it in position around the crank-shaft, such construction being in-

dispensable in the types heretofore employed when applied, as they are frequently required to be, between a pair of cranks. The weights which exert centrifugal action have heretofore been pivoted to the crank-disk and coupled by links to the movable eccentric, such construction, together with the divided eccentric and its connecting-bolts, involving considerable structural cost, and being undesirable for use in locations which are not readily accessible by reason of the difficulty of putting the parts in place and detaching them as required. Under my invention I am enabled to materially reduce the first cost of the governor and to apply and remove it or either of its members as required with great facility, irrespective of conditions imposed by its location or the relation of adjacent members.

In the practice of my invention I provide an eccentric, 1, in which is formed a transverse opening or shaftway, 2, of proper dimensions to admit of its desired traverse transversely to the crank-shaft 3, on which the governor is mounted for adjustment under the action of centrifugal force. A lateral gap or passage, 4, is likewise formed in the eccentric from its periphery to the adjacent side of the shaftway 2, the passage 4 being of slightly greater width than the diameter of the crank-shaft 3, so as to enable the eccentric to be located in proper position for connection to its support by moving the sides of the passage 4 past the crank-shaft. A pivot-arm, 5, is cast upon one side of the eccentric, and projects therefrom in an opposite direction to the passage 4, and the eccentric is pivoted by a pin or bolt, 6, to a crank-arm or disk, 7, on the crank-shaft 3. A weight, 8, by which the centrifugal action requisite for the adjustment of the position of the eccentric relatively to the crank-line is exerted, is cast upon one side of the eccentric at one end of the shaftway 2, constituting, substantially, an enlarged prolongation of the pivot-arm 5. The weight 8 may be cored out as shown, providing a recess for receiving a filling of lead, to increase in desired degree its centrifugal action. The movement of the eccentric 1 in opposite direction to that induced by the weight 8, consequent upon reduction of speed of the crank-shaft and corresponding diminution of centrifugal force, is

effected by a spring, 9, adapted to exert tension upon the pivot-arm 5 in opposite direction to the tendency induced by the weight 8.

The drawings illustrate two forms of construction and location of the centripetally-acting spring, each of which admits of its tension being effectively exerted in the manner above stated.

Referring to Figs. 1 and 2 the spring 9 is shown as composed of curved plates or leaves, which are secured at one end by a bolt, 10, to a seat or face, 11, on the pivot-arm 5, adjacent to the center of the opening through which the pivot-pin 6 passes. The opposite end of the spring 9 is curved in conformity with and abuts against a bearing, 12, on the periphery of the crank-shaft, which bearing may, if desired, be provided with a removable facing to prevent wear of the shaft. Movement of the weight outwardly from a line passing through the centers of the eccentric pivot and crank-shaft tends to straighten the spring, and is correspondingly resisted by the tension thereof, which, except as overcome by the centrifugal force of the weight, acts to move the eccentric into and maintain it in the position shown in the drawings, being that of greatest eccentricity.

In the construction illustrated in Figs. 3 and 4 the spring 9 is of helical form, and is coupled at one of its ends to an eye, 13, on the pivot-arm 5 of the eccentric, and at the other to a block, 14, bolted to the crank-disk 7. Outward movement of the weight 8 tends to extend the spring, and is resisted by its tension in a similar manner to that of the plate-spring first described.

The weight 8 may be balanced for gravity by a fixed counter-balance on the opposite side of the crank-disk, or by other means suitable for the purpose.

I claim herein as my invention—

1. The combination of a crank arm or disk

and an eccentric pivoted thereto, said eccentric having a transverse shaftway or opening and a lateral passage or opening leading therefrom to its periphery, substantially as set forth.

2. The combination of a crank arm or disk, a movable eccentric having a transverse shaftway or opening, and a lateral passage or opening leading therefrom to its periphery, a weight and a pivot-arm formed integral with the eccentric at one end and on one side, respectively, of its shaftway, a pivot coupling the pivot-arm to the crank arm or disk, and a spring connected to the pivot-arm in position to exert tension thereon in opposite direction to the centrifugal action of the weight, substantially as set forth.

3. The combination of a crank-shaft, a crank arm or disk fixed thereon, an eccentric having a transverse shaftway or opening and pivoted through a lateral arm to the crank-arm or disk, a centrifugally-acting weight fixed to the eccentric at one end of its shaftway, and a plate-spring fixed at one end to the pivot-arm of the eccentric and bearing at the other against the periphery of the crank-shaft, substantially as set forth.

4. In a steam-engine governor of the type adapted to be mounted on the crank-shaft of the engine, a movable eccentric having a transverse shaftway or opening, a lateral passage or opening leading therefrom to its periphery, a pivot-arm extending from the eccentric on one side of its shaftway and in opposite direction to its lateral passage, and a weight fixed to the eccentric at one end of its shaftway, substantially as set forth.

In testimony whereof I have hereunto set my hand.

WILLIAM A. BOLE.

Witnesses:

J. SNOWDEN BELL,  
R. H. WHITTLESEY.