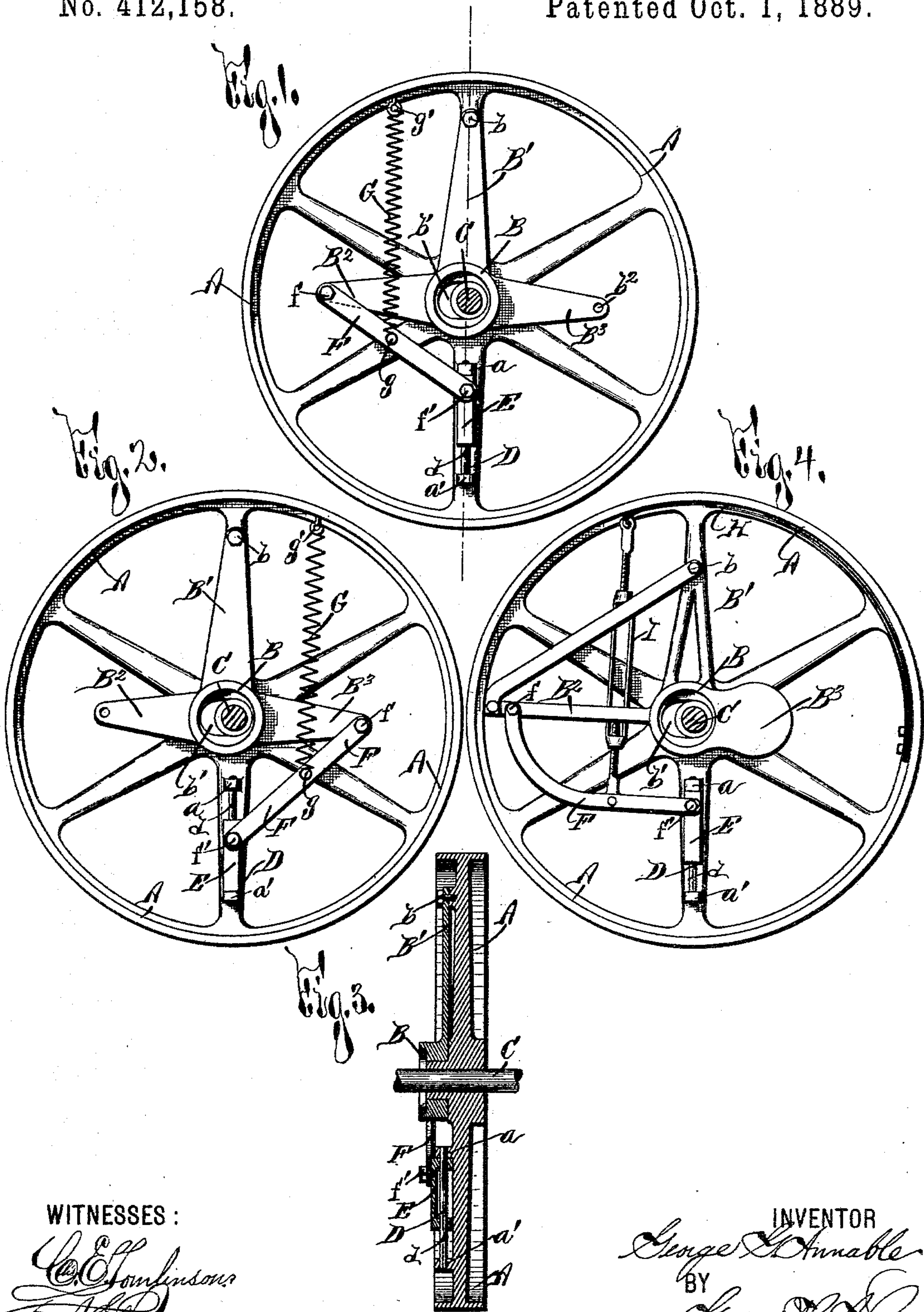


(No Model.)

G. G. ANNABLE.  
GOVERNOR.

No. 412,158.

Patented Oct. 1, 1889.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

GEORGE G. ANNABLE, OF SYRACUSE, NEW YORK, ASSIGNOR OF ONE-HALF  
TO JAMES D. WHEDON, OF SAME PLACE.

## GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 412,158, dated October 1, 1889.

Application filed July 13, 1889. Serial No. 317,406. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE G. ANNABLE, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Governors, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to that class of steam-governors operated by centrifugal force to govern the amount of steam let into the steam-cylinder, and thus regulate the force with which the engine is driven; and it has for its object the production of a simple and effective device, which is cheaply and readily constructed, very efficient and durable in use, and is extremely sensitive in order to produce an even operation of the engine, irrespective of the load placed thereupon; and to this end it consists, essentially, in a moving eccentric-support, a guide rotated by the revolution of the engine, a weight guided by said guide in such a manner that the centrifugal force of the weight holds the same against its guide-way, a retraction device connected to said weight to retract the same, and a connection or connections between the eccentric-support and the weight, so arranged that the spring does not withstand the entire centrifugal force of said weight.

It also consists in making the connections from the weight to the eccentric-support interchangeable to opposite points of said support, in order that the governor will operate irrespective of the direction of movement of the engine; and it furthermore consists in the detail construction and arrangement of the parts, all as hereinafter more particularly described, and pointed out in the claims.

In describing my invention reference is had to the accompanying drawings, forming a part of this specification, in which like letters indicate corresponding parts in all the views.

Figure 1 represents an elevation or face view of a balance-wheel provided with my governor. Fig. 2 is a like view to Fig. 1, with the governor in a different position from that illustrated in Fig. 1. Fig. 3 is a vertical sectional view taken on line  $x x$ , Fig. 1; and Fig. 4 is a face view of a modified construc-

tion of my governor secured to a balance-wheel.

My improved governor might be secured directly to the driving-shaft of the engine; but I prefer to support the same upon the balance-wheel A, which may be of any suitable form and construction. Guided upon the hub of the wheel A is the support or operator B for a suitable eccentric, which it is not necessary to either illustrate or describe in my present invention, since said eccentric may be attached to its support B in any well-known or desirable manner, and suitable connections may be secured thereto for operating the steam-valve in the ordinary or any desired manner.

Projecting upwardly from the support or operator B is an arm B', pivoted at  $b$  to the wheel A, and giving an oscillating movement to said eccentric-support. In order to allow of this oscillating movement, I provide therein the elongated opening  $b'$ , arranged on the outside of the shaft C of the balance-wheel A.

Provided upon the balance-wheel A, and preferably arranged diametrically opposite to the arm B' of the eccentric support or operator B, is a guide D, which may be of suitable size, form, or construction. This guide, as illustrated, consists of a rod  $d$ , mounted in lugs or ears  $a a'$ , projecting upwardly from an arm of said wheel. Movable upon the guide D is the weight E, which has a tendency to approximate toward the upper ear  $a'$  of the guide, according as centrifugal force is developed by the rotation of the balance-wheel.

Provided upon the support or operator B is a lug or ear B<sup>2</sup>. A connection F is pivoted at  $f$  to the lug B<sup>2</sup> and at  $f'$  to the weight E. It will thus be seen that as the wheel is rotated beyond the estimated amount the weight E is forced outward by centrifugal force, and by means of the connection F rocks the arm B' upon its pivot  $b$ .

Connected to the connection F at  $g$  is a spring G, the opposite extremity of which is preferably supported by an eye  $g'$ , secured to the wheel A. This spring is of sufficient strength to overcome the centrifugal force of the weight until a certain revolution of the



wheel is reached. When a load is placed upon the engine, the weight E immediately seeks the center by reason of the action of the spring G. As soon as the increased steam admitted by the inward position of the weight E causes the wheel to revolve more quickly, the weight is then forced outward by centrifugal force.

As the weight is arranged upon a guide, it will be understood that there is but one motion thereof—that is, from the center outward, or vice versa. Accordingly, the operation of said weight is very quick, and the governor is thus rendered extremely sensitive, causing the wheel to revolve with the same number of revolutions in a given time irrespective of the load placed thereon, since immediately when the load is varied the governing-weight E is instantly operated to shut off or put on the steam, as desired. The weight being arranged upon a guide requires less strength of spring to retract the same. This arises from the fact that the spring does not have to stand the entire centrifugal force of the weight E. It will be understood that the tendency of the weight E is in an ever-increasing peripheral curve, and this tendency forces the weight against its guide, causing the said guide to withstand a certain amount of the centrifugal force, which would otherwise come directly upon the spring. This produces an even movement of the weight E, prevents undue straining of the retracting-spring, and also causes the weight to remain at its desired position without variation until the load is varied. Moreover, in order to further increase the working-power of the spring the same is offset from the line of motion of the weight E.

In order to counterbalance the lug B<sup>2</sup>, I provide on the opposite side of the support B a like lug B<sup>3</sup>. Although this lug may be of any desirable form or construction, I prefer to provide the same with a pivot-point b<sup>2</sup> at the same distance from the center of the eccentric support as the pivot-point of the opposite arm. By this means, when it is desired to run the engine in the opposite direction, the connection F is disconnected at the point f, and is then swung over on the pivot f' until the pivot f is engaged with the opening b<sup>2</sup> of the lug B<sup>3</sup>. It will thus be seen that the balance-wheel can be revolved in the opposite direction without changing the operation of the governor. This latter feature is one of great advantage, since frequently it is desirable to change the direction of revolution of an engine, whereupon the parts must be ordinarily altered to allow the reverse motion. However, when this improved governor is connected to an engine, the only operation or adjustment necessary is to disconnect the connection F from one point of attachment of the eccentric support, and then connect to the oppositely-arranged point of attachment of said support.

When the connection F is shifted to the

position illustrated in Fig. 2, the spring G is connected on the opposite side of the arm B'. In order to allow of this moving of the spring G, the eye g', to which the same is attached, is preferably secured to the balance-wheel by means of screw-threads, and on the opposite side of the arm B' is a socket, with which said eye is engaged.

At Fig. 4 I have illustrated a modified construction of my governor. In this case the arm B<sup>3</sup> is shortened, and is provided with a weight of suitable size and shape. The connection from the weight E to the arm B<sup>2</sup> is also varied, and instead of a coil-spring I use a leaf-spring H, secured on the inner periphery of the balance-wheel rim, and connected by a turn-buckle I to the connection F.

The operation of my invention will be readily perceived from the foregoing, and it will be understood that my governor consists of but few parts, and that the peculiar construction thereof renders the operation very quick and sensitive, and prevents undue strain upon the retracting-spring. It will be understood that considerable change may be made in the detail construction and arrangement of the parts of my invention without departing from the spirit thereof; hence I do not limit myself to its precise form and construction.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a governor, the combination of an oscillating eccentric-operator for changing the throw of the eccentric, a guide arranged diametrically opposite to the pivot-point of said support, a centrifugally-operating weight guided by said guide, a connection between said eccentric operator and the weight, and a spring for retracting said weight, substantially as described.

2. In a governor, the combination of a rocking eccentric-operator B for changing the throw of the eccentric, a centrifugally-working weight E, a guide-rod d for said weight, and the link F, hinged to the said eccentric-operator and weight E, and also to the spring for retracting the weight, substantially as specified.

3. In a governor, the combination of an oscillating eccentric-operator for changing the throw of the eccentric, a guide arranged diametrically opposite to the pivot-point of said support, a centrifugally-operating weight guided by said guide, a link F, pivoted to the weight and pivoted off the center of the eccentric-operator, and a spring for retracting said weight, substantially as specified.

4. In a governor, the combination of an oscillating eccentric-operator for changing the throw of the eccentric, a guide arranged diametrically opposite to the said eccentric-operator, a weight guided by said guide, connection-points on either side of the center of said eccentric-operator, a link connected to



said weight and adapted to be connected to either of said connection-points of the eccentric-operator, and a spring for retracting said weight, substantially as described.

- 5 5. In a governor, the combination of an eccentric-operator, a projecting arm provided upon said operator and pivoted to the frame mounted on the driving-axle, a centrifugally-operating weight, a guide for said weight, arranged diametrically opposite to the said projecting arm of the eccentric-operator, arms  $B^2$  and  $B^3$ , projecting from opposite sides of the said eccentric-operator, a connection F

from the weight to either of said arms  $B^2$  and  $B^3$ , and the spring for retracting said weight, 15 substantially as specified.

In testimony whereof I have hereunto signed my name, in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 20 10th day of July, 1889.

GEORGE G. ANNABLE.

Witnesses:

CLARK H. NORTON,  
A. E. PARSONS.