

(No Model.)

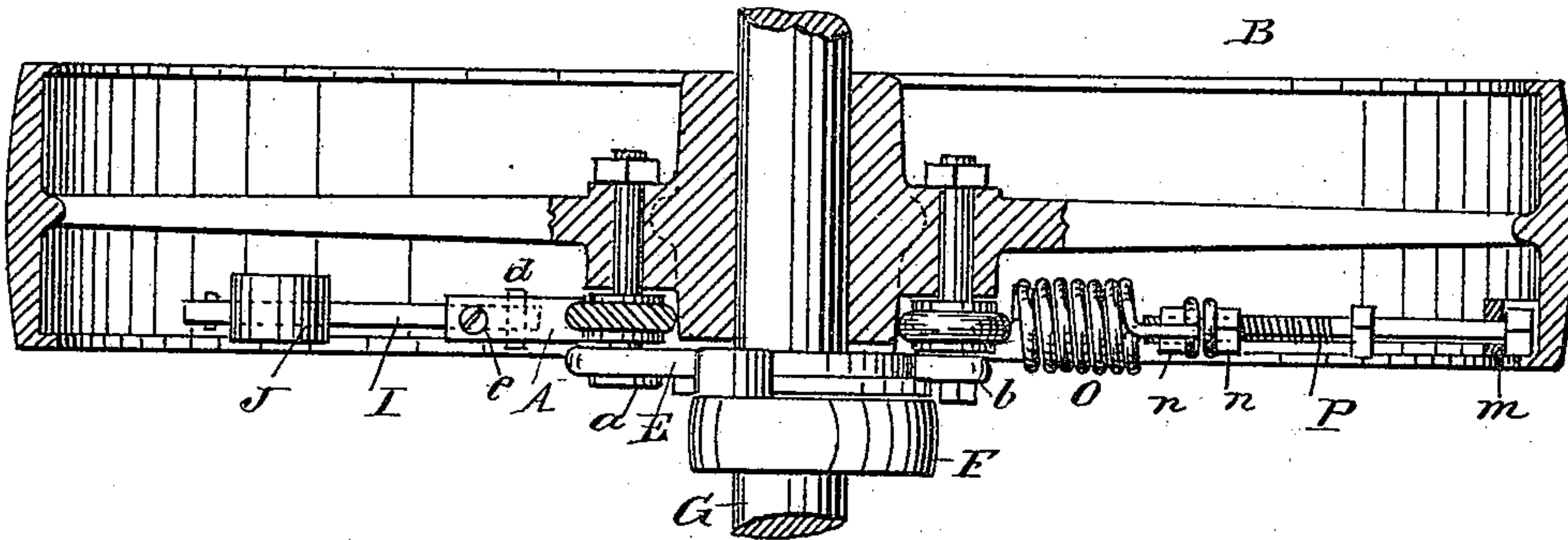
2 Sheets—Sheet 1.

M. A. GREEN.  
ENGINE GOVERNOR.

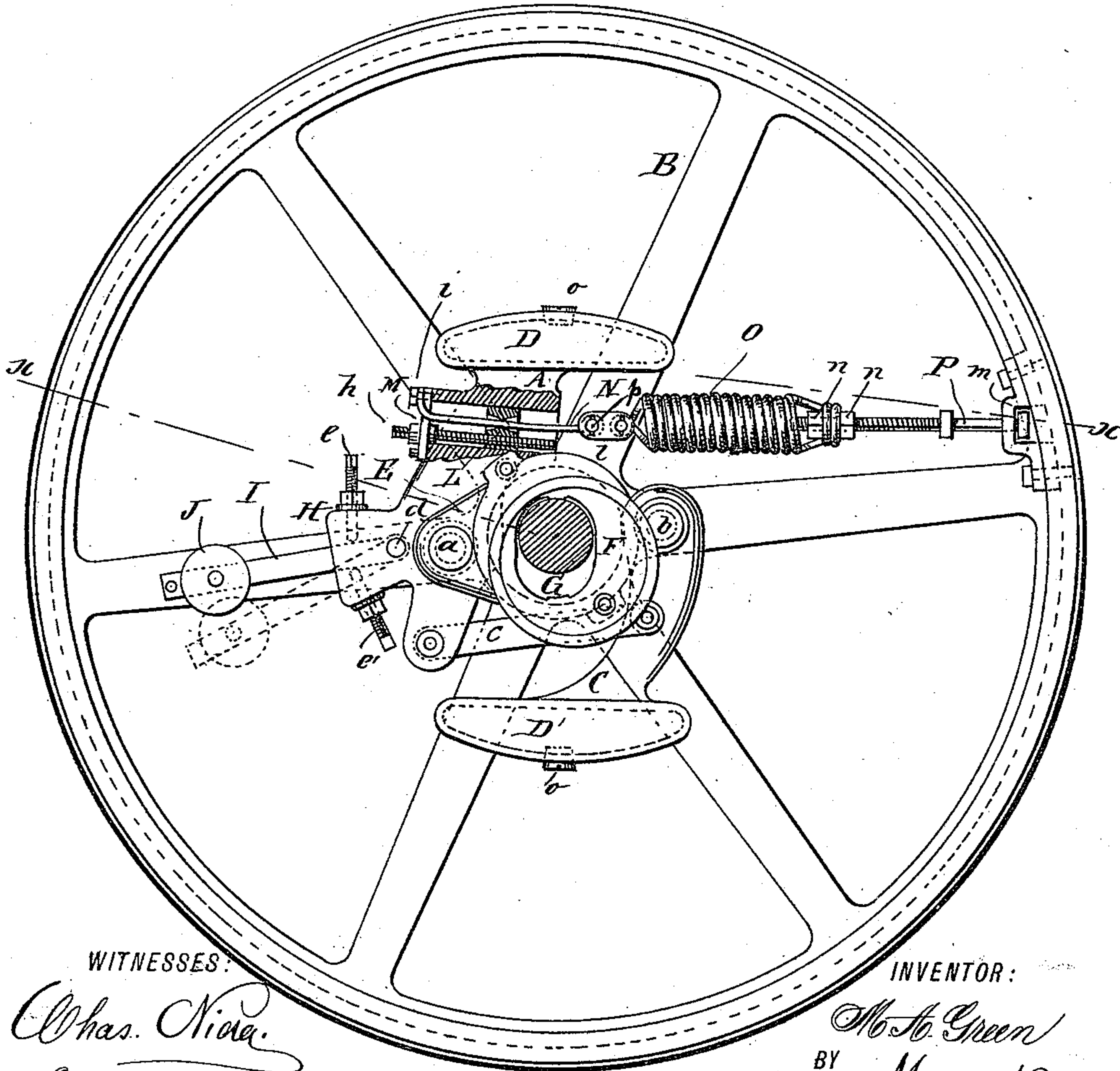
No. 442,774.

Patented Dec. 16. 1890.

*Fig. 2.*



*Fig. 1.*



WITNESSES:

*Chas. Nida.*  
*E. M. Clark*

INVENTOR:

*M. A. Green*  
BY *Munn & Co*  
ATTORNEYS

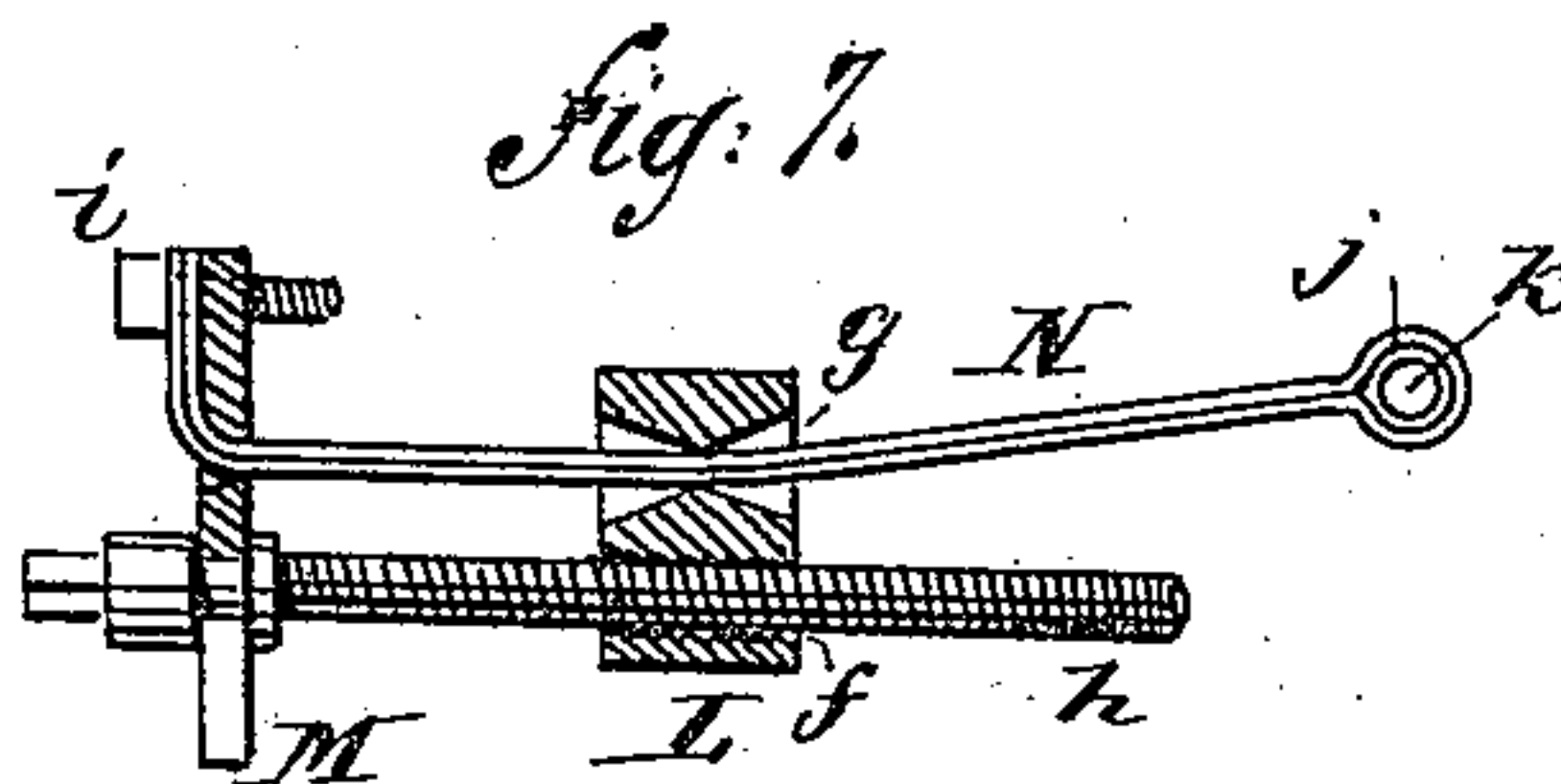
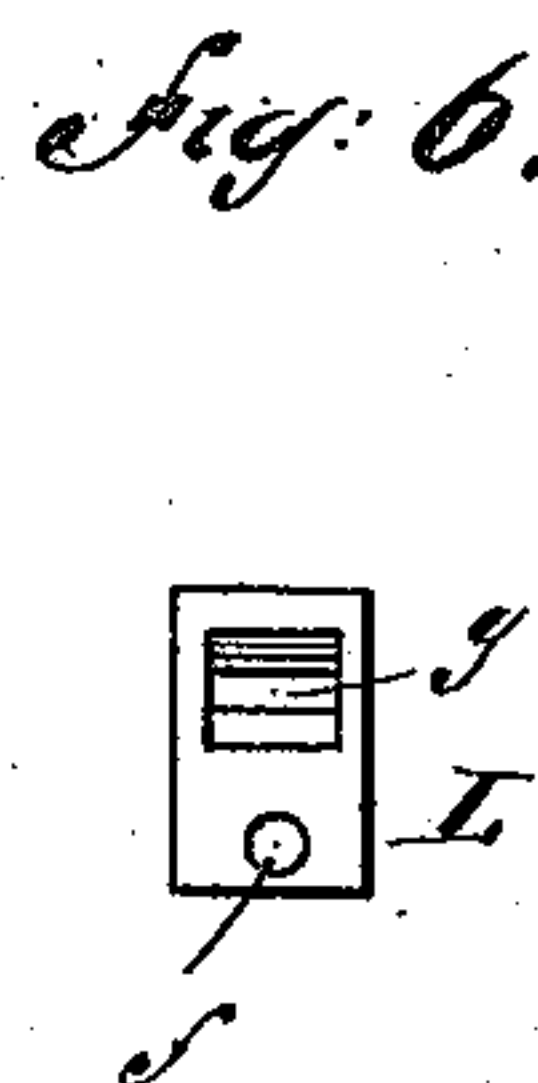
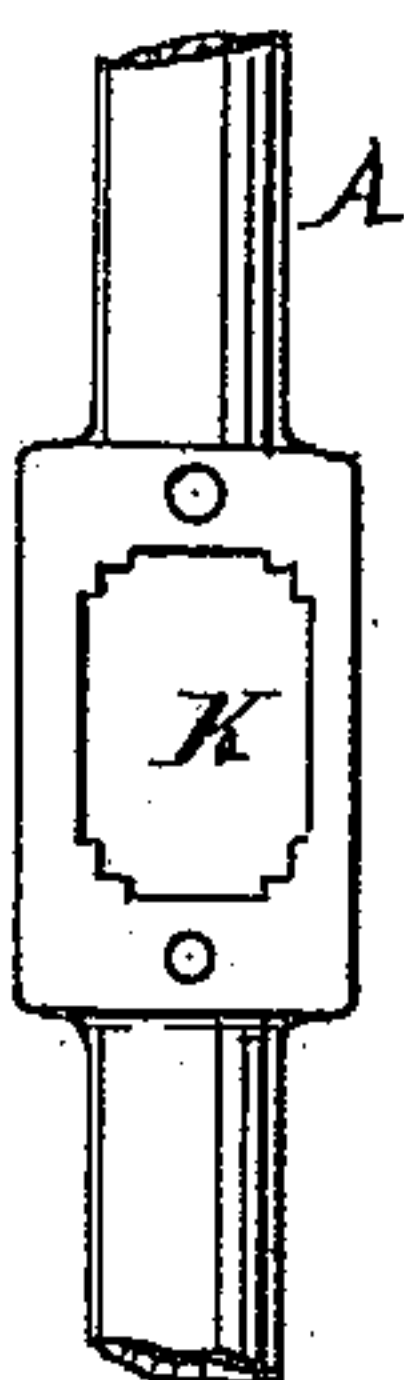
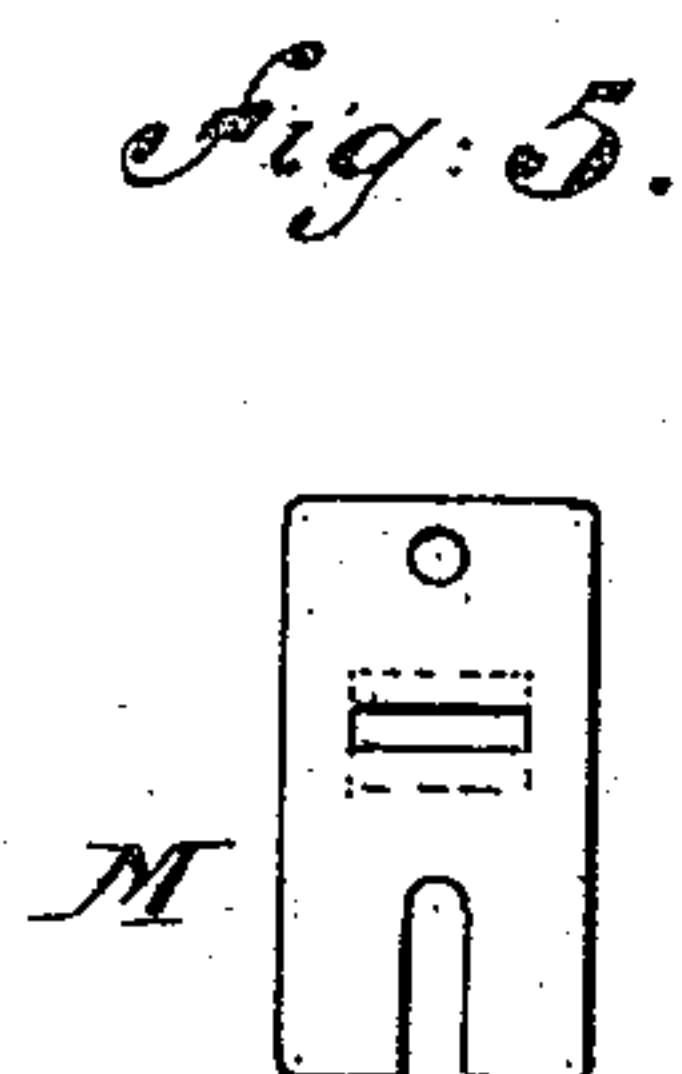
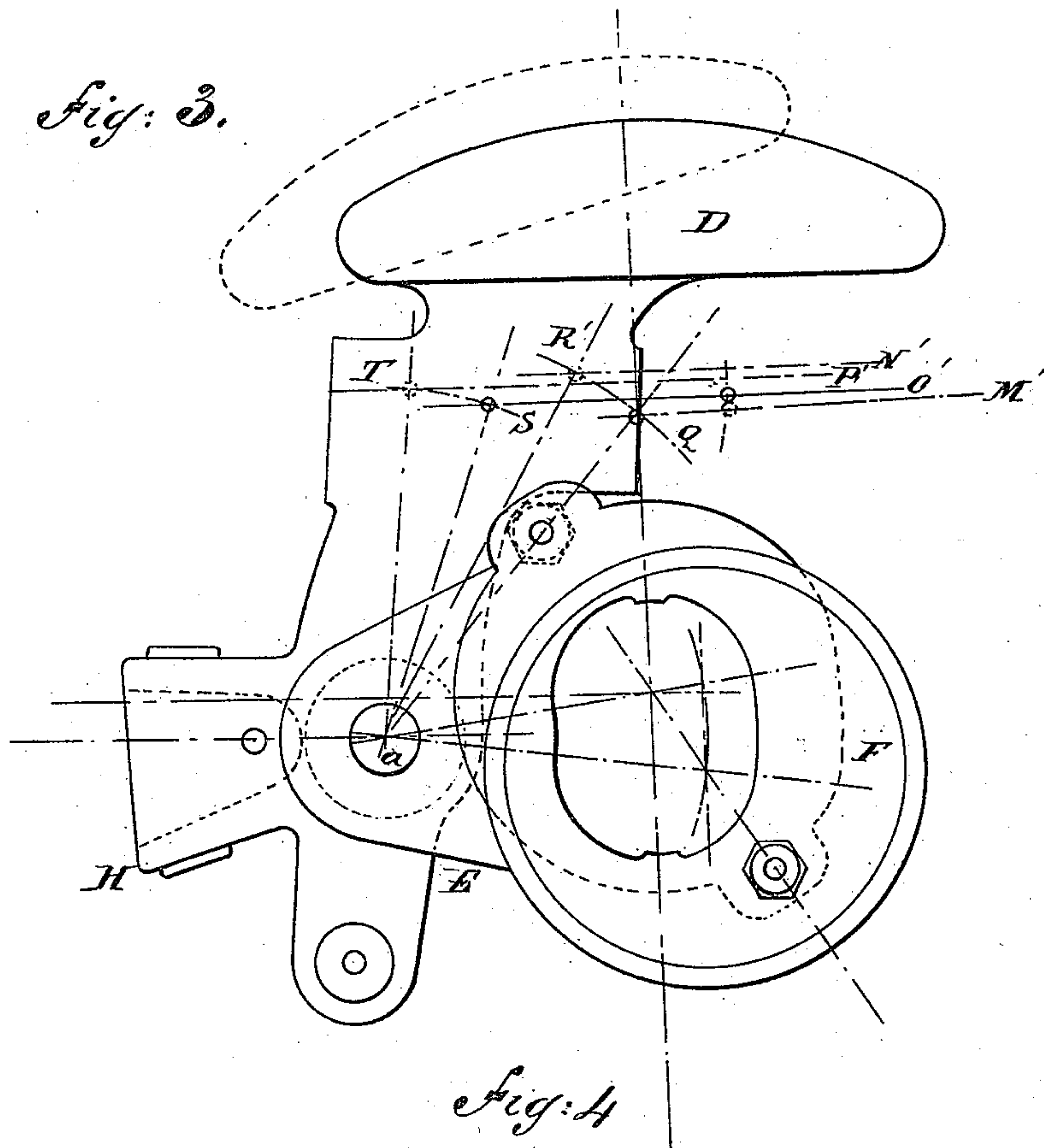
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2 Sheets—Sheet 2.

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WITNESSES:

Chas. Viola.  
E. M. Clark

**INVENTOR:**

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# UNITED STATES PATENT OFFICE.

MARTIN ASBURY GREEN, OF ALTOONA, PENNSYLVANIA.

## ENGINE-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 442,774, dated December 16, 1890.

Application filed July 31, 1890. Serial No. 360,513. (No model.)

*To all whom it may concern:*

Be it known that I, MARTIN ASBURY GREEN, of Altoona, in the county of Blair and State of Pennsylvania, have invented a new and Improved Engine-Governor, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a side elevation, partly in section, of my improved engine-governor. Fig. 2 is a horizontal section. Fig. 3 is a diagrammatic view illustrating the action of the auxiliary spring. Fig. 4 is a detail front elevation of a portion of the weight-arm. Fig. 5 is a detail view of the spring-support. Fig. 6 is a front elevation of the spring adjusting-block, and Fig. 7 is a side sectional elevation of the auxiliary spring adjusting mechanism.

Similar letters of reference indicate corresponding parts in all the views.

My invention relates to the class of steam-engine governors known as "fly-wheel governors," or those which comprise a laterally-movable eccentric upon the crank-shaft of the engine, and centrifugal weights operating in connection with centripetal springs to vary the position of the eccentric, so as to regulate the movements of the valve, thereby producing a uniform speed in the engine.

The object of my invention is to provide an improved construction in such governors whereby the force exerted by the springs may be readily and accurately adjusted with reference to the opposing force exerted by the centrifugal weights; and the invention consists in matters hereinafter set forth, and pointed out in the claims.

The weight-arm A is pivoted on the stud *a*, entering the fly-wheel B. A weight-arm C is pivoted on the stud *b*, which enters the wheel B, and the arms A C carry at their free ends the weights D D'. The arm A is prolonged beyond its pivot and connected with the arm C by the link *c*, so that as the weights swing outwardly the arms A C are made to act in unison. To the boss of the arm A is attached an arm E, which carries the eccentric F, the said eccentric being slotted to receive the main shaft G. A strap surrounding the eccentric F is connected with the engine-valve in the usual way.

The arm A is provided with a socket H, in

which is pivoted a lever I upon the pin *d*. The arm I carries a weight J, and is adjustable in the socket by the set-screws *e e'*. The weight J tends to oppose the action of the weights D more or less, according to its position relative to the said weights, this position being changed by means of the set-screws *e*. In the arm A is formed a mortise K, to which is fitted a sliding block L, having the screw-threaded aperture *f* and the mortise *g*, the said mortise being flared each way from the center of the block.

In a cap M, secured to the arm A, over the mortise K, is journaled an adjusting-screw *h*, which passes through the threaded aperture *f* of the sliding block L. A slightly-curved leaf-spring N passes through a slot in the cap M, and is bent over and secured by a tap-bolt *i*. The leaf-spring N is formed by doubling a bar of steel so as to form a loop *j* for receiving a bolt *p*, which passes through a pair of links *l*, attached to a double spiral spring O, connected adjustably with the threaded rod P, held by one end by the socket *m*, attached to the rim of the wheel B. The spring O is formed by bending a steel rod in the center into a loop for receiving the link *l*, afterward winding the ends of the spring simultaneously, and, finally, forming its extremities into loops for receiving the rod or adjusting-screw P. The spring O is made adjustable on the rod P by nuts *n*, placed on opposite sides of the loops.

Where my improved governor is used upon the end of the shaft, a crank-pin is substituted for the eccentric F.

It is found in governors of this class that to get fine regulation the springs have to be of high temper and are required to be drawn to a high tension when the governor is at rest, so that they will increase in force as the weights increase in centrifugal force as they move outward. It is possible to accomplish this by using a spring of sufficiently high temper, and by making a proper adjustment, so that the springs and weights are properly related to each other; but as no two springs are tempered alike, or increase in force alike, and as the friction of the mechanism of the governor is not always the same, there are points of adjustment that cannot be met by springs and weights alone, and a governor of



this class where the fine point of regulation is reached without the use of a dash-pot or some other means of steadying the governor is impracticable, and the weights will remain in their inner position until the engine has reached a high rate of speed, when they will quickly go to their outward position, cutting the steam off and allowing the engine to slow down below its normal speed before steam is again admitted.

By means of the adjustable block L, which travels along the spring N, two important results are secured. When the governor is at rest, as shown in Fig. 1, the spring N is bent at its fulcrum in the block L, so that when the engine is started the said spring N tends to straighten itself, thus acting in conjunction with the centrifugal force of the weights D, starting the weights outward. When the weights D have moved outward a short distance, the spring N resists the action of the weights, thus opposing the centrifugal force of the governor. These opposite effects of the spring N are necessary to secure close regulation.

By the use of the adjustable block L, which slides along the spring N, the point of fulcrum is changed so as to stiffen the spring N as the block is moved toward the main spring O, so as to increase the leverage of the spring over the weights D. When the block is moved in the opposite direction, the reverse effect is produced. By this method the use of a medium-tempered spring is made possible.

By means of the increased leverage from Q to R', as shown in Fig. 3, the spring overcomes the increased centrifugal force of the weights as they move outward and permits of adjusting the block L to a point where the power of the spring over the weights is such as to secure perfect regulation and steady movement. When the block L is moved back to the point S, the spring-line is at the point O', and when the weights have moved to their outer position the fulcrum-point is moved to T; but it has only increased in leverage on the weights about one-third as much as when the fulcrum-point was adjusted at Q.

I have mentioned but two extreme points of adjustment; but the block L may be moved in either direction as may be required to secure the proper regulation without changing the length or tension of the main spring O. By this method each governor may be perfectly adjusted to suit the temper of the opposing spring, and a point of nicety may be reached where the centrifugal force is exactly overcome by the centrifugal force of the spring. This will secure perfect regulation and steadiness of motion.

The weight J plays an important part in the action of the governor, for as the weights D increase in centrifugal force the centrifugal force of the weight J becomes less, and thus assists the spring O. The weights D are made hollow and of oblong form, and are

filled with lead to such an extent as to secure the desired action in the governor. To permit of the introduction of the lead, the hollow weights D are provided with screw-plugs o.

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

1. In an engine-governor, the combination, with the centrifugal weights, of a double-acting spring adapted to act with the weights when starting outward and to oppose the movement of the weights as the limit of engine speed is approximated, substantially as specified.

2. In an engine-governor, the combination, with the centrifugal weights, of a spring for opposing the centrifugal action of the weights, and an auxiliary spring adapted to act with the weights when starting outward and to oppose the movement of the weights as the limit of engine speed is approximated, substantially as specified.

3. In an engine-governor, the combination, with the centrifugal weights, of a spring for opposing the centrifugal action of the weights, an auxiliary spring adapted to act with the weights when starting outward and to oppose the movement of the weights at the limit of the engine speed, and means, substantially as described, for adjusting the auxiliary spring.

4. In an engine-governor, the combination, with the centrifugal weights, of an auxiliary weight adjustable independently of the eccentric and adapted to offer opposition to the movement of the centrifugal weights, substantially as specified.

5. In an engine-governor, the combination, with the centrifugal weights, of an opposing spring formed of two parallel helical coils having a common axis, whereby to prevent in a measure the deflection of the spring and to preserve its true alignment, substantially as specified.

6. In an engine-governor, the combination, with the weight-arm A, provided with the mortise K, of the slotted cap M, sliding block L, spring N, and adjusting-screw h, substantially as specified.

7. In an engine-governor, the combination of the arms having centrifugal weights, connections between said arms, an eccentric supported upon one of said arms, and an auxiliary weight having its support connected with one of said arms and adjustable substantially as described, whereby it may be set to oppose the centrifugal movement of the weights and the degree of its opposition may be regulated, substantially as set forth.

8. In an engine-governor, the combination of the arms having centrifugal weights and connections between said arms, the auxiliary weight, the support I for said weight, pivoted at d to one of the said arms, whereby the said support may be adjusted, and devices for securing the support in its different adjustments, substantially as set forth.



9. In an engine-governor, the combination  
of the centrifugal weights, a double-acting  
spring adapted to act with the weights when  
starting outward and to oppose the movement  
5 of the weights as the limit of engine speed is  
approximated, and the spring for opposing  
the centrifugal action of the weights, such op-  
posing spring being connected with the double-  
acting spring, substantially as set forth.

10. In an engine-governor, the combination 10  
of the weight-arms A C, the adjustable spring  
N, the spring O, threaded rod P, and adjust-  
ing-nuts *n n*, substantially as specified.

MARTIN ASBURY GREEN.

Witnesses:

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W. D. COUCH.