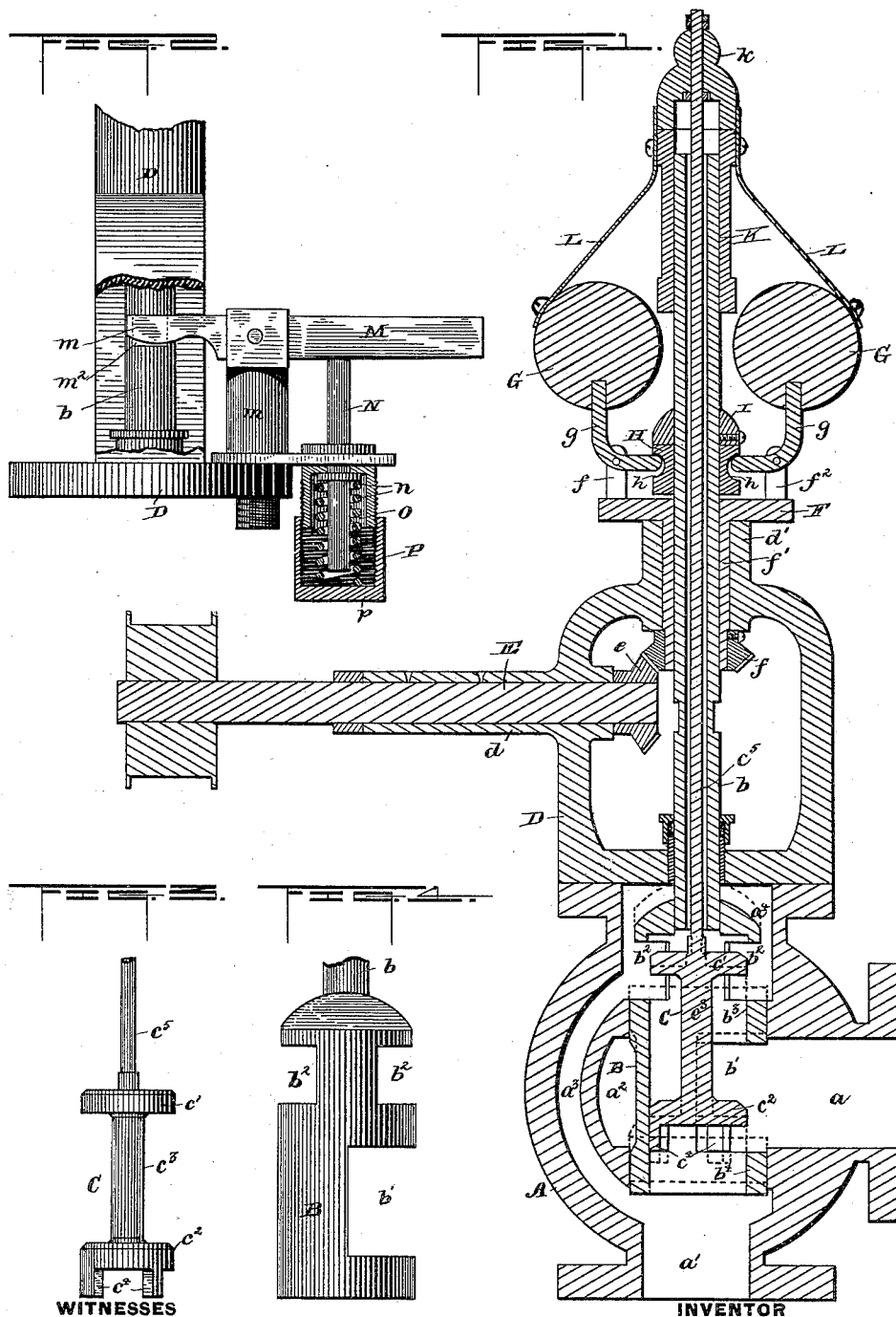


(No Model.)

O. K. COLE.  
GOVERNOR.

No. 423,221.

Patented Mar. 11, 1890.



**WITNESSES**

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# UNITED STATES PATENT OFFICE.

OKEY K. COLE, OF PARKERSBURG, WEST VIRGINIA.

GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 423,221, dated March 11, 1890.

Application filed December 11, 1889. Serial No. 333,358. (No model.)

*To all whom it may concern:*

Be it known that I, OKEY K. COLE, of Parkersburg, in the county of Wood and State of West Virginia, have invented certain new and useful Improvements in Governors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in governors.

The object is to provide a governor which shall be very sensitive, in which the movement shall be steady, the wearing friction reduced to a minimum, and which shall be simple and durable.

With these ends in view my invention consists in certain features of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical sectional view showing the parts assembled with valve full open, the dotted lines showing the position of the valve full closed. Fig. 2 is a partial view in side elevation, showing the speed-regulating device, a portion of the support being broken away. Fig. 3 is a detail view of the inner valve-section, and Fig. 4 is a detail view of the outer valve-section.

A represents the shell of the valve-chamber, here shown of globular form and provided at one side with an opening  $a$  for the admission of steam from the boiler, and with a central opening extending therethrough and furnishing at its lower end an opening  $a'$  for the exit of the steam to the cylinder, the upper greater portion of said central opening forming a guide and seat for the reception of the outer valve-section. The shell A is further provided with an interior annular recess  $a^2$ , in communication with the steam-inlet opening  $a$ , and with a steam-port  $a^3$ , connecting the upper portion of the central through-opening with the lower portion  $a'$  of said opening.

The outer valve-section B is of general cylindrical form, open at its lower end and closed, or partially so, at its upper end for the attachment of its hollow stem  $b$ . The valve-section B is provided with a port  $b'$ , open to the steam-inlet  $a$ , and with ports  $b^2$ , open to

the upper portion of the said central through-opening, and the portion  $a^4$  of said through-opening, which surrounds the portion of the valve-section B where the ports  $b^2$  are located, is larger than the section B, forming a steam-chamber surrounding the said section. The steam is also free to pass around the section B through the annular recess  $a^2$ . The section B is thus effectually balanced.

Within the hollow section B the inner valve-section C is located. It consists, preferably, of an upper and a lower disk portion  $c'$  and  $c^2$ , connected by a central shank  $c^3$ , the lower disk portion  $c^2$  being provided with depending guides  $c^4$ . The upper disk portion  $c'$  is constructed to engage an annular seat  $b^3$ , just below the ports  $b^2$ , at the same time that the lower disk portion  $c^2$  engages an annular seat  $b^4$ , and when the disk portions are so engaged the steam is entirely cut off. When disengaged from its seat the steam is free to pass from the inlet  $a$  beneath the lower disk to the outlet  $a'$ , and also beneath the upper disk through the ports  $b^2$ , and thence through the port  $a^3$  to the outlet  $a'$ . The valve-section C is also effectually balanced. The stem  $c^5$ , for operating the section C, extends up within the tubular stem  $b$  of the section B.

The support D for the valve-actuating mechanism is secured to the top of the shell A and has a bearing  $d$  at its side, in which the governor-driving shaft E is journaled, and with a bearing  $d'$ , in which the rotary ball-support F is journaled.

The drive-shaft E has fixed thereon a bevel gear-wheel  $e$ , which meshes with a corresponding bevel gear-wheel  $f$ , fixed on the sleeve  $f'$ , which depends from the rotary ball-support F.

The balls G are supported from below by angle-levers  $g$ , pivotally secured to diametrically-opposite lugs  $f^2$  on the support F, the balls being secured to the upwardly-extending arms of the levers, while the ends of the opposite arms of the levers loosely engage a recess or recesses  $h$  in the periphery of a sleeve H, which loosely surrounds the tubular stem  $b$  of the outer valve-section. A collar I, fixed to the tubular stem  $b$  above the sleeve H, forms an abutment for the upper end of the sleeve and causes the stem  $b$  to move upwardly with the sleeve. The tubular stem  $b$  projects upwardly between the

balls G, and is provided at its upper portion with a sleeve K, which loosely embraces it, the upper end of the sleeve K being provided with a cap *k*, to the crown of which the upper end of the valve-stem *c*<sup>5</sup> is secured, so as to cause it to rise and fall with the rise and fall of the sleeve K.

The balls G are supported from above by spring-arms L, fixed at their upper ends to the sleeve K and at their lower ends to the balls.

By the above construction it will be seen that as the balls are thrown apart by the rotation of their support the levers *g* will be rocked in a direction to lift the valve-section B, and simultaneously therewith the sleeve K will be drawn down by means of the springs which connect it with the balls, and hence the valve-section C will be slid downwardly. The simultaneously-opposite movements of the outer and inner valve-sections will tend to seat the inner section with great promptness, thereby rendering the valve extremely sensitive and the length of travel of both sections very small. This feature, taken in connection with the effectual balancing of the valves, renders the frictional wear extremely slight. It will be further observed that the spring-bars which connect the balls with the sleeve K, and hence with the inner valve-section, render the movements of the said inner section wholly free from the jerky motion sometimes imparted to a valve through a toggle or link connection, and because of their fixed connection with the sleeve K hold the balls in perfect alignment with the axis about which they revolve.

The speed-regulator consists of a lever M, fulcrumed on a standard *m*, fixed to the support D, one end of which is forked, the branches *m*<sup>1</sup> loosely engaging seats *m*<sup>2</sup> in the opposite sides of the valve-stem *b*, and its opposite end resting upon a plunger N, supported upon a spring *n* in a socket O. The tension of the spring *n* is increased or diminished by a follower P, operated by a nut *p*. In the present instance the follower itself forms the nut. Thus when the tension of the spring *n* is increased the forked end of the lever M will be depressed, thereby drawing down on the stem *b*, and hence upon the ends of the angle-levers *g*, and causing the balls to have a greater resistance to centrifugal force, and hence increase the speed of the engine by rendering the closing of the valves less easy to effect.

It is evident that slight changes might be resorted to in the form and arrangements of the several parts described without departing from the spirit and scope of my invention; hence I do not wish to limit myself strictly to the construction and arrangement herein set forth; but,

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, with a valve shell or casing, of an outer valve-section

seated within the shell and provided with ports therethrough, an inner valve-section, and means for moving the valve-sections simultaneously in opposite directions, substantially as set forth.

2. In a governor, the combination, with a valve shell or casing and a tubular outer valve-section seated within the shell or casing, the shell being provided with steam passage-ways around the exterior of the valve-section, and the valve-section having ports through its walls for the entrance and escape of steam, of an inner valve-section and means for simultaneously moving the valve-sections in opposite directions, substantially as set forth.

3. In a governor, the combination, with an outer balanced valve-section and an inner balanced valve-section, of a centrifugal force exerting a lift upon one of the valve-sections and a simultaneous depression upon the other valve-section, substantially as set forth.

4. The combination, with a rotary support carrying the governor-balls and angle-levers connecting the governor-balls with the support, of an inner and outer balanced valve-section, one of the sections having a stem in engagement with the said angle-levers to slide it and the other valve-section having an independent sliding connection with the governor-balls, substantially as set forth.

5. The combination, with a rotary support carrying the governor-balls and angle-levers connecting the governor-balls with the support, of valve-sections free to slide relatively to each other, the stem of one of the valve-sections being engaged with the said angle-levers, and the stem of the other valve-section being connected with the governor-balls by spring-arms, substantially as set forth.

6. In combination, the outer balanced valve-section provided with a tubular stem, the inner balanced valve-section having a stem located within the tubular stem of the other valve-section, and the governor-balls connected from below with the tubular stem by a pair of angle-levers and connected from above with the other valve-stem by a pair of spring-arms, substantially as set forth.

7. In combination, the vertically-sliding valve-stem, the governor-balls suspended by spring-arms and connected with the valve-stem by a pair of angle-levers, the speed-regulating lever engaged at one end with the valve-stem, and an adjustable spring-cushion exerting an upward lift upon the other end of the lever, whereby the valve-stem may be depressed and the balls drawn toward each other by the engagement of the stem with the angle-levers, substantially as set forth.

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

OKEY K. COLE.

Witnesses:

AARON P. GOULD,  
E. O. SEWARD.