

No. 754,950.

PATENTED MAR. 15, 1904.

F. WILLIAMS.  
VALVE GEAR.

APPLICATION FILED NOV. 28, 1903.

NO MODEL.

FIG. 1.

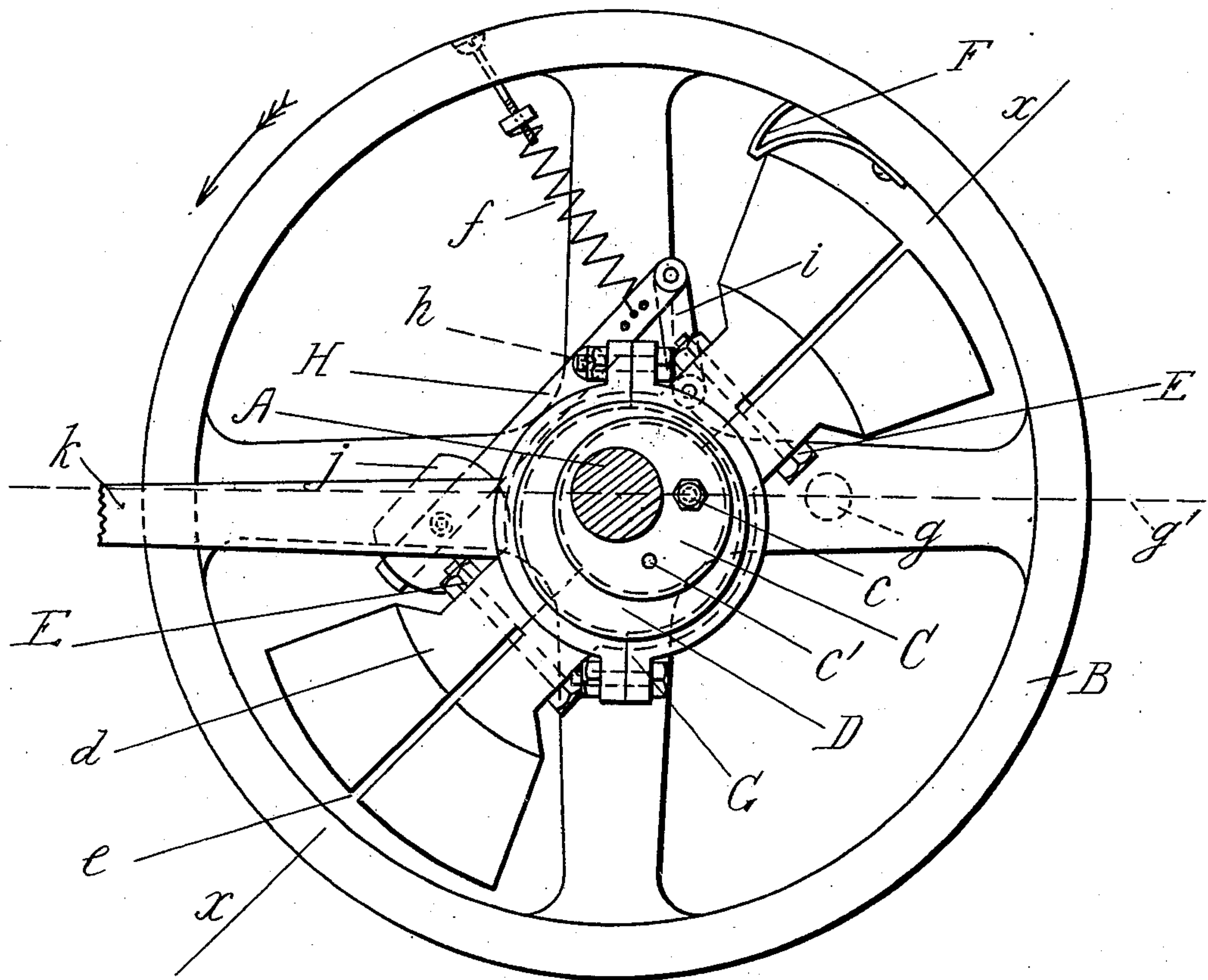
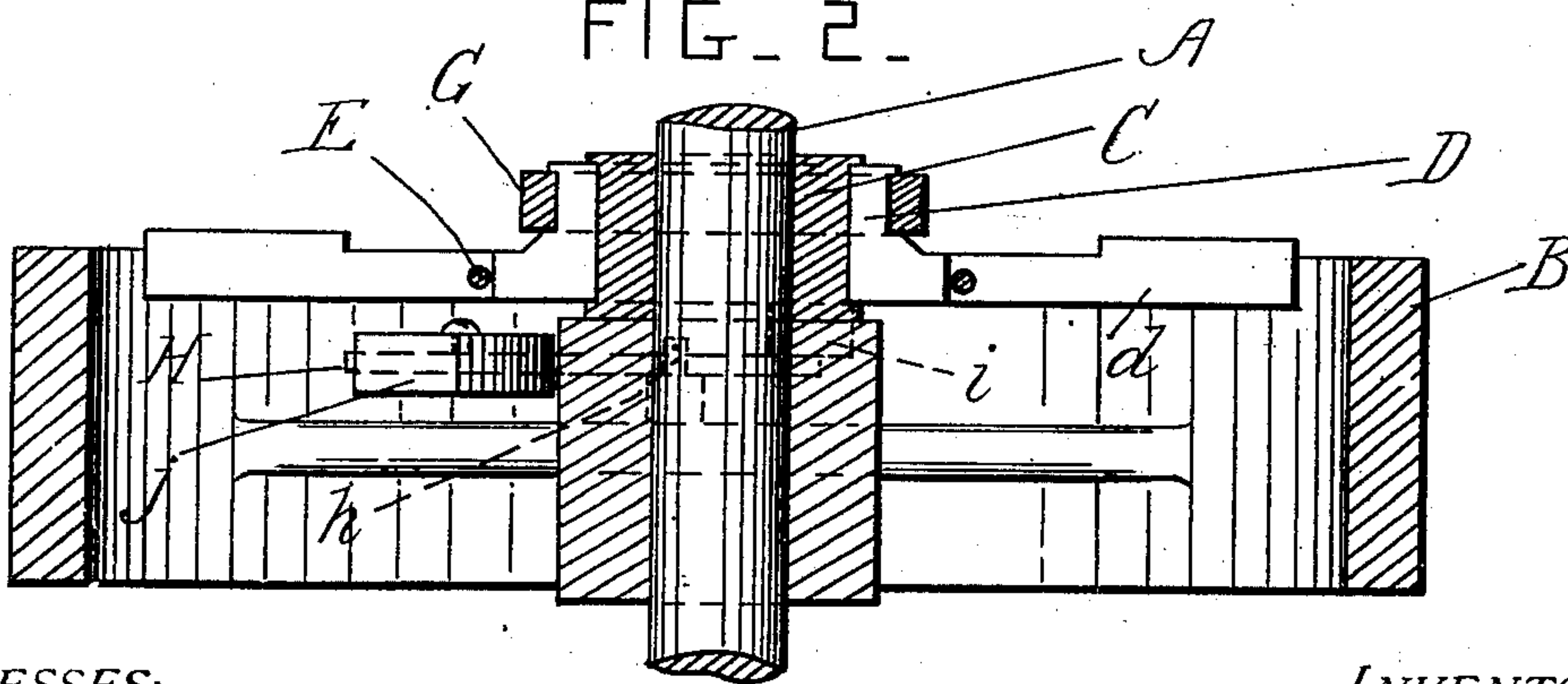


FIG. 2.



WITNESSES:

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## UNITED STATES PATENT OFFICE.

FRANK WILLIAMS, OF TROY, PENNSYLVANIA.

## VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 754,950, dated March 15, 1904.

Application filed November 28, 1903. Serial No. 182,960. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK WILLIAMS, a citizen of the United States, residing at Troy, in the county of Bradford and State of Pennsylvania, have invented certain new and useful Improvements in Valve-Gear; 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.

This invention relates to valve-gears for steam-engines provided with shifting eccentrics and operated chiefly by inertia; and it consists in the novel construction and combination of the parts hereinafter fully described and claimed.

In the drawings, Figure 1 is a front view of the valve-gear. Fig. 2 is a cross-section taken on the line  $x-x$  in Fig. 1.

A is the crank-shaft or driving-shaft of an engine of any approved construction, and B is a fly-wheel rigidly secured on it. This fly-wheel forms a carrier for portions of the valve-gear. C is an inner eccentric which is rigidly connected with the said shaft, being preferably secured to the hub of the said fly-wheel or carrier.

D is an outer eccentric which is mounted on the inner eccentric C, and  $d$  is a balanced governor-arm rigidly secured to the eccentric D. The governor-arm and the eccentric D may be formed integral with each other, if desired. The governor-arm and the eccentric D are preferably formed in two parts or halves, having their joint  $e$  across the longitudinal axis of the said arm. The two parts or halves of the said arm and its eccentric are connected together by bolts E, so that the eccentric D can be adjusted and tightened upon the inner eccentric C as their adjacent surfaces become worn.

F is a stop for the arm  $d$ , which projects from the fly-wheel or carrier. A spring  $f$  is connected to the fly-wheel at one end and is operatively connected with the governor-arm  $d$  at the other end. This spring normally presses the said arm against the said stop. The arrow in the drawing shows the direction

of motion of the fly-wheel with the eccentric C in the position shown. The dotted circle  $g$  indicates the position of the engine-crank, and  $g'$  is the center line of the engine.

H is a lever which is pivoted to one of the arms of the fly-wheel or carrier by a pin  $h$ . One end of the lever H is pivotally connected with the governor-arm  $d$  by means of a link  $i$ , and the other end of the lever carries an adjustable weight  $j$ . The spring  $f$  is preferably connected to the lever H at a point between the link and the lever-pivot instead of being connected to the governor-arm  $d$ .

The inner eccentric C is secured to the hub of the fly-wheel or carrier by a screw or bolt  $c$ , which passes through a hole in the eccentric and is screwed into the hub of the fly-wheel. When the direction of the motion of the fly-wheel is to be reversed, the screw is removed and the eccentric C is partially revolved upon the shaft in the direction of the said arrow in Fig. 1. A second hole  $c'$  is provided in the eccentric C for the said screw, so that the eccentric may be secured to the fly-wheel in a position suitable for the reversed motion. The outer eccentric is then removed to a reversely similar position, moving also the arm  $d$ . The lever H is then moved and is pivoted to a different arm of the fly-wheel, and the stop F is secured to a different part of the periphery of the fly-wheel in a reversely similar position, because the said governor-arm acts in the reverse direction when the direction of the motion of the engine is reversed.

G is the eccentric-strap, which encircles the outer eccentric D, and K is the eccentric-rod. The eccentric-rod is operatively connected with the slide-valve spindle, and any approved kind of a slide-valve or other valve may be used which will distribute the steam to the engine-cylinder in a satisfactory manner. When the speed of the engine and the fly-wheel increases above the normal, the inertia of the balanced governor-arm  $d$  causes it to lag in its revolution behind the fly-wheel, and the position of the outer eccentric upon the inner eccentric being thereby changed the slide-valve is caused to cut off earlier, thereby



diminishing the supply of steam to the cylinder and causing the engine to slow down to its normal speed.

The end portions of the balanced governor-arm *d* are heavy weights and are proportioned and adjusted in any approved manner, so as to supply sufficient power or inertia to effect the desired regulation. The small weight on the lever operates by centrifugal force and operates to insure the satisfactory action of the governor-arm and to prevent jumping or racing. The small weight *j* may be adjusted by sliding it upon the lever, and the spring *f* may also be adjusted in any approved manner so as to produce the best possible effect.

What I claim is—

1. In a valve-gear, the combination, with an engine-driving shaft, and an inner eccentric rigidly connected therewith; of an inertia governor-arm provided with an outer eccentric which is journaled on the said inner eccentric, said arm and outer eccentric being formed in two parts so as to be adjustable to the said inner eccentric and being also provided with means for securing the said parts together, a spring which holds the said arm in a prearranged position, and an eccentric-rod for operating the steam-supply valve, said rod being worked by the said outer eccentric, substantially as set forth.

2. In a valve-gear, the combination, with an engine-driving shaft, and a wheel secured thereon; of an inner eccentric mounted on the said shaft, means for rigidly connecting the said eccentric with the said wheel in different positions, an inertia governor-arm provided with an outer eccentric which is journaled on the said inner eccentric, a spring which holds the said arm in a prearranged position, and an eccentric-rod for operating the steam-supply valve, said rod being worked by the said outer eccentric, substantially as set forth.

3. In a valve-gear, the combination, with a driving-shaft, and a fly-wheel rigidly secured thereon and provided with a stop; of an inner eccentric also rigidly connected with the said shaft, a rigid governor-arm which forms an inertia weight, an outer eccentric rigidly connected to and supporting the said arm, said outer eccentric and arm being journaled on the said inner eccentric, a spring arranged between the said arm and fly-wheel and normally hold-

ing the said arm against the said stop, and an eccentric-rod worked by the said outer eccentric.

4. In a valve-gear, the combination, with a driving-shaft, and a carrier secured thereon; of an inner eccentric rigidly connected with the said shaft, an outer eccentric mounted loosely on the said inner eccentric, a rigid governor-arm which forms an inertia weight and which is rigidly connected to and supported by the said outer eccentric, a spring connected to the said carrier and holding the said governor-arm in a prearranged position, and an eccentric-rod worked by the said outer eccentric.

5. In a valve-gear, the combination, with a driving-shaft, and a carrier secured thereon; of an inner eccentric rigidly connected with the said shaft, an outer eccentric mounted loosely on the said inner eccentric, a rigid governor-arm which forms an inertia weight and which is rigidly connected to and supported by the said outer eccentric, a lever operated by centrifugal force said lever being pivoted to the said carrier and operatively connected with the said governor-arm, a spring connected to the said carrier and holding the said governor-arm in a prearranged position, and an eccentric-rod worked by the said outer eccentric.

6. In a valve-gear, the combination, with a driving-shaft, and a carrier secured thereon; of an inner eccentric rigidly connected with the said shaft, an outer eccentric mounted loosely on the said inner eccentric, a rigid governor-arm which forms an inertia weight and which is rigidly connected to and supported by the said outer eccentric, a lever operated by centrifugal force and pivoted to the said carrier, a link pivotally connecting the said lever with the said governor-arm, a spring arranged between the said carrier and the said lever and holding the said governor-arm and lever in a prearranged position, and an eccentric-rod worked by the said outer eccentric.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK WILLIAMS.

Witnesses:

H. K. MITCHELL,  
RALPH A. LOOMIS.