

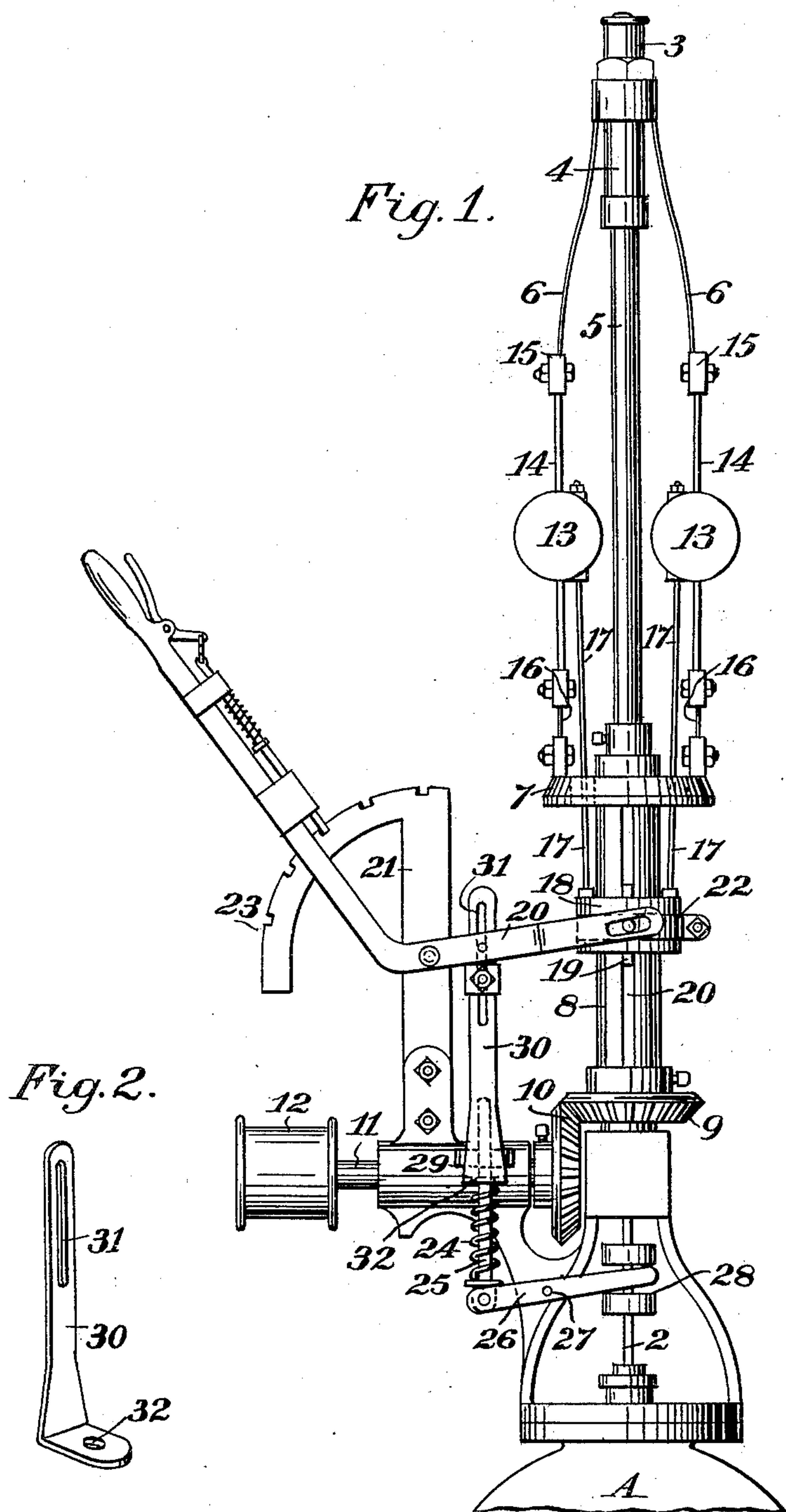
No. 707,697.

Patented Aug. 26, 1902.

C. A. HUFFMASTER.  
VARIABLE SPEED GOVERNOR.

(Application filed Nov. 29, 1901.)

(No Model.)



Witnesses,  
*E. A. Brandau*  
*J. A. Nurse*

Inventor,  
*Charles A. Huffmaster*  
By *Dwight Strong* *Attor*



# UNITED STATES PATENT OFFICE.

CHARLES A. HUFFMASTER, OF SAN LEANDRO, CALIFORNIA.

## VARIABLE-SPEED GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 707,697, dated August 26, 1902.

Application filed November 29, 1901. Serial No. 84,025. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES A. HUFFMASTER, a citizen of the United States, residing at San Leandro, county of Alameda, State of California, have invented an Improvement in Variable-Speed Governors; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to a device for regulating the action of a governor with relation to the speed of the engine with which it is connected; and it consists in a means for changing the position of the balls upon the guides upon which they are slidable, which guides are connected with springs, so that when the tension of the springs is overcome the centrifugal force of the revolving balls causes them to be thrown outwardly. A mechanism is provided by which the balls may be moved nearer to or farther from the fulcrum-point about which the guides are separable, so that by changes of position the governor may be set to operate with the engine running at any desired rate of speed.

My invention also comprises details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is an elevation of my invention. Fig. 2 is a perspective view of the bar 30.

The object of my invention is to provide a mechanism by which an engine running at any required rate of speed can be properly governed and the speed of the engine can be changed from fast to slow, or vice versa, and the engine equally well regulated by a simple adjustment of the governor, which may be effected while the engine is running.

I have here illustrated my device as applied to a governor having a valve-chamber A, within which the governor-valve is located, a valve-stem 2 extending up through the hollow intermediate sleeves and spindle and connected with a head or cap 3 at the top, and this cap has a sleeve 4, vertically slidable upon the upper end of the hollow spindle 5, so that when it is moved upwardly it opens the valve by drawing upwardly upon the valve-stem 2, and when moved downwardly it closes the valve to a greater or less degree by pushing downwardly upon the stem 2.

6 represents springs the upper ends of

which are fixed to the cap or head 3, as shown, and in the usual construction of a governor the lower ends of these springs would be attached to a disk 7, which is fixed to the sleeve 8, this sleeve having upon its lower end the beveled gear 9, which is engaged by the beveled gear 10, fixed upon the horizontally-revoluble spindle 11, through which motion is transmitted by means of the pulley 12 from some moving part of the engine, so that the governor is driven at a rate of speed dependent upon the speed of the engine. Ordinarily when the speed has increased to a certain point the separation of the balls or weights 13, which are fixed to the springs 6, will close the steam-valve when a certain rate of speed has been reached and will open it when the speed falls below the desired rate. It is the object of my invention to allow the engine to run at any desired speed by changing the tension of the springs and the power necessary to cause the balls or weight 13 to separate, and this is effected by moving the balls to or from a fulcrum-point about which they are separable, so that when near the fulcrum a much higher rate of speed is needed to separate them, and they will at such an adjustment regulate the engine running at a high rate of speed. If for any purpose it is desired to run the engine at a less rate of speed, the balls are moved to a point farther from the fulcrum, and are consequently more easily acted upon by centrifugal force, and the valve will be closed and controlled while the engine is running at a much slower rate of speed.

In carrying out this device I have shown the balls 13 as mounted upon essentially rigid guides 14, the upper ends of which are connected with the lower ends of the springs 6 by clamps, as at 15. The lower ends of the guides 14 are flexibly connected with the revoluble disk 7, and this connection may be made by means of a joint or, as at present shown, by clamping the lower ends of the guides to flexible springs, as shown at 16, and this point of attachment forms a fulcrum about which the upper ends of the guides may be separated or closed, the tension of the springs 6 serving to keep them normally closed toward each other. It will be manifest with this construction that when the



balls or weights 13 are moved up to a point near the upper end of the guides 14 they will when revolved have their greatest power to separate and to overcome the tension of the springs 6, and correspondingly when moved to a point nearer the fulcrum or lower end of the guides 14 it will need a greater force, and consequently a higher rate of speed of the engine, to overcome the tension of the spring 6.

10 In order to move these weights 13 upon the guides, and thus change the speed of the engine without stopping the movement of the parts, I have shown the weights 13 connected by rods 17 with a collar 18, which is slidable upon the spindle 8 and is made revoluble with it by means of a key or feather 19, which is slidable in a keyway 20 in the spindle 8. Thus the collar 18 may be raised or depressed by a suitable clutch-lever, to be hereinafter described. The rods 17 pass through the disk 7, the holes being of sufficient size to allow them to move freely and to allow the balls to be separated or closed together as much as may be desired.

25 In order to move the collar 18, and thus lower the balls, I have shown a lever 20, fulcrumed upon a standard 21, which may be fixed to and suitably supported from the sleeve in which the shaft 11 is guided and turnable or from any other suitable point of the governor. One end of this lever connects with a clutch-collar 22, fitting loosely in a groove around the collar 18, and the other end of the lever has a handle and is provided with a spring-pressed pawl, which is adapted to engage with notches in a segment 23, so that by moving the lever the pawls may be raised or depressed, as previously described.

40 A regulated tension may be produced upon the valve-stem 2 and through it upon the valve by means of a spring 24, surrounding a stem 25 and acting upon a lever 26, which is fulcrumed, as at 27, and has a fork at the opposite end which engages with clutch-collars 28 upon the valve-stem 2. Thus the downward pressure of the spring 24 acts to raise the valve-stem 2 and the valve and keep the latter open, while the centrifugal force of the balls when the engine is running tends to overcome this pressure and to close the valve. The stem 25 is slidable through a guide 29. 30 is a plate or bar slotted at the upper end, as shown at 31, and connected with the lever 20 at one side of its fulcrum-shaft, so that when the lever is moved the horizontal portion moving up and down will move the bar 30. The lower end of this bar is bent at right angles and has a hole made through it, as at 32, and through this hole the stem 25 passes. By this construction it will be seen that when the lever 20 is moved, so as to push the collar 18 down and with it draw the balls down to allow the speed of the engine to be increased, this bar 30 will be correspondingly pushed down, and as the bent portion which surrounds the stem 25 lies

above the spring 24 it will press the spring down, giving it a greater tension, and this, acting upon the lever 26 and through it upon the valve-stem 2, tends to hold the valve open with a greater pressure, so that the engine must run at a higher rate of speed to have any effect upon the governor.

I have in the present case shown a two-ball governor; but it will be understood that three balls may be employed having a corresponding number of guides and springs and connections with the revoluble disk 7.

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

1. The combination in a governor of weights capable of separation by centrifugal force, springs by which they are normally drawn together, guides extending between said springs and a revoluble fulcrum connections between the weights and a slidable revoluble collar upon the governor-sleeve, and means whereby the weights may be moved up or down upon the guides.

2. A governor consisting of a stationary hollow spindle, a valve-stem extending there-through, a revoluble cap at the top of the spindle within which the upper end of the valve-stem terminates, a sleeve revoluble upon the spindle, guides having the lower ends flexibly connected with a disk carried by the sleeve, springs connecting the upper ends of the guides with the revoluble cap, weights slidable upon the guides, a collar slidable upon and revoluble with the sleeve and in unison with the balls, rods connecting said collar with the balls, and a clutch-lever by which the collar and the balls may be moved up or down.

3. The combination in a governor of the spindle, valve-stem, revoluble sleeve, a collar slidable on and revoluble with said sleeve, guides having the lower ends flexibly connected with the sleeve, and the upper end with springs, balls slidable upon the guides having connections between them and the collar whereby they may be moved up or down to vary the leverage upon the fulcrumed guides and the consequent speed of the engine, a fulcrumed clutch-lever by which the sleeve is movable, a spring acting upon the governor-valve, and means intermediate between it and the lever whereby its tension is increased or diminished by the movement of the lever.

4. The combination in a governor of a vertical hollow spindle a valve-stem turnable therein, a sleeve turnable upon the spindle, rigid guides having their lower ends flexibly connected with the sleeve, and the upper ends with the upper end of the valve-stem, and springs by which the guides are normally drawn together, weights slidable upon the guides, a collar turnable with and slidable upon the sleeve, connections between the weights and collar, a lever by which the weights may be moved to or from the ful-



crum-points of the guides, and a segment-rack and pawl by which any adjustment is retained.

5 The combination in a governor of weights capable of separation by centrifugal force, springs by which they are normally drawn together, rigid guides extending between the springs and a revoluble fulcrum connection between the weights and a collar slidable upon  
10 and revoluble with the governor-sleeve, a lever by which the collar and weights are movable, a supplemental spring and lever through

which it acts upon the valve-stem, and a connection between said spring and the collar and weight-actuating lever, whereby the tension of the spring is changed, in unison with  
15 the movements of the weights.

In witness whereof I have hereunto set my hand.

CHARLES A. HUFFMASTER.

Witnesses:

J. N. FRANK,  
O. J. LYNCH.