(No Model.) 2 Sheets—Sheet 1.

J. C. COSFORD & J. P. KERN.

STEAM ENGINE GOVERNOR.

No. 335,892. Patented Feb. 9, 1886.

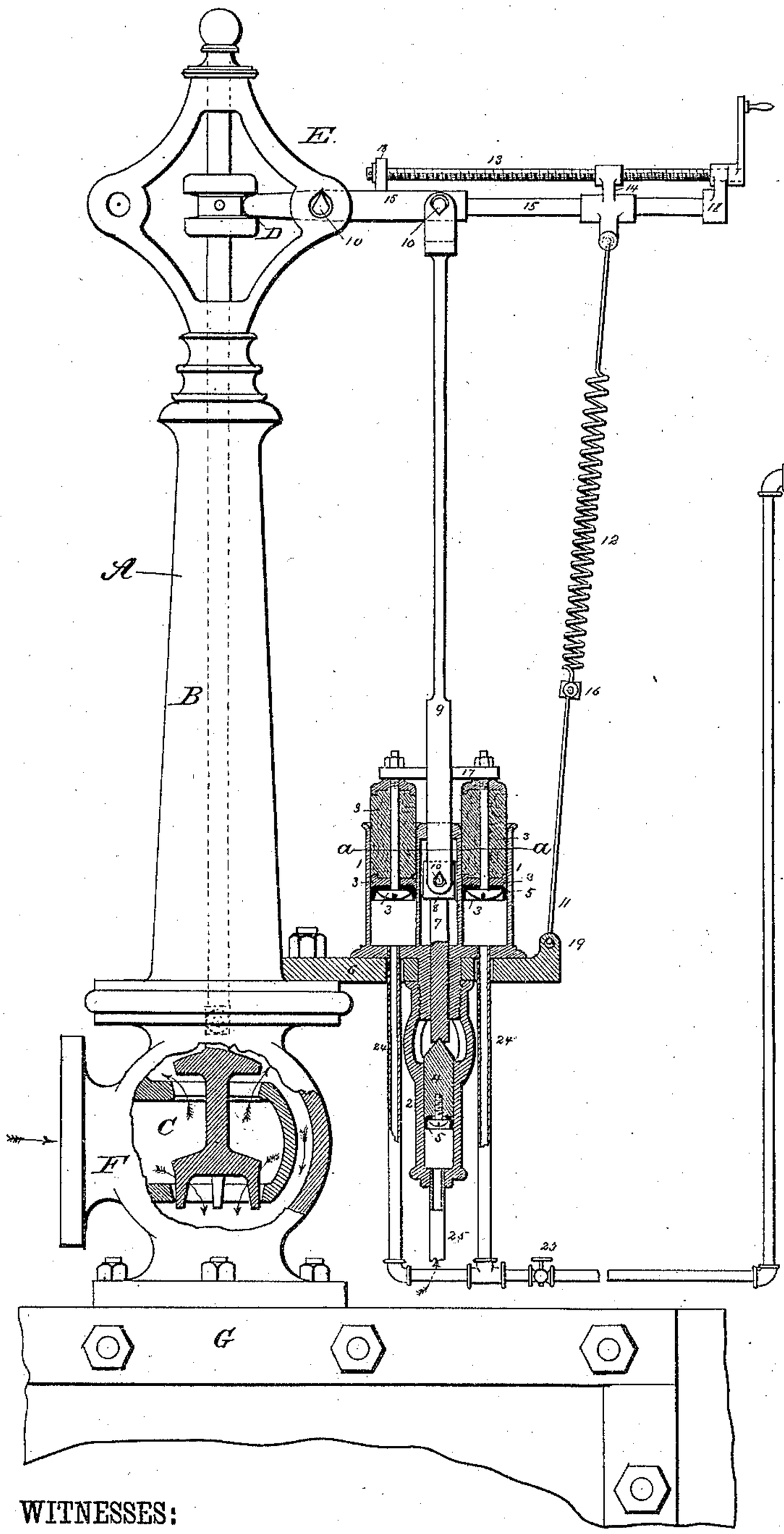

Fig. 1.

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Fig. 2.

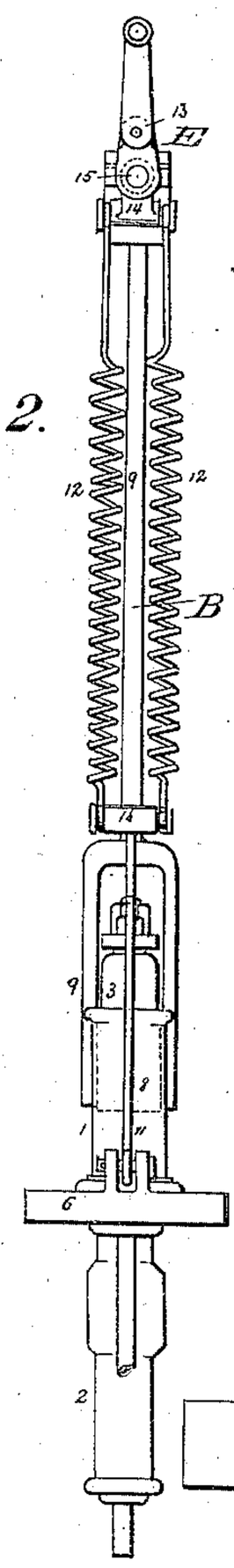


Fig. 3.

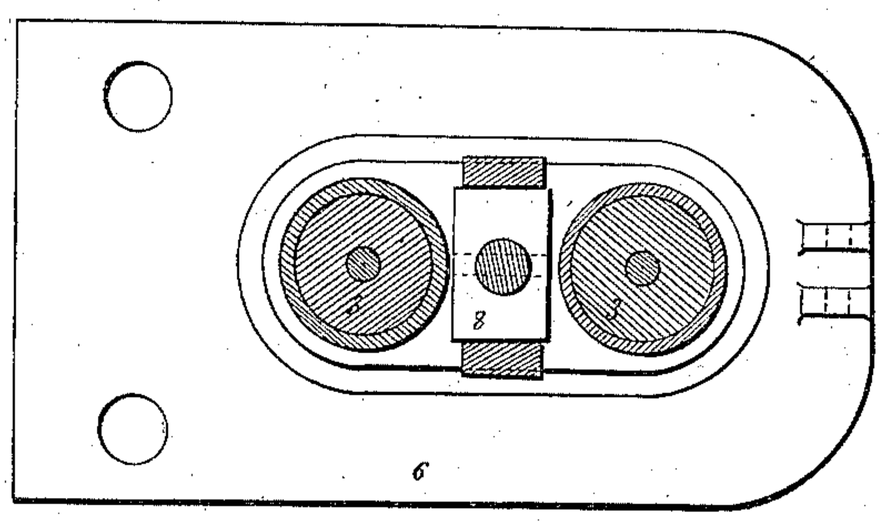
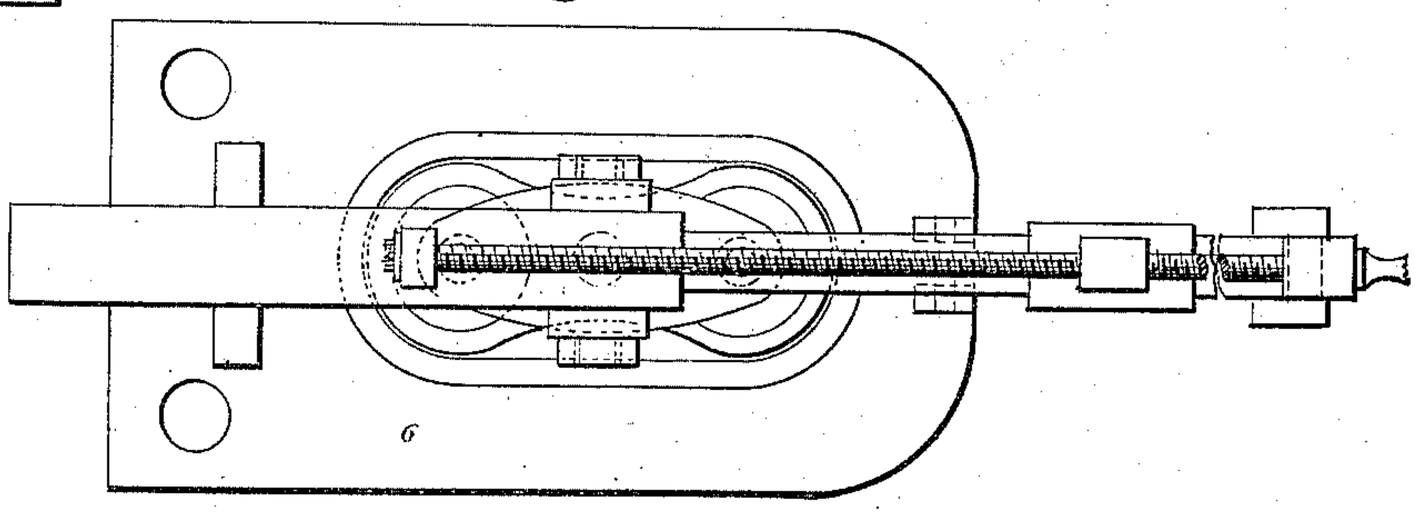


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOSEPH CASPER COSFORD AND JOHN PAUL KERN, OF MARQUETTE, MICH.

STEAM-ENGINE GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 335,892, dated February 9, 1886.

Application filed September 15, 1885. Serial No. 177,164. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH CASPER COSFORD and JOHN PAUL KERN, citizens of the United States, residing at Marquette, in the county of Marquette and State of Michigan, have invented certain new and useful Improvements in Steam-Engine Governors; and we 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.

Our invention relates to that class of steam-engine attachments known as "governors," the object of the same being to provide a device of this character which shall be adapted to have absolute and instantaneous control over the valve which supplies the live steam to the steam-chest and cylinder, and at the same time have the governor perfectly automatic in its action and capable of being adjusted in such a manner that it will at all times admit the exact quantity of steam required, and no more, to maintain the action of the engine at a required or given uniform rate of speed under all the varying circumstances of boiler-pressure or change of burden or load against which the engine is working, thus maintaining and holding the engine at any required rate of speed.

Our invention consists in certain novel features of construction and combination of parts, as will be hereinafter more fully described, and pointed out in the claims.

In the drawings which are made part of this specification, Figure 1 shows an upright sectional view of our governor, which, by way of further designation, we have named the "Marquette Governor." Fig. 2 is a sectional view, more in detail, of certain parts. Fig. 3 is a sectional view or plan of two water-pistons at the point *a a*, Fig. 1. Fig. 4 is a plan view of the bed-plate, to which are attached the two water-cylinders and the steam-cylinder, showing also the lever and adjusting tension-screw.

1 1 are two water-cylinders, slightly bell-mouth, and having a common bearing with shoulders closely fitting upon a bed-plate, 6, the central portion being turned off and accurately fitted, so as to pass through a hole in the bed-plate, and having a male thread cut thereon, suited to engage a female thread cut in the inside of the upper end of the steam-cylinder 2, by means of which the two water-cylinders 1 1 and the steam-cylinder 2 are firmly and securely fastened to the common bed-plate 6. This central opening through the connection and through the bed-plate is exactly over and on a line with the piston 4 of the steam-cylinder below, and is suited to the free action of the connection-rod 7, which is attached to the cross-head 8, and also connected by the fork connection-rod 9 to the lever 15 15.

3 3 are two water pistons or plungers, constructed of wood and metal, and accurately fitted to the cylinders 1 1, both pistons having shoulder metal caps at both ends, and each having a crown-head screw or bolt passing through its center from end to end, to hold the metal caps and the leather self-packing 5 5 in position, the upper end of said screws or bolts passing through a common cross-bar or cross-head, 17, and secured thereto by nuts or burrs, as shown in the drawings. The leather self-packing on the metal steam-piston 4 is held in place by a crown-head screw, while the upper end of said piston forms a cone, and is adapted to engage the connection-rod 7 from above. The connection-rod 7 is attached to the cross-bar 17, and is also connected by the fork connection-rod 9 at the cross-head and guide 8 and to the lever 15 15, having the V-bearings 10 10.

10 10 are V-bearings.

11 is the extension-rod to connect tension-spring to a fixed point below.

12 are two tension-springs, arranged to overcome upward pressure from water on the pistons 3 3 and steam-pressure on metallic piston 4.

13 is a regulation tension-screw, by means of which the position of the cross-head slide may be changed on the lever, in order to make the tension-springs engage the lever with more or less power, as may be desired.

14 is a combined movable slide on the lever 15 15 and nut through which the regulating tension-screw 13 operates.

15 15 is a lever connected at the point E, which is the fulcrum, with an arm of the column A, adapted to engage the spindle B at the point D to open or close the cut-off or throttle C, the said lever being connected by its long arm to the fork connection-rod 9 and the two

tension-springs 12 12, as shown in the drawings.

16 is a cross-head to connect tension-springs.

17 is guide-plate for piston and cross-head.

18 18 are guide-bearings for tension-screw.

19 is the lower pin-connection for extension-rod.

20 is the sand-trap, in which any possible sand or sediment in the water is allowed time to settle before going to the water-pistons.

21 is the drip-pipe for drawing off sand and sediment.

22 represents water-supply pipes from pumps connected with engine.

23 is the globe-valve cut-off to regulate water-pressure supply to keep the governor from acting too sensitively.

24 24 are water-supply feed-pipes.

25 is the steam-pipe from boiler, allowing steam to act upon condensed water through a goose-neck connection, (not shown on drawings,) so that steam will not come in contact with leather self-packing.

In our invention we do not limit ourselves strictly to the forms of construction herein shown.

It will be seen by the foregoing combination and construction that whenever the separate or combined upward pressure from the water upon the pistons 3 3 and of the steam upon the piston 4, acting through the connection-rod 7 and the forked connection-rod 9 upon the long arm of the lever 15 15, is greater than the power exerted in a downward direction by the tension-springs 12 12 on the lever, the lever will be raised, its short arm engaging the spindle B of the valve at D, thus closing the cut-off or throttle C, and, vice versa, whenever the upward pressure upon said valves is less than the power exerted by the tension-springs upon said lever, the lever will be drawn down, thus opening said cut-off or throttle, and whenever the pressure upon said pistons is just equal to the downward tension of the springs the lever will remain in equilibrium, and the position of cut-off or throttle C will not be changed. It follows, therefore, that any increase or decrease of pressure upon the said pistons, the downward force of the tension-springs upon the lever remaining the same, will work a change on the cut-off or throttle, opening or closing it to some extent.

It is needless, perhaps, to add that should the water-pressure upon the pistons 3 3 be increased and the steam-pressure upon the steam-piston 4 be decreased in the same ratio, the lever 15 15 will not change, and the throttle or cut-off will remain in the same position, and vice versa.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In an engine-governor, the combination of two water-pistons, 3 3, connected to a common cross-bar and cross-head, 17, and operated upon by water-pressure from pumps connected with engine, the connection-rod 7, firmly attached to the cross-head and guide 8 and the cross-head 17, with the metallic piston 4, operated upon by steam-pressure from boiler, with the fork connection-rod 9, attached to the cross-head and guide 8 and to the lever 15 15, to engage the spindle B at the point D with the spindle B of the column A, with the cut-off or throttle C of the globe-valve F, attached to steam-chest, as and for the purposes substantially as described.

2. In an engine-governor, the combination of the water-cylinders 1 1 with the pistons or plungers 3 3, with metal shoulder-caps and leather self-packing 5 5, with the crown-head screws or bolts passing through the center of said pistons, with their common cross-bar 17, having a rod-connection downward, 7, between said cylinders, to engage the steam-piston 4 of the cylinder 2 with the cross-head 8, with the fork connection-rod 9, with the lever 15 15, to engage the spindle B of the cut-off or throttle C, as and for the purposes substantially as described.

3. In an engine-governor, the combination of the pistons 3 3, operating in the cylinders 1 1, with the steam-cylinder 2, with the metal piston 4, having its upper end cone-shaped and adapted to engage the spindle or connection-rod 7 with the cross-head 8, the fork connection-rod 9, with the lever 15 15, the tension-spring 12 12, the extension-rod 11, the lower pin-connection for extension-rod 19, its cross-head connections 14 and 16, with the tension-screw 13 and its bearings 18 18, with the combined movable slide 14 upon the lever 15 15, serving also as upper cross-head to tension-springs, and as a movable nut, through which the tension-screw operates, the spindle B of the cut-off or throttle C, with the column A, as and for the purpose substantially as described.

4. In an engine-governor, the combination of the cylinders 1 1 and 2 with the respective pistons 3 3 and 4, the water-cylinders 1 1 being secured to the bed-plate 6 above, and connected to and with the steam-cylinder through the bed-plate, in the manner substantially as shown, with the sand-trap 20, the drip-port 21, with the water-supply ports from the pumps connected with the engine, 22, the globe check-valve to regulate the pressure of the water, to prevent the governor from acting too sensitive, 23, with the water-pressure feed 24 24, the pistons 3 3, with the cross-bar 17, the steam metal piston 4, with the steam-port 25, the piston-rod 7, the cross-head 8, the fork connection-rod 9, with the lever 15 15, with the spindle B of the cut-off or throttle C, as and for the purposes substantially as shown and described.

5. In an engine-governor, the combination of the bell-mouth cylinders 1 1 with the pistons 3 3, the leather self-packing 5 5, the guide-plate and cross-head 17, with the connection-rod 7 downward between said cylinders and through the cross-head and guide 8, through the bed-plate 6, to engage the metallic

piston 4, the steam-cylinder 2, the fork connection-rod 9, with the cross-head 8, and the lever 15 15, with the tension-springs 12 12, with the tension-screw 13, the bearings 18 18, the spindle B of the cut-off or throttle C, as and for the purposes substantially as shown.

6. In an engine-governor, the combination of the pressure from the boiler through the steam-port 25 on the metal piston 4 in the cylinder 2, with the connection-rod 7, the cross-head and guide 8, with the pressure of the water upon the pistons 3 3 in the cylinders 1 1, the feed-pipes 24 24, the globe check-valve 23, the supply-pipes from the pumps, 22, the sand-trap 20, the drip-port 21, the cross-bar 17, with the connection-rod 7, the cross-head and guide 8, the fork connection-rod 9, with the lever 15 15, with the tension-springs 12 12, the tension-screw 13, the spindle B of the cut-off or throttle C, as and for the purposes substantially as set forth.

7. In an engine-governor, the combination of a single steam-cylinder attached to the under side of a bed-plate and secured thereto by a tubular fitting coming down through a hole in the bed-plate from two water-cylinders standing side by side and attached by the same fitting to the bed-plate above, the steam-cylinder having a metal piston therein adapted to operate by direct boiler-pressure, the head of the piston having a conical-shape bearing adapted to engage the end of a connection-rod attached to a cross-head and guide coming down from above the bed-plate through the tubular connection, the cross-head being free to move up and down in the guide between the water-cylinders, and being attached to a lever by means of a fork connection-rod, with two water-cylinders having pistons connected at their tops by a common cross-bar and acting in unison, being adapted to receive water-pressure from a common feed-pipe from pumps connected with the engine, their common cross-bar being connected by a connection-rod and a fork connection-rod to a lever, the steam-piston and the water-pistons being adapted to impart upward pressure upon said lever, with two tension-springs attached to the lever, and adapted to draw down the end of the lever and to overcome the upward pressure of the steam and water, the short arm of said lever being adapted to open or close the cut-off or throttle, as and for the purposes as described.

8. In an engine-governor constructed substantially as shown, the combination of two tension-springs attached to the long arm of a lever by means of a sliding cross-head, their opposite ends being securely fastened to a cross-head and extension-rod to a fixed point below, the sliding cross-head also forming a movable nut, through which passes an endless screw with suitable bearing, and adapted to change the position of the sliding cross-head upon the lever, so as to make the springs engage said lever with more or less power when desired, with two water-cylinders standing side by side upon and being firmly and securely attached to a bed-plate, and through a bed-plate to a steam-cylinder below, which is provided with square shoulders, and is also securely fastened to the bed-plate and the cylinders above by means of a thread cut on the inside of the upper extension of the steam-cylinder, and adapted to engage the tubular portion of the shoulders of the two water-cylinders above coming down through a hole in the bed-plate, the water-cylinders being provided with wooden pistons or plungers having metal shoulder-caps at both ends and a leather self-packing adapted to work in said cylinders, both pistons having crown-head screws or bolts running through their centers from end to end, with suitable nuts, and being connected at their top by a common cross-bar, which allows of their free movement up and down in the cylinders, the cross-bar having a connection-rod extending downward through a cross-head and guide between said cylinders and through a tube in the bed-plate on a line with and to engage the metallic piston of the steam-cylinder below, the cross-head and guide above being connected to a lever by means of fork connection-rod, the water-pistons being adapted to impart motion to the lever from the pressure of the water through a supply-port from pumps connected with the engine, the steam-piston being also adapted to impart motion to the lever from the pressure of the steam from the boiler through a steam-port, the lever being adapted to open or close a cut-off or throttle, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

JOSEPH CASPER COSFORD.
JOHN PAUL KERN.

Witnesses:
JAMES M. WILKINSON,
A. F. MAYNARD.