2 Sheets—Sheet 1.

E. L. OTIS.

Governor for Pumping-Engines.

No. 208,489. Patented Oct. 1, 1878.

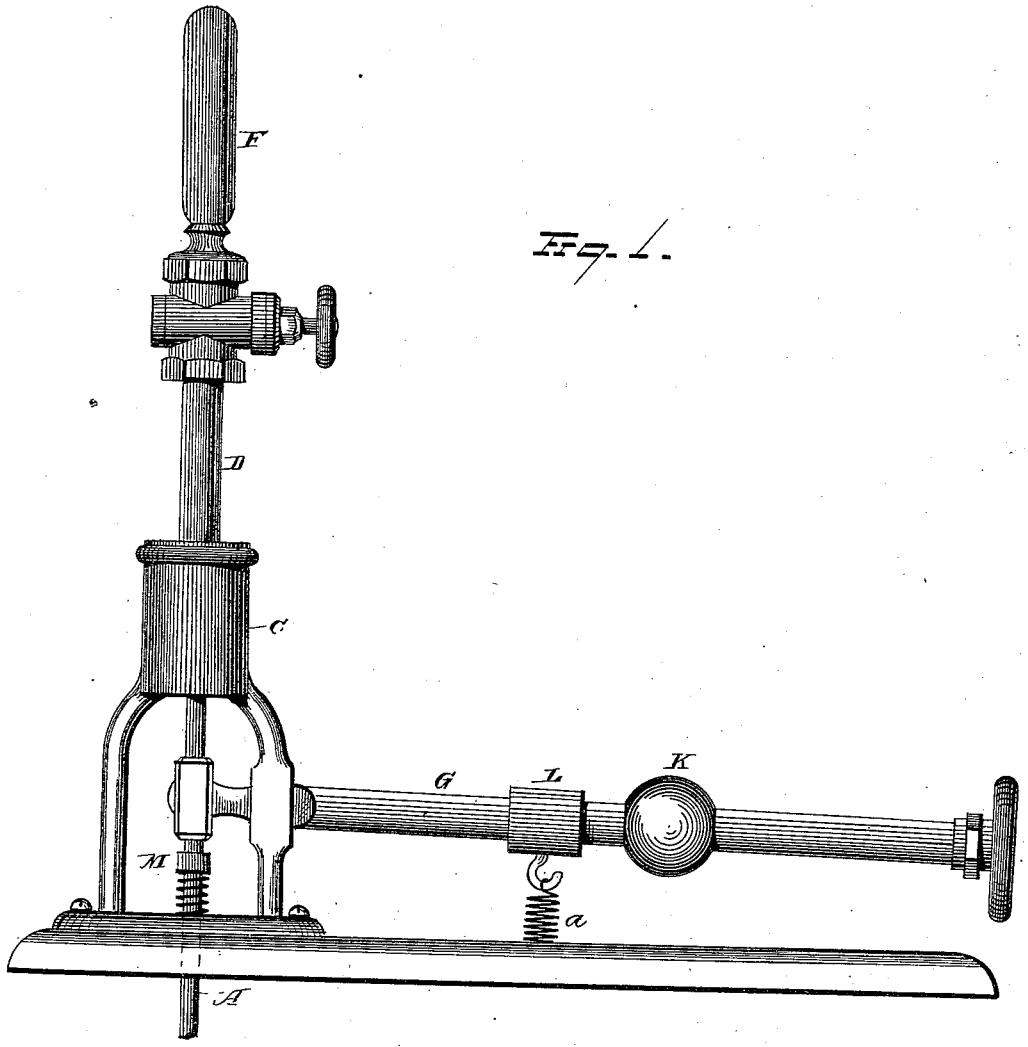


Fig. 1.

WITNESSES
E. J. Nottingham
A. M. Bright

INVENTOR
E. L. Otis.
By Leggett & Leggett.
ATTORNEYS

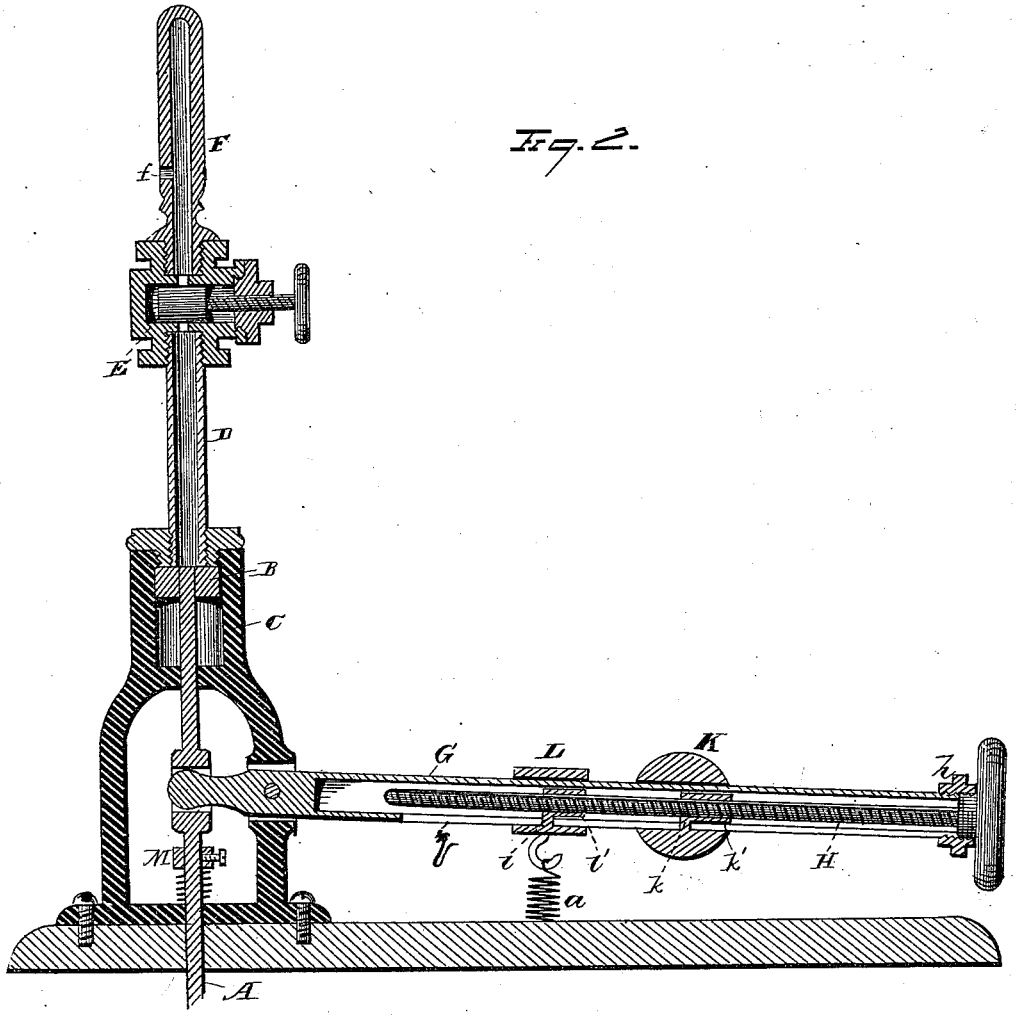
2 Sheets—Sheet 2.

E. L. OTIS.

Governor for Pumping-Engines.

No. 208,489. Patented Oct. 1, 1878.

Fig. 2.



WITNESSES
E. G. Nottingham
A. W. Bright

INVENTOR
E. L. Otis.
By Liggett & Liggett.
ATTORNEYS

UNITED STATES PATENT OFFICE.

ELBRIDGE L. OTIS, OF ROCHELLE, ILLINOIS.

IMPROVEMENT IN GOVERNORS FOR PUMPING-ENGINES.

Specification forming part Letters Patent No. **208,489**, dated October 1, 1878; application filed July 8, 1878.

To all whom it may concern:

Be it known that I, ELBRIDGE L. OTIS, of Rochelle, in the county of Ogle and State of Illinois, 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to improvements in that class of governors which regulate the action of steam-engines in the operation of force-pumps.

The object of the invention is to provide a governor for regulating the flow of steam to a pumping-engine, wherein the pressure in the main or eduction end of the pump will regulate and maintain the desired flow of steam to the engine; and to that end my invention consists in the following combinations of parts, as will more fully appear from the following description and claims.

Referring to the drawings, Fig. 1 is a view, in side elevation, of an apparatus embodying the invention. Fig. 2 is a view showing the same in sectional elevation. Each of said views simply represents those parts which constitute my invention, and their adaptation to suitable connecting mechanism is readily apparent without illustrating any specific form of the latter.

The valve-rod A connects at its lower extremity with any suitable valve adapted to govern the supply of steam to a pumping-engine, preferably a balanced valve. Its opposite end is provided with a piston, B, which works in a piston-cylinder, C, the latter communicating at its upper end with a connecting-pipe, D, having a valve, E, located therein in a suitable valve-chamber. This valve may be of any other form adapted to accomplish the purpose of wire-drawing the water into the piston-cylinder.

Preferably, in substitution for the globe-valve, I employ a perforated disk, the object being simply to provide means intermediate of the service-main or the eduction end of the pumping-engine and the piston-cylinder, whereby the passage of water between the same may be controlled and the action of the governor made quick or slow, as desired. The valve-stem is provided with a suitable hand-wheel or other means for operating the valve from without its chamber.

Instead of employing a valve or perforated disk, I may use a pipe having a very small passage-way. Secured above and in communication with this connecting-pipe D is an air-chamber, F, which is provided with an opening, *f*, adapted to engage with any suitable pipe connecting the said air-chamber with the service-main or eduction end of the pumping-engine. Communication with the same being established, the water enters the air-chamber under the same pressure, and forces a body of air up against the top of the air-chamber. This compressed body of air acts as an elastic cushion in bearing the sudden and violent increases of water-pressure which may occur. The reverse of this operation also obtains when the water-pressure is lessened, as in such instance the expansion of the compressed air prevents too sudden a change in relief of pressure in the piston-cylinder. From the air-chamber the water passes through the connecting-pipe, which carries it to the piston-cylinder, and in this passage it is subjected to the control of the valve, or other means which determines the degree of quickness or slowness with which the changes in its pressure shall operate upon the piston.

The action of the water-pressure upon the piston tends to move the valve-rod so as to close the steam-supply valve to the pumping-engine, and in this action it is resisted by the weight of the counterbalancing-lever G, which operates as a lever of the first order to move the valve-rod so as to open the said steam-supply valve. This lever is tubular, and also formed with the longitudinal slot *g*, preferably made in its lower or bottom side.

A screw-shaft, H, is detachably connected with the lever by a screw-clamping collar, *h*, and is provided with a suitable hand-wheel at its end, which projects from without the said tubular lever.

Any suitable form of weight-adjusting device may be used. Preferably I provide a ball, K, or a collar, L, which latter is connected with a spring, *a*, secured to a rigid object at its op-

posite end. In the drawings, I represent both these forms of adjusting devices, and also an upwardly spring-pressed collar, M, embracing the valve-rod, and adapted, by engagement with the valve-rod, to tend to raise the latter. This spring-pressed collar embracing the valve-rod is preferable in use, though not necessary, and either of the two adjusting devices on the lever may be used to the exclusion of the other.

Webs or fins *k* and *l* are respectively formed on the ball K and the collar L, the same projecting through the longitudinal slot of the lever, and provided with tubes *k'* and *l'*, screw-threaded on their interior, and through which the screw-shaft passes. By means of the rotation of said shaft within the tubular lever the adjusting devices are moved, as desired, to or from the fulcrum of the lever, to correspond with the given degree of pressure which is to be maintained in the service-main or eduction end of the pumping-engine. If a certain number of pounds pressure is to be maintained in the same, the adjusting devices are correspondingly set on the counterbalancing-lever, so that the valve-rod will tend to keep its valve open until a water-pressure in excess of that given as desired presses upon the piston, and forces the valve-rod to close its valve. The reverse of this operation obtains by the same means, as is apparent.

The foregoing described mechanism is preferred by me in the carrying out of the principle of my invention; but I am not restricted to the detail construction and arrangement of the same. For instance, the pipe which is adapted to wire-draw the water in its passage to the piston-cylinder need not be between the latter and the air-chamber; but, if desired, the same may be located between said air-chamber and the service-main or eduction end of the pumping-engine. So, too, any other form of an adjustably-weighted lever may be employed in substitution for the tubular slotted lever which connects with the valve-rod.

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

1. A hydraulic governor for force-pumps, the same consisting in the combination, with a steam-supply valve-rod provided with adjustable mechanism tending to force it upward and open the valve, of a piston secured to its upper extremity, and a piston-cylinder, which latter communicates at its top with pipe-connection adapted to permit of the passage of water from the service-main or eduction end of the engine into said cylinder, substantially as set forth.

2. In a hydraulic governor, the combination, with a rod attached to the steam-supply valve of the pumping-engine, and piston attached to one end of said rod, said piston located in a cylinder having communication at its upper end with the main or eduction end of the pump, of a valve for wire-drawing the water, said valve located between the cylinder and water-main, and mechanism for regulating the upward pressure on the valve in opposition to the water-pressure on the piston, which tends to close the valve, substantially as set forth.

3. The combination, with a steam-supply valve-rod, provided with adjustable mechanism tending to force it upward, and formed with a piston on its upper extremity, of an air-chamber having communication with the service-main or eduction end of the engine, and adapted in any suitable manner, to cause the water under elastic pressure to enter the cylinder of said piston above the latter, substantially as set forth.

4. The combination, with a steam-supply valve-rod provided with adjustable mechanism tending to force said rod upward, and formed with a piston on its upper extremity, which works in a suitable cylinder, of an air-pressure chamber having communication with the service-main or eduction end of the engine, and an intermediate upright pipe connecting the same with the top of said cylinder, said pipe being adapted by valve or other suitable means to wire-draw the water into the cylinder, substantially as set forth.

5. The combination, with a steam-supply valve-rod and a lever provided with a movable-weight device, of a shaft adapted by engagement with the latter to adjust the same upon said lever, substantially as set forth.

6. The combination, with a steam-supply valve-rod, of a tubular lever provided with an interior shaft, and a weight-adjusting device adapted to be moved upon the lever by engagement with said shaft, substantially as set forth.

7. The combination, with a tubular lever connected with a steam-supply valve-rod and formed with a longitudinal slot, of a shaft adapted to be rotated in said lever, and a suitable weight device, the latter formed with a fin or web, which projects through said slot and is provided with a tube having screw-thread engagement with said shaft, substantially as set forth.

8. The combination, with a steam-supply valve-rod provided with an upwardly spring-pressed collar, which engages therewith, of an adjustably-weighted lever, tending to raise said valve-rod, substantially as set forth.

9. The combination, with a steam-supply valve-rod, which is upwardly spring-pressed, of a tubular lever formed with a longitudinal slot, an interior rotating shaft, and an adjustable-weight device, which latter is adapted to have engagement with said shaft by a projection passing through said slot, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 26th day of June, 1878.

ELBRIDGE L. OTIS.

Witnesses:
G. W. CLARK,
W. W. GOULD.