(No Model.)

R. J. HOFFMAN.

SPEED REGULATOR.

No. 472,355. Patented Apr. 5, 1892.

Fig. 1.

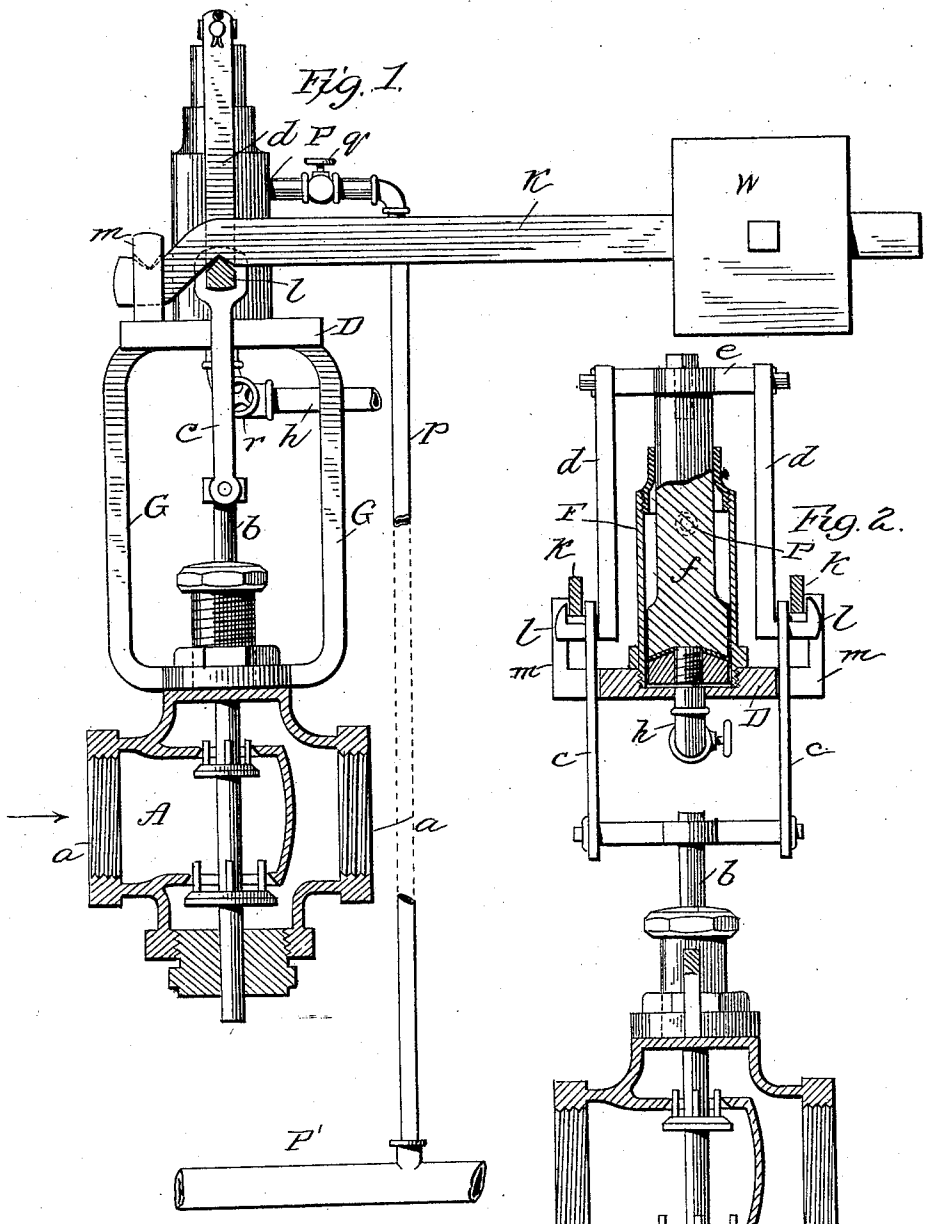
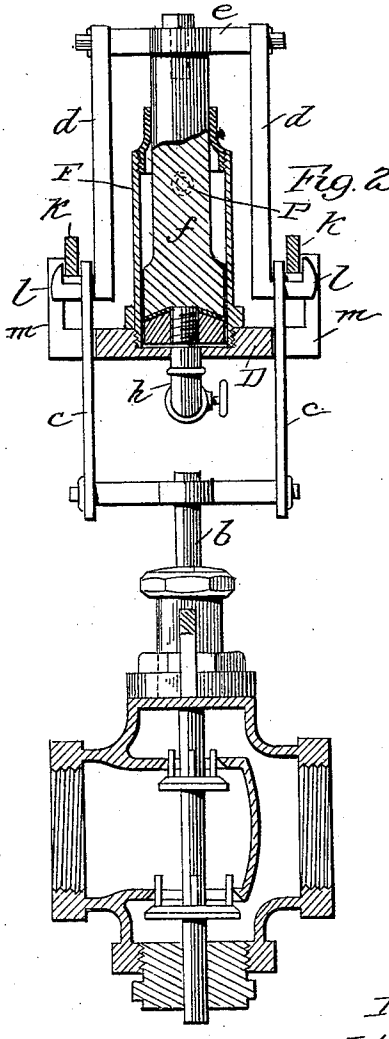


Fig. 2.



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UNITED STATES PATENT OFFICE.

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SPEED-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 472,355, dated April 5, 1892.

Application filed June 8, 1891. Serial No. 395,558. (No model.)

To all whom it may concern:

Be it known that I, ROSS J. HOFFMAN, a citizen of the United States of America, residing at Binghamton, in the county of Broome and State of New York, have invented certain new and useful Improvements in Speed-Regulators, of which the following is a specification.

The invention set forth hereinafter is an improvement in regulating devices for controlling the throttle-valves of the steam or other pipes which supply the motive power to the driving-engine and is of that particular class in which the regulating device is controlled by the water-pressure produced by the engine.

The object of the invention is to obtain a sensitive and uniform action of a regulating device upon the throttle-valve.

The special features are described in connection with the parts which are old and are indicated in the claim.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 shows the apparatus in side elevation. Fig. 2 is a similar view, partly in section.

In the drawings, A represents the valve-chamber of a main supply-pipe by which steam or other fluid under pressure conveys power to the driving-engine, the threaded ends *a a* of the valve-chamber showing the connections, the direction of the current being indicated by the arrow 1. In the valve-chamber is shown an ordinary valve, the stem of which *b* projects through a stuffing-box and is connected by a yoke *c*, the arms of which pass up outside of the base D of the pressure-cylinder and are connected to the hooked end of arms *d*, the upper ends of which are connected with the cross-bar *e*, which rests on the upper end of the piston *f*. This connection is such that the throttle-valve is suspended upon the piston of the pressure-cylinder and the pressure of the steam or other fluid in the main pipe tends to pull down the piston. The plate D, which supports the pressure-cylinder F, is carried upon a frame G, which is supported upon the valve-chamber, as shown clearly in Fig. 1. A port is made in the lower end of the pressure-cylinder, through which connection is made with a pipe *h*, this pipe having connection with the top of the pump or with some part of the system which receives the pressure of water from the pump, as may be most convenient, it being necessary only that the pipe *h*, which connects with the interior of the pressure-cylinder beneath the piston, should be in communication with the water-pressure caused by the engine, which receives its motor-power through the valve-chamber A. It will be readily understood that the pressure of the water underneath the piston *f* will tend to close the valves. Valves of this class have heretofore been regulated by means of a spring, the pressure of which completed the balancing of the valve and held it in properly-regulated position, adjusted to the required amount of steam or other fluid supplied to the engine. The action of the spring is unequal, and, while it is difficult to start, the resistance of it increases directly with the distance to which it is moved, the result being a reaction and consequent instantaneous and rapid oscillation of the valve. This unequal and sudden movement of the spring is especially unsuitable for operation in connection with the steady and uniform pressure of the water underneath the piston, which acts in opposition to the force of the spring, the water being unyielding and uniform in its movement.

In order to supply a steady uniform regulating pressure better adapted to act in connection with the water-pressure underneath the piston, I have provided a weight W, adjustable, as usual, on the lever K. This lever has bifurcated arms *k*, (shown in Fig. 2,) which extend on each side of the cylinder and are spread so as to rest on the knife-edges of the outwardly-bent ends *l* of the links *d*. The ends of the arms *k* are extended, being bent downward to pass under similar knife-edges on standards *m* on the base D. Thus the lever is fulcrumed at its outer end and acts as a lever of the first order, the resistance of the steam furnishing the work to be done by the lever or weight. The weight being adjustable according to the nature of the throttle-valve which is to be regulated, the pressure of the water, which varies according to the work which is to be done, when it is in excess of the normal pressure or beyond what is required at the moment, acts

to lift the weight, and thus control the throttle-valve, so as to reduce the orifices through which the steam passes, and thus diminishes the supply of steam to the engine. On the other hand, a reduction of the water-pressure in the pipe *h* below the normal or required point will cause the piston to descend by the pressure of the weight and will open the valve and increase the supply to the engine. In either movement the action of the weight is uniform throughout the whole movement, and it starts and stops without violence and without rapid vibrations to which the spring is liable when acted upon by the water-pressure.

In the water-pressure pipe *h* I have provided a regulating-valve *r*, by which I regulate the pressure of the water on the under side of the piston *f*. By means of this valve the most accurate adjustment can be attained and the valve nicely regulated to give the required movement.

In order further to relieve the movement of the piston in the pressure-cylinder from sudden and violent movement, I have established a connection between the chamber in the pressure-cylinder above the piston and the exhaust or suction side of the pump which supplies water to the tank or other receiver of the water-supply. This is shown in Fig. 1 at *p*. Its upper end communicates with the upper part of the pressure-cylinder, the point of communication being shown at P in Fig. 2. The other end connects with the suction-pipe P′ of the pump. While the pump is in action the force of the suction tends to reduce the pressure of the air which is in the cylinder above the piston and in the pipe *p*, and thus regulates the movement of the piston. At the same time the air which remains in the pipe and cylinder serves as a cushion, the elastic nature of which is very greatly increased by the increased space afforded by the pipe connections. The pipe *p* is provided with a regulating-valve *q*, by which the passage may be reduced or closed altogether.

I claim as my invention—

In combination with the throttle-valve and its casing, the pressure-cylinder and piston above the same, the yoke connection between the piston and the valve-stem extending upon each side of the cylinder and having on each side the laterally-projecting bearings *l l*, the plate D, into which the cylinder is screwed, having thereon the bearings *m*, the lever K, engaging the bearings *m* to pivot thereon and engaging the bearings *l* to press the same downward, with the yokes, piston, and valve, and the adjustable weight on the lever, substantially as described.

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

ROSS J. HOFFMAN.

Witnesses:
ISADORE MIDDLETON,
HENRY E. COOPER.