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R. B. McGOWAN.

GOVERNING DEVICE FOR STEAM PUMPS

APPLICATION FILED JULY 2, 1902.

NO MODEL.

Fig. 1.

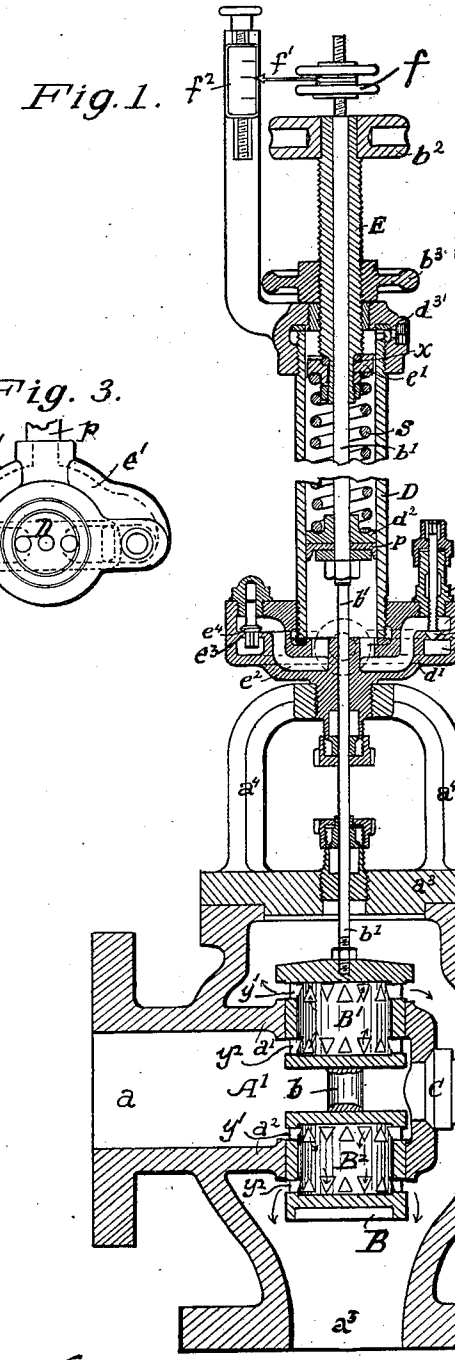

Fig. 2.

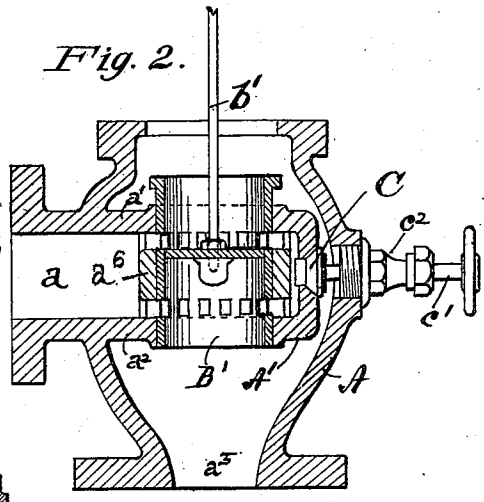

Fig. 3.

Witnesses.

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UNITED STATES PATENT OFFICE.

ROBERT B. McGOWAN, OF CINCINNATI, OHIO.

GOVERNING DEVICE FOR STEAM-PUMPS.

SPECIFICATION forming part of Letters Patent No. 730,682, dated June 9, 1903.

Application filed July 2, 1902. Serial No. 114,141. (No model.)

To all whom it may concern:

Be it known that I, ROBERT B. McGOWAN, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in Governing Devices for Steam-Pumps, of which the following is a specification.

My invention relates to governing devices for regulating the action of pumping apparatus where the resistance head or pressure varies or where it is desired to control the speed according to the demands of use—as in waterworks for municipal and other uses, hydraulic elevators, fire-engines, accumulator systems, air systems, &c.

To this end it consists in a balanced throttle-valve controlling the motor-fluid inlet provided with an adjustable spring acting normally to seat and close the valve and with a piston upon the valve-stem acted upon by pressure from the pump-reservoir in opposition to the spring and also in construction and arrangement of the parts including further features contributing to the efficiency of the device.

Mechanism embodying my invention is illustrated in the accompanying drawings, in which—

Figure 1 is an axial sectional elevation of my improved governing device complete; Fig. 2, a similar section of the valve-casing, showing a modified form of valve; and Fig. 3 a plan view of the valve-governing cylinder and its base, containing the passages for the water or air from the reservoir.

Referring now to the drawings, A designates the valve-chamber, into which the steam-inlet a extends, the inner closed extension A′ of said inlet a being pierced through its upper and lower walls a' a^2 for the play of a form of piston-valve B, to be more particularly described. An aperture is provided at the extremity of the extension A′, governed by an ordinary stop-valve C, whose stem c' extends outward through the side wall of the chamber A through the usual stuffing-box c^2, through which the stem c' is threaded.

The stem b' of the piston-valve B extends upward through an ordinary stuffing-box in a cap a^3, constituting the top wall of chamber A, and through a similar stuffing-box of a chambered bottom d' of a cylinder D, supported upon a yoke-piece a^4, rising from the cap a^3. Within the cylinder D and to the stem b' is secured a piston d^2, fitted with a cup-leather or other suitable packing p. The stem b' extends still upward through a flanged throat-piece E, threaded through a cap d^3, constituting the top or end wall of the cylinder D.

Within the cylinder D, interposed between the piston d^2 and a corresponding seat-flange e', (centered upon the lower end of the throat-piece E,) is a coiled spring S in compression, acting normally to depress the piston d^2 and the main valve B, to which it is ultimately connected through the stem b'. To increase the compression of the spring S, the throat-piece E is rotated in its threaded seat in the cap d^3 by means of a fixed hand-wheel b^2 and held fixedly in any position of adjustment by a jam-nut b^3, seated on its threaded portion and contacting against the cap d^3. To ease the friction of interrotation, ball-bearings x are introduced between the lower shoulder of the throat-piece E and the seat-flange e'.

The main valve B is a perforated cylindrical shell with closed ends and a central diaphragm. As shown in its preferred construction, the cylindrical valve is divided horizontally through the central diaphragm into two parts or chambers B′ B², spaced apart by a connecting-stem b. The two closed cylinders are duplicates, fitted to play with a practically steam-tight fit in like relations, respectively, in the upper and lower walls a' a^2 of the extension A′. Each chamber is provided with two horizontal series of perforations y' y^2 through the outer shell in such relation that in the mid-position of the valve shown in the drawings, Fig. 1, the openings stand equally above and below the walls of the extension A′. In this position the steam from inlet a passes freely through one set of the apertures into each chamber of the valve B and out through the other set of apertures, as indicated by the arrows, and thus freely supplies the motor-cylinder of the pump, (not shown;) but any elevation or depression of the valve B from this position will partially or wholly close the apertures by shifting their relation with the walls a' a^2, thus diminishing the steam-pressure. I prefer to make the steam-

apertures of the valve-shell of angular form, as indicated, so as to equalize the wear of parts, as is well understood. The vertical reciprocation of the valve is effected by pressure upwardly against the lower side of the piston p, and the counteracting downward pressure of spring s upon the upper side controlled as follows:

The chambered base d' of the cylinder D is cast with an admission-passage e', having a pipe connection p with the receiving-reservoir of the pump. (Not shown.) A second passage e^2, separated from the first by a diaphragm e^3, communicates with the bottom of the cylinder D. The separating-diaphragm e^3 is provided with two apertures communicating between the passages e' e^2, one controlled by a check or lift valve e^4, resting upon its seat normally by gravity, and the other aperture is controlled by an adjustable stopper or valve e^5, whose stem is threaded through a throat-piece e^6 and further provided with a stuffing-box. The function of the lift-valve e^4 is to retain the pressure beneath the piston p in case the resistance is reduced until relieved by the escape through the opening controlled by the plug-valve e^5, which can be adjusted so as to regulate, as desired, the adjustment of the equilibrium.

The operative functions of the device are as follows: In the accompanying drawings the parts are shown in mid-position of the main valve B, are open to the fullest extent, the valve B being held in such position by the upward pressure of motor fluid entering the passage e', lifting the check-valve e^4, entering the cylinder D through passage e^2, and then actuating the piston p against the counteracting force of the spring s. The spring s is "set" to the exact tension required to maintain the equilibrium of pressure necessary to retain the proper head or resistance at delivery end of the pump by means of the threaded throat-piece E, which, as stated, is secured in ultimate position by the jam-nut b^3. As the available steam-power is always somewhat in excess of that required to maintain the desired head, the full flow of steam will actuate the pump so as to raise the resistance head or pressure above the normal limit, and in such case the excess of resistance-pressure against the piston p will raise the valve B against the spring force, and thus lessen the supply to the motor end of the pump. As the resistance head or pressure diminishes the check-valve e^4 seats itself, and the equilibrium of pressures as between the passages e' and e^2 is soon attained by the retarded flow through the aperture controlled by the valve e^5, which acts as an adjustable stopper, and thus the valve B vibrates between the position of full opening (shown in Fig. 1) and that of a possible elevation, completely shutting off the steam. The downward limit of the valve B may be regulated by a nut f, threaded upon the extreme upward projection of the valve-stem b', constituting a stop by contact downward against the top of the throat-piece E; but while the service is in active operation the nut f will be raised above the throat-piece E and may be utilized as a carrier to move a pointer f' over a scale-piece f^2, indicating the relative positions of the valve B. When steam is shut off for a cessation of the pumping operation, the valve B will drop down as soon as the resistance head or pressure is lessened, if permitted by the stop f, until the flange at the upper end of the valve B contacts with the wall a', in which position the valve closes the steam-passage. To resume operations, the valve C is opened, thus admitting steam to the pump independently of the valve B until the normal resisting-head is reached, when the valve C is closed and the valve B again controls the action. The downward play of the valve B may be limited, if desired, to the mid-position shown by means of the nut f described; but ordinarily this is not required. It will be convenient generally to use the nut f in the position shown, and attached pointer f', operating upon an indicator f^2, to show the position of the main valve B.

The modification shown in Fig. 2 consists in constructing the valve B' with open ends and with two sets of openings, one at either side of a central diaphragm. The upper and lower walls a' a^2 of the extension A are connected by a shell a^5, bored to the diameter of the valve and provided with a circumferential opening registering in width with those of the valve B'. The action of the valve is substantially the same as that first described. Steam entering the valve through the series of apertures open to the inlet a passes upward and downward out through the valve above and below the walls a' and a^2 through the exit a^5 to the pump-cylinder. The frame and construction of the valves B and B' is such that they remain balanced at all points of their travel.

I claim as my invention and desire to secure by Letters Patent of the United States—

1. A pump-governing device, embodying a balanced throttle-valve divided into separate chambers each provided with a double series of perforations through the outer shell, said valve having its operating-stem extended as a piston-rod into a pressure-cylinder, and a piston upon the rod actuated in said cylinder in one direction by the resistance head or pressure, and in the other by an adjustable spring, substantially as set forth.

2. In a pump-governing device of the character indicated, the combination of the cylinder, D, and its chambered inlet-passage, with the lift-valve, e^4, and adjustable plug-valve, e^5, substantially as set forth.

3. In a pump-governing device of the character indicated, the combination of the cylinder, D, and its chambered inlet-passage, with the lift-valve, e^4, and adjustable plug-valve,

e^5, the piston, its governing-spring, and the adjustable throat-piece, E, substantially as set forth.

4. In a pump-governing device of the character indicated, the valve-chamber, A, having the inlet extension, A′, in combination with the perforated hollow valve divided horizontally into separate chambers each provided with a double series of perforations through the outer shell, said valve playing through the upper and lower walls of said extension, substantially as set forth.

5. In a pump-governing device of the character indicated, the valve-chamber, A, having the inlet extension, A′, in combination with the hollow valve divided into separate chambers each provided with a double series of perforations through the outer shell, said valve playing through the upper and lower walls of said extension, the stem extended through the governing-cylinder, and the nut, *f*, threaded upon the outward extension of the stem and contacting against the top of an extension of the governing-cylinder, substantially as set forth.

6. In a pump-governing device of the character indicated, the valve-chamber, A, having the inlet, A′, in combination with the perforated hollow valve playing through the upper and lower walls of said extension, and the auxiliary valve C, opening the inlet-passage directly to the exit-passage independently of the throttle-valve, substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ROBERT B. McGOWAN.

Witnesses:
JOS. R. GARTNER,
CHAS. HERBERT JONES.