No. 609,386. Patented Aug. 16, 1898.

# J. C. DEAN.

## STEAM PUMP REGULATOR.

(Application filed Aug. 16, 1897.)

(No Model.)

Fig. 1.

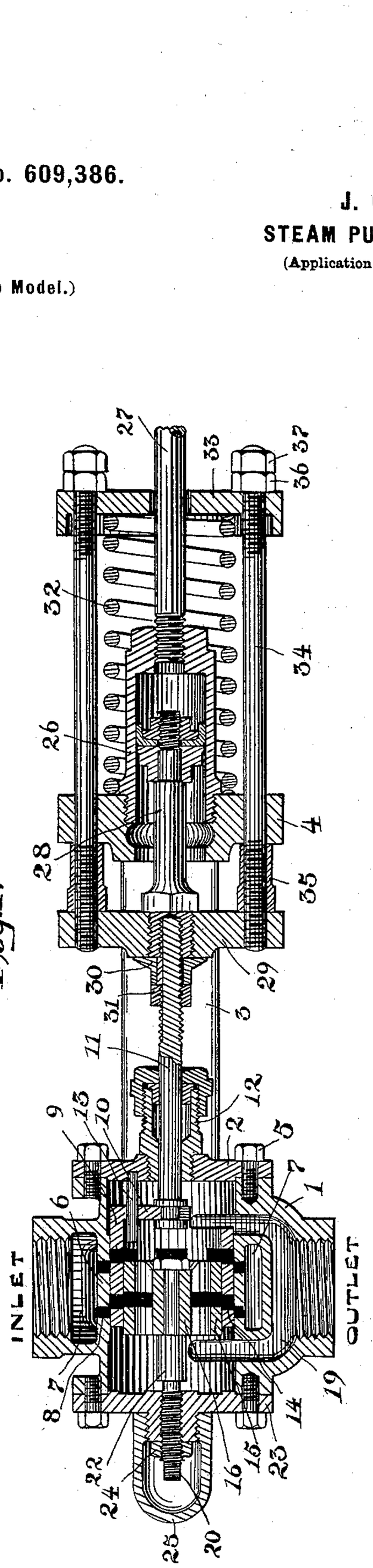


Fig. 2.

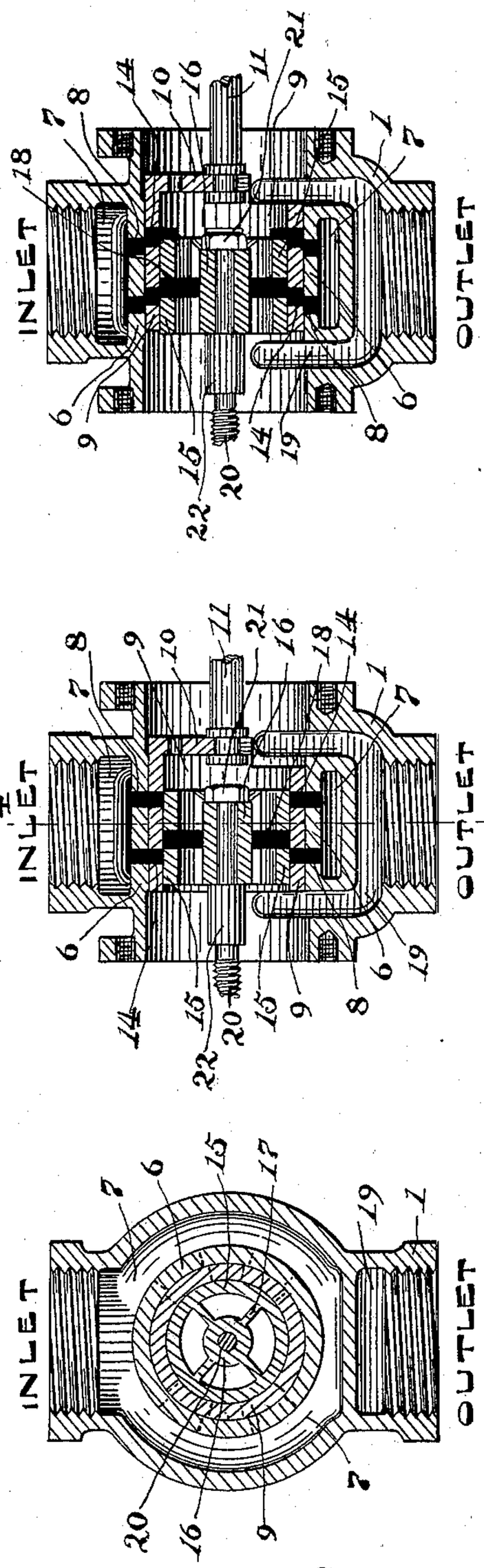


Fig. 3.




Fig. 4.




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# UNITED STATES PATENT OFFICE.

JOHN C. DEAN, OF INDIANAPOLIS, INDIANA.

## STEAM-PUMP REGULATOR.

SPECIFICATION forming part of Letters Patent No. 609,386, dated August 16, 1898.

Application filed August 16, 1897. Serial No. 648,462. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN C. DEAN, of Indianapolis, county of Marion, and State of Indiana, have invented a certain new and useful Steam-Pump Regulator; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like numerals refer to like parts.

My invention relates to a steam-pump regulator that will successfully govern and control the pressure of the water or fluid pumped, the initial speed of the pump, and the speed of the pump when under pressure.

One feature of my invention consists in placing a regulated movable valve in such position with relation to the valve-casing and an adjustable stationary valve that the movement of the regulated valve will modify or close the passage-way through the ports in the casing and valves, and thus regulate the pressure of the fluid pumped and the speed of the pump. I here show the regulated valve located immediately between the casing and the adjustable stationary valve.

Another feature of my invention consists in a construction whereby I am enabled to use balanced valves for this purpose, and to that end I show a valve-casing having a steam-chamber around it and ports from all parts of the steam-chamber, a regulated hollow valve within the casing, and an adjustable stationary hollow valve inside the regulated valve. The steam passes through the valves from all directions and out from the interior of the valves.

Another feature of my invention consists in placing both valves within one valve cylinder or casing, whereby a compact, strong, and durable construction is obtained.

In addition to the foregoing features my steam-pump regulator is simple in construction, easily and accurately adjusted, thoroughly well checked and balanced, and smooth yet positive in its operation to bring about a satisfactory automatic regulation of the pressure and speed.

The full nature of my invention will be understood from the accompanying drawings and the description and claims following.

Figure 1 is a central longitudinal section of my steam-pump regulator, showing approximately the position of the regulated valve before beginning work. Fig. 2 is a section of the valve portion of the device similar to what is shown in Fig. 1, excepting the regulated valve has been moved to the position it would approximately occupy when the pump is working under the proper pressure. Fig. 3 shows the same that is shown in Fig. 2, excepting the regulated valve is in the position it occupies when the pressure has reached the maximum limit desired. Fig. 4 is a central cross-section of the valve-cylinder and valves on the line 4 4 in Fig. 3.

In detail I make a valve-cylinder 1, to which I secure a frame comprising the cylinder-head 2, a pair of parallel arms 3, and a cross-bar 4, preferably integral and secured to the valve-cylinder 1 by the screw-bolts 5 through the head 2.

The valve-cylinder 1 is provided with inlet and outlet openings, as shown, the former for the entrance of steam from any suitable supply and the latter for the outlet of steam to the steam-cylinder of the pump. The valve-cylinder 1 is provided with a valve-casing 6, preferably integral with it and cylindrical, but so placed, as shown, that an inlet steam-chamber 7 extends from the inlet around the casing or substantially around it. The casing is provided with ports 8, consisting of slots that extend in series around said casing. I show two series of these ports in the casing.

Within the valve-casing 6 I place the regulated valve 9, it being a hollow cylindrical sliding piston-valve. It fits snugly within the valve-casing and across one end has an arm or bracket 10, to which a valve-stem 11 is secured, passing through a suitable stuffing-box 12, that is screwed into a threaded aperture in the cylinder-head 2. The regulated valve 9 is prevented from rotating by the pin 13, that is secured to the inner face of the head 2 and extends loosely through a suitable hole in the arm or bracket 10. The regulated valve 9 is provided with ports 14, similar to the ports 8 in the casing and adapted to register with said ports.

Within the regulated valve I place another valve 15, which I call the "adjustable stationary valve." As shown here, it consists of two rings secured to a hub 16 by suitable spokes 17, the rings being separated, so as to leave

the steam-port 18. This is an opening between the two rings all around the valve. The two rings serve to close the two series of ports in the valve 9. Any other construction of hollow valve so as to close said ports and provide ports adapted to register at times with the ports in the valve 9 will suffice. This valve 15 is stationary during the operation of the device and as compared with the valve 9, and it is hollow, so that the steam which passes through its port 18 or the ports in the valve 9 will escape from the chamber within the valves into the outlet-chamber 19 of the valve-cylinder 1. This outlet-chamber consists of a large passage-way from the center along the two opposite sides of the cylinder to the outlet, so that the steam entering the interior may pass both to the right and left in escaping.

The stationary valve 15 is adjusted by the following means: A valve-stem 20 extends through the hub 16 of said valve and is secured therein by the nut 21. It is provided with an enlargement or collar 22 between the valve and the cylinder-head 23, through the center of which said valve-stem extends. The collar 22 serves as a stop to limit the outward movement of said valve 15 while it is being adjusted. The outer end of the valve-stem 20 is threaded and likewise the aperture in the head 23, through which said stem extends. At its outer end said valve-stem 20 is flattened on two sides, whereby it may be readily rotated. It is obvious that when said stem is rotated the valve 15 will be moved in or out. A lock-nut 24 is placed on the outer end of the stem 20 to hold the valve in any desired position. Over the outer end of said valve I screw a cap 25 on a threaded projection from the head 23 to cover the parts.

The cross-bar 4 is centrally apertured and internally threaded to receive the pressure-cylinder 26. A pipe 27 leads to this cylinder from the outlet-pipe of the steam-pump or pipe or other vessel that receives the fluid under pressure from the pump, so that the fluid is under the same pressure in the cylinder 26 as in the outlet-pipe leading from the pump. Within the cylinder 26 a piston or plunger 28 is placed, with its outer end screwed into a threaded aperture in the cross-bar 29. The valve-stem 11 is screwed in a threaded recess in the outer end of the piston 28, making said valve-stem and the piston continuous; but their screw connection permits their combined length to be changed, whereby the regulated valve 9 may be adjusted with relation to the valve-casing 6 and the inner stationary valve 15. This adjustment of the piston or stem of the valve is effected in the following way: A gage-disk 30 is secured on the threaded end of the valve-stem 11 by means of a spline or otherwise, so that it will slide longitudinally thereon, but will not rotate independently of said stem. To the left of said gage-disk there is placed a lock-nut 31. The valve 9, therefore, is adjusted to the right or to the left by loosening the lock-nut 31 and rotating the gage-disk 30, and thereby the valve-stem 11, whereby said valve 9 will be moved to the left or to the right, as the case may be. After the proper position of the valve is obtained the lock-nut 31 is turned back tightly against the gage-disk 30.

The water or fluid in the cylinder 26 under pressure tends to force the piston 28 to the left; but this is prevented, until the desired limit of pressure is reached, by the spiral spring 32, that is coiled about the pressure-cylinder. It abuts against the cross-bar 4 at one end and at the other end against the cross-head or yoke 33, tending to push the latter to the right. The cross-head 33 is connected with the cross-head 29 by a pair of parallel guide-rods 34. These pass loosely through apertures in the cross-bar 4 and screw into the cross-head 29. Threaded sleeves 35 are placed between the cross-head 29 and the cross-bar 4 to limit the movement of such cross-head 29 and rods 34 to the right. On the right-hand ends of the guide-rods 34 a set-nut 36 is placed and preferably a lock-nut 37 also. The tension of the spring 32 is adjusted by the set-nut 36. By screwing it to the left the cross-head or yoke 33 is crowded against the spring 32, compressing it. By screwing said nut to the right the spring slowly relaxes.

The right-hand half of the device, as shown in Fig. 1, is not essentially new and its mode of operation is well understood. The tension of the spring 32 is so adjusted by the means I have described that it will resist the pressure of the water or fluid coming from the pump into the cylinder 26 up to a certain point, whatever pressure may be desired—that is, the spring will prevent the water or fluid under pressure from crowding the piston 28, valve-stem 11, and valve 9 to the left until the pressure has become so great in the cylinder as to overcome the resistance of the spring.

The operation of the valves may now be explained in connection with the means for regulating the valve 9, which has been explained. When the pump is started, both the valves occupy substantially the position shown in Fig. 1 or the reverse—that is, the opening between the port in the valve-casing and the port in the regulated valve 9 is very slight, sufficient only to permit the admission of enough steam to start the pump with the desired initial speed. The ports in the regulated valve 9 and in the stationary valve 15 at such stage register with each other, substantially as shown. As the pressure of water or fluid in the pressure-cylinder 26 increases it slightly and gradually crowds the piston 28, valve-stem 11, and regulated valve 9 to the left, thus increasing the passage-way for steam from the port in the valve-casing to the port in the valve 9, letting in more steam as the work of the pump and pressure increase. When the pressure is at about what is desired, the valve will be in the posi-

tion substantially as shown in Fig. 2, so that the three series of ports will make a large passage-way for the steam. The valve 9 is then so far to the left that the passage-way from the port in the casing to the port in the valve is about half-way open and there is a passage-way of about the same size between the ports in the valve 9 and in the valve 15. When, however, the pressure in the cylinder 26 becomes too great and overcomes the resistance of the spring 32, it suddenly throws the piston 28, valve-stem 11, and valve 9 to the left in the position shown in Fig. 3, leaving no passage-way for steam from the port in the valve 9 to the port in the valve 15. The steam being thus shut off for a time, the pump stops until the pressure in the cylinder has so decreased as to permit the spring to withdraw the valve 9 back into such a position as to make a passage-way for steam through the whole series of ports, whereupon the pump resumes work. It is therefore seen that the dimensions of the passage-way for the steam through the series of ports in the valves and valve-casing vary as the need of steam varies.

The adjustment of the various parts to vary the pressure and speed is as follows: To increase the pressure, compress the spring 32 by screwing up the nuts 36 and 37. This will require the fluid in the cylinder 26 to be under greater pressure than before in order to overcome the resistance of the spring. To decrease the pressure, unscrew said nuts.

To increase the initial speed of the pump, loosen the lock-nut 31 and turn the gage-disk 30 so as to unscrew the valve-stem 11. This will enlarge the passage-way for the steam from the port in the valve-casing to the port in the regulated valve 9 as compared with such passage-way, as shown in Fig. 1. To increase the initial speed of the pump, turn the gage-disk so as to screw the valve-stem in.

To decrease the speed of the pump when under pressure, loosen the lock-nut 24 and turn the valve-stem 20 so as to screw it in, thus decreasing the size of the passage-way from the port in the valve 9 to the port in the valve 15, and hence decreasing the amount of steam that can pass through while the pump is running under considerable pressure. To increase the speed of the pump when under pressure, unscrew the valve-stem, whereby the steam passage-way will be enlarged.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A steam-pump regulator including a valve-casing with a port in it, an adjustable stationary valve, and a regulated valve, said valves being movable for adjustment or regulation in the same direction.

2. A steam-pump regulator including a valve-casing with a port in it, an adjacent regulated valve with a port in it adapted to register with the port in the casing, and a stationary valve adjacent to the regulated valve and so adjustable that the passage-ways into and out of the port in the regulated valve will vary inversely.

3. A steam-pump regulator including a valve-casing with a port therein, a regulated valve with a port in it adapted to register with the port in the casing, a stationary valve adjacent to the regulated valve, and means for so adjusting such stationary valve that by its coöperation with the casing the regulated valve when operated to its fullest extent will at first form a minimum passage-way for steam that gradually enlarges to the maximum and then gradually diminishes until shut off.

4. A steam-pump regulator including a valve-casing with a port therein, a regulated valve with a port in it adapted to register with the port in the casing, a stationary valve adjacent to the regulated valve, means for so adjusting such stationary valve that by its cooperation with the casing the regulated valve when operated to its fullest extent will at first form a minimum passage-way for steam that gradually enlarges to the maximum and then gradually diminishes until shut off, and means actuated by the fluid being pumped for operating such regulated valve.

5. A steam-pump regulator including a hollow valve-casing with a circumferentially-extending port in it from the inlet, a regulated hollow slide-valve within the casing with a circumferentially-extending port in it adapted to register with the port in the casing, and a slidably-adjustable stationary valve within the regulated valve.

6. A steam-pump regulator including a cylinder provided with a casing therein so arranged as to leave an inlet-chamber around the casing and an outlet-chamber leading from the center of the cylinder with a series of ports through the casing leading from all parts of the outlet-chamber, a regulated cylindrical valve within said casing with a series of ports through it adapted to register with the ports through the casing, and a stationary valve within the regulated valve and adjustable in the same direction as the regulated valve moves.

7. A steam-pump regulator including a valve-cylinder having a head centrally apertured and threaded, a regulated slide-valve therein, a stationary valve within the regulated valve provided with a threaded stem extending through the threaded aperture in the head of the cylinder so that its rotation will cause the sliding movement of the stationary valve for its adjustment, and a lock-nut on such valve-stem for locking the valve in the adjusted position.

In witness whereof I have hereunto set my hand this 9th day of August, 1897.

JOHN C. DEAN.

Witnesses:
V. H. LOCKWOOD,
ZULA GREEN.