(No Model.)

J. P. STABLER.

STEAM PRESSURE REGULATOR.

No. 357,422. Patented Feb. 8, 1887.

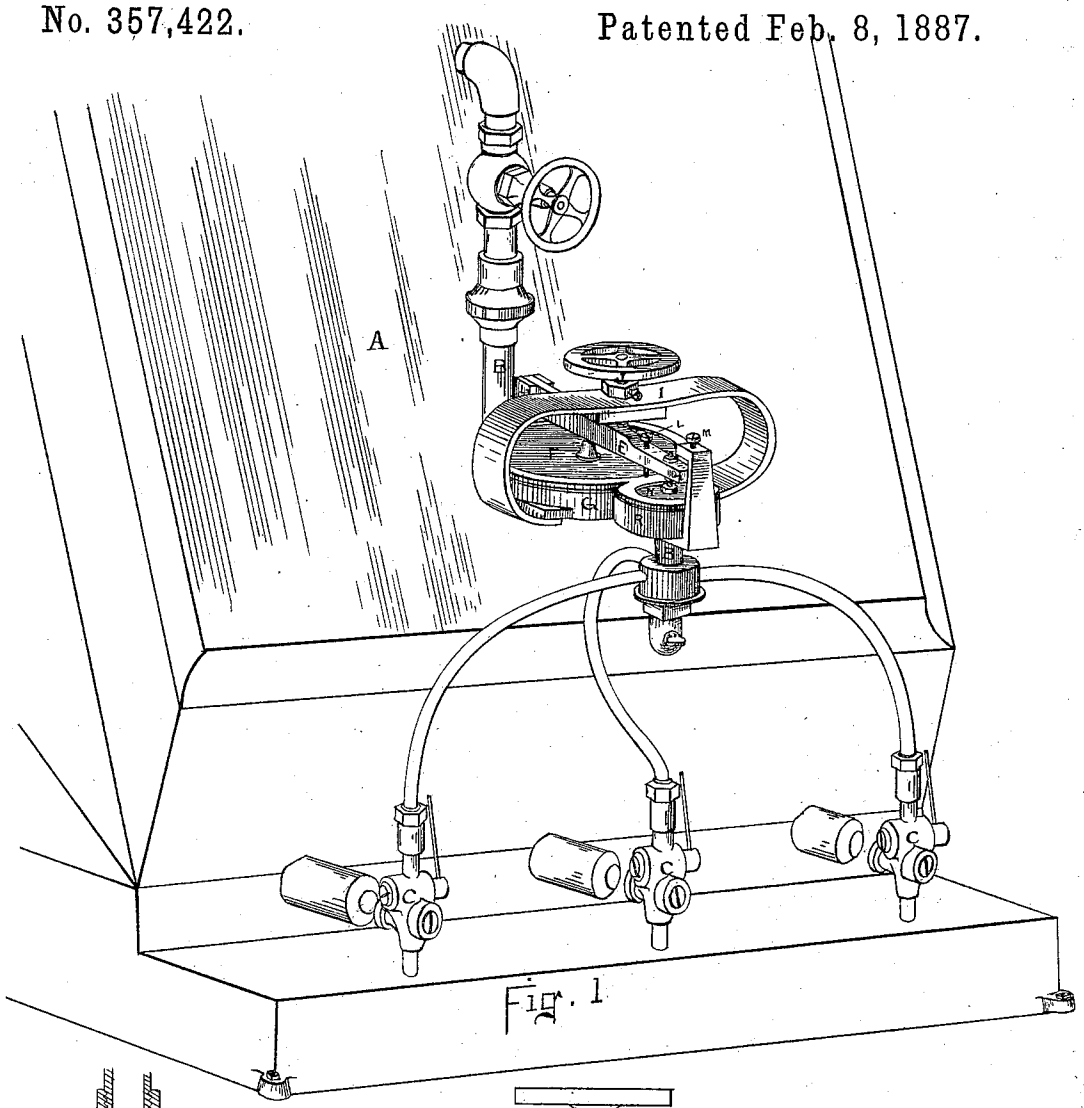


Fig. 1

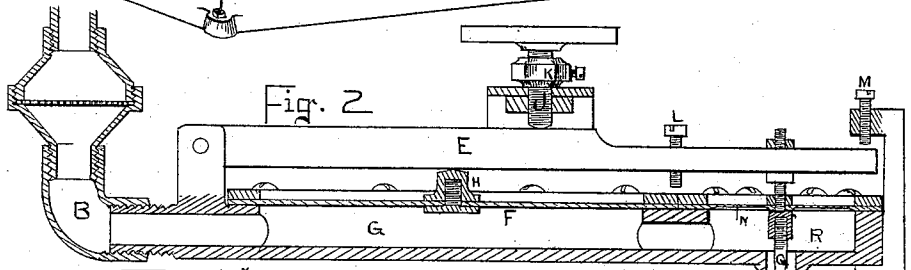


Fig. 2

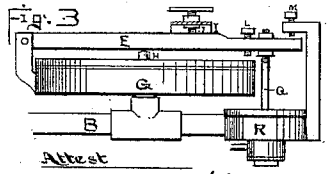


Fig. 3

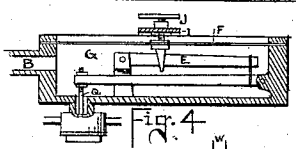


Fig. 4

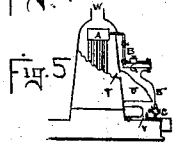
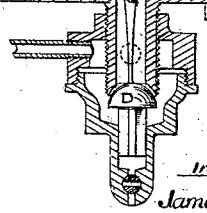


Fig. 5



Attest

A. H. Smith.

M. V. Smith.

Inventor.

James P. Stabler

By his Atty.

R. D. Smith

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

JAMES P. STABLER, OF SANDY SPRING, MARYLAND.

STEAM-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 357,422, dated February 8, 1887.

Application filed September 14, 1886. Serial No. 213,542. (No model.)

To all whom it may concern:

Be it known that I, JAMES P. STABLER, of Sandy Spring, Montgomery county, in the State of Maryland, have invented new and useful Improvements in Regulators for Steam-Valves; and I do hereby declare that the following is a full and accurate description of the same, reference being had to the accompanying drawings, wherein—

Figure 1 is a perspective view of my invention in operative position on the generator of a Shipman engine. Fig. 2 is a vertical longitudinal section of the same. Figs. 3 and 4 represent modifications of the same. Fig. 5 is a side elevation, partly in section, showing the ventilating-hood.

My invention has particular reference to the automatic regulation and control of the steam passing from the boiler to the atomizer or hydrocarbon-jet burner employed for the consumption of liquid hydrocarbon for steam generation and other purposes, though, as will appear, the invention is applicable for other purposes of regulation. The atomizer comprises a small steam-jet issuing into and passing through a small chamber, into which liquid hydrocarbon is also conducted. The hydrocarbon is immediately broken up and volatilized by the hot steam under pressure, and is carried out of said chamber intimately mixed with the issuing steam in a condition highly favorable to immediate and intense combustion. The issuing jet passes into the combustion-chamber accompanied with an induced volume of air. As the pressure of steam in the boiler increases a larger volume will flow to the atomizer, and the volume of hydrocarbon discharged and consumed will be correspondingly increased; but an exactly opposite result is desired, and for that reason devices have been made to automatically control and diminish the flow of steam as the pressure rises, so as to maintain the flame and steam-pressure at a substantially uniform standard. In general character these devices have, essentially, consisted of a valve in the steamway, attached to some part or device capable of resiliency and yielding to the pressure of the steam as it passes to said valve, so that an increase in steam-pressure will cause the valve to move toward its seat, and on diminution of said pressure the elastic resistance of the valve-holder will cause it to move away from its seat again.

The regulating-valve has generally heretofore been attached to and controlled by a metallic diaphragm constituting a flexible side for a chamber, through which the steam passes or has access on its way to the controlling-valve. This simple arrangement is inadequate, because a diaphragm with sufficient metal to possess the necessary resilliency would be too limited in its range of motion, and adjustment for different pressures could only be made by shifting the position of the valve. An independent spring was then employed to provide the required elastic resistance, and the diaphragm was made thinner and more flexible. Changes in the tension of the spring would then cause the valve to close at a greater or less pressure, as the case might be. Theoretically this arrangement is correct, but practically it is too delicate. The possible range of motion is too small, and there is too much liability of serious obstruction by small particles of solid matter sticking on the valve or valve-seat.

The object of my improvement is to correct these practical defects and other minor ones by an organization of devices which effect a largely-increased range of motion of the valve and its carrier.

It also provides safeguards against overstraining the parts. It also makes it possible to obtain uniform regulation for several atomizers by passing all the steam used through one regulator.

It also provides a capacity for automatic regulation in accordance with fluctuations of back-pressure between the pressure-regulator and burner, consequent on turning burners off or on.

It also provides means for preventing obstruction of the regulating-valve by arresting particles of dirt, scale, &c., from the steam-passages before said particles reach the regulating-valve.

It also provides means for preventing the escape of offensive odors and smoke from the torches when used with the Shipman or similar steam-generator.

Having now set forth the nature of my in-

vention, I will particularly describe the structure which I have preferred as applied to said Shipman engine and its mode of operation.

A is the steam-generator.

B is the steam-pipe for conducting steam from the steam-dome to the atomizer C. Within the pipe B, at a convenient point, the regulating-valve D is located. This valve, as shown, consists of a conical or spherical valve, mounted on a long stem, Q, which may be made flexible to compensate the slight deflection due to the movement of the lever E, to the extremity of which said valve-stem is attached.

The lever E passes over the flexible cover F of the steam-chamber G and makes contact with the middle of the same by means of the boss H, which, being nearer the fulcrum of lever E than its connection with the stem of the valve D, causes any movement of the cover F to be multiplied at the valve D; and therefore it is possible to obtain any necessary range of motion of the regulating-valve.

The cover F is a circular plate of resilient metal, such as hard brass or steel, clamped at its edges and exposed over its under side to the action of steam at boiler pressure. It is therefore pressed outward more or less, according to the force of such pressure, and carries the lever E and valve D with it, causing the valve D to move toward its seat as the pressure increases and away from its seat when said pressure diminishes again, and thereby regulate the pressure of steam passing through the atomizer C, and consequently vary the amount of spray thrown into the combustion-chamber, according to the pressure in the boiler.

The cover F will be sensitive to all variations of steam-pressure; but it is desirable that a certain predetermined pressure may be attained before regulation shall begin, and this is accomplished by imposing upon the cover F a permanent load equal to said predetermined pressure. This is most easily done by employing a supplemental or balancing spring, I, which may be caused to bear upon the cover F, most conveniently by indirection through the lever E, and thereby coincidently upon the valve D, with such force as may be necessary to balance the steam-pressure upon the cover F up to said predetermined pressure. When that pressure is exceeded, the valve D will begin to close. A screw, J, through said spring bears upon the lever E or upon the cover F, and affords the required means for changing the tension of the spring I at will, and thereby the permanent load is changed; and a nut, K, upon said screw constitutes a movable shoulder or stop to limit the range of motion of said screw. When, in any case, the screw J has been set to produce the desired tension, the nut K is run down to contact with the spring, and fastened there by a set-screw, and thereafter the screw J may be moved backward to relax the spring and restored again to the proper tension without trouble.

Screws L and M constitute adjustable stops to limit the downward and upward motion of the lever E, and prevent undue strain on the regulating-valve and its attachments by reason of excessive pressure from the cover F or screw J.

It is not desirable to pass the stem of valve D through a stuffing-box, because that would involve great and uncertain frictional resistance. I therefore connect said stem with the side of the steam-passage by means of a flexible diaphragm, N, (covering a small steam-chamber, R,) which is capable of yielding to permit the requisite motion of the valve-stem without leakage and without frictional resistance.

The valve D is necessarily small and delicate in its movements, and liable to be obstructed by small particles of solid matter. Such particles consist largely of fragments of scale from the inner surfaces of the iron pipe and fittings. They are liable to be detached by the expansion and contraction due to changes in temperature, to concussions, and especially to oxidation. I therefore place a fine-meshed or other screen, P, at a proper point in the steam-pipe, to arrest such particles before they reach the regulating-valve.

It will be observed that when steam is escaping from the atomizer the pressure on the atomizer side of the valve D will be less than on the regulator side, and therefore there will be upon said valve a preponderance of pressure to open it. This diversity of pressure will be increased with each additional atomizer set to work, or with an increased escape of steam from any other cause, and will be diminished when the escape of steam is decreased. With each change in the relations between the direct and back pressures upon the valve D there will be a movement of said valve tending to restore equilibrium. There is, then, a double effect of regulation always in action—one to regulate the pressure on the boiler side with reference to boiler-pressure and the other to regulate the pressure on the atomizer side with reference to the volume of escaping steam—and therefore one regulator may control the steam-pressures at any required number of points of issue.

It is necessary to employ with the jet burner or atomizer a constantly-burning torch, because the slightest interruption of the working of the apparatus will cause an extinguishment of the flame, and it is necessary to relight the same automatically. The torch V consists of a small naked flame from a lamp usually burning petroleum, and as heretofore employed they give off smoke and unpleasant odors. To obviate this I make an opening, T, in the front of the casing, which surrounds the generator A and constitutes the fire-chamber, and cover said opening with a hood, U, which projects forward and downward, so as to partly inclose the torch V and jet of the atomizer C and conduct all the smoke and odors from said torch into the fire-chamber, whence they pass, with the products of combustion, out through the pipe W to the chimney.

Having described my invention, I claim—

1. The steam-chamber G, provided with a flexible cover, F, for the same, and a regulating-valve, D, in the steam-pipe, combined with a lever pivoted to the frame and connected with said cover F, and at its extremity attached to the stem of said valve D, to move and control the same in correspondence with the steam-pressure upon said cover F.

2. The steam-pipe B, provided with an enlargement or chamber, G, and a flexible cover, F, for the same, and a regulating-valve, D, in said pipe, combined with the lever E, pivoted at one end to the frame and resting upon said cover at its center and attached to the stem of said valve D, to move and control the same in correspondence with the steam-pressure in chamber G.

3. The steam-pipe B, provided with an enlargement or chamber, G, and a flexible cover for said chamber, a lever, E, pivoted to the frame and supported by said cover, and a regulating-valve, D, in the steam-pipe, having its stem connected with said lever near its extremity to control the same in correspondence with the steam-pressure in the chamber G, combined with a balancing-spring, I, having a pressure bearing upon said cover, and a screw, J, whereby the pressure of said spring upon said cover may be regulated.

4. In combination, a steam-chamber, G, provided with a flexible cover, F, a lever, E, pivoted on the frame and resting on said cover, a regulating-valve, D, in the steam-pipe attached to and controlled by said lever, a balancing-spring, I, and its adjustable pressure-screw J, and the adjustable stop-nut K, substantially for the purpose set forth.

5. A steam-chamber, G, provided with a flexible cover, F, a lever, E, pivoted to the frame and connected with said cover at the center thereof, a balancing-spring, I, having a bearing upon said flexible cover, and a controlling-valve, D, connected with and moved by said lever, said valve being exposed to boiler-pressure of steam on one side and back-pressure on the other side and balanced by pressure at the cover F, whereby said valve may be self-adjusting to fluctuations of back-pressure, as set forth.

6. In combination, a steam-chamber, G, provided with a flexible cover, F, a lever, E, pivoted to the frame and connected with said cover at its center, a controlling-valve, D, attached to and moved by said lever, and stops L and M, to prevent undue strains upon the parts, as set forth.

7. A steam-pressure chamber, G, provided with a flexible cover, F, a lever, E, pivoted to the frame and resting on said cover, and a regulating-valve connected with and controlled by said lever, combined with a screen, P, in the steam-pipe to arrest particles of solid matter and prevent them from passing to said regulating-valve.

8. In combination, in connection with a hydrocarbon-furnace and steam-generator within the same, the atomizer C and torch Q, the hood R and opening S in the shell of said furnace, for the passage of smoke and air vitiated by said torch into the stack, as set forth.

JAMES P. STABLER.

Witnesses:
R. D. O. SMITH,
J. B. MCGIRR.