(No Model.)

H. GALE & C. D. WISELOGEL.

PRESSURE REGULATOR.

No. 383,877. Patented June 5, 1888.

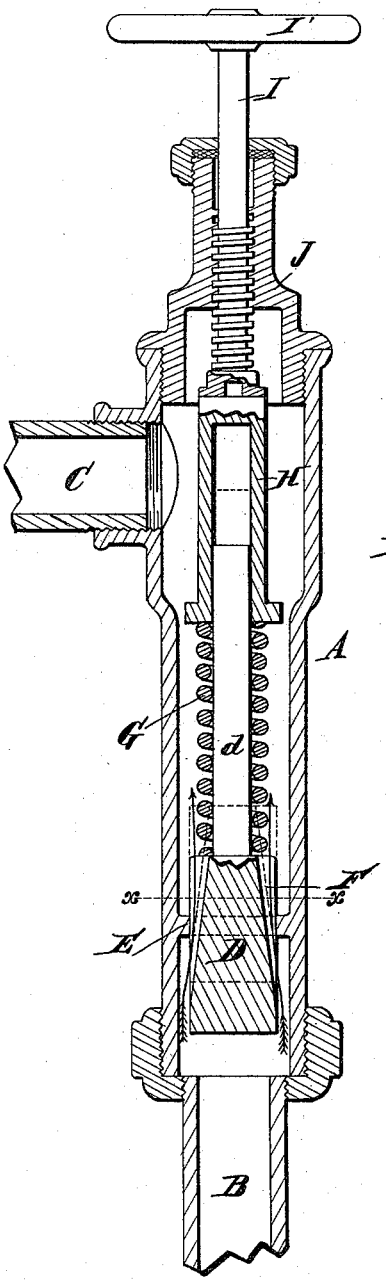

Fig. 1.

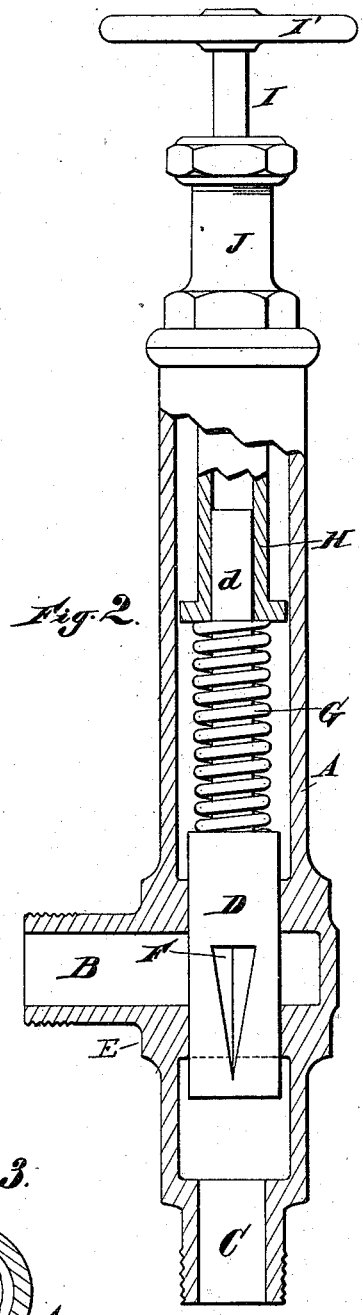

Fig. 2.

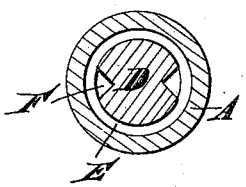

Fig. 3.

WITNESSES.

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UNITED STATES PATENT OFFICE.

HORATIO GALE AND CHRISTIAN D. WISELOGEL, OF ALBION, MICHIGAN.

PRESSURE-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 383,877, dated June 5, 1888.

Application filed October 31, 1887. Serial No. 253,886. (No model.)

To all whom it may concern:

Be it known that we, HORATIO GALE and CHRISTIAN D. WISELOGEL, citizens of the United States, residing at Albion, county of Calhoun, State of Michigan, have invented a certain new and useful Improvement in Pressure-Regulators; and we do declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

Our invention consists of the combination of devices and appliances hereinafter specified, and more particularly pointed out in the claims, and relates to improvements in pressure-regulators for governing the use of steam, gas, water, &c.

The objects of our invention are, first, to provide, in an improved pressure-regulator, mechanism whereby the size of the orifice for the admission of steam may be automatically increased or diminished according to the boiler-pressure, so that the amount of steam admitted will be sufficient to perform a given amount of work, no matter what pressure is carried in the boiler; second, to provide improved mechanism whereby the device may be adjusted so as to admit steam sufficient to perform a large or a small amount of work, as is required—as, for instance, the carrying of a constant pressure of thirty pounds or of fifty pounds—without regard to the fluctuations of the boiler-pressure.

In the drawings, Figure 1 is a central vertical section of a device embodying our invention; Fig. 2, a similar view of a slightly-modified form of our improved regulator, and Fig. 3 a cross-section on line *x x*, Fig. 1.

A represents the outer shell or casing; B, the inlet and C the outlet pipe; D, a piston-valve passed through the dividing-wall E and closely fitted to the aperture therein and provided with a stem, *d*.

F represents tapered longitudinal grooves cut into the sides of the piston-valve D and having their greatest cross-sectional area at the upper end and narrowing down to a point at the lower end.

G is a spiral spring located upon the valve-stem *d*, having a bearing upon the valve D and also having a bearing upon the lower end of the follower H. The follower H is made hollow and adapted to receive the stem *d* within its interior and to permit the same to play freely up and down therein.

I represents an adjusting-screw threaded through the cap J and provided with an operating hand-wheel, I'.

We will now describe the operation of our device as applied to a steam-pipe or other analogous mechanism.

Supposing that, in order to supply the requisite amount of water, the pump is required to run at a speed of fifty strokes per minute, and that the boiler-pressure stands at sixty pounds, the operator turns the hand-wheel I', forcing the follower H downward, so as to compress the spring G to a sufficient degree to crowd the piston-valve D downward against the steam-pressure through the aperture in the division-wall E until the opening formed by the tapered groove F is of sufficient size to admit the proper amount of steam to run the pump at the required speed—*i. e.*, fifty strokes per minute. So long as the pressure remains the same the piston will occupy the same position, and consequently the size of the aperture formed by the tapered grooves F will remain the same. Now, supposing that the boiler-pressure drops to forty pounds, the amount of steam required to operate the pump at the given speed under this pressure will of course be much greater than at a pressure of sixty pounds. It will be readily seen that as the boiler-pressure subsides the spring G will force the piston D down through the opening in the division-wall E until the pressure of steam upon the lower end of the piston and the pressure of the spring behind it are equal. Thus the size of the apertures formed by the grooves F is proportionately increased, and consequently the amount of steam admitted is greater than before, and the pump or other machinery operated by the steam passing through the regulator will continue to operate at the same rate of speed as when the boiler-pressure stood at sixty pounds. On the other hand, suppose that the boiler-pressure were to increase to eighty or ninety pounds. The pressure of steam upon the head of the piston D would force said piston upward, as shown by dotted lines, Fig. 1, and compress

the spring until the pressure of the spring behind the piston equaled that of the steam upon its lower end and the piston-valve reached a condition of equilibrium. It is thus seen that with the increase of boiler-pressure the size of the apertures for the admission of steam is proportionately decreased, and consequently the amount of steam is less under a high than under a low pressure, and the pump will still continue to operate at the same rate of speed as before. Under these varying conditions the steam in the delivery-pipe will of course maintain a uniform pressure, as a small volume of steam under a high pressure will by expansion attain the same degree of tension as a proportionately large volume under a low pressure, and consequently the amount of work done will be the same in either case. This arrangement of the valve to adjust itself automatically according to the pressure, thus maintaining a uniform operation of the pump or other machinery, is very advantageous, as it dispenses with the necessity of constant attention, which would otherwise be required.

One great objection where a device of this nature is not employed is that if left alone any increase or decrease in the boiler-pressure will cause the mechanism to operate more rapidly or more slowly in proportion to such variation of the pressure.

In the device illustrated in Fig. 2 the positions of the inlet and the outlet pipes are reversed, the piston-valve being elongated and fitted steam-tight on both sides of the inlet B. Now, supposing the boiler-pressure to be eighty pounds, and that it was desirable to deliver steam through the outlet-pipe C under a pressure of thirty pounds, the operator will adjust the screw I and follower H, as before, so that the pressure of thirty pounds in the delivery-pipe will just balance the pressure of the spring. Now, if less steam is used from the delivery-pipe, the pressure within the pipe will rise and the piston D will be automatically adjusted upwardly, thus diminishing the size of the apertures for the admission of steam in proportion to the increase in the back-pressure upon the piston. On the other hand, if the steam were used faster than it could be supplied through the opening at thirty pounds pressure, the spring G would crowd the piston downwardly until the size of the apertures formed by the tapered grooves F was increased to admit steam rapidly enough to maintain a pressure of thirty pounds.

The device may thus be adjusted to maintain in the delivery-pipe any degree of pressure equal to or less than that within the boiler without regard to the fluctuations of the boiler-pressure or the rapidity with which the steam is used from the delivery-pipe.

We would have it understood that we do not limit ourselves strictly to the construction shown in the drawings, as the same admits of various modifications without departing from our invention.

What we claim is—

1. In a pressure-regulator, the combination of a piston-valve provided with a series of tapered grooves having their greatest cross-sectional area at the top of said valve upon its side, an adjustable spring having bearings on the upper end of the valve and the lower end of the follower H, adapted to assist the valve in resisting the outflowing steam, and a close-fitting partition, E, through which the valve reciprocates, substantially as described.

2. The combination, in a pressure-regulator, of a piston-valve having a series of tapered grooves, a spring having a bearing on the valve and a bearing on the lower end of the follower H, and an adjustable screw for varying the tension of said spring, said piston-valve being adapted to reciprocate through a close-fitting partition in the shell or casing, and the piston-stem adapted to play freely up and down in the hollow follower H, substantially as described.

In testimony whereof we sign this specification in the presence of two witnesses.

HORATIO GALE.
CHRISTIAN D. WISELOGEL.

Witnesses:
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