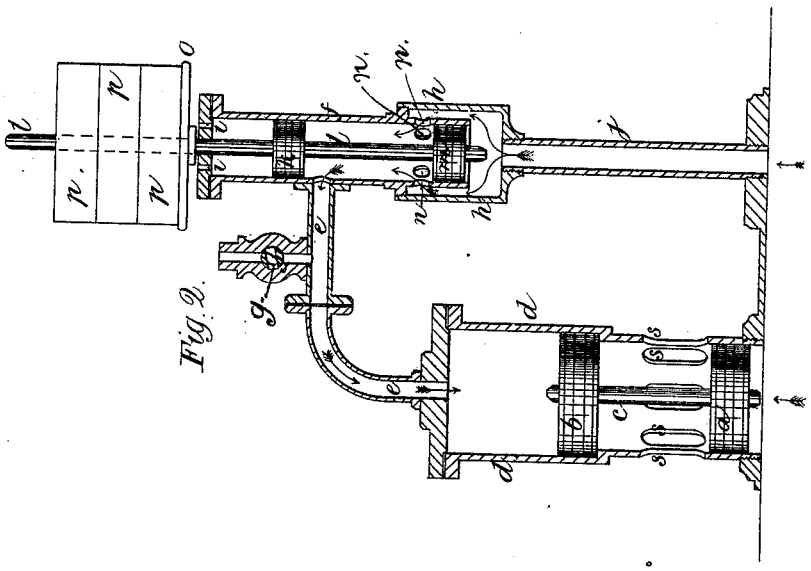
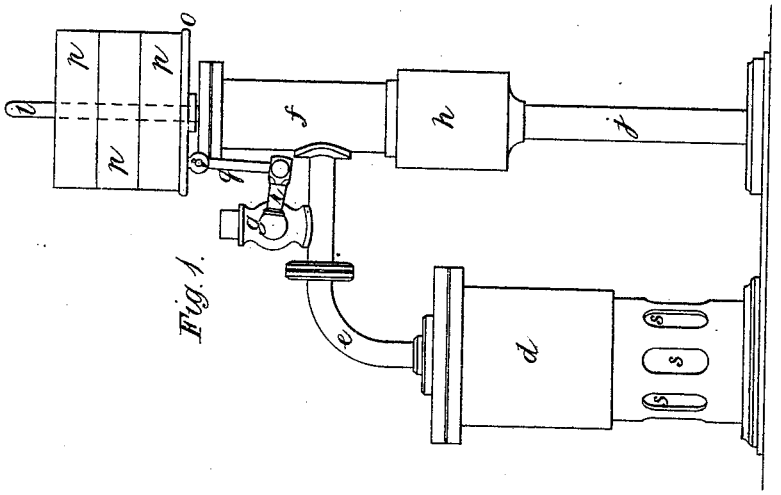
R. C. ANDERSON.
Safety-Valves.

No. 196,106. Patented Oct. 16, 1877.





Witnesses.
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UNITED STATES PATENT OFFICE.

ROBERT CHAPMAN ANDERSON, OF WOOD GREEN, ENGLAND.

IMPROVEMENT IN SAFETY-VALVES.

Specification forming part of Letters Patent No. **196,106,** dated October 16, 1877; application filed June 14, 1877; patented in England, December 6, 1876, for fourteen years.

To all whom it may concern:

Be it known that I, ROBERT CHAPMAN ANDERSON, of Wood Green, in the county of Middlesex, England, civil engineer, have invented certain Improvements in Safety-Valves, (patented in England 6th December, 1876,) of which the following is a specification:

The object of my invention of improvements in safety-valves for the escape of compressed steam, water, air, or other vapor, fluid, or gas from boilers or other vessels is to dispense with the usual external weights, levers, and springs. These external parts are liable to many objections, among which may be classed the slow relief afforded to the boiler or vessel under pressure by a valve so arranged, and the tendency which such weights, levers, and springs have to jam the valve in its seat.

In carrying out my invention I make use of the same force which presses upward against the safety-valve to press downward on a piston connected to the safety-valve in any convenient manner. This piston works in a vertical cylinder or tube riveted or otherwise secured to the boiler or vessel, and open at its lower end, but communicating at its upper end, by means of a valve apparatus to be hereinafter described, with the boiler or vessel under pressure. The surface area of this piston must be at least equal to that of the safety-valve, from whence it follows that these two opposite forces continually counterbalance each other until the desired maximum is reached, when, by means of the valve apparatus already alluded to, and which I shall hereinafter call the "pressure-regulator," the communication between the boiler or vessel and the cylinder or tube is cut off, and at the same time a small valve or tap or similar device in the top of a pipe immediately adjacent to the cylinder or tube is opened, whereby the pent-up force remaining in the cylinder or tube is discharged into the open air. All pressure being now removed from the piston, the safety-valve will at once fly wide open and relieve the excess of pressure in the boiler or other vessel.

There is scarcely any limit to the speed with which this relief may be obtained, as there is scarcely any limit to the size of safety-valve which may be employed, and also no obstruction to the escaping force, as the valve, not being encumbered with either weights or springs, will at once open fully to its utmost extent.

The excess of pressure having been relieved, the pressure-regulator again comes into action, and opens the communication between the boiler or vessel and the piston, and closes, at the same time, the small valve or tap or similar device before alluded to, the effect of which is that the piston is forced down and the safety-valve closed.

The pressure-regulator, through which the connection between the piston and boiler or vessel is made, and which effects the releasing and closing of the safety-valve, consists of a vertical cylinder or tube, open at both ends, and fitted to the boiler or vessel. Into the upper end of this cylinder or tube is inserted a steam-tight piston, which is connected, by means of a spindle or piston-rod, to a valve which is intended to close the lower end of the tube when required. At a point about midway between the piston and valve this cylinder or tube is connected, by means of a short pipe, with the cylinder or tube in which the piston attached to the safety-valve works. The respective surfaces of the piston and valve of the pressure-regulator must be identical in area.

The piston-rod or spindle projects upward from the piston, and carries a horizontal disk for the purpose of supporting weights; or, if preferred, a weighted lever may be used. The vertical movement of this piston and rod is made use of to actuate the small valve or tap, which allows the pent-up force in the safety-valve piston-cylinder to escape.

But to make my invention better understood, I will proceed to describe the same by reference to the accompanying drawing, in which—

Figure 1 is a side elevation, and Fig. 2 a vertical section, of a safety-valve constructed according to my invention.

Similar letters in both the figures represent similar parts.

a is the valve; *b*, the piston connected to the valve *a* by the spindle *c*. *d d* is the vertical cylindrical tube in which the valve *a* and piston *b* work, such cylinder being open at its lower end, as shown. *e* is the pipe or tube

forming the communication between the cylinder *d* and the cylinder *f* of the pressure-regulator. *g* is the valve or tap for discharging the pent-up steam in the cylinder *d*, as hereinafter described. The cylinder *f* of the pressure-regulator is open at the lower end, and its cover is provided with air-holes *i i*, or may be completely open. The lower part of the cylinder *f* is fitted into a steam-tight jacket, *h*, open at its lower end to the boiler or other vessel by means of the tube or cylinder *j*. *k* is the steam-tight piston in the upper end of the cylinder *f*, connected, by means of the spindle or piston-rod *l*, to the valve *m* in the lower end of the cylinder *f*; *n n*, holes or ports in the cylinder *f* above the valve *m*. *o* is the horizontal disk above the cylinder *f* for supporting the weights *p*. *q* and *r* are jointed levers or rods connecting the tap or cock *g* with the disk *o*.

From this arrangement it will be seen that, the parts being in the position shown in the drawing, the steam, water, air, or other vapor, fluid, or gas from the boiler or other vessel will press on the valve *a*, and will also pass up the tube *j*, into the jacket *h*, through the port-holes *n*, cylinder *f*, tube *e*, and, consequently, press on the piston *b*, and as the surface area of the piston is slightly in excess of that of the valve *a*, (to compensate for the friction,) the pressure on the latter will be counterbalanced by the pressure on the former, while the valve *m* and piston *k* will be kept in the position shown by the weights *p*, so long as the pressure of the steam in the boiler does not exceed that due to the weight on the disk *o*.

The working of this arrangement of safety-valve is as follows: Supposing that it is required that the safety-valve *a* shall be opened when the pressure in the boiler or other vessel shall exceed one hundred pounds (above that of the atmosphere) on the square inch, and that the piston *k* and valve *m* of the pressure-regulator have each one square inch of surface, it is only necessary to place one hundred pounds on the disk *o*. Thus the piston *k* and valve *m* will be caused to descend together to the end of their stroke, as shown in the drawing, and a free communication will be opened, as hereinbefore described, between the boiler or other vessel and the cylinder *d*, containing the piston *b*, connected to the safety-valve *a*. As soon as the pressure in the boiler or other vessel exceeds one hundred pounds (above that of the atmosphere) on the square inch, the piston *k* of the pressure-regulator, and with it the valve *m*, will be forced up by the pressure, and as the valve *m* will now be above the ports *n*, the steam will be cut off from its communication with the upper part of the cylinder *d*, and at the same time the weighted disk *o*, rising with the piston *k* and valve *m*, will, by means of the rods or levers *q* and *r*, open the tap or cock *g*, thereby allowing the pent-up steam in the cylinder *d* to escape. The pressure being now wholly removed from the upper side of the safety-valve piston *b*, the safety-valve *a* will be immediately raised, and the excess of pressure in the boiler or other vessel will then be relieved by the steam escaping through the openings *s s* in the cylinder *d*, and as soon as the pressure falls below one hundred pounds on the square inch the piston and valve of the pressure-regulator will again descend, as before, and reopen the connection between the boiler or other vessel and the safety-valve piston-cylinder, the effect being to force down the safety-valve piston and close the safety-valve. The openings *s s* may be inclosed with a jacket provided with an exit-pipe, should it be desired to carry away the escape-steam instead of allowing it to pass direct into the open air.

I would here observe that a pressure-regulator of the size shown in the drawing may be employed in combination with a much larger safety-valve than that shown.

I claim as my invention—

1. In a pressure-regulator, the combination, substantially as shown and described, of the parts *f*, *g*, *h*, *i*, *j*, *k*, *l*, *m*, *n*, *o*, *p*, *q*, and *r*, for the purpose set forth.

2. The combination of the cylinder *f*, valve *g*, valve *m*, ports *n*, weights *p*, and connections *q r* with the piston *b* and main valve *a*, substantially as and for the purpose set forth.

R. C. ANDERSON.

Witnesses:

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