A. TURNBULL.

SAFETY-VALVE.

No. 189,816. Patented April 17, 1877.

Fig. 1.

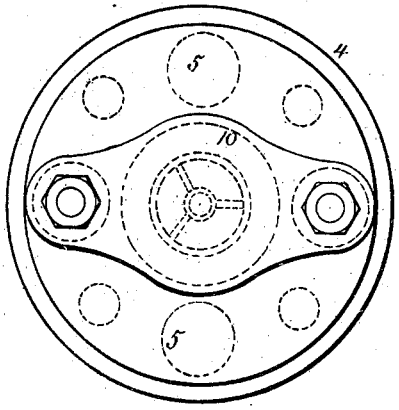
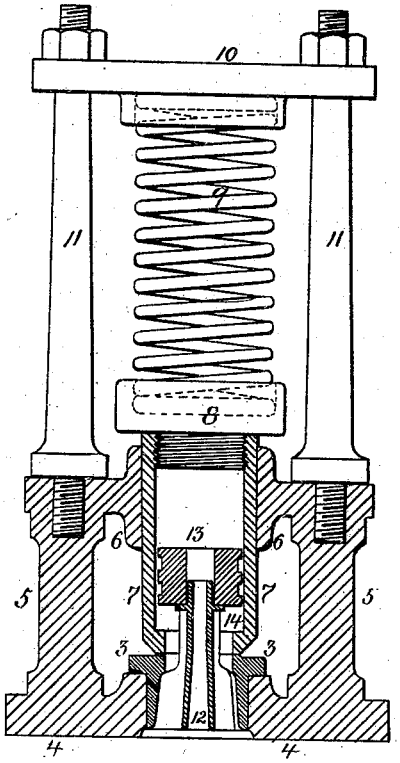


Fig 2.



Witnesses

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ALEXANDER TURNBULL, OF GLASGOW, SCOTLAND.

IMPROVEMENT IN SAFETY-VALVES.

Specification forming part of Letters Patent No. **189,816**, dated April 17, 1877; application filed March 7, 1877.

To all whom it may concern:

Be it known that I, ALEXANDER TURNBULL, of Glasgow, in the county of Lanark, Scotland, have invented certain Improvements in Safety-Valves, of which the following is a specification:

My invention has for its object to construct a safety-valve so that when it opens, in consequence of the steam or other fluid in the boiler or pipe, or other apparatus to which it is applied, being in excess of that to which it is loaded, the action of the steam or fluid, in escaping, shall not diminish the effect of the steam in opening the valve, or keeping it open to its full capacity as long as the internal pressure continues in such excess. My improved safety-valves may be loaded in any of the ways in which existing safety-valves are loaded; and when loaded by springs they can be proportioned so as to compensate for the increasing pressure of the springs as they become strained by the opening of the valves.

My improved safety-valve will open freely, so as to give a peripheral discharge area equal to the total area for the passage of the steam or other fluid through the seat of the valve, and as this exceeds the effective discharge area of ordinary safety-valves, it follows that my improved valve may, for a given discharge, be made correspondingly smaller than ordinary safety-valves.

My invention consists in making the valve in the form of an inverted cup or hollow cylinder, having a contraction near its lower end, as more fully described hereafter.

In the accompanying drawings, Figures 1 and 2 are, respectively, a plan and a vertical section of my improved safety-valve as loaded by a spring.

The valve-seat 3 is fitted into a hole in the bottom part 4 of a casting, 4 5 6, which can be fixed to a boiler or pipe, or other apparatus containing steam or fluid the pressure of which is to be limited by means of the valve. The casting is in the form of a circular base, 4, connected, by pillars 5, to an upper annular part, 6, which last is bored to act as a guide for the valve 7. This valve 7 is a hollow cylinder, the upper end of which is closed by or terminates in a cup, 8, to receive the bottom of a helical steel spring, 9. The spring 9 is held down by an upper plate, 10, fixed by screw-nuts on the upper ends of rods 11, screwed into the casing 4 5 6. The bottom end of the valve 7 is contracted, so that the annular part which bears on the seat 3 may be slightly less in diameter than the interior of the valve. The contact-surfaces of the seat 3 and valve 7 are shown flat; but they may be conical or spherical. The valve-seat 3 has attached to it, by radial feathers, a central tube, 12, which projects up into the hollow valve 7, and has a collar formed on it near its upper end. An annular block, 13, rests loosely on the collar on the central tube 12, and serves to check the communication between the upper part of the hollow valve 7 and the lower part thereof near the outlet. This block 13, while nearly as large in diameter as the interior of the hollow valve 7, is not in any sense a close-fitting piston, which would be liable to stick and get out of order; besides, it is not at all necessary for the action of the valve that it should fit like a piston. On the other hand, should the block 13, under any circumstances, ever tend to move up or outward with the hollow valve 7, it would be quite free to do so, as it is not fixed to the central tube 12.

With the spring 9 applied as shown in the drawing, its pressure down on the valve 7 will be greater the higher the valve is lifted, owing to its being thereby more compressed. This increased pressure of the spring will, however, be compensated for by action due to the interior of the valve 7, being larger in diameter than the inner edge of the contact-surfaces of the valve and seat. When the valve is shut the excess of pressure over that corresponding to the effective area of the seat, and acting inside the valve on its upper end, will be balanced by the downward pressure on the inside of the contraction 14 at the bottom of the valve; but when the valve is opened the pressure downward on the contraction 14 will be diminished in consequence of the vicinity of the contraction to the outlet-pipe, while the full pressure, or at least a greater pressure than that acting on the contraction 14, will be maintained against the upper end of the valve, and will continue to bear up the valve against the increased pressure of the spring.

The central tube 12 serves to separate the center of the column of steam from the outer parts of that column, which latter parts rush toward the outlet when the valve opens and become diminished in pressure; and to make such separation more certain and complete, the tube 12 may be continued downward to any reasonable extent. On the other hand, a greater pressure will be maintained in the center of the column of steam when the valve is open than at the outer parts, even without any separating-tube 12; and if, without that tube, the pressure of the center of the column of steam is not sufficient on a certain internal area of the tube 7, that internal area has simply to be made a little larger.

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

1. The combination, in a safety-valve, of the spring 9 and valve-seat 3 with the hollow valve 7, having the contraction 14 near the lower end, as and for the purpose described.

2. The combination of the valve-seat and the central tube 12 with the loaded hollow valves 7, having a contraction, 14, near the lower end, as specified.

3. The combination of the valve-seat and loaded hollow valve with the central tube 12 and the annular block 13, resting on, but unconnected with, the said tube, as set forth.

ALEXANDER TURNBULL.

Witnesses:
EDMUND HUNT,
LOCK MOORE.