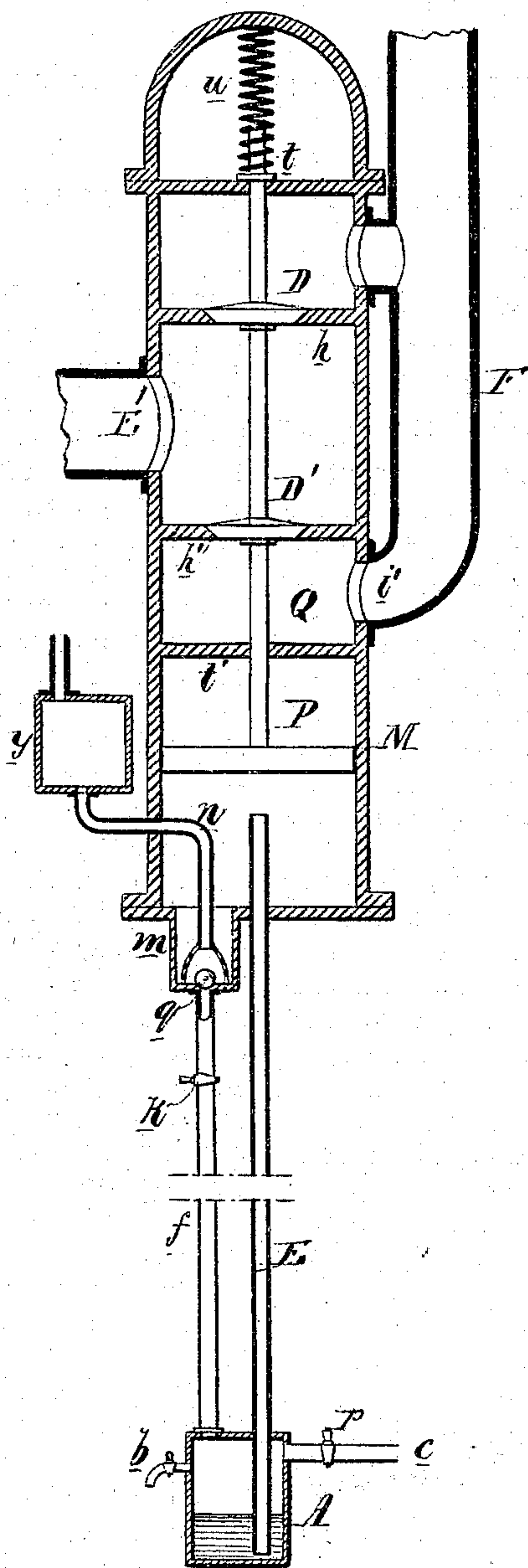


THEODORE D. RAND.
Improvement in Safety Valves.

No. 125,081.

Patented March 26, 1872.



WITNESSES { Harry Smith
Thomas M. Hoain

Theodore D. Rand
by his Atty.
Howson and son

UNITED STATES PATENT OFFICE.

THEODORE D. RAND, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN SAFETY-VALVES.

Specification forming part of Letters Patent No. 125,081, dated March 26, 1872.

Specification describing an Improvement in Safety-Valves, invented by THEODORE D. RAND, of Philadelphia, Pennsylvania.

Improvement in Safety-Valves.

My invention consists of certain apparatus, too fully explained hereafter to need preliminary description, whereby any dangerous excess of steam may be discharged from a steam-boiler by causing the steam to force from a tube a column of mercury, the absence of which from the tube permits the said steam to open a safety-valve. My invention further consists of certain apparatus, described hereafter, for setting the apparatus in working order after it has performed the duty of operating the safety-valve.

The figure in the accompanying drawing represents a vertical section of my invention.

A is a vessel, partly filled with mercury, and communicating with the steam-space of a boiler through a pipe, *c*, the vessel being furnished with a cock, *b*. The lower end of a tube, *E*, extends downward into the vessel nearly to the bottom of the same, the upper end of the tube projecting into the casing *M*, to which is adapted a piston, *P*, secured to a rod, *Q*, carrying two valves, *D* and *D'*, the former of which is adapted to a seat in a partition, *h*, extending across the casing, the valve *D'* being adapted to a like partition, *h'*. A pipe, *E'*, forms a communication between the steam-space of the boiler and the cylinder *M*, at a point between the two valves, and a pipe, *F*, has two communications with the cylinder *M*, one between the partition *h* and a partition, *t*, and the other through a branch, *i'*, between the partition *h'* and the partition *t'*. A chamber or pocket, *m*, is formed in the bottom of the cylinder *M*, and into this chamber extends a pipe, *n*, communicating with the external air, and enlarged at the lower end; and within this enlargement, which is perforated, is a spherical or other valve for closing an orifice which communicates with a pipe, *f*, the latter terminating at the top of the vessel *A*, and communicating with the interior of the same. The pipe *f* is furnished with a cock, *k*, and the pipe *c* with a cock, *p*.

When the apparatus is in working order the cocks *k* and *b* are closed, and the cock *p* is open; hence steam from the boiler, having

free access to the vessel *A*, will force the mercury upward through the pipe *E* to a height commensurate with the pressure of steam, and the height of this pipe is so regulated that the mercury will not be forced from its upper end until the steam in the boiler exceeds its maximum pressure. When this takes place, however, the mercury, being forced from the pipe, will find its way into the chamber *m*, and, closing the valve, will remain therein. In the mean time, the steam passing freely through the pipe *E* will act on the piston *P* and elevate the valves *D* *D'*, thereby permitting the steam from the boiler to rush through the pipe *E*, through the partitions *h* and *h'* in the cylinder *M*, and thence through the pipe *F* into the external air. When the boiler has thus been relieved from its excess of steam the cock *p* is closed and the cocks *k* and *b* opened, when the mercury will at once pass through the pipe *f* to the vessel *A*, and the piston being relieved from the pressure of steam the valves will be depressed to their seats either by a spring, *w*, acting on the valve-spindle, or the area of the lower valve may slightly exceed that of the upper valve, so that the greater pressure on the lower valve will induce the descent of both valves to their seats without the aid of a spring, when the piston is released from the pressure of steam. All that now remains to set the apparatus in working order is to open the cock *p* and close the cocks *k* and *b*.

The pipe *n* is furnished, at the upper end, with a box or chamber, *y*, communicating with the air, this box serving to retain any mercury which might be accidentally forced through the pipe *n*.

Although I prefer to use the valves *D* and *D'*, or other equivalent arrangement of double valves, the apparatus could be operated with a single valve, *D'*, providing its area was considerably less than that of the piston *P*; or, a single valve of different character—a slide-valve, for instance—arranged to open and close ports in a vertical partition, could be substituted for the said valve *D'*.

I claim as my invention—

1. A valve or valves and piston, contained within a casing communicating with the steam-space of a boiler and with the external air, all substantially as described, in combination with a pipe communicating with a vessel con-

taining mercury, and with the space in the above-mentioned casing below the piston, all substantially as set forth.

2. The combination of the chamber M, air-pipe *n*, and valve *q*, with the pipe *f*, communicating with the mercury-reservoir A.

In testimony whereof I have signed my name

to this specification in the presence of two subscribing witnesses.

THEO. D. RAND.

Witnesses:

WM. A. STEEL,
HARRY SMITH.