

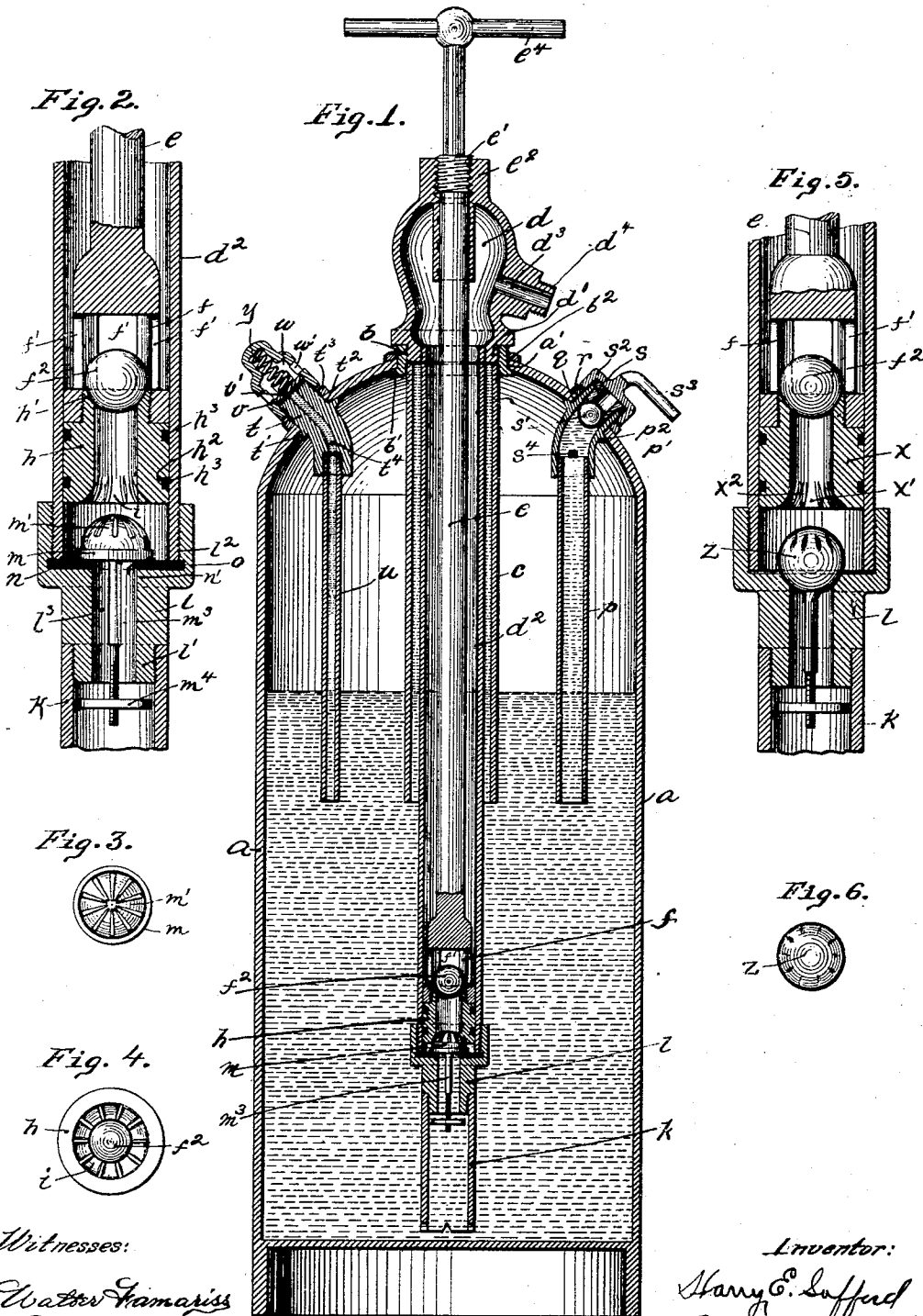
No. 664,898.

Patented Jan. 1, 1901.

H. E. SAFFORD.  
FIRE EXTINGUISHER.

(Application filed Jan. 27, 1897.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

HARRY E. SAFFORD, OF ALLEGHENY, PENNSYLVANIA.

## FIRE-EXTINGUISHER.

SPECIFICATION forming part of Letters Patent No. 664,898, dated January 1, 1901.

Application filed January 27, 1897. Serial No. 620,907. (No model.)

*To all whom it may concern:*

Be it known that I, HARRY E. SAFFORD, a resident of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Fire-Extinguishers; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to fire-extinguishers, and more especially to a certain improvement in that class of fire-extinguishers set forth in Letters Patent of the United States No. 439,565, granted to me on the 28th day of October, 1890, in which the fluid is contained within a suitable reservoir and is expelled therefrom when needed by compressed air or other stable gas confined within said reservoir or by a pump should the compressed air fail to do the work.

The object of the present invention is to improve on such a fire-extinguisher; and the invention consists in certain novel features, all of which will be fully hereinafter set forth and claimed.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a vertical section of my improved fire-extinguisher. Fig. 2 is an enlarged vertical sectional view of the lower end of the valve-controlling rod and its manner of connection with the valve. Fig. 3 is a top view of the valve. Fig. 4 is face view of the lower end of the piston. Figs. 5 and 6 show a modified form of my invention.

Like letters indicate like parts in each of the figures.

The reservoir *a* may be of any convenient size and shape and is constructed of copper or other suitable metal. An opening *a'* is formed in the head of the reservoir *a*, and within said opening is inserted the collar *b*, said collar having the flange *b'*, adapted to engage with the inner faces of the top of the reservoir *a* around said opening. A jam-nut *b<sup>2</sup>* engages with the external threads of said collar *b* and acts to hold said collar in position, the flanges *b'* of said collar being drawn up against the inner face of the reservoir by tightening said jam-nut. Solder is placed around the flange *b'* to make the joint air-

tight. A section of tubing *c* engages with the internal threads of the collar *b*, being sweated therein, and said tubing extends down within the reservoir to a point below the liquid-line. In this manner air-tight joints are provided.

The air-chamber *d* of the pump has the threaded portion *d'*, adapted to engage with the internal threads of the collar *b*. The pump-barrel *d<sup>2</sup>* has its upper end screwed into the air-chamber *d*. The air-chamber *d* is provided with the outlet-port *d<sup>3</sup>*, having the hose connection *d<sup>4</sup>*. A piston-rod *e* has the threads *e'* formed thereon adapted to engage with the threaded neck *e<sup>2</sup>* of the air-chamber *d*. The upper end of the piston rod or stem *e* is provided with the handle *e<sup>4</sup>*.

At the lower end of the rod *e* is the cage *f*, having the openings *f'*. This cage *f* incloses the ball or valve *f<sup>2</sup>*, which is adapted to rest on the valve-seat *h'* of the piston *h*, said piston *h* screwing into the threaded seat in the cage *f*. The piston *h* may be provided with suitable annular grooves *h<sup>2</sup>* for the reception of packing *h<sup>3</sup>*. The piston *h* has the concave seat *i* formed therein, the face of said seat having ribs or corrugations formed thereon, and while I have illustrated these ribs or corrugations as regular and at regular intervals I do not wish to limit myself to any particular form, as a serrated or roughened face might be employed with like effect, as will more fully hereinafter appear. The lower extension *k* of the pump-barrel is screwed onto the threaded end *l'* of the nipple *l*, the upper end of said nipple having the threaded portion *l<sup>2</sup>*, adapted to engage with the lower end of the pump-barrel *d<sup>2</sup>*. This nipple *l* has the passage *l<sup>3</sup>* therein, which is closed by the valve *m*. The valve *m* has the convex face *m'*, which is also provided with corrugations or ribs corresponding to those of the concave seat of the piston, so that when said piston is in engagement with the valve said concave seat will fit over the convex face of the valve like a hood, the corrugations meshing or interlocking in such a way that when the piston is turned the valve also will be compelled to turn. Furthermore, the piston and valve as taken from the sand after casting will have uneven faces on the concave seat and convex portion, respectively, so that even without making special provision for their in-

terlocking they will adhere sufficiently to turn the valve under ordinary circumstances. The valve  $m$  has the stem  $m^3$  passing down through the nipple, a stop  $m^4$  being secured on said stem to regulate the upward movement of said valve. The valve  $m$  rests upon the packing-ring  $n$ , of leather or other suitable material and having the opening  $n'$ , corresponding with the opening in the nipple. In order to hold said packing-ring securely in position, I form in the nipple  $l$  a recess or groove  $o$ . The packing-ring is then forced down into the nipple, and by pressure applied thereto its outer edges are forced into the recess  $o$  in such a way that said packing-ring is held securely in place against any vertical movement or liability of its turning when the valve is turned, in the manner more fully hereinafter set forth. This packing-ring  $n$  provides an excellent seat for the valve to rest upon, as the valve when forced down into place forms a very tight joint with said packing-ring and prevents leakage. Furthermore, the lower end of the pump-barrel upon being screwed down into the nipple  $l$  has its lower end forced into contact with the packing-ring in such a way as to form a very tight joint, so that the necessity of soldering the pump-barrel at its lower end to prevent leakage is obviated. The lower end of the pump-barrel not only aids in holding the packing-ring securely in position, but at the same time packs the joint made by the pump-barrel with the nipple, which makes it easy to make repairs or inspect the valve without the necessity of removing any solder.

Extending down within the reservoir  $a$  is the charging-tube  $p$ , said tube screwing into the nipple  $p'$  and being sweated therein. This nipple  $p'$  has the annular flange  $p^2$ , adapted to engage the inner face of the reservoir around the opening  $q$ . A jam-nut  $r$  engages with the threads on the outer end of the nipple and acts to hold said nipple securely in place, with the flange  $p^2$  drawn up tightly against the inner face of the reservoir. Solder is placed around the flange  $p^2$ . A valve-seat  $s$  engages the threads on the interior of the outer end of the nipple  $p'$  and forms a seat for the valve  $s'$ . The cap  $s^2$  fits over the valve-seat  $s$  and is screwed down onto the nipple, said cap having the handle  $s^3$ . A stop  $s^4$  regulates the downward movement of the valve  $s'$ . The air and liquid are introduced through this opening  $q$ , as will more fully hereinafter appear.

For the purpose more fully hereinafter set forth I provide the extinguisher with a safety-valve, which is constructed in the following manner: A nipple  $t$ , having the annular flange  $t'$  engaging with the inner face of the reservoir around the opening  $t^2$ , is held in place by means of the jam-nut  $t^3$ . Solder is placed around the flange  $t'$ . This nipple has the small passage-way  $t^4$ , and communicating with said passage-way is the tube  $u$ , which is screwed to the inner end of said nipple, being

sweated therein, and which extends below the liquid-line of the reservoir. On the outer end of the nipple  $t$  is the leather or like disk  $v$  and upon said disk the metal disk  $v'$ . A cage  $w$  is adapted to screw down onto the nipple  $t$ , said cage having the openings  $w'$ , the lower of said openings when the cage is inclined as shown being at or below the level of the valve, so that any liquid escaping will flow out of the cage and none will be left above or around the valve and in the cage to corrode the parts and prevent the easy and ready automatic operation of the valve. A spring  $y$  is interposed between the head of said cage and the plate  $v'$ . This safety-valve may be of any desired construction and may be located at any point on the extinguisher which may be found desirable. For example, if located below the liquid-level in the tank the tube  $u$  may be dispensed with and the valve communicate directly with the liquid.

The operation of my improved extinguisher is as follows: The valve  $m$  having been seated by the rod  $e$ , a force-pump is adjusted to the opening  $q$ , the cap  $s^2$  having been removed, and air is then pumped into said opening, forcing down the valve  $s'$  and forcing the air into the empty vessel through the tube  $p$ . This column of air is then compressed by introducing the liquid by the same pump until a compression of the air column represents the pressure the extinguisher is to be charged with. The pump is then removed, when the check-valve  $s'$  will resume its seat to prevent the escape of the liquid, and the cap  $s^2$  is adjusted to place. It will be observed that by extending the tubes  $c p u$  to a point below the liquid-line, as there is no possibility of the air confined above the liquid escaping through the joints at the openings  $a' q t^2$ , owing to the manner in which said joints are constructed, it would have to pass down through the liquid and up the said tubes; but these tubes are also filled with liquid, so that any connections made with the reservoir are liquid joints—that is, joints to prevent the escape of liquid and not to prevent the escape of air, which is practically impossible to do. The piston-rod is brought to the position shown in Fig. 1 by being screwed down until the concave seat on the piston fits down over and engages with the convex portion of the valve, the shape of the seat and the valve insuring the engagement of the piston and valve in such a manner that when the piston rod or stem is turned the valve also will be turned. If now it is desired to use the extinguisher, the piston-rod being in the position shown in Fig. 1, said rod is given a series of turns by means of the handle to release the piston from the threads  $e^2$  of the air-chamber  $d$ , when the piston-rod is in position for elevation. This turning of the piston-rod, with the corrugations on its concave seat in engagement with the corrugations of the convex portion of the valve, will cause said valve to turn on its seat and so free said

valve from any binding action which may have been caused by corrosion or other cause, and thus permit the compressed air above the liquid-line to force the liquid up through the valve to the pump-barrel and thence to the outlet-port  $d^3$ . The pump is always in readiness to be employed in case the pressure of the air within the reservoir is not sufficient to discharge the liquid with force enough to carry it the distance desired. By this form of connection between the piston and the valve the engagement of the one with the other is always insured upon the lowering of the piston. No matter whether the valve has been turned around during the operation or whether it rocks or leans to one side, the piston coming down straight, and guided by the pump-barrel, the engagement is always perfect.

It is well known that air has expansive properties which under certain conditions may become dangerous or destructive to the tank. For instance, if the extinguisher be filled two-thirds full of liquid and the remaining space is occupied by air at a pressure of one hundred and fifty pounds and this pressure put in at zero temperature and if the extinguisher be brought into a place where the temperature is heated to a high degree a very great increase in pressure would be the result. If one of the extinguishers were in an overheated room where it would be subjected to sufficient heat, an explosion or bursting of the extinguisher might take place, and in any event a great strain on all the joints and fittings would occur, which would gradually develop into leaks. In my improved extinguisher in case the pressure becomes too great the liquid will be forced up through the tube  $u$  and out through the opening in the nipple  $t$ , the pressure acting to compress the spring  $y$  and force the disks  $v v'$  beyond the openings in the cage  $w$  to permit the escape of the liquid. In addition to its function as a safety-valve it has also the further important function in the fact that it serves as a detector in case of overpressure. Instead of simply permitting the escape of part of the air because the pipe leading to the valve extends below the liquid-line it is evident that only liquid can escape from this pipe, and the liquid escaping will at once give notice of the reduction of pressure in the fire-extinguisher, when it can be tested to determine whether it is necessary to recharge it or to increase the air-pressure therein. This is important in connection with fire-extinguishers, which must always be in proper condition for use and which might be affected from change of temperature to such an extent as to at least seriously reduce the pressure. As soon as the pressure has been reduced by the escape of the liquid the opening in the nipple will be closed again. In this manner the danger of the bursting or other injurious effect to the extinguisher is avoided, and notice is given by the presence of the liquid or

the traces of the same on the outside of the extinguisher that something may be wrong, leading to investigation and correction, if needed. This safety-valve also acts to prevent the overcharging of the extinguisher.

In Fig. 5 I have illustrated a modified form of my invention in which the piston  $x$  has the concave seat  $x'$  with the corrugations  $x^2$  formed thereon adapted to fit over and engage the rubber or like elastic ball  $z$ , which acts as a valve. Upon screwing down the piston the concave seat will be forced down onto the ball, and when left to stand in this position the corrugations of the concave seat will form corresponding depressions in the ball, so that when the valve-stem is turned the ball will also be turned and unseated.

In my improved extinguisher the pump may be dispensed with entirely by employing simply a tube with a valve therein and a rod engaging with said valve and adapted to hold the valve and turn it in its seat, compressed air serving to force the liquid to the discharge-port. Furthermore, it is apparent that instead of having the concave seat in the piston engaging with the convex face on the valve the construction may be reversed—namely, the piston may be made convex and adapted to engage with the concave seat on the valve.

I am aware that prior to my invention devices have been suggested whereby when the steam-pressure in a steam-boiler has reached an excessive point a safety-valve communicating by a pipe with the water in the boiler will be opened, permitting water to pass said valve and to be emptied into the boiler-furnace to quench the fire and thus reduce the steam-pressure, and also that in connection with this same device it has been suggested that pipes furnished with cocks may be attached to said pipe, connecting the water in the boiler and the safety-valve, whereby when the cocks are opened water will be forced through said pipe to be utilized for extinguishing fires; but such devices are not akin to my invention and are for wholly non-analogous purposes. They are foreign to this invention and this art and are hereby disclaimed.

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

1. In a fire-extinguisher, the combination of a tank having a valve in the escape-tube thereof, a controlling-rod, and means whereby the rod is locked to hold the valve upon its seat and released to open the valve, said rod having a concave seat on its lower end having corrugations thereon, and said valve having a convex face with corrugations adapted to be engaged by said concave seat, substantially as set forth.

2. In a fire-extinguisher, the combination of a reservoir, a nipple having an opening, an outwardly-opening safety-valve controlling said opening, a pipe connected to said nipple and extending below the liquid-line of said

reservoir, a valve-chamber, and a drain-port in the valve-chamber at or below the level of the valve when seated.

3. In a fire-extinguisher, the combination  
5 of a reservoir, a nipple having an opening communicating with the interior of the reservoir below the liquid-line, a valve controlling said opening, a cage engaging said nipple, and a spring interposed between the cage and

the valve, said cage having a drain-orifice at or below the level of the valve when seated.

In testimony whereof I, the said HARRY E. SAFFORD, have hereunto set my hand.

HARRY E. SAFFORD.

Witnesses:

ROBT. D. TOTTEN,  
ROBERT C. TOTTEN.