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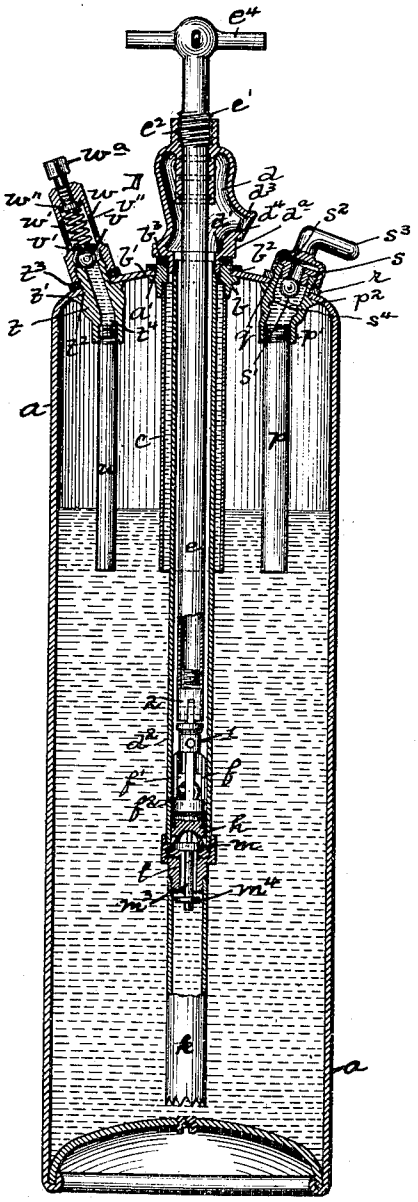
H. E. SAFFORD.

FIRE EXTINGUISHER.

APPLICATION FILED JULY 3, 1905.

Fig. 1.



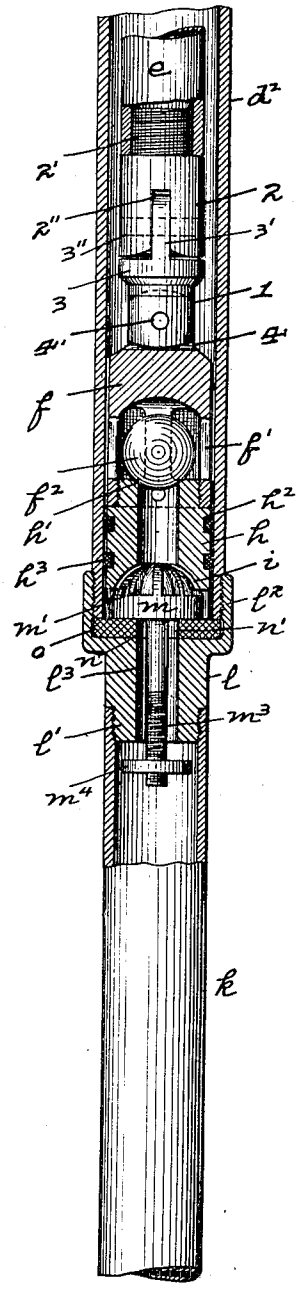


Fig. 2.

WITNESSES

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FIRE-EXTINGUISHER.

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Application filed July 3, 1905. Serial No. 268,046.

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 certain improvements in that class of fire-extinguishers shown and described in United States Letters Patent Nos. 439,565 and 664,898, granted to me on October 28, 1890, and on January 1, 1901, respectively, and in which the fluid is contained within a suitable reservoir and is expelled therefrom when needed by compressed air or other staple gas confined within said reservoir or by a pump should the compressed air fail to work.

The object of the present invention is to insure the fire-extinguisher of working the chemicals therein at all times and overcome liability of the chemicals working the machine, thereby improving such form of a fire-extinguisher in other respects; and the invention consists, generally stated, in the novel arrangement, construction, and combination of parts, as hereinafter more specifically set forth and described, and particularly pointed out in the claims.

To enable others skilled in the art to which my invention appertains to construct and use my improved fire-extinguisher, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a vertical central section of my improved fire-extinguisher. Fig. 2 is an enlarged vertical section of the lower end of the valve-controlled rod and showing its manner of connection with the valve.

Like symbols of reference herein indicate like parts in each of the figures of the drawings.

The reservoir *a* may be of any convenient size or 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^2 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, and a washer b^3 is placed between the upper end of the collar *b* and flange d^8 of the pumps D, located above the reservoir *a*. 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 D has the threaded portion *d'*, adapted to engage with the internal threads of the collar *b*. The pump-barrel d^2 has its upper end screwed into the air-chamber *d*. The air-chamber *d* is provided with the outlet-port d^3, having the hose connection d^4. A piston-rod *e* has the threads *e'* formed thereon, adapted to engage with the threaded neck e^2 of the air-chamber *d* The upper end of the piston-rod or stem *e* is provided with the handle e^4.

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^2, 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 cage *f*, which carries the valve f^2 and the piston *h*, is connected to the piston-rod *e* by a universal joint 1, which is composed of a head 2, having a nipple 2' extending up from the same for being connected within the lower end of the pipe forming said rod, and within this head is the slot 2'' for confining a lip 3' on the movable portion 3 of said joint, while such lip is pivotally held in said slot by a pin 3'', which extends through said head and lip. The head 2 is provided with a like slot in the lower end of the same and at right angles to the slot 2'' for confining a lip 4, formed on the upper end of the cage *f*, which lip is pivotally held in its slot by a pin 4', which passes through said head 2 and said lip 4. This piston *h* may be provided with suitable annular grooves h^2 for the reception of the packing h^3. 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^2, adapted to engage with the lower end of the pump-barrel d^2. This nipple l has the passage l^3 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. 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. The 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 a 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 then 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 and sealed thereon is the ball-valve v, and upon said valve is the metal disk v'. A cage w is adapted to screw down onto the nipple t, said cage having the openings w', the lower end of said openings when the cage is inclined, as shown, being at or below the level of the disk, 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 a disk w'' at the head of said cage and the plate v', and a set-screw w^a engages with said head and disk w to adjust said spring. 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^3 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 the 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.

In order to provide for as cheap a pump as possible in this class of fire-extinguishers, you are naturally limited in the weight of the tubing employed in such pump, and while great care is taken in making such tubing it has been found almost impossible to get a perfect straight and true piston and pump-barrel at all times, in which case the pump would work very stiff or not at all by reason of binding or sticking of the parts on account of such discrepancies or imperfections in the tubing. It will also be seen that when the piston is shut down on the valve tight enough to hold back the pressure of one hundred and fifty pounds of air in the reservoir such piston will spring to one side or the other, and if the vessel is not used soon after it is charged the piston takes a set by reason of such springing out, and then there would be difficulty in moving said piston-rod up and down through the chamber of the pump and piston through the pump-barrel. Therefore in order to overcome these difficulties in operating the pump the universal-joint connection 1, connecting the piston-rod with the piston by the movable part 3, will provide a form of a rigid joint, as it were, but will allow the piston-rod to move from side to side in one direction and the piston to move from side to side in the opposite direction, thereby permitting a slightly-crooked tube to be used in making the pump parts. When the piston is seated on the valve, it will take a straight position on it by reason of the movable joint connection between the piston and piston-rod, and without such a connection or provision it would be a case of forcing these parts into position where they would stay, so that when you desire to use the pump it would be practically useless by reason of its working very stiff or failure to work at all. It will also be seen that 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, and by the 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, as the piston will come down straight, and guided by the pump-barrel the engagement is always perfect and the pump operative at all times through the joint connection.

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 the 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 pressure of the liquid or the traces of the same on the outside of the extinguisher that something may be wrong.

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

In a fire-extinguisher, the combination of a tank having a valve in the escape-tube thereof and provided with corrugations thereon, a controlling-rod having a piston thereon and provided with corrugations for engaging with the corrugations on said valve, and a joint member between said rod and piston and loosely connected thereto by joints at right angles to each other.

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

HARRY E. SAFFORD.

Witnesses:

J. N. COOKE,

R. H. AXTHELM.