

Feb. 8, 1938.

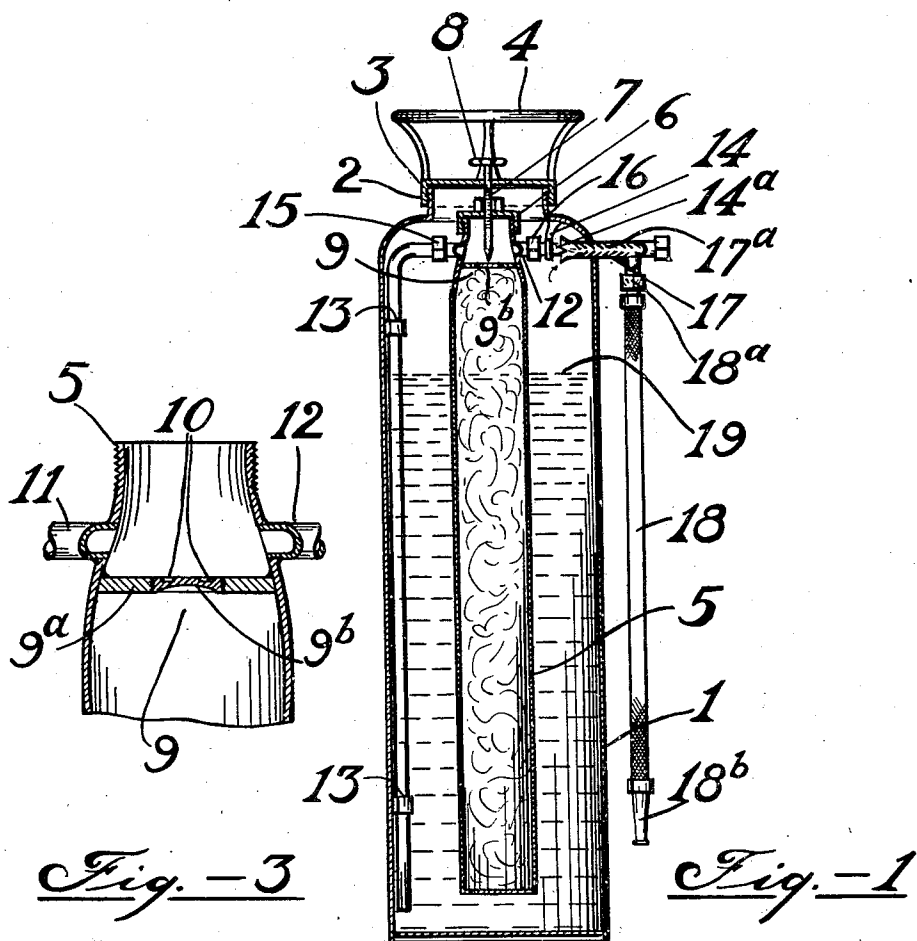
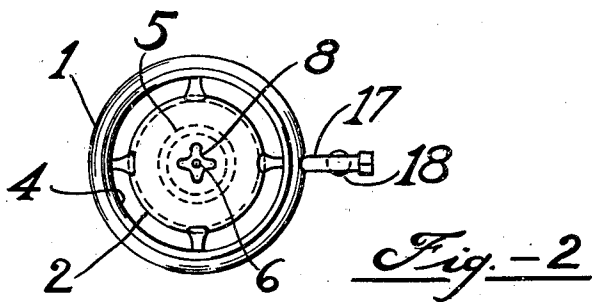
R. M. URQUHART

2,107,313

HAND OPERATED FIRE EXTINGUISHER

Filed Sept. 7, 1934

3 Sheets-Sheet 1



Radcliffe M. Urquhart Inventor

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3 Sheets-Sheet 2

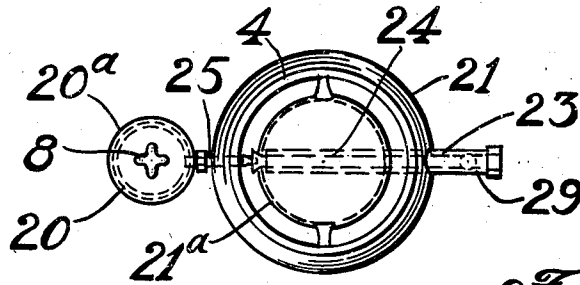


Fig. -5

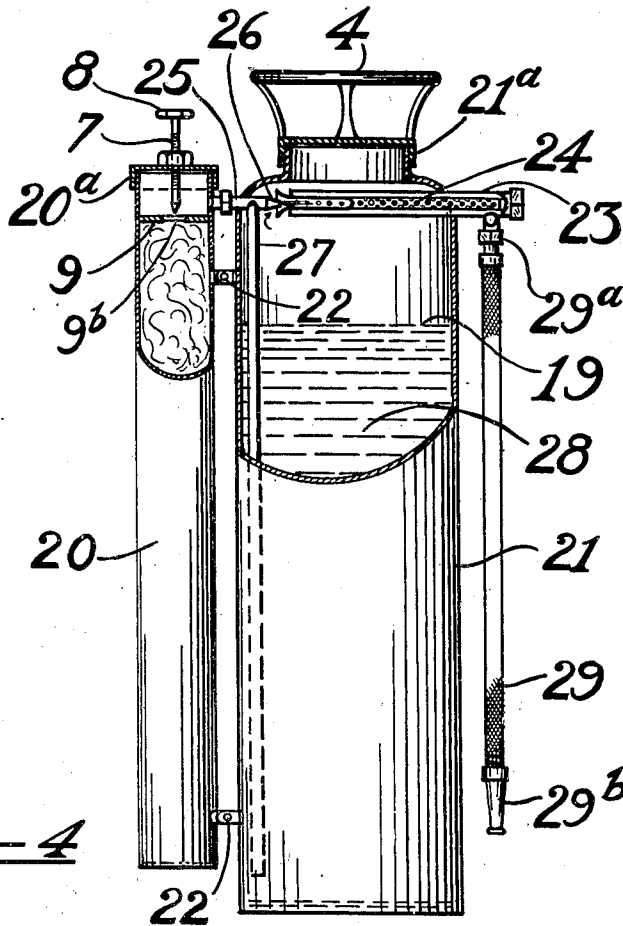


Fig. -4

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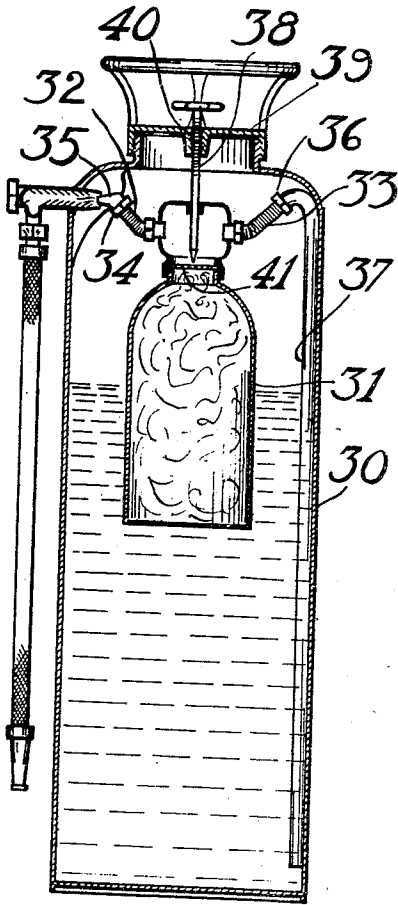
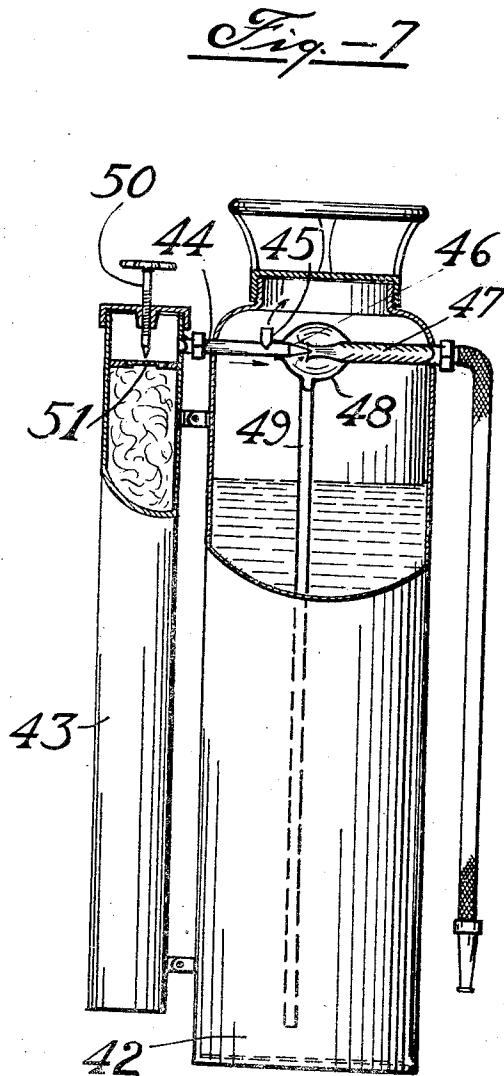


Fig. -6



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UNITED STATES PATENT OFFICE

2,107,313

HAND OPERATED FIRE EXTINGUISHER

Radcliffe M. Urquhart, Philadelphia, Pa.

Application September 7, 1934, Serial No. 743,031

6 Claims. (Cl. 169—31)

This invention relates to improvements in fire extinguishers of the hand operated type, in which foam is generated by breaking a container, rupturing a diaphragm or the like, to bring foam-forming components together. A particular object of the present invention is to provide an improved and simplified construction in which foam is generated, not by chemical means as in the ordinary extinguishers, but mechanically. This is accomplished by releasing a gas under pressure to serve as a foaming and foam expelling means.

The invention will be fully understood from the following description read in connection with the accompanying drawings, in which

Fig. 1 is a vertical section through a fire extinguisher having an internal gas cylinder;

Fig. 2 is a top plan view of the same;

Fig. 3 is a detail of the frangible diaphragm shown in Fig. 1;

Fig. 4 is a view similar to Fig. 1 but showing an exterior gas cylinder;

Fig. 5 is a top plan view of Fig. 4;

Fig. 6 is a vertical section through an alternative form in which the gas container is flexibly suspended; and

Fig. 7 is a similar view showing a type which is best operated without inverting the extinguisher, as distinguished from the inversion types of Figs. 1 to 6.

Referring first to Figs. 1, 2 and 3, reference numeral 1 denotes a container, which may be of the usual cylindrical type or of any other desired shape. Container 1 has a cover 2 detachably connected with it by screw threads 3. The hand wheel 4 is attached to the cover or formed integrally with it.

Within the container 1 is a vessel for gas under pressure, referred to for convenience as cylinder 5. This has a cover 6 screw threaded on its neck and carrying a puncturing pin 7. The pin passes through a perforation in cover 2 and is operated by a handle 8 extending above the cover, to puncture a diaphragm 9 extending across the neck of the cylinder.

In general the gas used will be compressed or liquefied carbon dioxide, but for the purpose of this invention other gases, even those capable of supporting combustion, may be used. The gas is so entrapped in the foam, when made as subsequently described, that there is very little difference between gases supporting and gases not supporting combustion.

The pressure may be whatever is desired, but 75-125 pounds per sq. in. in the cylinder is usually

suitable. The diaphragm 9 can readily be made to withstand such pressures, and yet be easily punctured to release the gas. As shown in detail in Fig. 3, the diaphragm preferably comprises a collar 9a secured to the neck of the cylinder 5, by welding or otherwise, and an inner disk 9b of frangible metal screw threaded in the collar. Wrench slots 10 are provided for removal of the disk. The diaphragm with the cover 6 forms a chamber adapted to distribute the escaping gas in a manner subsequently described.

The cylinder 5 is supported in the container by engagement with the gas discharge pipe 11 and foam discharge pipe 12; or it may be supported by a collar secured to the container wall or cover, or any other suitable means. The pipes 11 and 12 are secured to the container by straps 13 and 14 respectively. Couplings or back-off nuts 15 and 16 unite the ends of pipes 11 and 12 with the corresponding openings in the neck of the cylinder.

In the discharge pipe 12 there is a nozzle 14a of the eductor type which discharges into a conduit 15. In this there are arranged a series of baffle plates, spirals, or the like, 17a, adapted to break up and finely subdivide foam passing through the conduit. This opens into a hose 17 to which it is connected by a coupling 18.

The container 1 will ordinarily be filled with an aqueous solution of saponin, soap bark extract, licorice extract or other so-called foam stabilizer, up to about the level indicated by line 19. Assuming that the container is charged with such a solution and the cylinder with carbon dioxide gas under pressure, it will be seen that when the disk 9b is punctured by downward movement of the pin 7, gas will rush out of the cylinder through pipe 11 and discharge near the bottom of the container. The user will quickly invert the extinguisher after puncturing the diaphragm. The gas puts the solution under a slight pressure and simultaneously rushes out of the ejector nozzle 14a, now submerged in the solution, into the baffled conduit 15. The gas educes the foam-making solution through this conduit and has sufficient pressure to throw the foam the desired distance through nozzle 17 of the hose 17a.

The mechanical breaking of the foam by its passage through the conduit is highly desirable. A more copious and lasting foam is produced in this way. However, it is not absolutely essential and the conduit may be made without baffles, still retaining some advantages of the invention.

The loss of gas before the extinguisher is in-

verted does not amount to much; but it can be avoided altogether by allowing the gas container to puncture itself on inversion by the use of a collar mounting or the flexible suspension of Fig. 6.

In the form of the invention shown in Figs. 4 and 5 the general principle is the same as above described but the gas cylinder, designated 20, is on the outside of the container 21. The cylinder is supported by straps 22 secured to the wall of the container. The discharge conduit is in the form of an outer tube 23 within which there is a perforated tube 24. The gas discharged from the cylinder 20 escapes through connection 25 and passes through the branches 26 and 27 into the body of foam forming solution 28 and the discharge conduit 23 respectively. The extinguisher is inverted as soon as the diaphragm is punctured. The partly formed foam is drawn into the discharge conduit by the stream of gas from branch 26, and ejected through the hose 29. This discharge conduit serves the same purpose as the baffled conduit 15 of Fig. 1; namely, it acts as a foaming and foam subdividing chamber, in which stable foam is formed. When the extinguisher is inverted the solution enters the discharge conduit 15 of Fig. 1 or 23, 24 of Fig. 4, and is swept through it by the high pressure gas coming out of the cylinder. The solution and the gas pass along together, with any foam formed adjacent the inlet of the discharge conduit which may be drawn into the conduit by the gas stream.

In Fig. 6 there is illustrated an alternative form of the invention, in which the extinguisher container 30 is provided with an internal gas cylinder 31 flexibly suspended by connections 32 and 33. Connection 32 is secured by a suitable coupling 34 to the eductor nozzle 35. The connection 33 is secured by a suitable coupling 36 to a pipe 37 which extends from the upper part of the container 30 to a pin adjacent the bottom.

The perforating pin 38 is rigidly mounted in the cover 39 by a screw threaded connection 40.

It will be seen that when the container 30 is inverted, the weight of the cylinder 31 will cause the pin 38 to perforate the diaphragm 41 when the cylinder falls. In this way all loss of gas is avoided since the solution in the container 30 is over the gas outlet when the perforation is made.

In the form of the invention shown in Fig. 7, it is not necessary to invert the container, which is designated 42. As shown, there is provided an exterior gas cylinder 43, but this may be arranged on the inside if desired. The gas is discharged from the cylinder through a pipe 44 which has a branch 45 leading into the upper part of the container 42 and terminates in an ejector nozzle 46 arranged adjacent to a baffled tube 47, as described in connection with the other figures. A housing 48 encloses the nozzle and the inlet end of the tube 47. This housing has an opening into a tube 49 which extends to a point near the bottom of the container 42, or in any event, below the surface of the liquid in the container.

In the operation of this form of the invention the perforating pin 50 is screwed down to perforate the diaphragm 51. The gas rushes out of the cylinder 43 through the pipe 44. Part of the gas escapes through branch 45 and exerts pressure on the surface of the liquid in the container. This causes the liquid to rise through pipe 49 into the housing 48. In this the liquid is foamed by the gas rushing out of nozzle 46. The foam

is formed, subdivided, and stabilized by passage through the baffled tube 47.

In an application Ser. No. 638,272 filed on October 28, 1932 by Radcliffe M. Urquhart and George G. Urquhart, the general principles of making mechanical foam are described and claimed. The present invention is an adaptation of those principles to an efficient and economical hand operated extinguisher.

The extinguisher is recharged by taking off the cover 2 and filling the outer container 1 with aqueous solution of a foam stabilizer. The gas cylinder is supplied with liquid carbon dioxide through the opening left by the removal of disk 9b, or if compressed gas is to be used, suitable fittings may be provided for pumping gas into the cylinder, or the cylinder may be removed and a new cylinder set in, the old cylinder being returned to factory for recharging.

Various changes and alternative arrangements may be made within the scope of the appended claims in which it is my intention to claim all novelty inherent in the invention as broadly as the prior art permits.

I claim:

1. A fire extinguisher, comprising a container for a foam forming liquid, a supplementary container, secured to and carried by the container for the liquid, adapted to receive and hold under pressure a quantity of a gaseous material, a conduit for foam extending through one wall of said liquid container, disposed horizontally therein and having an open end communicating with the liquid in the container when in use, baffles disposed interiorly of the conduit, a distributing chamber formed at one end of said supplementary container, pipe connections associated with said distributing chamber and with the liquid container connecting the chamber with a vapor space above the liquid and with a nozzle discharging into the open end of the baffled conduit in the liquid container, means associated with the supplementary container for releasing the pressure of gaseous material therein whereby said gaseous material is utilized to generate a fine foam within the liquid container and to discharge said foam from the container.

2. A fire extinguisher comprising a container for a foam forming liquid, a supplementary container associated therewith and adapted to receive and hold under pressure a quantity of a gaseous material, a conduit for foam extending through the container and having an open end communicating with the liquid in the container when in use, baffling means disposed interiorly of the conduit, connections associated with said supplementary container and with the liquid container connecting the supplementary container with a space above the liquid and with a nozzle discharging into the open end of said baffled conduit, means associated with the supplementary container for releasing the pressure of gaseous material therein whereby said gaseous material is utilized to generate and discharge a fire extinguishing foam.

3. A fire extinguisher comprising a container for a foam forming liquid, a cylinder charged with compressed gas in said container, means for mounting the cylinder for a limited fall when the container is inverted, means for puncturing the cylinder when it falls and means for conducting the resulting gas stream into foam forming relationship with the liquid, including foam stabilizing means provided in series with said means for

conducting the gas stream into the foam forming liquid.

4. Apparatus according to claim 3 in which the cylinder is suspended by flexible pipe connections, said connections leading respectively to a discharge conduit for foam and to a conduit for transferring gas to the space in the container above the liquid therein.

5. A fire extinguisher comprising a container for foam forming liquids, a supplementary container adapted to hold under pressure a quantity of gaseous materials, a conduit for foam communicating with the liquids in the container when in use, foam stabilizing means in operative relation to said conduit, said supplementary container communicating with a space above the liquid when in use and with an ejector means adapted to exhaust the said liquid and said gas into the said conduit, means associated with the supple-

mentary container for releasing the pressure of gaseous material therein whereby said gaseous material is utilized to generate and discharge a fire extinguishing foam.

6. A fire extinguisher comprising a container for foam forming liquid a supplementary container adapted to hold under pressure a quantity of gaseous material, a conduit for foam communicating with the liquid in the container when in use, foam stabilizing means in operative relation to said conduit, means for releasing said gaseous material from the supplementary container communicating with a space above the liquid when in use to increase the pressure on said liquid, and with an ejector means adapted to exhaust said liquids and said gas into said conduit.

RADCLIFFE M. URQUHART.