May 17, 1938. G. SCHAAF 2,117,684

FIRE EXTINGUISHER

Filed Oct. 14, 1935

FIG. 1.

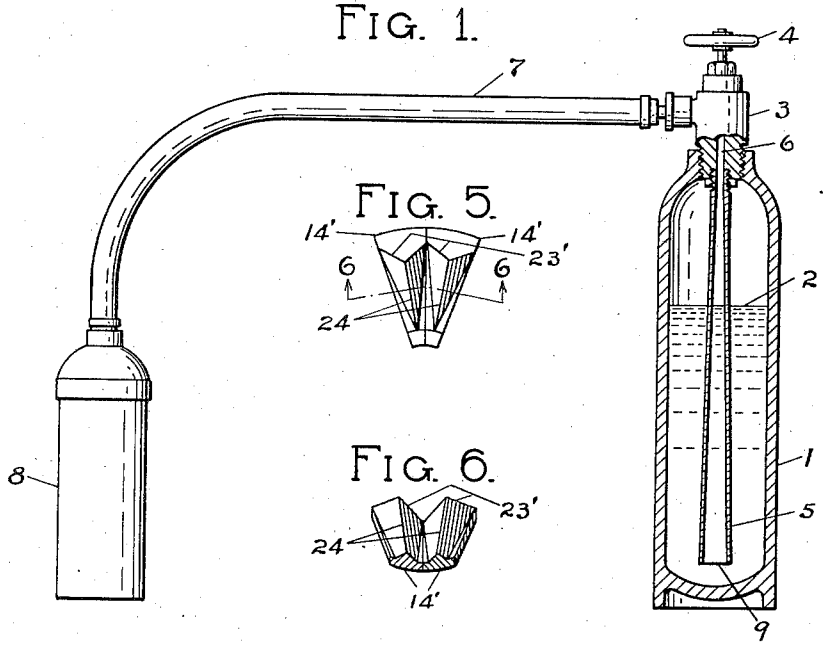
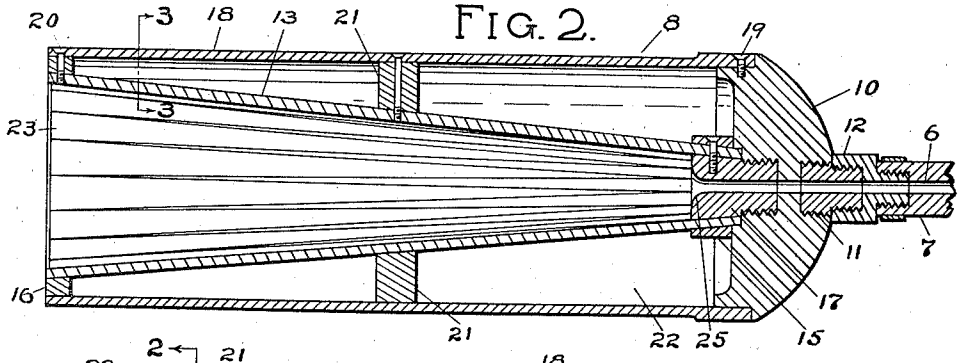


FIG. 5.

FIG. 6.

FIG. 2.



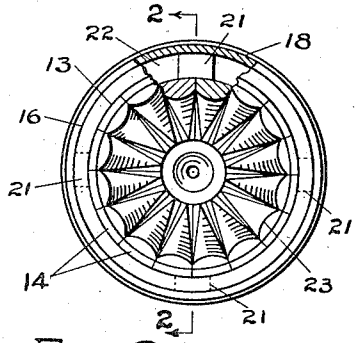


FIG. 3.

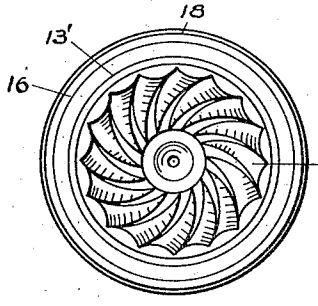


FIG. 4.

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Patented May 17, 1938 2,117,684

UNITED STATES PATENT OFFICE

2,117,684

FIRE EXTINGUISHER

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Application October 14, 1935, Serial No. 44,924

13 Claims. (Cl. 169—11)

My invention relates to a fire extinguisher of the type which employs a liquid carbonic acid or carbon dioxide stored in a container under pressure and more particularly to the method and apparatus for discharging the liquid to form a so-called snow and for expanding and spreading it in a manner to get the best results in extinguishing a fire.

The fires which usually occur and can be controlled or extinguished by the ordinary hand extinguisher can be generally placed in two classes. One is the fire spread over a considerable surface without much depth as where gasoline has been spilled and become ignited. Secondly where gasoline of some depth as in a pail is ignited. The fire of the first class can be extinguished with some degree of efficiency by either an extinguisher shooting out a small and concentrated stream of gas and snow to be swept back and forth over the fire or by an extinguisher with a wide stream which rolls over and smothers the fire. In a fire of the second class the highly concentrated stream when shot into a pail of ignited gasoline serves only to scatter the fire and not extinguish it and the stream is not large enough to smother it and prevent spreading as is accomplished by a wider stream. The difficulty encountered in the fire of the second class is that the large body of gasoline continually feeds the fire and it must be extinguished in its entirety by cutting off all air at once to be successful in fighting it.

The main object of my invention is to furnish an extinguisher which will fight the two mentioned classes of fires with equal efficiency.

Another object is to furnish an extinguisher with a nozzle having tapered ridges which will agitate the issuing stream to create a quantity of snow as a blanketing medium.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists in certain features of novelty in the construction, combination and arrangement of parts by which the said objects are attained, the invention being more particularly pointed out in the claims.

In the accompanying drawing:

Figure 1 is a side elevation, partly in section, of a container and nozzle with connections which constitute a fire extinguisher embodying my invention.

Fig. 2 is a central longitudinal section of my nozzle on line 2—2 of Fig. 3 showing the tapered internal ridges and an insulating chamber.

Fig. 3 is an end view of my nozzle showing the ridges in the horn and the insulating chamber partly in section on line 3—3 of Fig. 2.

Fig. 4 is an end view of my nozzle showing spiral ridges to give the issuing stream a rotary motion.

Fig. 5 is an end view of two sections of the horn as in Fig. 3 but showing angular instead of rounded ridges.

Fig. 6 is a sectional view on line 6—6 of Fig. 5.

Referring to the drawing, 1 is a storage container or tank to hold a charge of liquid carbonic acid 2 under high pressure. 3 is a T forming a stopper for the tank 1 and having a valve 4. The carbonic acid is conducted from the tank 1 through a conduit formed by a tube 5, a passage 6 in the T 3, which is controlled by the valve 4, and a flexible hose 7 leading to the discharge nozzle 8. The tube 5 extends from T 3 to near the bottom of tank 1 and has a passage tapered from its lower end opening 9 to the smaller sized passage 6 at the top to allow the liquid to freely enter said tube 5 without boiling.

In Fig. 2, the nozzle 8 is formed of a base 10 with a nipple 11 threaded into it to take the hose connection 12. In the nozzle 8 is a horn 13, shown of built-up construction, although it may be cast in one piece as 13' of Fig. 4. The sections of the horn 13 consist of the sixteen pieces 14 shown joined in end view in Fig. 3 (and two together as 14' more in detail in Figs. 5 and 6) bound at their inner ends by a band 15 and at their outer ends by a band 16. Fastened in the small end of the horn 13 is a spreader 17 threaded to connect the horn 13 to the base 10.

18 is a tube forming a casing for the nozzle 8, connected to the base 10 by screws 19 and to the large end of the horn 13 by screws 20 through the band 16. Four distance pieces 21 are located intermediate of the ends of the horn 13 and the casing 18. The horn 13 is insulated by means of the air in the space 22 enclosed around the outside of it by the casing 18 and on the ends by base 10 and band 16. Each section 14 has a rounded ridge 23 tapering toward the spreader 17 at the apex of the horn 13.

Referring to Figs. 5 and 6 it will be seen that each section 14' is tapered on the sides to fit adjacent sections to complete a horn and the top of each ridge terminates in a line as at 24 instead of being rounded as a ridge 23 of section 14. The horn thus has a corrugated inner surface to break up the discharged stream which suddenly expands as it leaves the discharge passage 6 and agitating the issuing stream causes it to produce a large percentage of snow.

The discharge passage marked 6 leading from the upper end of tube 5 through the T 3, hose 7, connection 12, nipple 11, base 10 and spreader 17 is of uniform size until it reaches the orifice 25. The orifice 25 is a graduated enlargement of the passage 6 to graduate the drop of pressure of the stream of carbonic acid as it expands into the horn 13. The drop in pressure of the liquid from the tank 1 through the uniform passage 6, and consequently the drop in temperature, is not sufficient to freeze any water content of said

liquid or to form a snow to clog said passage 6. Also the opening 9 into tube 5 being larger than the passage 6 allows the liquid 2 from tank 1 to enter said tube 5 at a lower speed than it attains in said passage 6. This prevents agitation and boiling at said opening 9 and the taper of the tube 5 gradually builds up the speed of the liquid to that attained in said passage 6.

The graduated discharge opening of the orifice 25 reduces the pressure and expands the liquid to form a gas at this point so the stream fills the horn 13 and the inner corrugated surface of the horn agitates said stream to form a large amount of snow which the horn spreads to blanket a fire.

An orifice having an abrupt ending the same size as the passage and especially a restricted orifice will shoot the stream out in a concentrated form with such force that it will not blanket a deep fire and only serves to scatter it.

The spreader 17 and the horn 13 are insulated by the air in space 22 from the cold caused by the expansion of the liquid at the orifice 25 and in said horn.

In Fig. 4 is shown the end view of a one piece horn 13' having ridges or corrugations 23'' which are spirally formed.

The effect of either form of corrugations is to retard the speed of the issuing stream and so produce snow.

The effect of the spiral form of corrugations is to agitate the issuing stream even more than the straight corrugations, while the rotary motion gives a good directional effect to the stream.

Having thus described my invention what I claim is:

1. In a device of the character described, comprising a container for holding carbon dioxide under pressure, a horn, a conduit leading from near the bottom of said container to said horn, and a pipe as a portion of said conduit and extending from near the bottom to the top of said container, said conduit from said container having a passage of substantially uniform size and said pipe having a passage tapered from its mouth to said uniform conduit passage.

2. In a device of the character described, comprising a container for carbon dioxide under pressure, a discharge nozzle, a conduit from said container to said nozzle and with a substantially uniform passage and having a graduated discharge orifice at said nozzle, a tube extending from near the bottom of said container to said conduit, said tube having a passage tapered from its mouth to said conduit passage and an internally corrugated horn as a portion of said nozzle.

3. In a device of the character described, comprising a container for carbon dioxide under pressure, a conduit extending from said container, a nozzle at the discharge end of said conduit, a horn as a part of said nozzle and a closed casing inclosing an air space about said horn as a means to insulate said horn by the air in said casing.

4. In a device of the character described, a container for a fire extinguishing fluid having the physical properties of CO_2, a conduit extending from said container, a tube extending from near the bottom of said container to said conduit and tapered from its mouth to said conduit, a horn at the discharge end of said conduit and closed means to insulate said horn by inclosing air in contact with its external surface.

5. In a device of the character described, including a container for carbon dioxide liquefied under pressure, a discharge nozzle, a conduit from said container to said discharge nozzle with a substantially uniform passage and a horn, said nozzle providing means to form an orifice with a graduated enlargement from said uniform passage into the apex of said horn.

6. In a device of the character described, comprising a container for holding carbon dioxide under pressure, a conduit leading from near the bottom of said container, a nozzle at the discharge end of said conduit and a horn as a portion of said nozzle and having corrugations on the inner surface thereof whereby a substantial increase of the internal surface of said horn is obtained.

7. In a device of the character described, including a receptacle to contain carbon dioxide, an outlet pipe leading from near the bottom of said receptacle, a conduit in communication with said outlet pipe, a valve to control the flow of fluid through said conduit, a horn at the discharge end of said conduit and means to insulate said horn, said horn having internal ridges extending in a lengthwise direction to increase the internal surface of said horn.

8. In a device of the character described, including a receptacle to hold carbon dioxide, a conduit extending from said receptacle and a horn at the discharge end of said conduit, said horn having internal ridges tapered from its outlet to its apex to substantially increase the internal surface of said horn.

9. In a device of the character described, comprising a container for carbon dioxide, a conduit extending from said container and a horn at the discharge end of said conduit, said horn having spirally formed corrugations on its internal surface whereby substantial obstructions are presented across the flow of the stream of discharging fluid.

10. In a device of the character described, comprising a container for carbon dioxide, a conduit extending from said container and a horn at the discharge end of said conduit, said horn formed in sections and with internal ridges presenting surfaces at an angle to the flow of a discharging stream of fluid.

11. In a device of the character described, a container for liquid carbon dioxide, a conduit extending from said container, a horn at the discharge end of said conduit and substantial ridges on the internal surface of said horn to break up and agitate a stream issuing from said conduit, said conduit having a flared discharge orifice.

12. In a device of the character described, a container for liquid carbon dioxide, a conduit extending from said container, a horn at the discharge end of said conduit and substantial ridges on the internal surface of said horn having surfaces at an angle to each other and to the flow of a discharging stream of fluid.

13. In a device of the character described, a container for a fire extinguishing fluid liquefied under pressure, a conduit extending from said container, means forming a flared discharge orifice at the end of said conduit, and tube means beyond said orifice to direct a stream issuing from said orifice, said tube means arranged with corrugated means extending over its internal surface into the path of a discharging stream from said orifice.

GEORGE SCHAAF.