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FIRE-EXTINGUISHING METHOD AND APPARATUS

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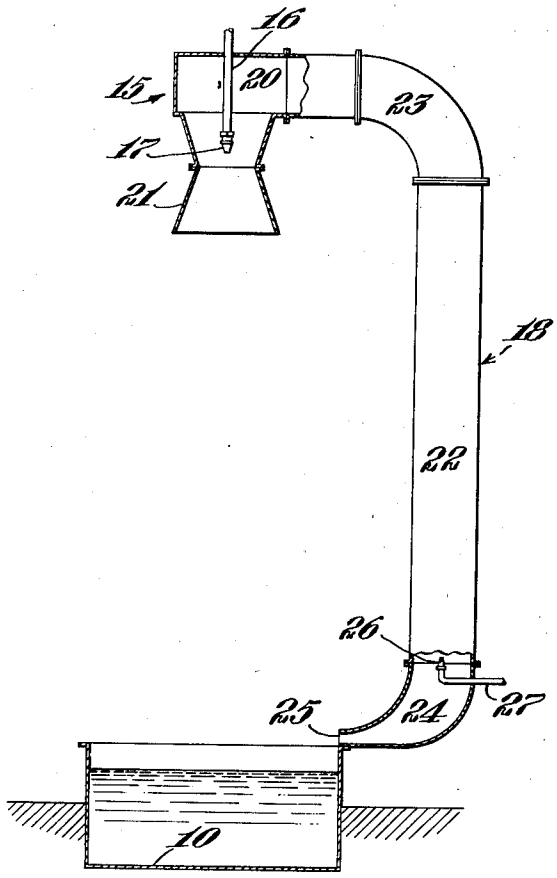



Fig. 1

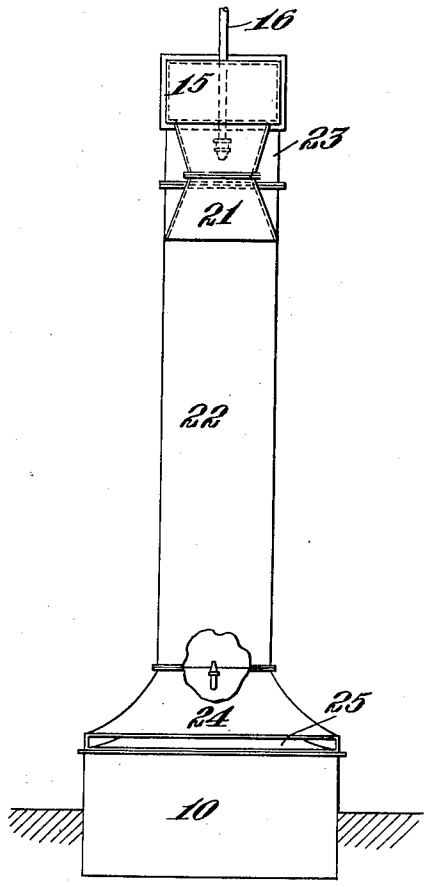



Fig. 2

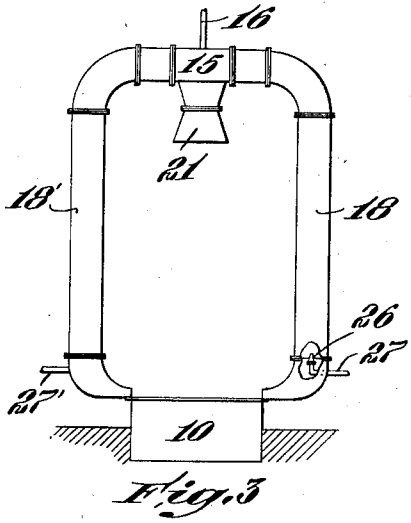



Fig. 3

Inventor
James B. Smith
By Roberts, Cushman & Woodbury.
Attys.

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## FIRE-EXTINGUISHING METHOD AND APPARATUS

James B. Smith, Rockland, Mass.

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12 Claims. (Cl. 169—12)

This invention relates to a method of extinguishing fires which comprises propelling a conical spray of water, steam or other fire-extinguishing material from an orifice to the fire and in the apex portion of the conical spray aspirating a gaseous extinguisher which is sufficiently deficient in oxygen to tend to smother the fire, such a method being described and claimed in the copending application of Norman J. Thompson, Serial No. 291,349 filed August 22, 1939. As disclosed in said application a method of the type referred to is exceptionally efficient in extinguishing fires of flammable liquids in exposed places, such as open tanks (vats, pans, trays, etc.) of flammable liquids, such fires being very difficult to extinguish because of their exposure to drafts of air such as those induced by the fire and those resulting from open windows and the like.

Objects of the present invention are to provide apparatus which is simple and inexpensive to construct, which is quick and effective in action, which can be installed over open tanks without interfering with the normal use of the tanks, which eliminates or greatly reduces the cost of operation and which is generally superior to apparatus heretofore used for extinguishing fires in open tanks.

According to the present invention the products of combustion of the fire are utilized as the aforesaid gaseous extinguisher to smother the fire, being conducted into the aforesaid spray of fire-extinguishing fluid by a duct leading from the tank to the apex of the spray and thence returned directly to the combustion zone. The products of combustion are preferably entrained in said spray of propellant particles by enclosing the apex of the conical spray in a casing shaped to serve as a mixing chamber. By employing a spray comprising water particles the aspirating action is fairly efficient because water particles are heavy compared with the gaseous products of combustion; consequently the mixture of water particles and products of combustion will carry considerable distances without using excessive pressure in the spray nozzle. Moreover the water particles help materially to extinguish the fire, not only by their cooling effect but also by a smothering effect as they flatten upon impingement with the surface of the flammable liquid and tend to form a film over the surface of the liquid. While the spray of water particles may be formed with a jet of steam, which may or may not condense into water vapor as it emerges from the nozzle, of course the cooling effect is greater if the spray be produced with cold water. On the other hand steam is more effective in excluding air from the combustion zone, requiring less gaseous extinguisher to smother the fire. The gaseous products of combustion which are carried to the fire by the aspirating action of the water spray not only tend to displace the oxygen in the region of the fire but their presence in and around the spray tends to prevent the spray from carrying air to the fire.

For various reasons a mixture of water particles and gaseous extinguisher is superior to a spray of either water particles alone or gaseous extinguisher alone, particularly when the water particles are sprayed directly to the fire from a nozzle and the gaseous extinguisher is drawn into and around the spray of water particles by aspirating action. Such a mixture will extinguish difficult fires of certain flammable liquids such as gasoline which a water spray alone will not extinguish, and less difficult fires of flammable liquids are extinguished more quickly and at less expense. Even in those cases where water alone will extinguish the fire much more water is required, thereby resulting in more water damage.

Instead of using a fluid, such as water or steam, as the propellant, the spray may comprise a fire-extinguishing powder such as the well-known du Gas powder or finely-comminuted water-proof particles of sodium carbonate, in which case the powder may be sprayed in any suitable way as by a rotary pump.

For the purpose of illustration typical embodiments of the invention are illustrated in the accompanying drawing in which

Figs. 1 and 2 are side and front elevations, respectively, of one embodiment, parts being broken away; and

Fig. 3 is a front elevation of another embodiment.

In the drawing is shown a tank 10 adapted to contain a flammable liquid such as ether, gasoline, naphtha, acetone or lacquer. While the invention is particularly adapted for use with liquids having flash points of 150° F. or less, its use is obviously not so limited.

The apparatus shown in Figs. 1 and 2 comprises a spray unit 15 including a pipe 16 and nozzle 17, and a duct 18 connecting the unit 15 to the tank 10. The unit 15 is mounted directly over the tank 10 and includes a hood comprising a chamber 20 and an outlet tube 21. The tube 21 has a Venturi shape and leads from the under side of the chamber 20. The outlet of the noz-

zle 17 is disposed somewhat above the most constricted area of the tube 21.

The duct 18 comprises a vertical central section 22 and elbows 23 and 24 at the ends of such section. The elbow 23 is connected to the chamber 20 of the hood and is of the same internal cross section. The elbow 24 terminates in a vertically restricted mouth 25 at one wall of the tank 10, the mouth 25 and wall being of the same length (see Fig. 2).

Should the flammable liquid in the tank 10 become ignited a flow of propellant, usually water, is initiated through the pipe 16 from any suitable source and leaves the nozzle in a spray directed to the tank. The aspirating action of the spray creates a suction in the hood of the unit and in the duct 18. This suction draws the products of combustion through the mouth 25 into the duct 18 and thence into the chamber 20 of the hood, the spray then returning them to the combustion zone. Such products of combustion, being deficient in oxygen, assist in extinguishing the fire by excluding air from the combustion zone and, to some extent, by mingling with the vapors evolved by the liquid and reducing their concentration to such a degree that they no longer support combustion. It will be understood that at the same time the stream of water or other liquid acts in the usual way to blanket the fire and cool the body of flammable liquid.

A spray of water or other cooling medium may be directed upon the walls of the aforesaid duct by a nozzle 26, thereby to avoid overheating the duct by the products of combustion. In automatic systems this spray may be started simultaneously with the main spray from nozzle 17. By directing this auxiliary spray in the direction of circulation of the combustion products it may assist the circulation of the gases.

Instead of providing only one duct between the tank and the spray unit additional ducts may be provided. Thus Fig. 3 illustrates an installation including two such ducts. The structure and operation of this installation are of course similar to those of the installation shown in Figs. 1 and 2 and will not be described in detail. The same reference characters have been applied to the corresponding elements and the additional elements are designated by primes of the numerals applied to similar elements.

The essence of this invention is the employment of the products of combustion in the extinguishing of fires and the circulation of such products from the combustion zone to the spray unit and thence back to that zone with the spray of extinguishing propellant. While certain installations are shown on the drawing and the invention is described with relation thereto, it will be understood that the invention is not limited to such installations and may be employed in other installations within the spirit and scope of the invention set forth in the following claims.

I claim:

1. The method of extinguishing fires which comprises propelling a divergent spray of fire-extinguishing particles directly to the fire, conducting gaseous products of combustion from the fire to the region of the spray and by aspiration of the spray inducting said products into a divergent portion of the spray and returning the products to the combustion zone.

2. Apparatus for extinguishing a fire in an open tank of flammable liquid which comprises a hood above the tank, the hood having a downwardly directed open end, a nozzle for directing a divergent spray of particles of fire-extinguishing material through said chamber toward said open end, and a duct extending from the top of the tank to said hood to carry gaseous products of combustion from the fire to said hood, whereby the said products are drawn into the spray and carried back to the tank to help smother the fire.

3. Apparatus for extinguishing a fire in an open tank of flammable liquid which comprises a hood above the tank, the hood having an inlet and a downwardly directed outlet, a nozzle for directing a divergent spray of particles of propellant through said chamber toward said outlet, the parts being so correlated that the divergent spray substantially fills said outlet, and a duct extending to said inlet from the top of the tank to carry gaseous products of combustion from the tank to said hood, whereby the said products are drawn into the spray and carried back to the tank to help smother the fire.

4. Fire-extinguishing apparatus for extinguishing a fire in an open tank of flammable liquid comprising a nozzle for directing a spray of particles of propellant fluid into the tank, a casing surrounding the outlet of the nozzle and terminating a short distance in front of the nozzle in an open end which is in alignment with the outlet end, and means for conducting products of combustion from said fire into said casing, whereby the casing serves as a mixing chamber to entrain the products of combustion in and around said spray as the latter passes directly from said nozzle to the fire.

5. Means for extinguishing a fire in an open tank which comprises a funnel-shaped shell mounted above the tank with its flaring outlet directed downwardly toward the tank, means for conducting products of combustion from the fire to the interior of said shell, and a nozzle for delivering a spray of fire-extinguishing fluid into said shell and thence through said outlet, thereby to propel said product of combustion from the shell to the fire.

6. Means for extinguishing fires of flammable liquids including a spray unit which comprises a hood and a pipe terminating within the hood in a nozzle through which a spray of fire-extinguishing liquid is directed into the combustion zone, and means through which the products of combustion are conveyed from the combustion zone to the hood, such products of combustion being moved through said means and returned to the combustion zone by said spray.

7. Means for extinguishing fires of flammable liquids including a spray unit which comprises a hood and a pipe terminating within the hood in a nozzle through which a spray of fire-extinguishing liquid is directed into the combustion zone, and a duct through which the products of combustion are conveyed from the combustion zone to the hood, such products of combustion being drawn through said duct and returned to the combustion zone by the aspirating action of said spray.

8. Means for extinguishing fires of flammable liquids including a spray unit which comprises a hood and a pipe terminating within the hood in a nozzle through which a spray of fire-extinguishing liquid is directed into the combustion zone, and a duct through which the products of combustion are conveyed from the combustion zone to the hood, means in said duct for creating a supplementary jet of fluid to cool the duct.

9. Means for extinguishing fires of flammable liquids in a tank including a spray unit which comprises a hood, and a pipe terminating within the hood in a nozzle through which a spray of fire-extinguishing liquid is directed into the tank, a duct leading from said unit to said tank and having a mouth at one side of the tank, and means in said duct for drawing the products of combustion from the tank through the duct to the unit, said products of combustion being returned to the tank with the spray of fire-extinguishing liquid.

10. Means for extinguishing fires of flammable liquids in a tank including a spray unit which comprises a hood, and a pipe terminating within the hood in a nozzle through which a spray of fire-extinguishing liquid is directed into the tank, a duct leading from said unit to said tank and having a mouth at one side of the tank, and a nozzle in said duct by which a stream of liquid is directed in the duct toward the unit, said stream drawing the products of combustion from the tank through the duct to the spray unit, such products of combustion being returned to the tank with the spray of fire-extinguishing liquid.

11. Means for extinguishing a fire comprising a spray means from which a flaring stream of fire-extinguishing fluid may be sprayed, means for mounting said spray means so that said fluid may be sprayed directly to the fire, and means for directing products of combustion produced by the fire to the region of said spray means so that the spray causes said products to be drawn into the spray at a flaring portion thereof and returned to the fire, thereby assisting in smothering the fire.

12. The method of extinguishing a fire which comprises propelling a divergent spray of discrete fire-extinguishing particles to the fire directly from a location in the space adjacent to the fire, directing the products of combustion of the fire to said location, and at said location introducing said products into the spray by aspiration at the divergent portion of the spray, thereby to return products of combustion to the fire.

JAMES B. SMITH.