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May 19, 1942. N. J. THOMPSON 2,283,775

FIRE EXTINGUISHING METHOD AND APPARATUS

Filed Oct. 17, 1940

Fig. 1

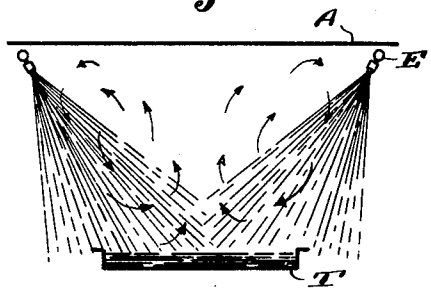


Fig. 4

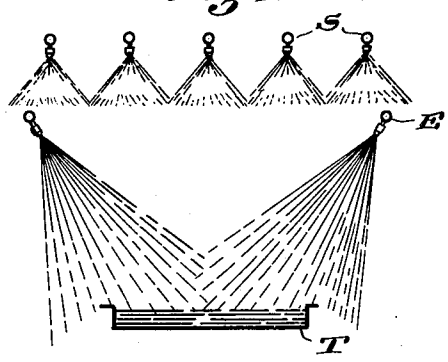


Fig. 2

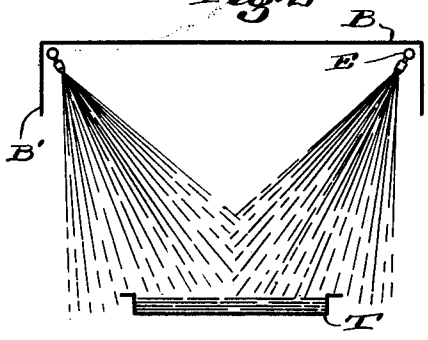


Fig. 5

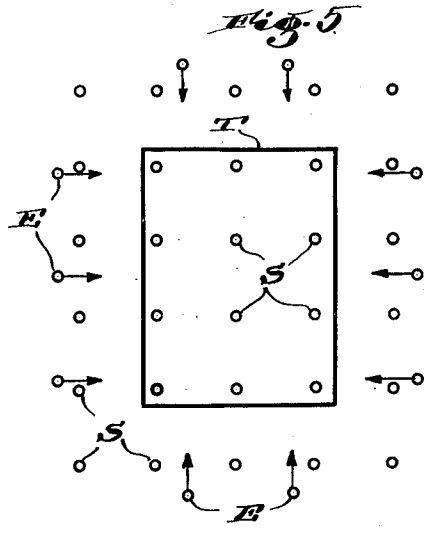
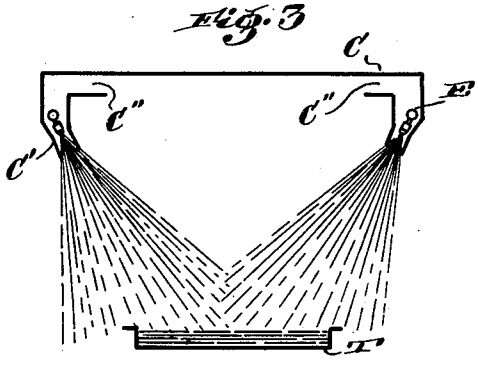


Fig. 3



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UNITED STATES PATENT OFFICE

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FIRE EXTINGUISHING METHOD AND APPARATUS

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Application October 17, 1940, Serial No. 361,554

6 Claims. (Cl. 169—2)

This invention relates to a method and apparatus for extinguishing fires, particularly intense fires of localized character such as fires in open vats or tanks of acetone, cleaning naphtha, lacquer and other flammable liquids. Such fires are extremely difficult to extinguish not only because of the flammable nature of the liquid but because they produce an indraught of air from the sides which rapidly and continuously feeds the fire with oxygen. It has been proposed to extinguish such fires with a jet of water, steam or other inert gas from an overhead nozzle but it has been found that, if the jet be large enough to produce a substantial blanketing effect on the fire, the jet will produce a draught of air toward the fire which largely counteracts the blanketing effect.

Objects of the present invention are to provide a fire-extinguishing method which will carry fire-extinguishing fluid to the fire without producing much if any draught of air toward the fire, which tends to shield the fire from the surrounding air, which returns a substantial portion of the products of combustion to help smother the fire, and which cools the products of combustion before returning them to the fire. Further objects are to provide apparatus for attaining the aforesaid ends which is simple and inexpensive to manufacture and install, which can be standardized for use in a wide variety of industries, which does not require special designs for different conditions of use, which can be installed by plumbers and other artisans without special training and which does not obstruct access to the tanks protected by the apparatus or in any way interfere with the normal use of the tanks.

According to the present invention a plurality of sprays of fire-extinguishing particles, such as powder, water, steam or other inert gas, are propelled to the fire from adjacent locations along the periphery of the space above the fire so as to tend to confine the products of combustion to the said space and the products of combustion which rise through the space are directed to said sprays, whereby the sprays return the products of combustion to the fire and shield the fire from the surrounding air without any ducts or obstructions which interfere with access to the vat or tank from the side. In the case of a tank protected on one or more sides by a wall or walls the sprays need be located only along the one or more sides of the tank opposite the wall or walls, but in the case of a tank unprotected by adjacent walls the sprays are preferably distributed either all the way around the periphery of the space above the tank (one at each corner often sufficing in the case of small tanks) or at least along two opposite sides. By locating the sprays as aforesaid the products of combustion tend to rise from the tank in the form of a column which can be deflected into the sprays by a ceiling or baffle located at or slightly above the level of the nozzles from which the sprays are projected. While the ceiling may comprise only a flat surface it is somewhat more effective if it has sides depending to or somewhat below the level of the nozzles immediately outside the nozzles. Instead of obstructing the upward flow of gases with a solid ceiling the obstruction may comprise a zone of fine spray produced by so-called fog nozzles or nozzles of the hollow cone type, hereinafter referred to as spray nozzles in contradistinction to the fire-extinguishing nozzles referred to above. In the preferred embodiments of the invention the fire-extinguishing nozzles are located somewhat outside the space immediately above the vat or tank with their axes inclined inwardly toward the center of the vat or tank but directed below the center of the surface of the liquid therein so that the converging streams tend to force the rising products of combustion toward the center of the aforesaid space in the form of a current which flows upwardly to the aforesaid ceiling and is then deflected laterally into the streams.

According to this invention the fire-extinguishing nozzles can be located at a sufficient distance above the flammable liquid surface so as not to interfere with normal operations, such as dipping or washing metal parts, even in continuous conveyor equipment. For example the nozzles may be located at a level eight feet or more above the level of the flammable liquid, affording ample head space for normal use of the tank or vat of liquid without interference by the nozzles. By arranging the fire-extinguishing nozzles so as to shield the fire from the surrounding air and to return the products of combustion to the fire it is possible to extinguish the most difficult fires, such as a fire in a tank of motor gasoline, with the relatively low water pressures commonly available. The location of the nozzles well above the tank also eliminates the danger of the nozzles being clogged by liquid splashed from the tank in normal use.

For the purpose of illustration embodiments of the invention suitable for use with water as

the extinguishing material are shown in the accompanying drawing, in which:

Figs. 1 to 4 inclusive are vertical sections, in diagrammatic form, of various embodiments of the invention; and

Fig. 5 is a diagram, in plan view, showing a typical distribution of nozzles for the modification shown in Fig. 4.

In each of the four embodiments T represents a tank of flammable liquid and E the aforesaid fire-extinguishing nozzles. In each embodiment the fire-extinguishing nozzles are preferably distributed as illustrated in Fig. 5, being located substantially outside of the space immediately above the tank but having their axes inclined inwardly toward the center of the tank so that the flaring streams from the nozzles impinge upon the liquid in the tank in converging relationship.

In the case of a tank measuring six feet by eight feet for example, with a head space of approximately eight feet between the level of the liquid and the level of the lower ends of the nozzles, the nozzles may be located approximately three feet outside the edge of the tank with an inclination of approximately 20° between the axis of each nozzle and the vertical, so that the axis of each nozzle intersects the surface of the liquid approximately one foot from the edge of the tank. The fire-extinguishing nozzles are of the solid cone type and with a spread of approximately 70° the distribution of the streams is substantially as shown in Figs. 1 to 4 inclusive. In each embodiment the nozzles may be mounted on piping supported from overhead in any suitable manner.

In Fig. 1 the aforesaid ceiling or baffle is in the form of a flat surface A located immediately above the nozzles E. In Fig. 2 the baffle B has a depending portion B' closely surrounding the nozzles E, the depending portion B' preferably extending continuously along the four sides of the rectangular row of nozzles. With depending sides three feet in depth for example, and head space of eight feet between the upper edge of the tank and the lower edges of the depending sides, the nozzles are preferably mounted approximately eleven feet above the level of the liquid. In the embodiment diagrammatically illustrated in Fig. 3 a tubular housing C' surrounds each nozzle with an inlet C'' through which the products of combustion may be drawn by the aspirating action of the water jets. While the housings may be built integrally with the baffle C they are preferably separate units mounted in juxtaposition to the baffle.

In the modification shown in Figs. 4 and 5 the baffle, corresponding to A, B and C in the preceding figures, is in the form of a fine spray of water produced by spray nozzles S of the hollow-cone type distributed over the tank T and the region immediately surrounding the tank. By using nozzles of the hollow-cone type an effective barrier to the updraught of combustion gases may be produced with a small amount of water. For example excellent results have been obtained with spray nozzles discharging only about 0.40 gallon of water per minute, whereas the extinguishing nozzles E may discharge as much as sixteen gallons per minute or even more. Thus the hollow-cone nozzles S produce fine spreading sprays of low volume which form a ceiling adapted to obstruct the rising products of combustion, whereas the solid cone nozzles E produce less divergent sprays of much larger volume which form a wall adapted to isolate the fire and return the products of combustion to the fire and shield the fire from the surrounding air in the rest of the room.

In each of the four embodiments of the invention chosen for the purpose of illustration the products of combustion rising from the burning liquid tend to circulate in the direction of the arrows shown in Fig. 1. By providing the depending sides B' as shown in Fig. 2 less gas escapes between the nozzles, and by providing double inclined walls as shown in Fig. 3 the recirculating action of the jets of water is somewhat more effective. In each case the fire is substantially shielded from indraughts of the surrounding air by the products of combustion entrained in the cones of spray, especially since the cones overlap each other and extend somewhat outside of the tank. As shown in Figs. 1 to 4 the sprays should be directed below the center of the upper surface of the liquid or other hazard.

From the foregoing it will be evident that the products of combustion are recirculated to assist in smothering the fire without any ducts leading upwardly from the periphery of the tank, whereby all sides of the tank are unobstructed for normal use. It will also be understood that in case of fire the water may be turned on either manually or automatically in response to the heat of the fire.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. The method of extinguishing a fire in a hazard in a part of a room which comprises separating said part of the room from the rest of the room with a wall of fire-extinguishing particles by propelling a plurality of sprays of said particles downwardly along the periphery of said part of the room so as to tend to confine the products of combustion to said part, the sprays being inclined toward said part but directed below the center of the upper surface of said hazard so as to tend to impel the products of combustion upwardly, and directing the products of combustion which rise through the space to said sprays, whereby the sprays tend to isolate the fire in said part of the room and to return the products of combustion to the fire and to shield the fire from the surrounding air in the rest of the room.

2. The method of extinguishing a fire in a part of a room which comprises separating said part of the room from the rest of the room with a wall of fire-extinguishing particles by propelling a plurality of high-volume sprays of said particles downwardly along the periphery of said part of the room so as to tend to confine the products of combustion to said part, and obstructing the products of combustion which rise through the space with a ceiling of more divergent fine sprays of relatively low volume, whereby the high-volume sprays tend to isolate the fire in said part of the room and to return the products of combustion to the fire and to shield the fire from the surrounding air in the rest of the room.

3. Apparatus for extinguishing a fire in a hazard in a part of a room which comprises means for separating said part of the room from the rest of the room with a wall of fire-extinguishing particles by propelling a plurality of

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sprays of said particles downwardly along the periphery of said part of the room so as to tend to confine the products of combustion to said part, said means including a row of downwardly-directed nozzles distributed along the periphery of said part of the room to produce overlapping sprays, said nozzles being inclined toward said part but directed below the center of the upper surface of said hazard to impel the products of combustion upwardly, and means for obstructing the products of combustion which rise through the space and directing the products to said sprays, whereby the sprays tend to isolate the fire in said part of the room and to return the products of combustion to the fire and to shield the fire from the surrounding air in the rest of the room.

4. Apparatus for extinguishing a fire in a hazard in a part of a room which comprises means for separating said part of the room from the rest of the room with a wall of fire-extinguishing particles by propelling a plurality of sprays of said particles downwardly along the periphery of said part of the room so as to tend to confine the products of combustion to said part, said means including a row of downwardly-directed nozzles distributed along the periphery of said part of the room to produce overlapping sprays, said nozzles being inclined toward said part but directed below the center of the upper surface of said hazard to impel the products of combustion upwardly, and means for obstructing the products of combustion which rise through the space and directing the products to said sprays, said last means including a plurality of overhead nozzles for producing fine spreading sprays of low volume, whereby said sprays tend to isolate the fire in said part of the room and to return the products of combustion to the fire and to shield the fire from the surrounding air in the rest of the room.

5. Apparatus for extinguishing a fire in a part of a room which comprises means for separating said part of the room from the rest of the room with a wall of fire-extinguishing particles by propelling a plurality of sprays of said particles downwardly along the periphery of said part of the room so as to tend to confine the products of combustion to said part, said means including a row of downwardly-directed solid-cone nozzles distributed along the periphery of said part of the room to produce overlapping sprays, and means for obstructing the products of combustion which rise through the space and directing the products to said sprays, said last means including a plurality of hollow-cone nozzles for producing fine spreading sprays of low volume, whereby said sprays tend to isolate the fire in said part of the room and to return the products of combustion to the fire and to shield the fire from the surrounding air in the rest of the room.

6. Apparatus for extinguishing a fire in a vat of combustible material comprising a row of nozzles distributed along the periphery of the vat for directing sprays of fire-extinguishing particles toward the vat, the nozzles being located overhead and outside the periphery of the vat, the nozzles being inclined toward the center of the vat but directed below the center of the surface of the material in the vat, and means for obstructing the products of combustion which rise through the space and directing the products to said sprays, whereby the sprays tend to isolate the fire and return the products of combustion to the fire and to shield the fire from the surrounding air.

NORMAN J. THOMPSON.