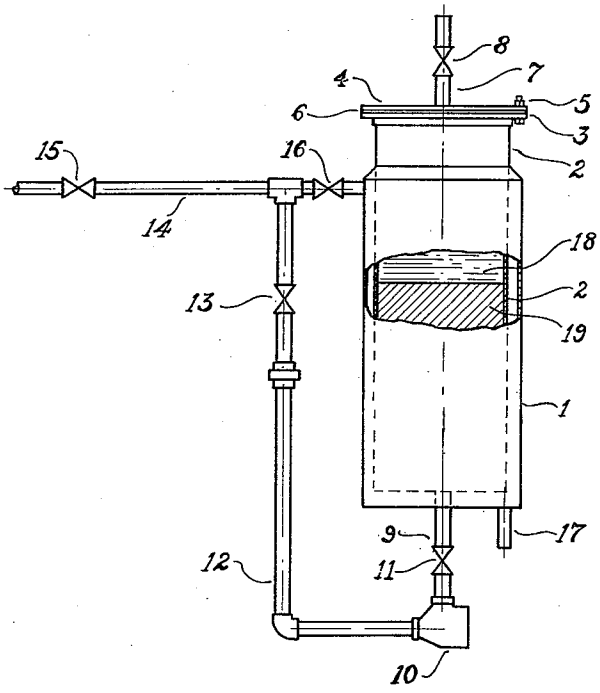
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PROCESS FOR GENERATING SMOKE CLOUDS

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PROCESS FOR GENERATING SMOKE CLOUDS

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This invention relates in general to smoke generating devices, and more particularly has reference to a process and apparatus for evolving smoke clouds.

The invention described herein may be manufactured and used by or for the Government for Government purposes, without the payment to me of any royalty thereon.

Previous to this time, the various devices employed for evolving smoke clouds to obscure land operations, marine movements, and the like, have not been equipped to vary at the will of the operator, the density of the smoke cloud produced, which is frequently very advantageous. The processes heretofore employed for this purpose have been of such a nature that, once having been put in operation, the generation of smoke proceeded at a rate determined by the construction of the apparatus and did not allow an increase or decrease in this rate, which is an exceedingly desirable factor in many instances. Furthermore, in the case of many smoke materials, the processes heretofore employed did not allow a full utilization of the obscuring power of the resulting smoke, due to an incomplete dispersion of the material or to a dispersion in particles too large to remain in suspension in the air.

An object of this invention is to provide a smoke generating device adapted to evolve a maximum quantity of smoke at a rapid rate with full utilization of the smoke material consumed.

Another object of this invention is to provide a smoke generating device adapted to evolve a maximum quantity of smoke at a rapid rate, in which the density of obscuring material may be increased or decreased to any desired degree.

Still another object of this invention is to provide a smoke generating device in which the rate of dispersion of the smoke agent may be regulated at the will of the operator.

Still another object of this invention is to provide a smoke generating device employing an agent to heat smoke material and to aid in the dispersion of the substance the introduction of which may be regulated to regulate within certain limits the density of the smoke produced.

Still another object of this invention is to provide a smoke generating device in which the bulk of the reactive materials for evolving obscuring screens may be positioned apart from the point where it is desired to generate the smoke.

A further object of this invention is to provide a process for generating smoke screens by hastening the oxidation of reactive materials.

A still further object of this invention is to provide a process for generating smoke screens by the atomization of molten smoke producing materials with an inert substance, adapted to increase the density of the screen produced.

A still further object of this invention is to provide a process for generating smoke clouds, in which molten reactive materials may be dispersed by an inert substance, and the density regulated within certain limits by the quantity of dispersing agent introduced in the reactive substance.

With these and other objects in view which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention, may be varied in construction, proportions and arrangement, without departing from the spirit and scope of the appended claim.

In order to make my invention more clearly understood I have shown in the accompanying drawing means for carrying the same into practical effect, without limiting the improvements in their useful applications to the particular constructions, which for the purpose of explanation, have been made the subject of illustration.

In the drawing forming a part of the specification there is shown an elevation view of a suitable apparatus for carrying out the process forming the subject matter of this invention.

Referring more particularly by numerals to the drawing, the apparatus comprises a tank 1, adapted to act as a jacket for a con-

tainer 2, having a flanged rim 3. A top 4 is hinged on the top of the rim 3 and fixed thereon by a bolt 5. A gasket 6 is interposed between the top 4 and the rim 3 to insure a leak-proof joint and thus seal the container.

A vent pipe 7 communicating with the container 2, is mounted on the top 4, and provided with a valve 8, to allow the release of pressure within the container 2, when it is desired. A pipe 9 having a valve 11 interposed thereon is mounted on the bottom of the container 2, extending through the bottom of the jacket 1. The end of the pipe 9 is mounted in a nozzle 10. A pipe line 12 having a valve 13 interposed therein is also connected to the nozzle and the other end connected to a feed line 14 having a plurality of valves 15 and 16, interposed in the line 14 on each side of the connection with the line 12. As may be noted from the drawing the feed line 14, on the right hand side of the valve 16 is connected to the jacket surrounding the container.

An exhaust pipe 17 is mounted on the bottom of the jacket 1 to permit the escape of exhaust from the jacket 1.

When it is desired to operate the device, the cover 4 is adapted to be removed and the container 2 partially filled with water 18, or other inert liquid, whereupon a charge of suitable smoke producing material 19, preferably having a low kindling temperature, such as phosphorus, is introduced so that the water is displaced, and the cover replaced on the top. It is only necessary that sufficient water remain in the container after it has been charged to act as a seal for the phosphorus or other material.

The open end of the feed line 14 is adapted to be fixed to any suitable source of steam supply so that when the valves 15 and 16 are opened, steam may be introduced in the jacket 1, surrounding the container 2.

When sufficient steam has been introduced to the container, to elevate the temperature of the phosphorus or other reactive material in the container to the desired degree, so that it becomes molten, the valve 13 in the line 12 is opened and the valve 11 in line 9 also opened if it is wished to disperse the material, so that steam is allowed to pass into the nozzle 10 from the line 14, together with molten phosphorus or other material, from the container 2. The amount of phosphorus passing into the nozzle 10 may be varied at will be regulating the valve 11.

In this manner the molten phosphorus is allowed to flow by gravity into the nozzle 10 when it is broken up into fine particles and ejected into the air compressed by the steam in the line 12, flowing at a right angle to the line 9, so that the phosphorus is completely atomized, and due to its low kindling temperature is caused to ignite spontaneously on coming in contact with the air when it is completely burned in a very small fraction of a second.

If the immediate use of the device is not desired after the steam has been admitted, the pressure created by the molten material in the container may be regulated by the operation of the valve 8 in the vent line 7 and the pressure exerted by the steam held within safe limits, by outlet through the exhaust pipe 17, which may be provided with a safety valve if so desired.

It is manifest that, while only a single nozzle is shown for dispensing the smoke, any desired number may be used, and a series spread over a wide front or distributed about a vessel so that any desired quantity of smoke may be evolved to suit the particular requirements. In certain installations where more than one nozzle is employed, the steam supply lines may be jacketed to decrease heat exchange through the pipes with the air and afford a conservation of steam. In most instances it is preferable in time of war that the tank be placed in the ground in land emplacements or below the water line in marine installations so that the container holding the bulk of reactive material is least apt to be ruptured by shell fire and the safety factor in the use of the device may thus be materially increased.

It will be appreciated that this invention is not limited to the use of phosphorus, as any other smoke producing material applicable to this apparatus, such as titanium-tetra-chloride may be used, and the water dispensed with and any inert fluid employed in its place, as it is also obvious that while the heating is preferably accomplished with high pressure steam in a jacket as shown, because of the ready availability and ease of control in fixed installations, the heating may be accomplished by electricity or any other desired agent and the smoke agent atomized by any other suitable fluid under pressure. When phosphorus is used, however, it is preferred that steam be employed as previously described for the reason that a simplification of equipment and economy is thereby secured inasmuch as the same agent is utilized to melt and to atomize the phosphorus. The use of steam also has the further advantage that the density of the smoke screen generated may be increased or decreased, within certain limits, according to the amount of steam admitted, and also the steam, under certain circumstances, adds somewhat to the obscuring action of the phosphorus smoke.

While a gravity feed line is shown for conveying the smoke producing material to the nozzle, it is obvious that the material may be fed in nozzles positioned above the container at any elevation by utilizing the internal pressure created in the receptacle

which it is apparent, may be readily regulated or by making use of gas or water pressure created in the receptacle which it is apparent, may be readily regulated, or by making use of gas or water pressure. It is also obvious that the flow of the smoke producing material may be varied at will either by varying the pressure in the receptacle or by regulating the valve by which the smoke producing material is admitted into the atomizing nozzle. Atomization may be carried on with a compressed inert fluid such as carbon dioxide instead of steam.

There is accomplished by the invention a process and apparatus for generating smoke screens in which a smoke screen may be evolved with the maximum generation of smoke at a rapid rate having a method of control making it possible to increase or decrease the density of the smoke evolved to any desired degree by varying the amount of smoke producing material dispersed and by the use of an agent adapted to heat the smoke producing material so that it is dispersed in condition suitable for producing the maximum volume of smoke from a given amount of material and the safety element of the device materially increased, inasmuch as the bulk of the reactive material may be placed our of range of shell fire.

While I have shown and described the preferred embodiment of my invention, I wish it to be undertsood that I do not confine myself to the precise details of construction herein set forth, by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention, or exceeding the scope of the appended claim.

I claim:

The process of producing smoke clouds from solid smoke material comprising the steps of introducing the smoke material and an inert sealing liquid into a closed zone, supplying steam to said zone in indirect heat exchange relation to heat the sealing liquid and melt the smoke material to generate internal vapor pressure in said zone, discharging said molten smoke material from said zone under the influence of said internal vapor pressure, controlling the rate of said discharge by varying said internal vapor pressure and injecting steam into said smoke material while being discharged to atomize said material and disperse it into the atmosphere in the form of a cloud.

In testimony whereof I affix my signature.

BENJAMIN G. MACINTIRE.