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FIRE EXTINGUISHER

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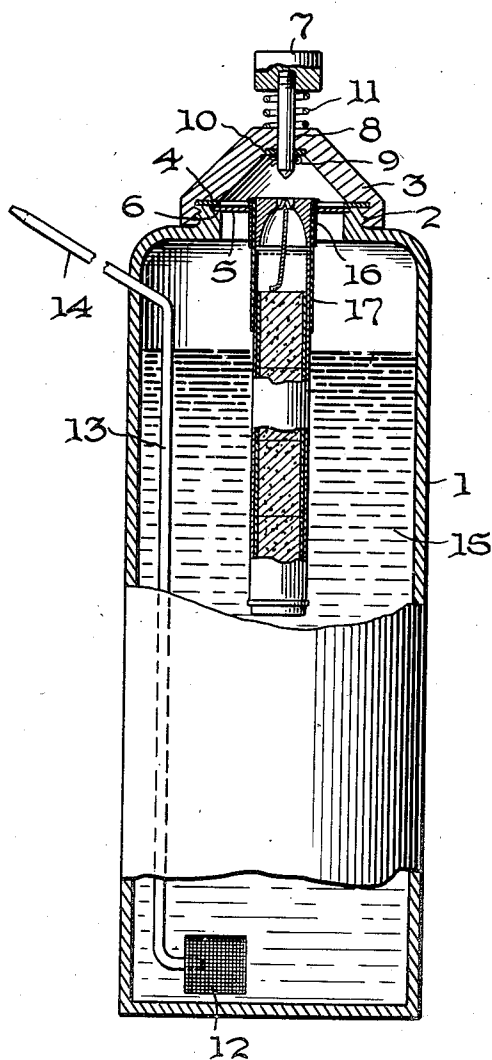


Fig. 1.

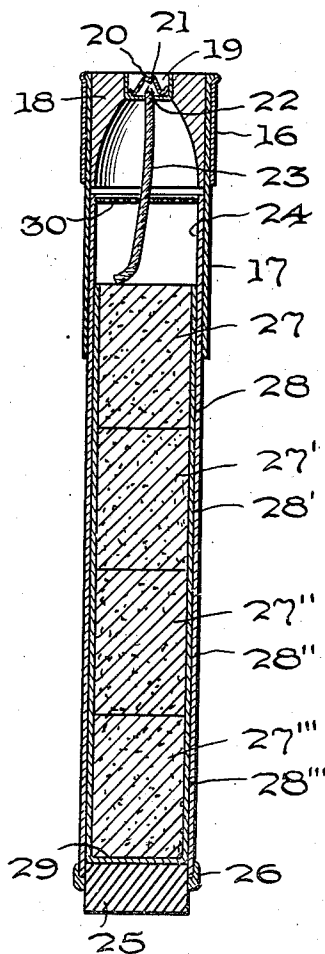


Fig. 2.

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## UNITED STATES PATENT OFFICE

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## FIRE EXTINGUISHER

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1 Claim. (Cl. 169—31)

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The present invention relates to fire extinguishers of the kind in which a fire extinguishing liquid partly filling a vessel is forcibly ejected by gas pressure developed from a cartridge contained within the vessel. The invention relates more particularly to improved or modified fire extinguishers of the kind described and to the manufacture thereof. This application is a continuation of our application Serial No. 474,070, dated January 30, 1943.

Various kinds of gas generating device have been employed for the purpose of establishing a suitable pressure within a fire extinguisher to eject the fire-extinguishing liquid from it with sufficient force to produce and maintain for a pre-determined time a powerful jet of the liquid, which can be directed from a safe distance towards a fire, for instance, acid containers associated with sodium bicarbonate, or pressure vessels containing compressed carbon dioxide, having a member frangible by the operator from the exterior of the extinguisher.

It has been further suggested to employ a cartridge containing a deflagrating composition in compact form, yielding gaseous combustion products when burned above the surface of the fire extinguishing liquid; but the intense heat produced by the combustion of such compositions has hitherto given rise to certain disadvantages which have precluded this method of generating the required gas pressure from achieving general adoption. Thus with such cartridges it would be necessary to provide a heat insulating lining for at least a substantial portion of the wall of the extinguisher or to construct it of heat resisting material, and to provide heat insulation for parts which must be handled by the operator. Moreover, the rise in temperature in the portion of the apparatus in the immediate proximity of the cartridge may be so great that instead of continuing to burn progressively from its exposed surface inwards, the deflagrating composition may become so hot that it undergoes spontaneous ignition throughout its unburned portion, whereby a violent and even dangerous increase in pressure may take place within the extinguisher.

We have found that these disadvantages may be obviated and other advantages obtained by causing the combustion of a compact combustible gas generating composition capable of self-sustained combustion to take place under the surface of the fire extinguishing liquid after it has been ignited, whereby the heat generated by its combustion is efficiently absorbed and dissipated by the liquid.

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According to the present invention a fire extinguisher comprises in combination a vessel partly filled with a fire extinguishing liquid and having an outlet from which the liquid can be forcibly ejected by internally developed gas pressure, a gas generating cartridge within said vessel containing a compact composition capable of self-sustained exothermic gas generating combustion, and ignition means to start its combustion, said cartridge being adapted to cause the further combustion thereof to take place under the surface of said fire extinguishing liquid, and the combustion gases to pass through said liquid. Preferably the gas generating cartridge comprises a breech portion containing the means of ignition, and an ejectable combustion chamber portion attached to the breech portion and containing the compact composition, the ejectable portion being adapted to sink and remain completely submerged under the fire extinguishing liquid when ejected, and also to permit the combustion of the compact charge to continue after it has been projected under the surface of the liquid, while permitting the hot gases to escape from it through the liquid. When the ejectable combustion chamber portion is attached to the breech portion of the cartridge the compact combustible charge is desirably wholly or partly above the level of the liquid, and the joint, between the parts of the cartridge, is preferably waterproofed so as to prevent any possibility of the liquid creeping into the cartridge until the charge has been properly ignited and the combustion chamber portion has been ejected into the liquid.

The means by which the combustion of the compact charge of gas-producing material is caused to continue under the surface of the liquid while permitting the escape of the gases through the liquid to the space above it, may advantageously consist in the provision at the breech end of the combustion chamber of a wall comprising vents of such number and size as to offer little resistance to the exit of the combustion gases but prevent the entry of the fire extinguishing liquid into the combustion chamber against the pressure of the emergent gases, and a space is preferably provided between the near end of the charge and the vents. A sinker may advantageously be provided at the remote end of the chamber.

The compact self-sustained combustible gas-producing charge may advantageously consist of a pellet of the nature of blackpowder preferably of a slow burning type, or a modified blackpowder-like deflagrating composition, advan-

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tageously one in which the sulphur has been omitted or replaced by another combustible ingredient. Colloided smokeless powder compositions may also be employed, but other gas producing compositions capable of progressive combustion with or without flame may be used, the precise nature of the compact gas-producing composition not being an essential feature of the invention. The burning surface of the compact gas-producing charge can be restricted by a closely fitting armour of non-conducting material applied to a portion of its surface. The compact charge may be of constant burning surface characteristics, or it may, if desired, be of a form providing a somewhat increasing burning surface, so long as it preserves its compact structure while burning, since the volume available for the expansion of the gases above the surface of the liquid continuously increases as the liquid is ejected, and smaller variation in the pressure as the water is ejected can thereby be obtained. These burning surface characteristics can conveniently be imposed by application of a non-conducting armour as aforesaid as is known.

The fire extinguisher for use with a cartridge made in accordance with the present invention is provided with means for holding the breech portion of the cartridge with at least the ignition means above the level of the fire extinguishing liquid, and means co-operating with the ignition means therein to initiate the combustion when actuated by the operator. For instance the breech portion of the cartridge may include a percussion cap and a fuze leading therefrom through a gas venting aperture to the charge in the combustion chamber portion and the extinguisher body may be provided with a striker adapted to be impacted against the percussion cap. The fire extinguisher is also preferably provided with a filter to prevent solid particles from choking the liquid discharge tube. The body of the fire extinguisher may be made of sheet metal or other material of comparatively light construction since according to the invention no dangerous peak pressures are experienced.

The invention is further illustrated in the accompanying drawings of which Fig. 1 represents in vertical axial section the general arrangement of a fire extinguisher containing a cartridge made in accordance with the invention and Fig. 2 is an enlarged vertical axial section of one form of cartridge made according to the invention.

In Fig. 1, 1 is a fire extinguisher vessel, which may be made of sheet metal, synthetic resin or the like. 2 is a threaded neck and 3 is a threaded head. 5 is a centrally perforated metal plate held between the shoulder 6 of the threaded neck 2 and a rubber washer 4 when the head 3 is screwed down on the neck 2. 7 is a striker head into which is threaded a striking pin 8 held by a cotter pin 9 against a gas sealing washer 10 by a spring 11 under compression. 12 is a metal wire filter protecting the internal portion 13 of the delivery pipe from being entered by any solid material from the cartridge. 14 represents the nozzle at the termination of the external portion of the delivery pipe, through which the fire extinguishing liquid 15 is projected.

In Figs. 1 and 2, 16 is the flanged metal base and 17 the cardboard or metal cylindrical wall of the breech portion of the cartridge, which may be similar in construction to the blank cases employed for shotgun cartridges or very light cartridges. 18 is a base wad, 19 is a cap chamber, 20 is a percussion cap, 21 a percussion cap com-

position, and 22 is an anvil. 23 is a fuze leading from the cap chamber 19 to the charge 27 in the ejectable portion of the cartridge. The fuze 23 advantageously consists of a tube with a control filament of inflammable material such as a thread of guncotton, quickmatch, primed cambric or the like. 24 is the cylindrical wall of the ejectable charge holding and combustion chamber portion of the cartridge, which may be made of metal or other material resistant to the action of the fire extinguishing liquid. This ejectable portion is held in place in the breech portion in any conventional manner, such as by a frictional fit and even may be sealed conventionally with lacquer or the like, against ingress of liquid. Such a joint naturally is watertight but breakable under the pressure of gases developed by combustion of the charge within. 25 is a lead sinker attached by a watertight soldered joint 26 to form the remote end wall of this portion of the cartridge. The charge of gas-producing material capable of self-sustained combustion in this case consists of four superposed solid cylindrical pellets of a compressed blackpowder-like composition 27, 27', 27'' and 27''', each surrounded on its cylindrical surface by closely adhering layers 28, 28', 28'', 28''' of heat insulating material protecting the cylindrical surfaces from becoming ignited, and thus making the pellets burn in an end to end direction. These insulating layers may advantageously consist of overlapping windings of insulating tape, and a continuance of this wrapping around the remote end of the pellet 27''' is shown at 29. 30 is a terminal disc provided with a number of perforations through which the gases escape from the ejectable portion of the cartridge when this has been submerged in liquid.

In certain cases it is possible to dispense with the wrapping with insulating material as, for instance, when the composition is compressed directly into a tube of poorly conducting material, in which case the tube may be proofed against the action of the fire extinguishing liquid or made of material capable of withstanding its action so as to serve as the material of the wall of the ejectable portion of the cartridge. In some cases it may be necessary to provide in addition to the fuze 23 a small amount of additional material facilitating the ignition of the gas producing composition charge, which, however, is not usually required when the latter is of a blackpowder-like nature.

The compact charge arranged as described in the above example is characterized by a constant burning surface, but it is often desirable to employ compact forms of increasing burning surface; for instance the pellets may be of successively increasing diameters; or of progressively increasing diameter individually. Longitudinally channeled forms may also be employed.

The progressive character of the gas evolution as the gas space increases owing to the forcing out of the fire extinguishing liquid and the small volume occupied by the cartridge in relation to the quantity of gas it evolves render it an advantage of the invention that a fire extinguisher of a given volume may be more nearly full or may be made of lighter construction than is usually possible with known fire extinguishers operated by internally supplied gas pressure, without increasing the risk of the extinguishers bursting.

We claim:

1. A fire extinguisher comprising in combination a vessel partly filled with a fire extinguishing liq-

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uid and having an outlet from which the liquid can be forcibly ejected by internally developed gas pressure, a gas generating cartridge within said vessel containing a compact composition capable of self-sustained exothermic gas generating combustion and an ignition means to start its combustion, said gas generating cartridge comprising a breech portion and a separably attached ejectable combustion chamber portion, said breech portion containing said ignition means, said combustion chamber portion containing a charge of said compact composition, a gas vent in the wall of the said combustion chamber with a space intervening between the charge

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and the vent, and the shell of the said cartridge being water tight.

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