

Health & Safety

Fire Grenades: Harmless or Poison?

Fire outbreaks have been a concern throughout history. If one considers how people heated their homes (fireplaces), lit their rooms (candles, lanterns, gas lighting), and cooked their food (hearthths or fuel-burning stoves), it is little wonder that house fires would be of concern to people in their day-to-day lives.

Fire extinguishers have been around since ancient times—some no more than a hand pump delivering water—but one of the more creative, and decorative, versions of the fire extinguisher came in the form of glass spheres known as fire grenades (Figures 1 and 3). In the 19th and early 20th century, these artifacts were used to fight fires by having a person throw the glass container at the base of a fire. The glass smashed, releasing the fire-fighting fluid to extinguish the flames. Fire grenades are often found in historic buildings, hanging on a wall bracket or suspended from the ceiling from metal rails, as an early method of “fire sprinklers.” The fire would cause the seal to open, and the solution would be poured onto the fire. The glass items could be filled with various liquids and sometimes solids, including water, carbonic acid, sodium bicarbonate, ammonium chloride, sodium chloride, and later, carbon tetrachloride. Of the materials one might find in these fire grenades, one of the most popular is also one of the most dangerous: carbon tetrachloride (CCl_4).

Carbon tetrachloride (also known as tetrachloromethane, perchloromethane, carbon tet, and CTC) is a colorless liquid with a sweet odor that evaporates readily. It had been used in the dry-cleaning industry and as a refrigerant (R-10). It has since been banned from commercial use due to environmental and safety concerns; this occurred in the US in 1985 and worldwide in 2010. Carbon tetrachloride was first brought to the United States from Germany as “Carbona,” a cleaning agent created by Ernst Klipstein in 1898; its first American manufacturer was most likely Dow Chemical in 1908. It was used as a fire extinguishing reagent as early as 1911. The chemical had multiple appealing properties; it has a very low freezing point (-50°F), can extinguish multiple types of fires, and is nonflammable. However, its byproducts from putting out fire are phosgene (COCl_2) and chlorine (Cl_2) gases.

Phosgene, originally synthesized in 1812, was used by the German army during World War I as a chemical weapon. It was an effective weapon, as phosgene is heavier than air and could overwhelm enemy trenches, leaving soldiers with teary, clouded eyes, a burning throat, and painful coughing; heavy exposure could even cause pulmonary edema and cardiovascular collapse. Chlorine gas was also used in chemical warfare during the first World War. It utilizes the moisture available in the eyes, throat, and lungs to produce hydrochloric acid, which creates a severe burning sensation. Therefore, carbon tetrachloride's use in confined spaces to smother a fire had the potential to be deadly to its user and bystanders.

How can one tell the difference between the fire grenade that holds salt water versus the one that contains carbon tetrachloride or other potentially dangerous chemicals? Given that these glass vessels were hermetically sealed, telling the difference between the two contents is near impossible. Color can also not be used as an indicator of danger even though the liquid inside may be clear, or dyed red or blue, as both water and carbon tetrachloride are clear liquids. Also, colored glass could be used, or the interior of the bulb may have been painted.

Figure 1. Newspaper advertisement for the Harden Star fire grenade, which appeared in the *Chicago Tribune*, February 2, 1885.

To determine the solvent inside, manufacture date is the best method of identification. It is safe to assume that any fire grenade manufactured before 1908 does not contain carbon tetrachloride. One brand of fire grenade that contains carbon tetrachloride is Red Comet, a company that began manufacturing fire grenades in 1919 (Figure 2). Red Comet had a long-standing relationship with Dow Chemical; the company set up a chemical pipeline that ran directly to the Red Comet plant from the local railroad station in Littleton, Colorado, most likely containing carbon tetrachloride or another chlorinated solvent with similar properties. However, if a date cannot be determined for the fire grenade, it is preferable to err on the side of caution and assume that it contains carbon tetrachloride.

So, what should you do if there is an accident and one of your fire grenades breaks? If breakage occurs during a fire, evacuate the building and inform first responders of the carbon tetrachloride so they are aware of the potential hazards. If a fire grenade breaks, resulting in a carbon tetrachloride spill, consult the safety data sheet that should be on hand for proper cleanup procedures including appropriate personal protective equipment (PPE); use inert materials to absorb the spill and a suitable sealable container to hold the absorbed material once cleanup is complete. This will involve some preparation before there is an issue, such as having an appropriate prepared spill kit. If you are not able to manage the spill safely, call your local fire or police department and ask for assistance with hazardous material cleanup.

The good news is that if the fire grenades are well sealed, devoid of cracks, breaks, or other flaws in the glass, they should be safe to store. Store them in a cool, dry, well-ventilated location, separate from alkali metals. Add a label about appropriate storage and possible hazards whenever possible. Check a safety data sheet for carbon tetrachloride for detailed information. State and local ordinances should be consulted when dealing with these potentially dangerous "fire bombs." Keep in mind that if you are the caretaker of a historic property with this kind of fire prevention system, the fire grenades will break if there is a fire. Brackets and ceiling systems should be checked regularly for corrosion and metal fatigue to prevent accidental breakage.

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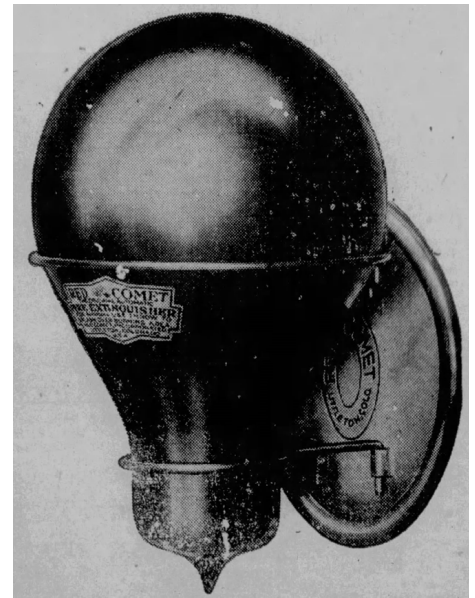


Figure 2. Newspaper Advertisement for Red Comet, which appeared in *Nebraska, The Crofton Journal*, June 3, 1937.

PUTS OUT FIRE INSTANTLY!!

**THE HARDEN HAND-GRENADE
FIRE EXTINGUISHER**
IS THE
QUICKEST, SUREST AND MOST EFFECTIVE
INVENTION FOR
EXTINGUISHING FIRES
IN THEIR EARLY STAGES,
THAT HAS EVER BEEN DEvised.



These GRENADES are made of glass, containing a fluid which, upon being BROKEN OVER or THROWN INTO A FIRE, generates a gas that EXTINGUISHES THE FLAMES INSTANTLY, as if by magic. FIRE CANNOT EXIST IN CONTACT WITH IT A MOMENT. These grenades can be placed in every room of your home, office, store, manufactory or place of business at convenient points, and in case of fire are ALWAYS READY FOR IMMEDIATE USE. They are small and no experience is necessary to handle them. ANY MAN, WOMAN OR CHILD WHO CAN THROW A BALL, CAN USE THESE GRENADES EFFECTUALLY IN PUTTING OUT A FIRE. They are tightly sealed, will not deteriorate with age or burst or freeze in any climate, and are PERFECTLY HARMLESS, should a grenade get accidentally broken, THE CONTENTS CANNOT POSSIBLY INJURE THE PERSON, CLOTHES OR CARPETS IN THE SLIGHTEST DEGREE. Should a person's clothes catch fire, and the contents of a Hand-Grenade Fire Extinguisher be thrown over the victim's head and clothes, the fire would be PUT OUT IN AN INSTANT, and perhaps a life saved thereby. No man, merchant, manufacturer, farmer, hotel or vessel should be without them, as the price is within reach of all. They are valuable everywhere, and especially so where there is a lack of water facilities and no fire department exists, as is the case in small towns and farming communities. A dozen or more of these wonderful Hand-Grenades at your home or place of business in case of fire may save you hundreds or thousands of dollars.

The Inter-State Industrial Exposition building at Chicago has TAKEN FIRE TWICE during the year, and TWICE EXTINGUISHED by the HARDEN HAND-GRENADE FIRE EXTINGUISHERS. The grenades have the official endorsement of JOHN P. REYNOLDS, Secretary of the EXPOSITION, also of the NATIONAL EXHIBITION OF RAILWAY APPLIANCES; of S. D. FISHER, Secretary of Illinois State Board of Agriculture; and D. J. SWEENEY, Fire Marshal of Chicago; besides hundreds of citizens of Chicago who have witnessed various tests, given at the Illinois State Fair Grounds, Chicago Base Ball Park and other points. The *Chicago Tribune*, *Times*, *Inter Ocean*, *News*, *Journal* and *Herald*, have all had favorable comments upon the value of the grenades.

EVERY CITIZEN CAN PROTECT HIMSELF AGAINST FIRE. The prices of the HARDEN HAND-GRENADE FIRE EXTINGUISHERS are \$9.00 per dozen, pint size, or \$5.00 per dozen, half-pint size, and will be sent, packed a dozen in a case, to any address on receipt of the money. Fuller particulars given in circulars. Agents will be wanted in every county.

MANUFACTURED AND SOLD BY
THE HARDEN HAND-GRENADE FIRE EXTINGUISHER CO.
205 WABASH AVE., CHICAGO, ILL.

Figure 3. Another example of a Harden grenade-style fire extinguisher advertisement from the *Topeka Tribune*, February 2, 1884.

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