CHEMISTRY

Wetter Water Checks Fires

This important new fire-fighter has the power to penetrate well into burning materials. Other weapons include fog-foams and fire-extinguishing chemicals.

By A. C. MONAHAN

➤ WATER alone, foe of fire, is losing its rank as the number one fire fighter. Wetter water, fog-foams and fire-extinguishing chemicals are taking its place. Chemistry is playing an important part in fire-fighting and in fire prevention.

It has long been realized that fire-fighters need a more effective and less destructive weapon than water. Water frequently does more damage than the fire it puts out. This accounts for the popularity of carbon dioxide gas, used for years to fight fire. This heavier-than-air non-combustible gas smothers fire by keeping oxygen away. In major fires its usefulness is limited.

Important among the newer weapons against fire is what is called wetter water. This is ordinary water to which chemicals have been added that give it power to penetrate well into burning materials to the regions where the combustible gases form.

Fog-foams are particularly effective for gasoline and oil fires which have become more common with the present wide use of these fuels. Some of the newer gases are more suitable for fire-fighting under certain conditions than the carbon dioxide standby.

These chemical fire-fighters are not new in the sense that their use has just been discovered. But during the past few years improved chemicals and methods of application have been developed.

Fire Losses Greater Now

New weapons for fire-fighting are of great importance at the present time. Annual losses by fire are much greater now than in the prewar years. These increased losses are not due merely to inflated property values. The actual number of fires has increased, and this applies to conflagrations as well as small fires. Needless destruction of property and resources by fire in the United States runs considerably over $2,000,000 a day.

Using chemicals to make water penetrate deeper into materials to which it is applied is used in washing clothes as well as in fire-quenching. This so-called wetter water gets rapidly into burning materials, through wood char, wall-board, upholstery, baled cotton and paper, to the zone where heat is causing the formation of combustible gases to add to the fire.

There are now several commercial preparations available for the purpose. One, for example, is the Unox Penetrant of Carbide and Carbon Chemicals Corporation which is said to have exceptionally high penetrating action. A one-percent solution, that is, one gallon of the preparation to 100 gallons of water, is sufficient for Class A fires. These are fires in which smoke and gases are formed below the surface of the burning material. Another is Drench, manufactured by the fire specialties division of Arnold-Hoffman, Providence, R. I.

In extensive tests on the fire-extinguishing effectiveness of chemicals, conducted by the U. S. Forest Products Laboratory, Madison, Wis., just before the war, a long list of chemicals was used, all of which had some value. Potassium acetate, potassium bicarbonate, and potassium carbonate have pronounced flame-extinguishing capacity. Phosphoric acid, diammonium phosphates, monoammonium phosphates, and boric acid have pronounced glow-extinguishing and total-extinguishing capacity. Other chemicals that showed lower but distinctive total-extinction effectiveness in concentrated solutions include ammonium sulfate, lithium chloride, magnesium chloride and zinc chloride.

Increase In Fuel-Use

With the tremendous increase in the use of gasoline, fuel oils and other petroleum products in engines, heating, cleaning and other applications, a special fire-fighting problem is presented. Water is not effective in killing an oil or gasoline fire. Fog-foam seems to be the answer.

The so-called Navy bean soup, used on shipboard and other places by the U. S. Navy where gasoline and oils are used in large quantities, is made from soybeans, fish scales and iron salts. When applied with water through jets to produce a fine mist-like spray, it can be spread several inches thick to seal in combustible gases and seal out oxygen.

The snowy bubbles last for hours; their adhesive qualities make it stick to anything, and even high wind will not blow it away. Fog-foam fire-fighting systems are now installed on Navy aircraft carriers, and also on fire-fighting tugs for killing fires on other vessels or in harbor neighborhoods.

One important use of this mechanical foam is in fighting fires in above-the-ground giant storage tanks where petroleum or its products are stored for distribution or held for processing. In this case the fog-foam may be pumped into the bottom of the burning tank through the oil pumping line itself. When applied in this manner, it arises through the oil, cooling it below ignition temperature, thus killing the fire.

In another method of application the fog-foam is poured onto the flames through fixed lines that discharge against the sides of the tank. In a relatively recent test made by the Standard Oil Company of Ohio, a 93-foot diameter tank of crude oil was deliberately set afire. The fire was extinguished in four minutes by a blanket of foam fed through six lines at the rate of 15,000 gallons a minute.

Carbon dioxide has been, and still is, the principal fire-extinguishing gas used in household and factory extinguishers, and also in the gas-delivering city fire department equipment. However carbon tetrachloride is also used. Wider installations of these effective extinguishers would lessen greatly present fire losses.

Efficient Fire-Extinguisher

Methyl bromide has long been advocated as a fire-extinguisher, particularly for aircraft engine fires. It is said to be the most efficient extinguishing agent commercially available, from 20% to 100% more effective than carbon dioxide, but this gas is poisonous. Also it is highly corrosive and can not be used in contact with certain metals, among which is aluminum. It is being used to a certain extent, but not for fires in passenger or crew compartments.

Among the fire-extinguishing gases are the fluorine-chlorine-methane gases known as Freons, widely used in refrigerators and air-conditioning equipment. They are harmless to men, being non-toxic, non-combustible, non-explosive and non-irritant.

The U. S. Bureau of Mines recommends

FIGHT FIRE WITH FOG—This nozzle jet for fire-fighting fog is made of a molded, shatterproof plastic.

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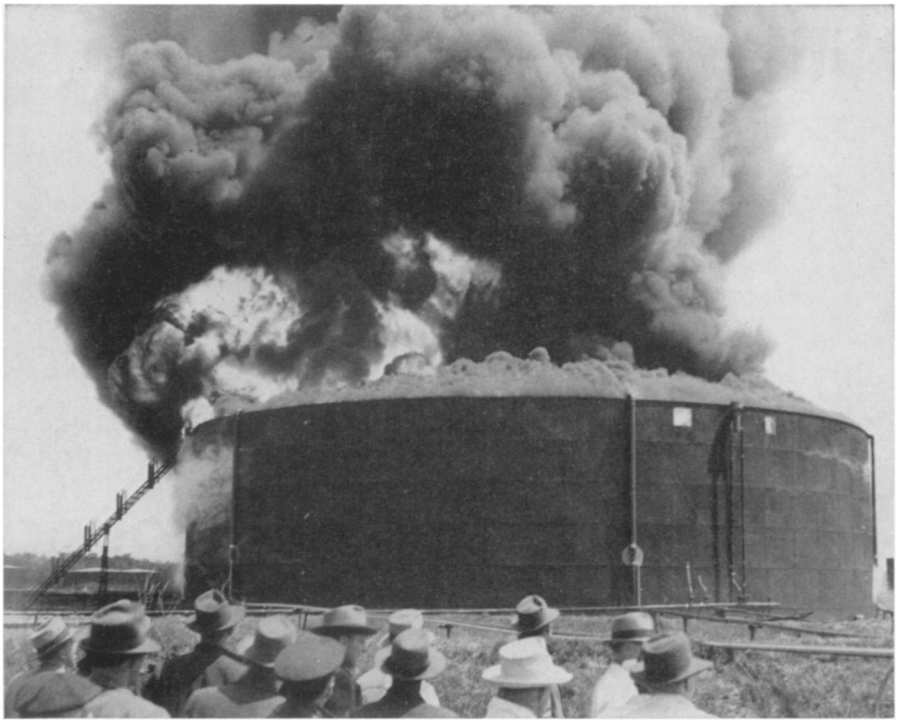

MECHANICAL FOAM QUELLS FLAMES—A crude oil fire in a giant Standard Oil storage tank was quickly extinguished with mechanical foam delivered inside the tank by six-inch vertical pipes on the outside of the tank.

one of the Freons, Freon 11, for use in extinguishing gasoline fires around mines, a rather common occurrence. In tests with six gases on three different types of gasoline, it found Freon 11 most effective. The other gases tested were Freon 12, Freon 21, carbon dioxide, automobile-exhaust gas and nitrogen. They were effective in fire-extinguishing in the order named.

Most every fire has a small beginning. Careless persons are responsible for many. Discarded glowing matches and butts of cigarettes cause more fires than any other single cause, it is claimed. The use of noncombustible materials, and others made fire-resistant by chemical treatment, would kill many fires caused by carelessness or otherwise, right at their start. These chemical treatments are for both woods and textiles.

Chemists have worked for years to develop compounds which will render organic materials fire-proof or fire-resistant. They have met with considerable success. Wood, clothing, draperies, and other articles made of textiles can be made sufficiently fire-retardant to make their extended use almost compulsory.

Wood is treated both by impregnation and by coatings. A paint containing ammonium phosphate gives wood an excellent fire-resisting finish. Cementiferous paints developed in England are claimed to have high value.

Cloth is made less of a fire hazard by what are known as flame retardants and glow retardants. Some give temporary protection only, and others a relatively permanent protection. Of the water-soluble flame retardant compounds, borax and aluminum sulfate have long been used. They are said to be less effective, however, than such mixtures as borax and boric acid, and those of either borax or boric acid, or both, with diammonium phosphate or sodium phosphate.

Other flame retardants include various phosphoric acids or salts; sulfamic acid; ammonium sulfamate, sulfate and molybdate; zinc chloride, aluminum oxychloride and several mixtures of these or other chemicals. The water-soluble glow-retardants are largely boric and phosphoric acids and their acid salts. For durable treatment, a urea-phosphate type of treatment is employed, also a metallic oxide-chlorinated body type.

The many textile treatments to render fabrics less of a hazard from fire, and how they act, are beyond the understanding of most persons except chemists. The point is, however, that there are successful methods of treating clothes and other fabrics that greatly decrease their danger from fire, and their wider use would prevent many destructive fires and save many lives.

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Rhododendrons and azaleas are generally regarded as two distinct types of plants but both belong botanically to the same genus; for convenience the ones with evergreen leaves are called rhododendrons and those with deciduous leaves azaleas.

"The whole world is queer except thee and me, and sometimes even thee seems a little queer"

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