CHEMISTRY

Soda Pop Gas Goes To War

Life rafts are inflated, airplane fires put out, "Mae Wests" made buoyant, and even bullets are propelled by this versatile gas, CO_2.

By HARLAND MANCHESTER

See Front Cover

➤ THE BIG BOMBER settled slowly into the sea; she was a carrier-based plane, not built to float. The three men pulled the folded rubber lifeboat from its cover and turned a valve. In a few seconds "The Raft" was inflated, and Airmen Dixon, Aldrich and Pastulla set out on their grim, 34-day ordeal which will be remembered as long as sea stories are told.

Then there was Ensign Gay, sole survivor of U. S. Torpedo Squadron Eight. He also turned a valve in a "rubber doughnut," and lived to tell his gripping tale of the picturesque inferno of Midway.

These men, and thousands like them, owe their lives to one of the most spectacular technical developments of the war—the use of soda pop gas to save men, ships, planes, engines and industrial plants. This versatile gas—carbon dioxide—is the stuff that puts the fizz in fountain drinks and the bubbles in ginger ale. In its solid form it is dry ice. It is a universal gas—every time we exhale we produce it. It has been known for some five centuries, but only recently has it been harnessed to the many vital jobs which it now performs on every battle front.

Ensign Gay, with that curious perception of detail which men sometimes show in the face of death, glanced at a metal cylinder attached to his bobbing craft, and the words, "Bloomfield, N. J." were engraved on his mind. When he was rescued he wrote to a Bloomfield friend and thanked the town for providing him with a "grandstand seat." The message was forwarded to the Walter Kidde Company, for it was at the six Kidde plants—five of them new—that the soda pop inflation devices which saved the lives of Gay, the Dixon trio and many others, were developed and produced.

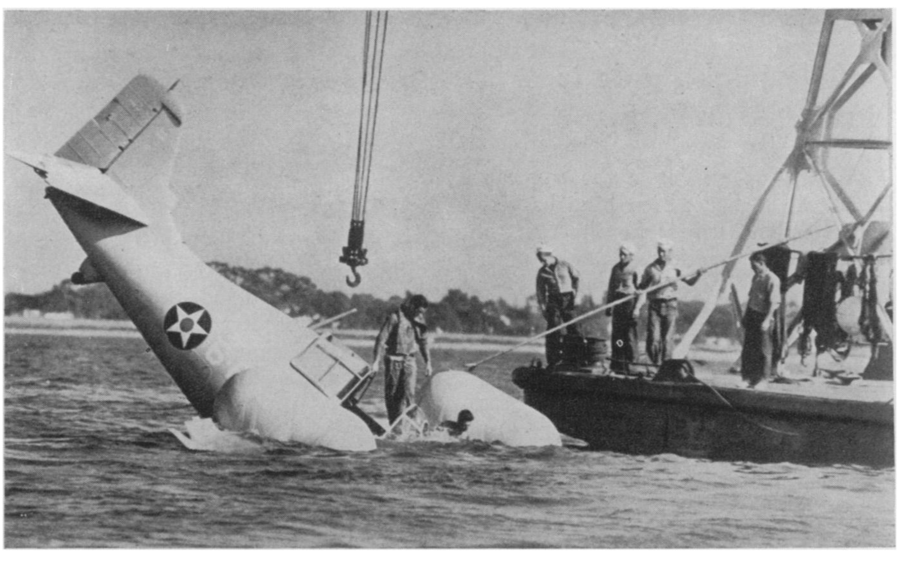
CO_2 has been applied by Kidde engineers to an amazing number of wartime uses. Packaged and geared to various devices, it kills airplane engine blazes in full flight, snuffs out and smothers fires on ships, furnishes emergency power to push down landing wheels and open bomb bays, and, of greatest importance to sea-stranded fliers and marine workers, it turns a wad of canvas into a lifeboat.

Besides the Kidde firm, a number of other concerns have been active in the development of fire-extinguishers and other devices making use of carbon dioxide. Among them are American Lafrance, Safety Fire Extinguisher Company, General Detroit Company and the Cardox Corporation. The Liquid Carbonic Company has provided fellowships for research looking toward wider industrial uses of this gas.

The big fact about CO_2 as a lifesaver is that more of it can be squeezed into a small volume than any other gas available. This makes it easy to ship to the ends of the earth in small containers. It is sent in liquid form to fill the flasks of life preservers and rafts. One quart compressed to liquid form will fill about two-and-a-half barrels when released. It will expand as much as 450 times its compressed volume.

Gas-inflatable lifesavers are now being produced by the million in all shapes and sizes. Buxom "Mae West" life vests have cartridge-like CO_2 cylinders which puff them up in two seconds. There are rubberized dinghies which are dropped by rescue planes. A man in the plane tosses out a bundle which looks like a duffel bag, hanging onto one end of a cord. When the cord snaps, the gas is released, and the boat, equipped with concentrated food, and paddles for navigation, is completely inflated when it hits the water.

One of the newest carbon dioxide lifesavers is a one-man parachute boat weighing only 12 pounds, which the pilot wears, strapped to the seat of his pants. It is now being turned out by the U. S. Rubber Company on a 'round-the-clock schedule. When the pilot bails out in his 'chute, he first inflates his "Mae West" on the way down, which keeps him afloat while he gets the lifeboat ready. This seaworthy boat, five and a half feet long, is equipped with paddles, plugs to stop up bullet holes, and a can of chemical which will stain the surrounding water with yellowish phosphorescence to attract the attention of rescuers.



AIRPLANE WATER WINGS save many planes, crashing into the water like the one on the front cover of this week's SCIENCE NEWS LETTER, from a watery grave. Large folded bags carried in wing compartments are automatically inflated by a water-sensitive device as soon as the plane makes a forced landing at sea.

"Airplane water wings," another automatic CO_2 invention, have saved many a plane and pilot from a watery grave. Large folded bags carried in wing compartments, also controlled by a water-sensitive device, are inflated with the gas when the plane makes a forced landing at sea.

A dramatic new aviation role of CO_2 is to provide an emergency power house. A single pound of this highly-compressed gas, quickly released, supplies as much power over a short period as the average car engine. So a flask of CO_2 may be used as a small motor to perform a task when the regular equipment is out of order. In airplanes, for instance, the retractable landing gear is lowered, brakes are applied and bomb bay doors are opened by the pressure of oil in hydraulic systems. But if even one of these oil lines is severed in combat, the system will not work. Without supplementary power, the home-coming pilot can't get his wheels down.

Flasks of CO_2 are attached to the pistons which are ordinarily operated by oil pressure. So if the hydraulic system is knocked out, the pilot simply turns a valve on his instrument panel and CO_2 takes over. It can exert a pressure up to 150,000 pounds.

Used to Fight Fires

The most widespread war use of soda pop gas is in fighting fires. When oil and gasoline fires are blanketed with carbon dioxide, the flames are deprived of the oxygen they need, and promptly smothered. Today there is hardly a plane, tank, or ship of any size made without one or several CO_2 devices to protect against fire. And the number of laboratories and plants which have installed the gas fire-fighting systems runs into the thousands.

In the days before the CO_2 fire-killers were developed, an engine fire in the air often turned the plane into a crematory. Today steel bottles of CO_2 stand guard over engines in all our war and transport planes. Near the engine is a detector in which a filament melts at the slightest flicker of flame and sends an electrical warning to the pilot. He pulls a control on the instrument board, and CO_2 rushes through pipes to outlets encircling the engine cylinders, flooding the engine compartment with clouds of fire-smothering vapor. In a few seconds the fire is out.

Carbon dioxide is also used for the explosion-proofing of empty spaces in wings and fuselages. Before this development, the space surrounding the gasoline tanks was always a danger point. When an enemy bullet penetrated a gas tank—even the self-sealing variety—a few drops of fuel would drip out, causing dangerous vapors to form. A tracer bullet or even a spark could ignite these vapors and cause an explosion in mid-air. Now, when entering a combat zone, the pilot turns a handle on the instrument board and floods the empty spaces with the fire-killing gas, making it impossible for the explosive vapors even to form.

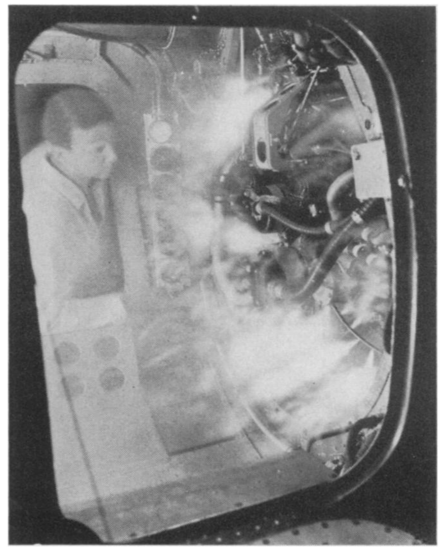
American tanks are protected against fire by similar uses of soda pop gas. Once a tank catches fire in combat, due to a broken fuel line or an enemy shell, the fire may last all day, twisting the tank into a useless hulk. Even before our invasion of Africa, CO_2 systems had saved many American tanks and their crews from fiery destruction.

In the marine field the gas fire-fighting equipment has been developed to its highest peak of efficiency. On big liners like the Queen Mary, there is an ingenious cabinet mounted in the control room which enables the ship's officers to detect and extinguish fires in as many as 40 different locations in the hold in less than a minute.

Like most complicated mechanisms, this one was slow in coming and was the product of many minds. It began about 1900 with a boy named Fred Meyer whose mother ran a tobacco shop in Jersey City. A ship burned off the Jersey Coast with great loss of life, and the boy brooded about it. He and his brother Richard worked out a crude system of pipes through which samples of air could be drawn from various parts of a ship. An officer sniffed at the outlets of the pipes, and when he smelled smoke, he turned a valve and steam was driven down the pipe to smother the fire.

Put on Ships

Fred's mother proudly described her son's invention to William Rich, a tobacco salesman who came to her shop. Much impressed, Rich secured capital and founded a company to make and install the apparatus. By the time he died in 1916 the system was used on 30 ships, including the Mauretania. When the firm was left without a head, Walter Freygang, son of a stockholder, persuaded his friend Walter Kidde to buy the patents. Mr. Kidde, perceiving the short-comings of the system as well as its merits, commissioned Freygang to go ahead and improve it.



FIRE!—It is much less of a nightmare to the pilot when he is protected with modern fire-fighting apparatus.

Steam was not wholly satisfactory as a fire extinguisher. It often caused more damage than the fire. Carbon dioxide proved to be the answer. A Swedish inventor named Rustige worked out a method for siphoning the gas from cylinders so that it could be used as an extinguisher. It was found that no fire could live if the expanding gas cut down the oxygen supply in the surrounding air by as much as one-third. And the gas did not damage the cargo. So Rustige's ideas were merged with those of the Jersey City boy to produce the fire-detection and CO_2 extinguishing systems now used.

To demonstrate the device, Arthur Doxsey, Kidde engineer, went to England and rented a small ship, installed the system, invited a delegation of the British Chamber of Commerce on board, and set fire to the vessel. It was almost too good a show, but the CO_2 did its work promptly and the delegates went ashore shaken but convinced.

As the system now works, air samples are constantly collected in various compartments of the hold by inverted metal bowls attached to the ceiling. Tubes from these collectors lead to the ship's control room, and an exhaust motor draws the air samples up the tubes. The tubes terminate in an upright, open-front cabinet in a kind of pipe-organ arrangement. If a wisp of smoke rises from one of the open pipe-ends, it is clearly revealed in a shaft of light focused from below.

By watching the pipes, a ship's officer can easily detect a fire in any part of the hold. As an added precaution when he turns his back, there is an "electric eye" watchman which automatically samples the air from each of the pipes in turn, making the rounds in about two minutes. When smoke breaks the light beam, an alarm rings and a signal flashes showing the location of the fire. The smoke-sniffing pipes also act as fire hoses, and carbon dioxide rushes down the pipe to smother the flames.

Similar CO_2 fire-fighting systems have been installed in plants where fire-hazardous work is done. Sometimes the gas closes the windows and smothers the fire in the same operation. CO_2 systems are made to order for electrical power plants where liquid extinguishers are out of the question. Repositories of articles of great value, like the Archives Building at Washington, have fixed CO_2 systems, while many other establishments, like the Sterling Memorial Library at Yale, are protected by portable soda pop gas extinguishers.

The energy of expanding CO_2 is even being used to propel bullets. Ray J. Monner, Denver inventor, is manufacturing a so-called "dry-ice gun," and the Colorado Defense Force has ordered the first hundred to use in place of the Springfields taken over by the Army. A cylinder beneath the barrel is loaded with crushed "dry ice" which becomes liquefied. When the trigger is pulled, a valve is opened, and a little of the violently expanding gas drives the .22 caliber bullet from the barrel. One loading is good for 1800 shots.

This becomes less of a Buck Rogers dream when you consider that there are 30,000 foot-pounds of energy in a single pound of the compressed gas. And if it can open a bomb bay, launch a life raft, close a window and shoot a gun, it can be used for other specialized power jobs. So engineers are making plans.

Whatever these plans may come to, soda pop gas still packs its triple threat as life-saver, fire-fighter and refrigerant, and has an expanding future both in war and peace.

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DENTISTRY

Fingertip Control

New gadget relieving dentists' feet of control of the drill is invented by dentist who tired of being a "one legged crane."

➤ A GADGET to put dentists back on their feet has been invented by Dr. Maurice I. Blair, Chicago dentist. Dr. Blair's fingertip dental engine control, which changes the control of the dental engine from foot to hand, has just been given its first public display.

The fingertip control which, Dr. Blair reports, is the first change in drill control in 30 years, is shockproof. It is manipulated simply by a sensitive electric button on the mirror handle, which is connected by aerial wire to the drill through a two-tube radio.

Dr. Blair reports that the inspiration for this improvement was the fact that he "got awfully tired of always standing on one foot." Dentists now use the foot control which makes it necessary for one foot to be constantly on the control.

Dr. Blair also points out that the foot control is an eyesore and a nuisance since most dentists' floors are waxed to a point of slipperiness and the foot control is always slipping out of reach, with the dentist sliding with it. Many a patient who has tripped over it will bless Dr. Blair for his invention.

In the two years that it took Dr. Blair to perfect his invention he ran across many disappointments when he found it impossible to use his original idea of placing the button directly on the drill. However, he hit upon the safe and happy idea of placing it in the mirror handle and it has proved to be successful.

After the end of the war, Dr. Blair's control will be manufactured so that other dentists may share in his invention.

"I am now working on an improvement which will use a low voltage switch to start and stop the dental engine, thus eliminating the radio circuit which has given a little trouble in some areas because of interference," Dr. Blair has just reported.

"I am more convinced than ever that the foot control must go in order to eliminate the fatigue which it gives to dentists who are one-legged cranes every time they operate the dental engine."

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ENGINEERING

Tire Wear on Passenger Cars Reduced by Half

➤ TIRE WEAR on passenger cars is now less than half as great as it was a year ago on main rural highways, a new report by O. K. Norman, highway engineer-economist of the Public Roads Administration, indicates. Traffic counts made after rationing showed 40% reduction compared to traffic a year ago. There was also a fourth less tire wear per travelled mile, due to lower speeds, according to studies by the Public Roads Administration and state highway departments.

More than half the drivers travel at speeds over 35 miles per hour, a survey in rationed areas indicated. Average for passenger cars was 36.6 miles per hour in a rationed area, and only 37 even in areas that were not rationed at the time of the survey.

Trucks now travel at about the same speed as passenger cars. Prior to rationing and the new speed limit, average car speed was nearly 50 miles per hour.

Considering that there has been little enforcement of the 35-mile speed in some states, it is encouraging to find that so few drivers travel at speeds more than five miles per hour in excess of the limit, Mr. Norman stated.

Most of the studies on the 35-mile limit were conducted within a month after the new law became effective. Since many states had not started to enforce the reduced limit or changed their speed signs at that time, Mr. Norman points out that a further decrease in average speeds is probably now in progress.

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