PHYSICS

Helium, Sun Gas

The United States has a world monopoly on this element, useful in the air, in hospitals and for deep-sea divers.

By ROBERT N. FARR

➤ ONE SCIENTIFIC research baby, born afighting in the first World War, fighting again in this war, now looks forward to an even more useful career in peacetime. It is helium, the lightweight among non-burnable gases.

Uncle sam has a world monopoly on the large-scale production of this gas, known to science as chemical element No. 2. So rare was helium in 1917 that it sold at a rate of $2,500 a cubic foot, but it is so plentiful now that Uncle Sam extracts millions of cubic feet of it at less than a cent per cubic foot.

No one will ever see helium gas. It is completely colorless, odorless and tasteless.

This "invisible gas" lifts Navy blimps, used to ferret out Nazi U-boats. It carries meteorological balloons to stratospheric altitudes, gaining weather data vital to the success of military and naval operations. Deep beneath the sea it helps reduce the danger while divers do their work. In war plants it helps curb explosion hazards. Doctors use it in treating respiratory diseases.

Uncle Sam controls the production and distribution of helium through the Department of the Interior, with the Bureau of Mines actually drilling the gas wells, and building the plants in which helium is extracted from the natural hydrocarbon gases, piped from deep beneath the earth's crust.

Most helium-yielding gas wells are in the southwestern part of the United States, particularly in Texas, Kansas and New Mexico.

"The Sun Gas"

Helium was named "the sun gas" because it first was detected in the sun's spectrum in 1868 as a strange new yellow line. Later it was discovered on earth in certain minerals, and more recently in natural hydrocarbon gases.

No helium is being produced commercially from any source outside the United States today. However, there is a potential yield of 200,000 cubic feet a day from the gas that pours forth from boric acid fumaroles in Italy. Canada also has some natural gases that contain a small percentage of helium.

At the close of World War I the desirability of helium as a lifting agent was well established, its value lying in the fact that while its lifting power is 92% of that of hydrogen, lightest of all gases, it forms no dangerous explosive mixture with air, which hydrogen does.

Twenty-five years of research has barely scratched the surface of the possibilities for the industrial, scientific, and medical uses for the "sungas." Helium is now available in large quantity for research and commercial applications.

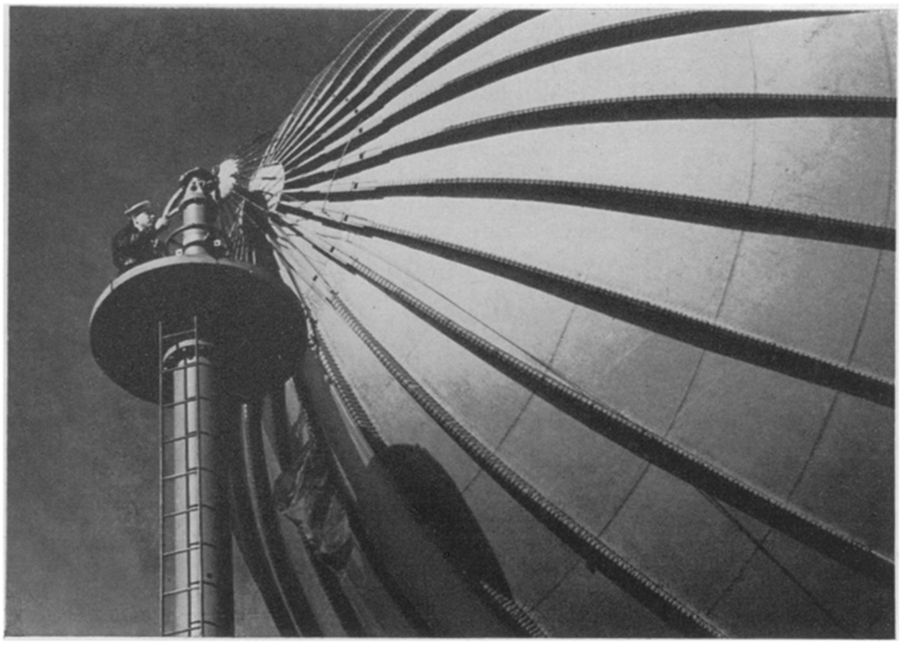
A list of present and possible future uses of helium includes use as a food preservative, an extinguisher for fires, a cleansing agent to remove impurities from molten metals, in the development of explosion-proof motors, in refrigeration to produce ultra-sub-zero temperatures, in optical instruments, and as a tracer element to determine migrations of underground deposits of natural gas.

New techniques of studying weather require the use of large balloons to carry heavy meteorological equipment to high altitudes. Because it explodes and burns, the use of hydrogen to lift these balloons proved to be quite dangerous, therefore the U. S. Weather Bureau now uses helium to help get weather predictions.

In the medical field the sun element has been used for more than 20 years in experiments and in actual practice in preventing caisson disease, or "bends," in deep-sea divers, tunnel workers, and others forced to work in atmospheres of relatively high pressure.

Aids Deep-Sea Diving

The old method of using compressed air in deep-sea diving limited the depth to which a diver could safely go to little more than 250 feet. At this depth the increased oxygen made the diver lose part of his ability to think, and as a result he could work less than one hour at that depth. It also required up to four hours for the diver to return to the outside air in order to avoid the "bends," which is due to nitrogen bubbles coming out of his body (*Turn to Page 238*)



FILL HER UP!—That is just what is being done to this Navy blimp. The helium provides lifting power for ships used for coastal patrol work.

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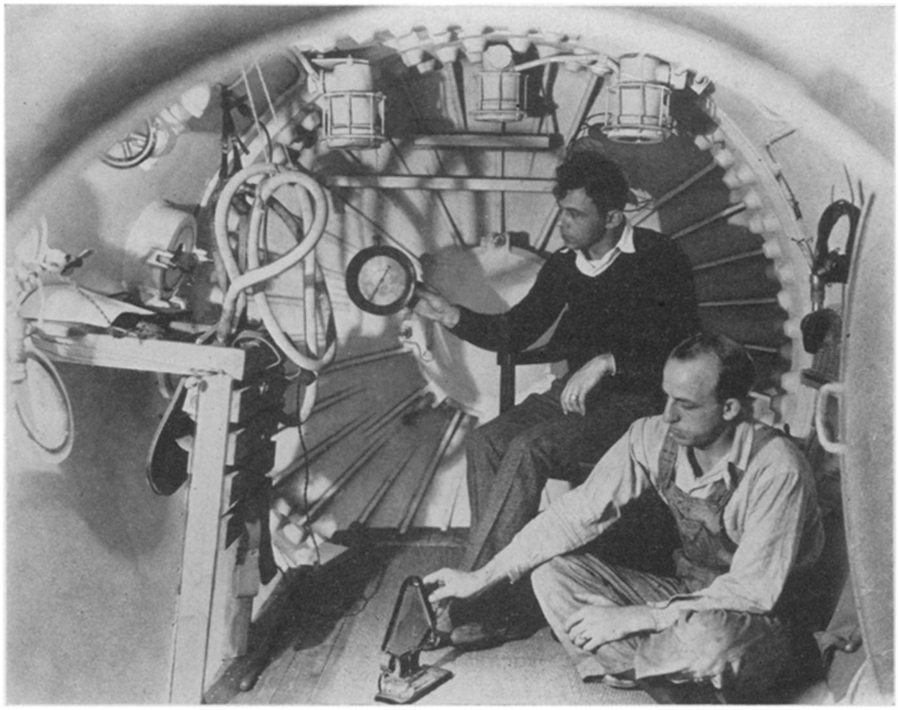
tissues and collecting at his joints.

Dr. R. R. Sayers, director of the Bureau of Mines, and his associates worked with Navy Department personnel to develop a helium-oxygen mixture for deep-sea diving, thereby eliminating the nitrogen which may cause the "bends." By using this helium-oxygen mixture, the depth to which deep-sea divers can go has been greatly increased, and the divers are able to work at these greater depths for longer periods of time, and can return to the outside air in a fraction of the time necessary where compressed air is used.

On the basis of somewhat limited experiments, it appears that the helium-oxygen mixture may be of value in preventing "sky bends," a complaint of flyers who go up to altitudes of around 30,000 feet. During descent from high altitudes nitrogen bubbles form in the body by fundamentally the same process that causes them to appear in deep-sea divers.

Ear trouble, the most common complaint of airplane pilots and passengers, can be relieved or prevented by inhaling a helium-oxygen mixture during marked changes in altitude of the plane, especially when descending.



TESTING CHAMBER—The use of helium-oxygen mixtures for diving and caisson work is being tested in the compression chamber shown in this U. S. Bureau of Mines photograph.

Among other new medical applications of helium are the treatment of pneumonia, asthma and other respiratory diseases in which helium eases the burden on weakened lungs. Asthmatic patients frequently get relief almost instantly by inhaling a mixture composed of helium and oxygen. This is not considered a cure for asthma, but in many cases war workers who suffer from asthma are enabled to keep on the job by taking a whiff of the breathing mixture from time to time.

One of the newest uses for helium is in the heliarc process of welding magnesium. Helium acts as a shield to hold off the oxygen of the air and thus prevents the metal from bursting into flame. The blanket of helium not only smothers any tendency of the metal to ignite, but it makes the joint stronger and less susceptible to corrosion. It is also being used with steels and other metals to produce better welds.

Liquid helium may one day be employed to treat materials such as metals and plastics at extremely low temperatures. Although this field is still largely unexplored, the low temperature of liquid helium, in addition to its other characteristics, may have definite advantages over other cooling agents.

Since it is a better heat transfer agent, and of lower density than air, helium is used with large-capacity dynamo-electric generators to dissipate heat and reduce resistance to rotation of the armatures, thereby increasing the capacity of the generator.

Now used between the lenses of some optical instruments, helium gas curtails errors of vision because it has a low refractive index and high heat transfer. As a coolant, helium used around electrical instruments prevents electric sparks from igniting explosive mixtures which may be present in the surrounding air.

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