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SCIENTIFIC RESEARCH TO MAKE NEW DIRIGIBLES SAFER

Scientific research, now in progress at the U. S. Bureau of Standards, promises to make the two new dirigibles, each of 6,000,000 cubic feet capacity, the construction of which is contemplated by the government, safer than any previously built. This is the opinion of Dr. L. B. Tuckerman, assistant chief of the Bureau of Mechanics and Sound.

"For thousands of years," says Dr. Tuckerman, "man has looked upon the birds of the air and dreamed of the time when he, too, would fly, yet it is but a little over a century and a half since man first took to the air, in the balloons of Montgolfier and Charles. It is a scant quarter of a century since navigation of the air became a reality. There has not yet been time for him to learn all the dangers of the air nor for his skill to defeat them. Much already has been accomplished. In the years before the war the German Zeppelins carried over 42,000 passengers in more than 2000 flights, and after the Armistice one airship, the Bodensee, carried 2500 more passengers without a single injury to passengers or crew. Much more, however, remains to be done. The loss of the R-38, the Roma, and finally the Shenandoah warns us against over-confidence.

"Even the Polar flight of the Norge, dramatically successful though it was, shows again that only through navigating the air, can we learn to make air navigation safe. The danger to airships from ice was learned only by actual flight, and the flight of the Norge teaches us that this danger must be considered even more carefully in the future. If, after ten thousand years of building houses and 5000 years of sailing ships, human lives still are lost in the destruction of these works of man by the forces of nature, we must expect as the price of our conquest of the air a toll of human lives.

"First, the airship must be built of light, but sound and lasting materials, in particular its rigid frame-work. For this reason, the Bureau of Standards studies in its Metallurgical Division and Engineering Mechanics Section the properties of duralumin, how it is affected by heat treatmont and working, how well it resists the corrosive influence of the atmosphere. Duralumin (the aluminum alloy of which the Shenandoah and Los Angeles were built) is today, when unprotected, more resistant to atmospheric corrosion, or rusting, than unprotected structural steel, but the investigations of the Bureau of Standards promise to furnish means of making it even more durable. Of these sound materials, strong and light girders must be built. So light that a man can carry one of them in his hand and yet so strong that they will carry loads of thousands of pounds. Not yet do we know how light these girders may

be constructed and still be safe but the safety of the ship is insured by testing each of its main girders in our testing machines so that we know its strength is greater than the strength for which it was designed. For the Shenandoah nearly 150 full sized girders were tested and a similar and larger program is planned for these newer ships.

"The lifting of the airship is due to the helium gas confined in the gas cells. The securing of gas cells, light and strong and impermeable, is necessary to the safety of the ship. The strength and the permeability of the gas cells are tested by the Textile Section and the Gas Section of the Bureau of Standards, and an active investigation is being carried on to secure even stronger, lighter, and more impermeable cells.

"When the ship is flown, it is necessary for its safety that the ongines which drive it shall be adequate in power and reliability. Theoproblem of a reliable airship engine is not so simple as that of a reliable automobile engine. Two factors enter into the problem which are of less importance for automobiles. In the first place, lightness of construction is essential far more than in any engine which operates on the ground and in the second place, it is necessary that the engine operate successfully under extremes of temperature and pressure never encountered by an automobile engine. Even relatively small heights interfere considerably with the running of an automobile engine, but an airship engine must notonly operato satisfactorily at the temperatures and pressures at the surface of the earth but at temperatures often 30 degrees or 40 degrees below zero and pressures less than one third the airpressure at the surface of the earth, found at altitudes of 30,000 to 35,000 feet.

"The altitude chamber of the Bureau of Standards is a chamber in which engines can be tested under approximately these conditions. Refrigerating machines lower the temperature and large air pumps exhaust the air so that the engines are run under pressures and temperatures corresponding to altitudes of over 30,000 feet. All the types of airship engines used by the U. S. Navy have been tested in these chambers before being installed.

"The future of air navigation is full of promise and in that future the airship has its place distinct from that of the airplane. It is surely fitting that the United States, which gave to the world its first successful airplane, should actively advance man's final mastery of the air."

Practically all insect-eating plants grow in acid bogs where nitrogen is not available for their roots.

A Kansas City doctor declares that an experienced physician can tell the volume of blood in an individualls body by studying thepalm of the hand.
