NORMAL BREATHING UNDER WATER

A wisp of synthetic membrane, only a thousandth of an inch thick, may hold the answer to a simple system for supplying submarines with air drawn from the water around them, the purification of air in space capsules or moon stations, and a means of providing cheap, reliable oxygen supplies for patients in hospitals or at home.

The secret lies in a silicone film that is thinner, and therefore more permeable than any silicone membrane ever before reported. Even though this membrane is completely free of holes, it permits the passage of liquids or gases. The method of producing the membrane was discovered by Dr. Walter L. Robb of General Electric company research laboratory. Possible applications are being studied at the GE's advanced technology laboratories and elsewhere.

Membranes have been made from a variety of materials, one of the most useful is a special type of silicone rubber in the development of which GE research played a major role during World War II. The membrane is 30 times as permeable as the rubber in automobile tires would be at equal thickness and 1,000 times as permeable as the plastic films used for wrapping foods.

Since different gases pass through the membrane at different rates it is called "selective." The ability of the membrane to "select" those gases which will pass through most easily could be applied to space capsule.

An opening covering with such a membrane would allow unwanted water vapor and carbon dioxide to escape easily into the vacuum of space, while vital oxygen was held in, because the first two gases pass through much more quickly than oxygen. In fact, since water vapor passes through 60 times as fast as oxygen, the membranes might be used on earth as devices for dehumidifying air.

Oxygen, on the other hand, passes through such a membrane over twice as fast as nitrogen, which makes up 80 per cent of the air we breath. As a result, if ordinary air is brought into contact with one side of a membrane, while the other side of the membrane is maintained at a lower pressure, the gas passing through the membrane will be rich in oxygen. If the low-pressure side of the membrane is maintained at 1/15 of atmospheric pressure, for example, the air passing through will contain approximately 35 per cent oxygen, instead of the usual 21 per cent. The 35 per cent figure is close to that found in hospital oxygen tents and infant incubators.

In industry, enriched air is used in a variety of processes, where the membrane system could reduce costs. Helium could also be "filtered" out of air or natural gas. In such cases, other types of polymers would be used, rather than silicone rubber, since various polymers differ in the rate which they allow different gases to pass through.

Underwater applications would depend upon the fact that sea water is essentially saturated with air to a depth of many hundreds of feet. A membrane with sea water flowing past on one side and with pressure below one atmosphere on the other side would extract air, while resisting the passage of water under tremendous pressure. — *Manila Bulletin.*