Work on the relative permeability of fabrics to helium and hydrogen has been carried out by Barr[1] who made careful measurements in 1915. The amount of helium at his disposal was limited, the total being about 310 ccs. The area of the test pieces used was 25 square centimetres; and measurements were made employing the volume-loss method.

Experiments on the permeability of fabrics to helium and to hydrogen have recently been carried out at the United States Bureau of Standards. While no account of this work has yet appeared in print, it is understood that the results obtained are in close agreement with those given in this paper.

For the present work the area of the test piece used was 500 square centimetres, and a supply of helium of practically 100 per cent purity was available.

Definition of Permeability

The British practice is to express permeability as the volume in litres of dry gas at 15·5°C. and 760 mm. which leaks through one square metre of fabric in 24 hours. Permeabilities are expressed in this paper according to this definition. Some experiments, however, express the volume in litres at 0°C. and 760 mm. In British practice the temperature of the fabric is usually 15·5°C.

The United States Bureau of Standards on the other hand, expresses permeabilities in litres of dry gas at 0° and 760 mm. passing through one square metre in 24 hours. The fabric is maintained at 25°C. during the period of test.[2]

The essential requirements for the determination of the leakage of a gas through a fabric are (*i*) an apparatus—usually called a permeameter—to hold a sheet of fabric so that air may be passed over one surface at a definite rate while the gas passes over the other surface, (*ii*) a means of determining the amount of this gas which diffuses through the fabric into the air.

In these tests a Shakespear permeameter was used and two methods were employed to determine the amount of gas in the air, (*i*) by using a Jamin Interferometer, (*ii*) by using a Katharometer. The permeameter is described below under "Description of Apparatus," while the use of the Interferometer and Katharometer is detailed under "Measurement of Permeability."

[1] Barr. *Loc. cit.*

[2] Tech. Paper. No. 113.