These readings with the necessary temperature and pressure readings yield the following results:

V = the rate of flow of air expressed in litres per hour of dry gas at 15·5°C. and 760 mm.

r = the percentage of hydrogen or helium in the outflowing air.

If the area of the fabric exposed = A sq. cms. the permeability, P, is given by the equation

$$P = \frac{V \times r \times 10,000 \times 24}{100A}$$

In the permeameter employed A = 500 sq. cms. and, on substituting, the formula becomes P = 4·8 × Vr.

(b) In the second method, a Katharometer together with a mirror galvanometer was used. The Katharometer, manufactured by the Cambridge Scientific Instrument Co., Ltd., was designed by Dr. G. A. Shakespear and has been described by him elsewhere[1].

The explorer and galvanometer employed have been referred to in another paper[2].

In making Katharometer readings about 1 minute was allowed after adjustment. The permeameter air-chamber was then closed and readings taken at one minute intervals for about 20 minutes. When the readings were completed the exit-trap from the air-chamber of the permeameter was opened, and the air stream re-established. If subsequent readings were made, sufficient time was given for equilibrium conditions being reached.

With the Katharometer, the permeability (P) is given by the expression: P = galvanometer-scale divisions × a constant.

The constant for hydrogen-air was calculated from data supplied by the Cambridge Scientific Instrument Co., Ltd., while that for helium-air was deduced making use of the calibration results obtained by one of the writers.[3] The actual values of the constants found were for hydrogen 0·4377, and for helium, 0·6870.

Results

The results obtained by the two methods are collected in tables II and III. Column 1 gives the fabric number as described in Table I; column 2, the sample mark; columns 3 and 4 the permeabilities to the nearest decimal place at 15·5°C. and 760 mm.; column 4, the

[1] Shakespear. Advisory Committee for Aeronautics. No. 317. A new Permeability Tester for Balloon Fabrics. 1917.

[2] Murray. Proc. Roy. Soc. of Canada, 1919.

[3] Murray loc. cit.