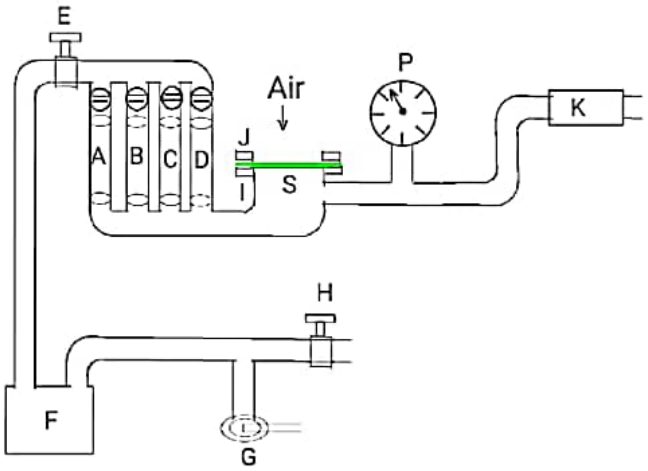
(Schematic diagram of Shirley fabric air permeability tester)

A,B,C& D - Rotameter
E - Series valve
F - Reservoir
G - Suction pump
H - By-pass valve
I - Specimen fixing plate
J - specimen clamp
K - Safety valve
S - Test Specimen
P - Draught gauge



In this apparatus, Air at Standard Atmospheric condition is drawn from the laboratory through the test specimen S by means of a suction pump A, the rate of flow being controlled by means of the by-pass valve B and the series valve C. The rate of flow is adjusted until the required pressure drop across the fabric is indicated on draught gauge D, graduated from 0 to 25 mm head of water. For fabrics of high resistance, the rate of flow of air through the specimen is inadequate for proper operation of the suction pump; this is overcome by opening the by-pass valve B which supplies air to the pump directly.

For fabric of low resistance, when high rates of flow are attained, valve B is closed or permitted to supply only a small volume of air, fine control is obtained by adjusting valve C. E is a reservoir which smooths out any disturbance due to the varying velocities of the streams of air drawn through the various paths by the pump.

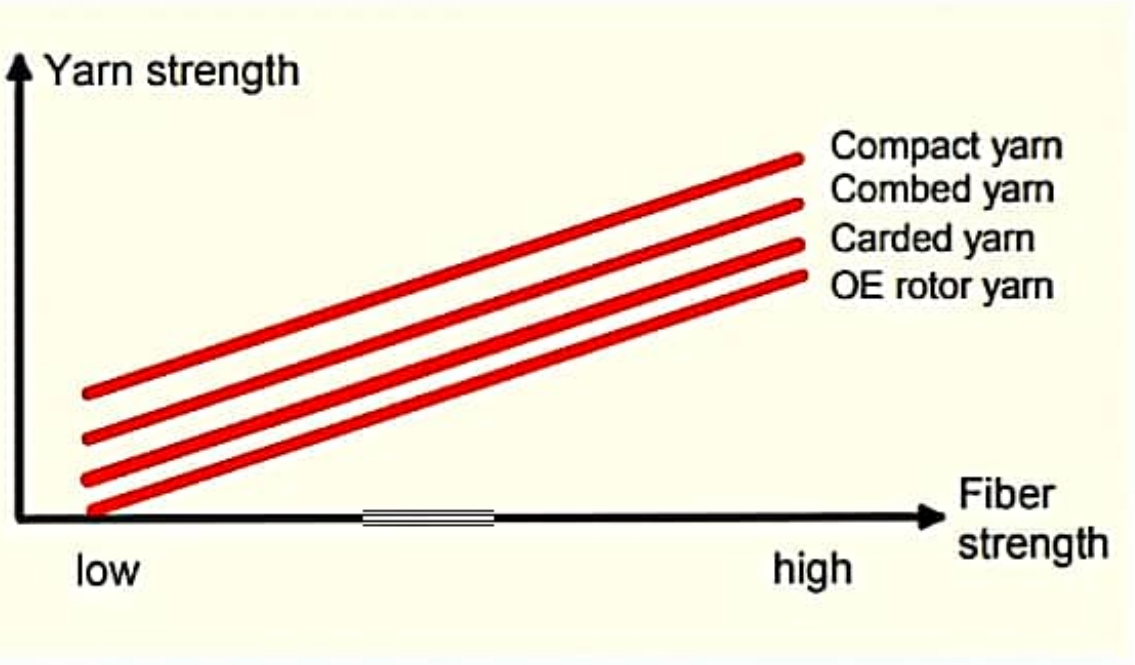
When the required pressure drops, which is normally 1 cm of water, is attained and the indicator of the draught gauge is steady, the rate of flow of air is read off one of the four Rotameters R, selected according to the permeability of the test specimen. The Rotameters are calibrated, at 20° C and 760 mm of mercury, to indicate air flow in cubic centimeters per second and they cover the following range:

R1 0.05-0.5
R2 0.5-3.5
R3 3-35 and
R4 30-350.

It is easy to select the most suitable Rotameter for any fabric. The test is commenced with R4 open and the other Rotameters closed. If the flow is less than 30 cm^3/sec, R3 is opened and R4 closed. This procedure is repeated until the most suitable range for the fabric under test has been selected. To prevent damage to the draught gauge, should the pressure drop across the fabric inadvertently be allowed to exceed the range of the gauge, a safety valve F is provided.

The test area is 5.07 cm^2, since a 1-inch diameter circle is exposed when the specimen is clamped in the holder. From the readings on the Rotameter either the air permeability or the resistance can be computed. The average rate of flow form five specimens is calculated and by dividing by 5.07 we obtain the air permeability of the fabric in cubic centimeters per second at 1 cm head of water. Alternatively, 5.07 may be divided by the mean flow; this gives the air resistance of the fabric in seconds per cubic centimeter per square centimeter under a pressure of 1 cm of water.

Yarn strength versus fiber strength



There is a strong correlation between yarn strength and fiber strength for a given twist