$\frac{1}{2}$ in. diameter polychlorotrifluoroethylene† rods and ram-extruded $\frac{1}{2}$ in. diameter rods of polytetrafluoroethylene‡. In the text the names for these four polymers will often be abbreviated, respectively to PBAC, PET, PCTF, and PTFE.

Materials obtained as rods were machined to cylindrical shapes whose gauge dimensions were 0·150 in. diameter and 0·60 in. length. The PET sheet material was machined to gauge dimensions of 0·60 in. length, 0·20 in. width, and thickness as received.

2.2. *Apparatus and Procedures*

The specimens were strained in uniaxial tension in a chamber at confining pressures up to 8 kb using castor oil as the pressure-transmitting fluid. The high-pressure apparatus has an internal, pressure-compensating load cell and windows for viewing and photographing the specimen during the test; afterward the films are measured for determining true stresses and strains. The apparatus is a modified version (Das and Radcliffe 1968) of that described by Pugh and Green (1956) and Pugh, Lees, Ashcroft and Gunn (1961). The tests were conducted at constant crosshead velocity of 0·006 in. min^{-1} at room temperature, 300°K.

Polycarbonate specimens were also tested at low temperatures under atmospheric pressure in a cryostat using fluids to cool protected specimens by air convection and some conduction. The fluids at their use temperatures were water (273°K), tetrachloroethylene (251–253°K) monochlorobenzene (229°K), solid carbon dioxide (194°K) in an acetone bath, ethyl alcohol (148°K) and isopentane (116°K). These tests were also tensile in nature, the crosshead velcotiy being 0·005 in. min^{-1}. Further details can be found in the thesis of Christiansen (1970).

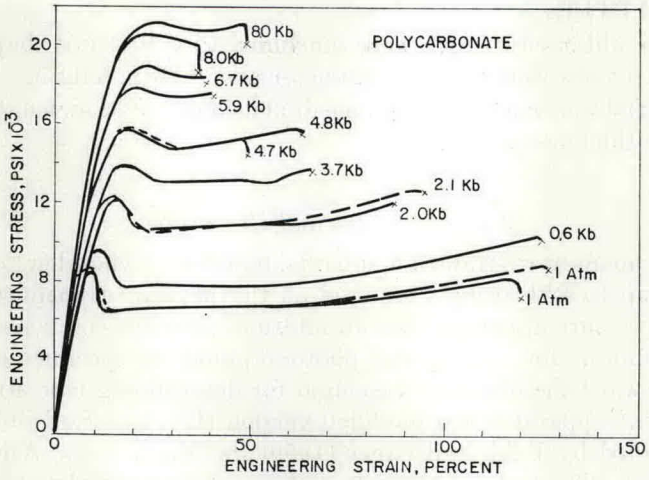
§ 3. Results

3.1. *Experimental*

The nominal stress–strain curves for the four polymers at various pressures are shown in figs. 1 to 4. For PBAC, PET, and PCTFE there were increase of modulus, yield stress and strain, and decreases of fracture strain. When the nominal stresses are corrected for the change of diameter the true stresses are obtained. From Considere constructions (see, for example, Vincent 1960) on true stress–strain plots the true yield stresses were obtained, and these increase linearly with pressure for PBAC, PCTFE, and PTFE up to 4 kb. The respective values of true yield stress at atmospheric pressure were 9000 p.s.i., 5700 p.s.i., and 850 p.s.i., respectively, for the last-mentioned three materials, and the slopes of their pressure dependence (in units of p.s.i./p.s.i.) were 0·145, 0·231 and 0·095.

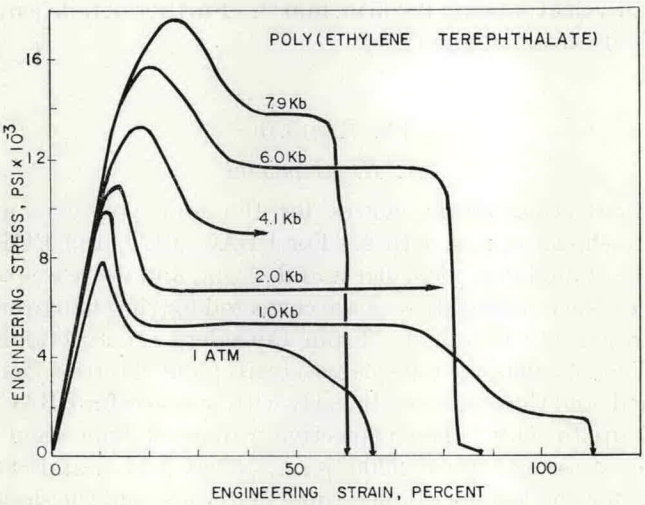
† Kel–F^{r} 81, Grade III, trademark of the 3M Co.
‡ Teflon^{r} 6121 from E. I. du Pont de Nemours & Co., Inc.

Fig. 1



Engineering tensile stress–strain curves for polycarbonate at various pressures.

Fig. 2



Engineering tensile stress–strain curves for poly(ethylene terephthalate) at various pressures.