needle valve E, F. The pressure of gas in the pipette was adjusted to the desired va... by means of the compressor and the pipette sealed by closing the needle valve B. T... manifold was then closed to the high-pressure system and opened to the gas burette a... pumping system to evacuate the connecting lines. After this had been done the bur... was sealed from the pumping system by mercury and the gas enclosed in the pipette ... expanded into the burette which was maintained at constant temperature in an oil b... Here its pressure was measured, using a mercury manometer. From volume a... pressure measurements with the burette the number of moles of gas initially encl... in the pipette was found and hence its density at the high pressure calculated. The ... burette had been calibrated previously [5] but a correction was applied in these measurem... for the fact that 1 ml of the gas was at the cryostat temperature.

The cryostat consisted of a Dewar flask containing liquid nitrogen and fitted wit... rubber bung through which passed the steel connecting line to the pipette. Temperat... were measured by a platinum resistance thermometer in a pocket immersed in the liq... nitrogen adjacent to the pipette. A connection to a vacuum pump was also prov...

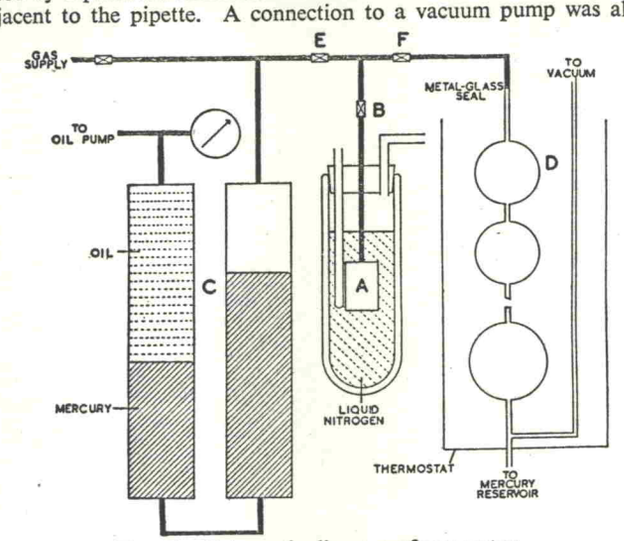

FIG. 1.—Schematic diagram of apparatus.

to reduce the pressure on the liquid nitrogen and so obtain temperatures below the norm... boiling point.

It was necessary that the valve B used for sealing the gas pipette be outside the cryo... and it was therefore inevitable that a small proportion of the enclosed gas was approx... ately at the ambient temperature instead of that of the cryostat. Care was taken to ens... that this amount should be as small as possible; it was about 10 % of the total. T... temperature of the needle valve B was noted at each density determination and the num... of moles of gas at this temperature calculated from the compressibility data of Mic... and Goudeket [7] and subtracted from the total to find the number of moles at the cryo... temperature.

The total volume of the pipette and the fraction of this volume which was immers... in the cryostat were calculated from the dimensions of the apparatus. These volu... were checked by comparing the results of some measurements of the compressib... of hydrogen at 293° K and 79° K with the data of Michels and Goudeket [7] and of John... and White [8] respectively.

High pressures were measured by Budenberg standard test gauges of the Bourd... tube type, the accuracy of such gauges being sufficient for the purpose of the investigat...

Commercial (electrolytic) hydrogen was purified by the method of Hainsworth ... MacInnes.[9] Gas from a cylinder was passed at a pressure of 100-150 atm throug... tube containing platinized asbestos heated to 110° C and then through a steel trap ... mersed in Dry Ice and alcohol to the gas compressor.

Deuterium was prepared from 99·7 % D_2O by a method similar to that used by S... and Steacie.[10] A 500 ml steel reaction vessel was immersed in Dry Ice and alco... evacuated and then filled with dry nitrogen. It was next opened and 50 ml of D...