widths at zero pressure should be inversely proportional to the elastic moduli. If these conditions are adequately met, and the elastic properties of the materials are uniform throughout the range of stress involved, proportionality of the distortions will be assured. This will remain valid even if the viscosity of the transmitting fluid is dependent on pressure, as will almost certainly be the case. It is, however, worth noting that the effective area of a pressure balance may depend to some extent, at high pressures, on the viscous properties of the fluid used.

The present series of experiments at the National Physical Laboratory is intended to cover the range up to 3,000 atmospheres. The two materials so far used are a hard tool steel and a special type of bronze of high tensile strength. The strains of the materials loaded in tension, compression and shear have been measured over the range of stresses imposed in the pressure experiments. Within the limits of accuracy of these measurements, the stress–strain relationships were linear and conformed to a fixed ratio of the elastic moduli of 1·44 : 1. Measurements in three directions at right angles which were made by the ultrasonic-wave velocity method, using longitudinal and shear waves, indicated the materials to be satisfactorily isotropic. The accuracy of construction of the assemblies is largely limited by the accuracy with which the cylinder bore can be made and measured. Owing to recent improvements which have been made in the Metrology Division of the Laboratory in the measurement of the form and diameters of cylinder bores[3], it has proved possible to construct piston–cylinder assemblies to the requisite precision, and with the required degree of similarity.

The results of the present series of measurements show that the method is capable of a very satisfactory degree of accuracy and consistency, and permits the measurement of the variation in effective area over a wide range of pressure to within a few parts in 10^6 of the total area. In fact, over small ranges of pressure, variations in effective area of only a few parts in 10^6 of the total area can be determined. An example of the results obtained is shown in Fig. 1, where it will be seen that a particular steel piston–cylinder assembly of nominal area 0·02 sq. in. may change in effective area by an amount of the order 1 part in 2,000 per 1,000 bars of applied pressure. In this instance the change proved to be a linear function of pressure to the order $\pm$ 1 part in 10^5 of the total area.

While the present series of tests is intended to cover the range up to 3,000 atmospheres, plans are being made to extend this range to higher pressures