being the range over which the dependence of viscosity on pressure is most variable as between the different fluids. Whilst the variations shown in Fig. 1.24*b* are not excessive in relation to the precision of the measurements, there is no reason to suppose that the full scope of these variations is necessarily covered by the three particular fluids which happen to have been used. It seems clear therefore that at high pressures it is necessary to associate any precise calibration of the effective area of a pressure balance with the particular transmitting fluid employed. It will be observed that in one case illustrated in Fig. 1.24*b*, where liquid paraffin was used as the transmitting fluid, the dependence of effective area upon pressure does not exhibit the same degree of linearity as in the other two cases—a light mineral oil and castor oil—in which the relationships can be represented by straight lines to within an accuracy of the order ± 1 part in 10^5. Whilst therefore the variations in the case of assemblies of this type seem to be for the most part linear, this condition cannot necessarily be assumed to apply in the case of all fluids.

In Fig. 1.24*d* are shown some comparable results for piston-cylinder assemblies of the differential type (Fig. 1.23*b*), in which the pressure acts upon the difference in the areas of two coaxial piston-cylinder units rigidly connected together with the load suspended from the base of the lower piston. These results have been obtained by comparison with the assemblies calibrated by the similarity method. It will be seen that the rate of change of effective area with pressure for different assemblies of this pattern, covering different pressure ranges, shows a greater degree of variability of slope than in the case of the simpler type of assembly, but it is not yet known whether these results are typical of differential-piston assemblies in general.

CONCLUSIONS AND FURTHER WORK

The methods described above seem to provide a basis for greatly improved calibrations of pressure balances. In particular, the similarity method for measuring the changes of effective area at elevated pressures relies on the properties of the balances themselves and is thus entirely independent of the use of the high-pressure mercury column.

The N.P.L. also proposes to instal a high-pressure mercury column of the general type recently described by Bett, Hayes and Newitt (1954), and this may be effected by the transfer of the mercury column already erected at Imperial College to the N.P.L. for maintenance as a pressure standard. The existence of these two independent methods is likely to prove very advantageous in that there will be ample means for the investigation of any uncertainties or discrepancies which may subsequently be encountered.

Preparations are being made for an additional check of the validity of the similarity method by the use of additional materials. It is clear that if a further comparison could be made, using either one or preferably two materials substantially different from those already employed, this would afford a very crucial test of the accuracy of the entire procedure. In addition, efforts are being made to extend the range of application of the method to pressures above 3,000 atm., and it is hoped that eventually an extension to the order of 6,000 atm. may be possible. This extension, however, will probably involve greater difficulties than have been encountered hitherto.

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APPENDIX 1.VI

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