It seems possible that the existence of a sharp transition temperature may be associated with the desorption of gas from a film originally formed under poor vacuum conditions, or on a substrate not free from gas, owing either to the existence of a critical temperature for gas desorption or to a delay of recrystallization owing to the presence of gas. That gas may be important under high vacuum conditions (10^{-7} mm.) has been shown here in work on the high-frequency resistance of thin molybdenum films deposited on glass. High-frequency resistance is insensitive to large-scale structural changes, for example, to formation of cracks and fissures, and even to the formation of 'windows'[9]. Nevertheless, there is an increase in film resistance with time unless the glass has been thoroughly degassed by prolonged baking.

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Principle of the Cartesian Diver applied to Gasometric Technique

IF for some reason or other the quantity of gas in a Cartesian diver decreases or increases, the pressure necessary to bring the diver to a standstill at a fixed level will change correspondingly, that is, the pressure change will be a measure of the change in quantity of gas. If, therefore, within the diver processes take place involving liberation or absorption of gas, the rate of these processes may be estimated quantitatively by measuring at different times the pressures at which the diver is in (unstable) equilibrium at a fixed level.

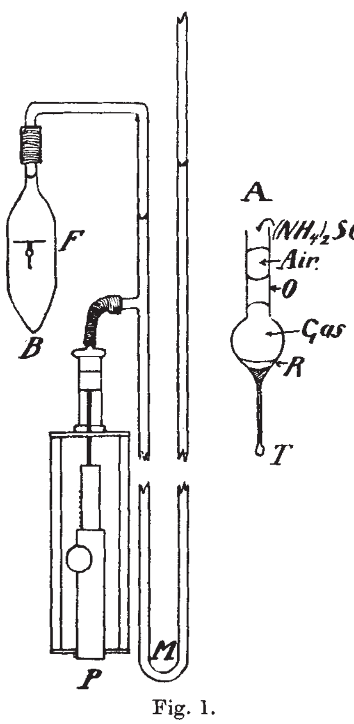

Fig. 1.

Fig. 1 shows how this may be done on an ultramicro scale. *A* is a diver of the simplest type and with a gas volume of approximately 10 c.mm. In the bottom of the bulb 1 c.mm. of reaction mixture (*R*) is placed, and in the neck there is a small stopper of paraffin oil (*O*). *T* is a glass tail which serves as a weight to maintain the diver in a vertical position and to regulate its equilibrium pressure at a value close to that of the atmosphere. The diver is placed in a vessel *B* filled with saturated ammonium sulphate (to reduce gas exchange to a minimum without increasing viscosity). *B* is submerged in a well-regulated thermostat ($\pm$ 0·02°) and connected with the manometer *M* and pressure adjuster *P*. The latter consists of a syringe the piston of which is moved by means of a rack. The manometer and the syringe are filled with water. By pressing the piston up and down it is possible to bring the diver to a temporary standstill at the mark *F*, and the corresponding pressure observed on the manometer is reproducible within 0·2 cm. water. Since this uncertainty is 0·02 per cent of the total pressure (about 1 atm.), any variation of the quantity of gas within the diver may be measured with an accuracy of $\frac{10 \times 0{\cdot}02}{100}$ c.mm.

Furthermore, the equilibrium pressures of two different divers kept in two different vessels for a period of 24 hours will not change mutually by more than 0·2 cm. water.

The principle has been successfully applied to the study of choline esterase activity using the Warburg technique (change of carbon dioxide tension over bicarbonate buffered reaction mixtures). But it is also applicable to the study of respiration and generally in many cases where gasometric analysis is used.

Details and applications will be described in subsequent papers.

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On Bremsstrahlung

THE method previously used[1] to calculate the cross-section for pair production by a beam of γ-rays has been extended to deal with transitions of a Dirac electron between two states of positive energy in a Coulomb field. It is thus theoretically possible to obtain an exact evaluation of the differential cross-section for energy loss by radiation of an electron incident on an atomic field (neglecting screening, which is justifiable for the energy values used). Actually, owing to difficulties of computation, the calculation is only practicable for fairly slow electrons losing more than half their kinetic energy in the field of a heavy nucleus. This is the case in which the values calculated by the use of Born's approximation[2] may be expected to be least reliable. The numerical work involved in the exact solution is too heavy to