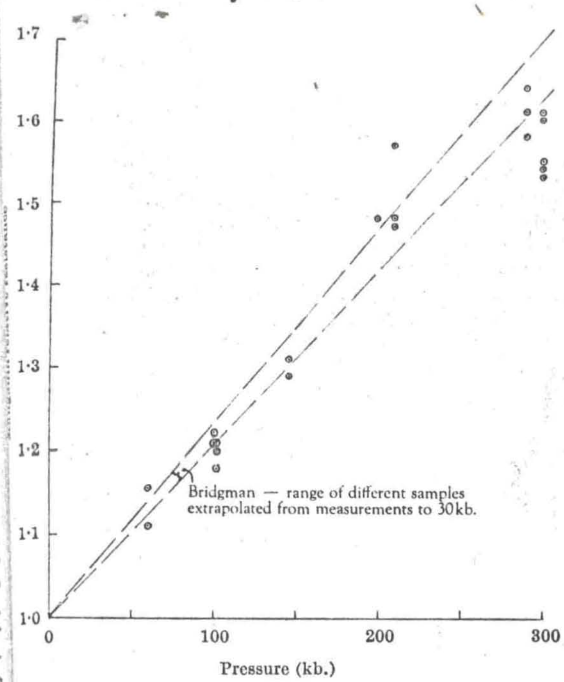

Fig. 1. Manganin relative resistance versus pressure

ose found in bismuth (27 kb. at 42° C.)[2] and iron 31 kb. at 37° C.)[3] determined from shock-wave sults.

A polymorphic transition in iron thought to be the to γ change has been observed by Balchan and rickamer as a resistance discontinuity statically at 3 kb. 20° C. (ref. 4) and dynamically by Bancroft, terson and Minshall as a volume discontinuity at 1 kb. and at a temperature of 37° C. calculated m thermodynamic consideration of the shock nt. Fig. 2 confirms a dynamic resistance tranion in the neighbourhood of 150 kb. 100° C. The nperature was estimated from the relative resisnce after a correction for pressure taken from idgman's work on iron had been applied[5,6]. Work proceeding on the more accurate evaluation of the nsition pressure. This transition is almost certainly t previously observed at 130 kb. The relative nge in resistance at the transition point agrees h that found statically, and, as each point repreits measurements made within the first 0·1 μsec. of pressure pulse being applied to the wire, Fig. 2

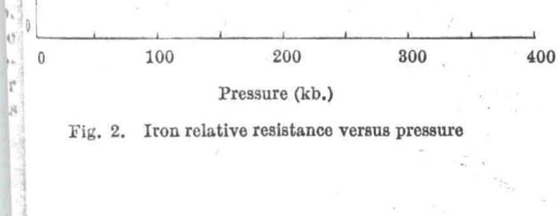

Fig. 2. Iron relative resistance versus pressure

implies that the α to γ transition takes less than 0·1 μsec. to complete. Duff and Minshall[2] have reported that the 27-kb. transition in bismuth under similar conditions takes less than 1 μsec.

We wish to thank Dr. D. J. Phillips for his help in the preparation of this communication and the Atomic Weapons Research Establishment, Foulness, for permission to publish it.

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ENGINEERING

Convection-free Post-arc Gap Recovery

THE recovery of the voltage breakdown strength of a gap subsequent to an arc discharge is of basic interest in the performance of circuit breakers. Experiments using the simplified condition of 'free recovery' (that is, no voltage is applied to the gap until the instant of measuring its breakdown strength) have been performed by Edels and Ettinger[1] during times 10–100 μsec. after current interruption, and by Crawford and Edels[2] for longer delay times. During the early stages of recovery the gap still has a finite resistance, and 'thermal breakdown' occurs on applying a suitable constant voltage, but at longer delay times the breakdown mechanism is that of a spark.

A square current pulse was used for the initial arc in the foregoing experiments, so that the gap conditions at the start of the recovery period were those of the steady-state arc, and any gas flow was determined solely by natural convection. Edels, Shaw and Whittaker[3] measured recovery characteristics with forced gas flow in the gap and found that the recovery was much more rapid for times 1–100 msec. after current interruption when using gas speeds of a few m./sec., through gaps greater than 3 mm.

In order to further the examination of the relative importance of the electrodes and gas flow on gap recovery, it was decided to make measurements in the spark breakdown régime under convection-free conditions, for by eliminating flow through the gap the gas would cool only by thermal conduction to the electrodes and surrounding gas—ignoring the small effect of radiation. Natural convection depends on differential pressure gradients, and these may be eliminated within an enclosed chamber by allowing the chamber to move solely under the action of gravitational forces. An arc chamber was constructed from a 'Pyrex' cylinder, 4 in. diameter and 4 in. long, with 'Duralumin' end-pieces sealed by 'O' rings. This could be projected vertically upwards by a spring, guidance being provided by wheels running on vertical rails. Electrical supplies to the chamber electrodes were provided via brushes sliding on vertical conductors, and the electrode gap could be varied by a micrometer head. After leaving the spring the chamber moves freely under gravity both upwards and downwards, apart from slight frictional forces