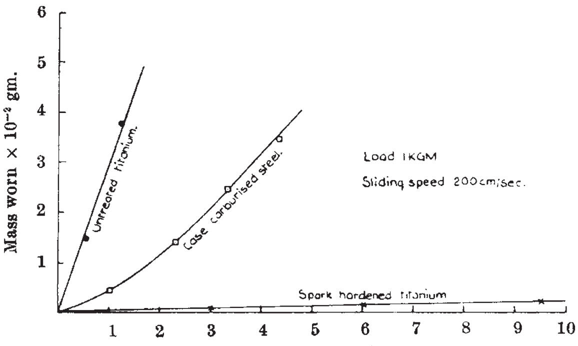

Fig. 2. Change of rate of wear produced by spark-hardening titanium, and comparison with case-carburized steel

For comparison a wear curve for mild steel, case-carburized by conventional means and tested under the same conditions, is also shown in Fig. 2. In these particular rubbing circumstances the spark-hardened titanium is plainly of superior wear-resistance, and it seems likely that spark-treated non-ferrous metals will find applications for wear-resistant parts in engineering practice.

A fuller account of this work will be published in due course.

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Strength of Glass Fibres

PREVIOUS workers have reported that the tensile strength of nominally identical glass fibres is very inconsistent, with coefficient of variation between 5 and 25 per cent[1,2]. In an attempt to reduce this variability, I have made and tested 'E' glass fibres under carefully controlled conditions. The fibres were drawn from molten glass in a platinum crucible, and were wound around a rotating drum. Only that part of the fibre between the crucible and drum was used for testing. The manipulation technique involved gripping the free length of fibre at its two ends, and mounting it with vacuum wax on a slotted paper mount, which when cut into pieces provided ten test pieces each 1 in. long. Each test piece on its mount was assembled in a special 'chain-o-matic' testing machine with controlled rate of loading, and the mount was severed before application of load. By this means it is possible readily to test large numbers of fibres with surfaces which are mechanically undamaged. To reduce atmospheric attack each batch of ten test pieces was tested within two minutes of manufacture, and in an atmosphere of less than 40 per cent relative humidity.

Using the above technique I have been able to obtain fibres of remarkably consistent strength; on some occasions the coefficient of variation of breaking stress of ten test pieces has been only 1 per cent.

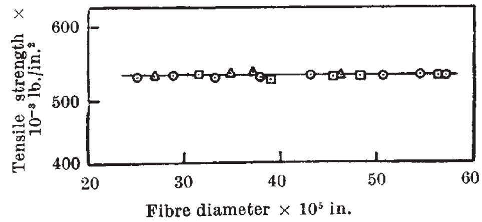

Fig. 1. Temperature of glass in crucible. △, 1,340° C.; ○, 1,300° C.; □, 1,260° C.

Another observation was also made. Over the range for which fibres of uniform diameter can be drawn with my apparatus (2–6 × 10^{-4} in.), the breaking stress is independent of fibre diameter and of the temperature of the glass in the crucible; it is also independent of the rotational speed of the drum. The results are illustrated in Fig. 1. Each point is the mean breaking stress of ten test pieces. Previous workers using different testing techniques have found a very appreciable reduction in breaking stress with increase in diameter for the range shown in Fig. 1.

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Spiral Pits on Silicon Carbide

THE dislocation theory of crystal growth[1] suggests that the crystal growing at low supersaturation in the presence of a single dislocation is not composed of an infinite number of layers stacked on each other as ideally considered, but is a helicoid with the dislocation line as its axis and the point of emergence of the dislocation at the top. The observation of a growth hill in the form of a 'spiral staircase' on a number of crystals reported in recent years[2] has amply substantiated the theoretical predictions. Silicon carbide crystals have afforded evidence[3] of a large variety of spiral growths, for example, monomolecular as well as microscopic, and interaction of spiral growth due to two or more dislocations of same as well as of opposite sign. In some cases, hitherto unobserved, silicon carbide crystals exhibit spirally terraced pits. Fig. 1 shows a phase-contrast micrograph of a spirally terraced pit. It is easy to decide with the fringes of equal chromatic order that this feature is a pit. The step height of this terraced pit as determined from high-dispersion Fizeau fringes corresponds to 27 ± 2 A., which is the repeat distance of this crystal identified by X-rays as 33 *R* (Ramsdell's symbol).

Frank[4] has shown that when growth spreads from an isolated pair of dislocations, respectively right- and left-handed, the terrace line connecting them wraps around and meets itself on the other side: thus forming a short connecting terrace line again and an outward growing closed loop. Such an interaction has been exemplified on silicon carbide[5]. If these two dislocations are cancelled by moving together, as suggested by Mott[6], or by a process of double cancellation, as envisaged by Anderson and Dawson[7], flat-topped crystals would result. Fig. 2 is, however, an example of a flat-bottomed crystal. The