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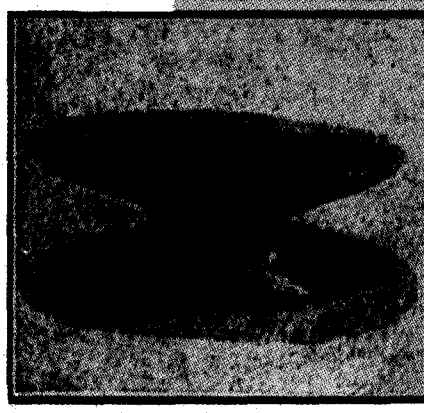
Percussion figures in isotropic solids

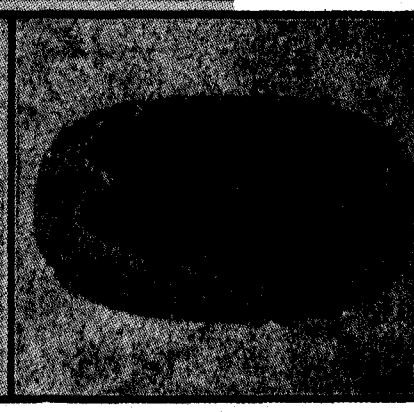
The accompanying photographs are of interest as illustrating the manner in which an isotropic solid breaks down under the stresses set up by impact when these exceed the limits of perfect recovery, and have a bearing on the theory of the collision of elastic solids developed mathematically by Hertz.

Figures 1, 2, and 3 are pictures of the percussion figure, taken from three different points of view, produced on the surface of a thick glass plate by the

(1)



(2)



(3)

Figures 1–3

impact of a polished hard steel ball. Near the centre of the region of contact between the sphere and the plate the stresses are mainly in the nature of a volume-compression, and fracture accordingly does not originate there, but occurs at or near the *margin* of the compressed area in the form of a fine circular crack which spreads inwards into the plate obliquely in the form of a surface of revolution. This is clearly shown in figure 1, which is a front view of the percussion figure by reflected light, the dark circle in the middle being the uninjured area of contact between ball and plate. The circular interference-rings seen in the picture are a measure of the separation of the surfaces of the internal fracture within the plate.

Figure 2 is a side view, and figure 3 an oblique view, of the internal fracture seen through the edge of the plate, the lower half of each picture being the image of the upper half formed by the reflection of light at the interior surface of the plate. The circular area of contact from the margin of which the fracture starts appears in figure 3 as an elliptic white disc at the centre. It seems clear that the internal fracture practically occurs along the surface of maximum *shearing* stress set up during the impact.

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