are made up of combinations of these small joint-planes and the cross fractures. (See Figs. 1 and 2.)
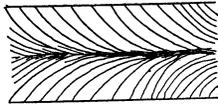

Fig. 1. Feather fracture. The lines diverge towards the margin of the divisional plane.
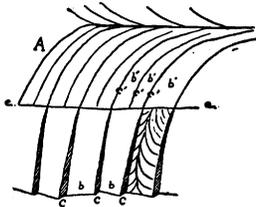

Fig. 2. Ideal arrangement of planes and fractured surfaces. A, principal joint-face ; e, e, margin of A ; b, b, imbricated planes of fringe ; c, c, fractured surface between b-planes ; b′ b′ and c′ c′, analogous to bb and cc on A, giving rise to feather fracture.' In the b-plane on the right feather fracture is also shown.

The margin of joint-planes of this class frequently dies out in a fringe in which these small joints are much enlarged, the interval between them is increased, and this is accomplished by their being turned at a considerable angle, from 10 to 25 degrees, to the principal joint-plane. These small joints also, where well developed, show feather fracture lines diverging towards the outer margin. Joint-planes are thus complex surfaces of fracture. Over the surface of the large joints the smaller joint-planes become so closely set and so nearly parallel to the principal surface of fracture that these smaller fracture surfaces gradually disappear before the unaided eye and become a mere granulation of the joint surface.

Where these joints are developed in a single stratum, they are commonly in the Mystic River argillite quarries in the form of elongated elliptical planes, the main fracture dying out above and below where the texture of the rock changes parallel with the stratification plane. The fringe of marginal joints then give rise to a set of joints in the underlying and overlying beds having a different direction from that of

the main joint in the intermediate bed. Of less frequent occurrence are discoidal joints, evidently entire joint planes, of small size and circular in area because the stress which produced them was relieved by a small fracture in essentially homogeneous material. These vary
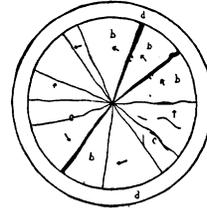

FIG. 3. Discoidal joint, with b-planes and c-fractures analogous to system of fractures in fringe of elliptical joints; d, marginal conchoidal fracture area. Arrows show dip of imbricated b-planes.

from half an inch to three inches in diameter. They consist of the small imbricated planes (b in the diagram) and the cross fractures (c in the figure). The author refrained at the present stage of the investigation from expressing an opinion as to the origin of these joints. The subject was illustrated by typical specimens. These joint structures also occur in the felsites of Salem Harbor, the granitic and dike rocks and in gneisses. A report on the investigation is in preparation.   T. A. JAGGAR, JR.,
Recording Secretary.

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