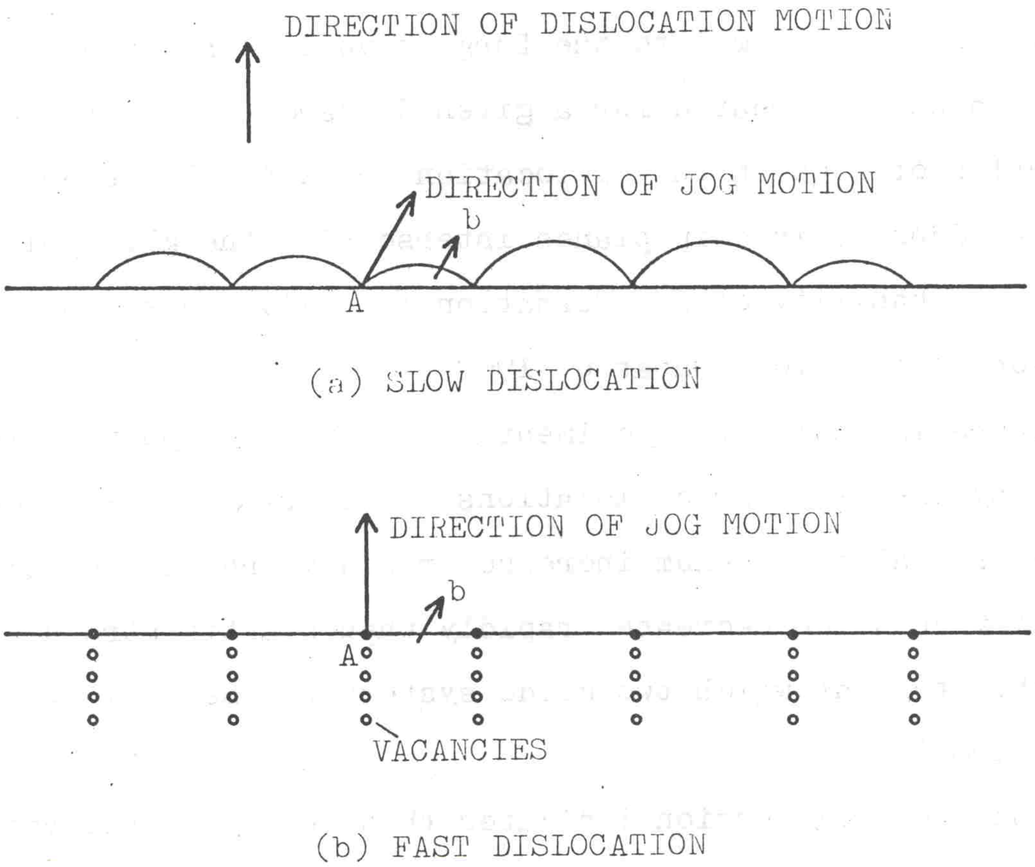

Fig. 13. Motion of jogged dislocations of mixed character at low and high speeds. (a) Low speed dislocation. (b) Dislocation speed approaching shear-wave speed.

estimates the stress on a dislocation required to bring it to relativistic speed to be about 1 kbar; this conclusion is supported by work by Granato (1973).

In summary, rate of formation of vacancies by dislocation motion will depend on concentration of jogs on the dislocation, jog speed normal to the Burgers vector, and mean number of vacancies created for a given distance of jog travel. Concentration of jogs on the dislocation in turn will depend on dislocation density in slip planes intersecting the glide plane and on the probability of jog formation in a given dislocation-dislocation interaction (Nabarro, 1967).

There is indirect experimental evidence for point defect formation by intersecting dislocations. Electrical resistance of single crystal molybdenum increases rapidly and mass density of potassium chloride decreases rapidly when plastic strain reaches the stage at which two glide systems become active. (Nabarro, 1967).

The above discussion indicates that theory of the rate of formation of vacancies as a function of plastic strain and strain rate will depend on the spatial and velocity distributions of dislocations. Nabarro (1967) cites two simple models based on these ideas which predict vacancy concentrations depending respectively on the three-halves and five-fourths power of strain. Saada (1961) has developed a model for defect production in tensile deformation valid for annealed f.c.c. metals. The concentration of point defects generated is given by