Using an extension of Eshelby's (1957) solution for the shear stresses around a misfitting inclusion having the same elastic constants as the matrix, with inclusion and matrix being elastically isotropic, Lally and Partridge showed that shear stresses will develop in the matrix adjacent to the hydrogen-filled cavity. Comparison of their eqn. (1) for shear stress with that given here for the same problem indicates that the two approaches apparently agree only for the condition that $\nu = \frac{1}{3}$. However, a recalculation based on the Eshelby model used by Lally and Partridge has indicated an error in their calculation and confirmed the correctness of the form of equation developed in the present work. Nevertheless, the hypothesis that the dislocation loops in magnesium are generated as the result of shear stress arising from the internal pressure remains valid and provides further support for the analysis presented in the present paper concerning similar phenomena developed by external pressure.

The stress field which arises around an internal discontinuity (cavity or inclusion) as a result of differential compression on pressure application is analogous to that which is developed due to differential thermal contraction during cooling. Accordingly, it might be expected that the nature of such pressure-induced dislocations would be similar to that of those induced thermally. Although a complete diffraction contrast analysis of pressure-induced dislocations has not yet been reported and has not proved possible in the present study, both the mechanism of loop formation (Jones and Mitchell 1958) and the nature of the loops (Lawley and Meakin 1964) have been examined for the thermal case. For such loops at spherical glass particles in silver chloride, Jones and Mitchell showed the successive stages of formation (as illustrated in fig. 3 *b*) to be nucleation of a dislocation segment in the region of maximum shear, followed by glide of the edge component away from the sphere along the surface of the glide cylinder and of the two screw components in opposite directions around the cylinder until they meet to form a full prismatic loop. Using transmission microscopy, Lawley and Meakin showed that loops formed in a similar manner at carbide particles in molybdenum were interstitial in nature. The thermal and pressure cases are completely analogous when the discontinuity is a particle and the generation of interstitial loops would act in both cases to reduce the locally induced stresses by transporting material away from the particle-matrix interface. However, for an internal cavity (depending on the relative magnitudes of the internal and external pressures) the appropriate relaxation could require transport of vacancies away from the cavity, i.e. the formation of vacancy loops. The shape changes observed here for the cavities in copper (see fig. 5 *b*) are in keeping with such a mechanism.

§ 5. Summary and Conclusions

The stress fields developed at internal cavities, and rigid and elastic inclusions in an isotropic solid subjected to external hydrostatic pressure have been computed and compared with experimental observations of