$$v_\ell = \sqrt{\frac{K + 4/3G}{\rho}}$$

$$v_\tau = \sqrt{\frac{G}{\rho}}$$

v_ℓ = velocity of the longitudinal wave
v_τ = velocity of the shear wave
K = bulk modulus
G = shear modulus
ρ = density

Expressing the elastic constants in terms of these velocities:

$$K = \rho(v_\ell^2 - 4/3\ v_\tau^2)$$

$$E = \frac{9KG}{3K+G} = \rho v_\tau^2 \frac{3v_\ell^2 - 4v_\tau^2}{v_\ell^2 - v_\tau^2}$$

$$G = \rho v_\tau^2$$

$$\nu = \frac{3K-2G}{2(3K+G)} = \frac{v_\ell^2 - 2v_\tau^2}{2(v_\ell^2 - v_\tau^2)}$$

where E = Young's modulus and ν = Poisson's ratio.

SAMPLE PREPARATION

Dental amalgam samples were prepared from spherical and micro-cut commercial dental alloys with 45%, 50% and 52% Hg by weight. The samples were triturated for 15 seconds in a Wig-L-Bug and condensed in a 1 cm. diameter, cylindrical, steel die at pressures of 1000-3000 psi. This pressure range was chosen since mercury was not expressed from the samples, and hence, the mercury content was known.

EXPERIMENTAL TECHNIQUE

High pressures were applied to samples using an uniaxial, solid media press. The specimen was placed between two tungsten carbide pistons, see Figure 1, and was constrained laterally by two pyrophyllite gaskets and a tungsten carbide girdle. The gaskets and girdle prevent radial extrusion of the specimen and reduce the radial pressure gradient over the sample. Since the stresses in the specimen can be separated into hydrostatic and deviatoric components, the