

### Results

The variations of the longitudinal and shear ultrasonic wave velocities with pressure of the three alloys are shown in Figs. 1a and 1b. The wave velocities of all three alloys show linear increases with pressure. Examination of these graphs indicates that the slope of the shear velocity of  $\gamma$  appears to change in the neighborhood of 25 kb.; the slopes of the longitudinal and shear velocities of  $\gamma_2$  appear to change in the neighborhood of 15–20 kb. The possible causes of these observations will be discussed below. The remaining velocities exhibit linear behavior from 0–50 kb. Table I lists the slopes of these curves and the longitudinal and shear velocities of each alloy at atmospheric pressure; these values were obtained by least squares analysis and back extrapolation. The percent errors shown represent the standard deviation from the least squares line and not the experimental error of the data points; the precision and accuracy of these measurements are as described in the previous paper.<sup>1</sup>

The elastic constants of these alloys were calculated from the wave velocities as described in the previous paper.<sup>1</sup> Figures 2, 3, and 4 show the behavior of the bulk, shear, and Young's moduli of  $\gamma$ ,  $\gamma_1$ , and  $\gamma_2$  as functions of pressure. The values of each elastic constant at atmospheric pressure in Table II were obtained by back extrapolation along the straight lines fitted to the data points by least squares analysis.

TABLE I  
Longitudinal Ultrasonic Wave Velocities

Alloy	Pressure range (kb)	Slope ( $\times 10^2$ cm/sec/kb)	Velocity at atmospheric pressure ( $\times 10^6$ cm/sec)
$\gamma$ -Ag <sub>3</sub> Sn	0–50	$10.35 \pm 0.64\%$	$3.82 \pm 0.05\%$
$\gamma_1$ -Ag <sub>2</sub> Hg <sub>3</sub>	0–50	$11.52 \pm 1.1\%$	$3.05 \pm 0.12\%$
$\gamma_2$ -HgSn <sub>7-8</sub>	0–20	$9.55 \pm 1.9\%$	$3.23 \pm 0.08\%$
	20–50	$11.13 \pm 1.2\%$	
Shear Ultrasonic Wave Velocities			
$\gamma$ -Ag <sub>3</sub> Sn	0–25	$2.54 \pm 2.7\%$	$1.77 \pm 0.06\%$
	25–50	$3.85 \pm 1.9\%$	
$\gamma_1$ -Ag <sub>2</sub> Hg <sub>3</sub>	0–50	$3.99 \pm 0.93\%$	$1.42 \pm 0.09\%$
$\gamma_2$ -HgSn <sub>7-8</sub>	0–20	$3.98 \pm 1.0\%$	$1.54 \pm 0.35\%$
	20–50	$5.31 \pm 1.9\%$	

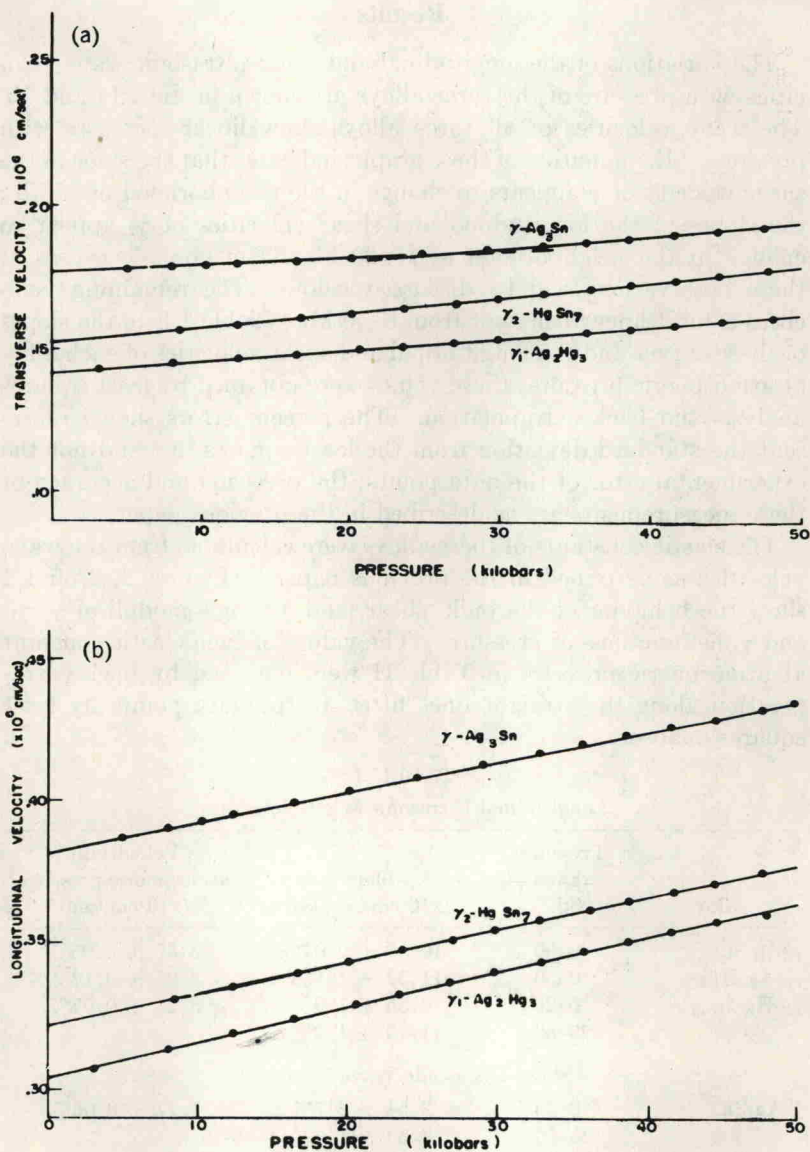


Fig. 1. (a) Velocities of shear ultrasonic waves in the constituent phases of dental amalgam as a function of pressure. (b) Velocities of longitudinal ultrasonic waves in the constituent phases of dental amalgam as a function of pressure.