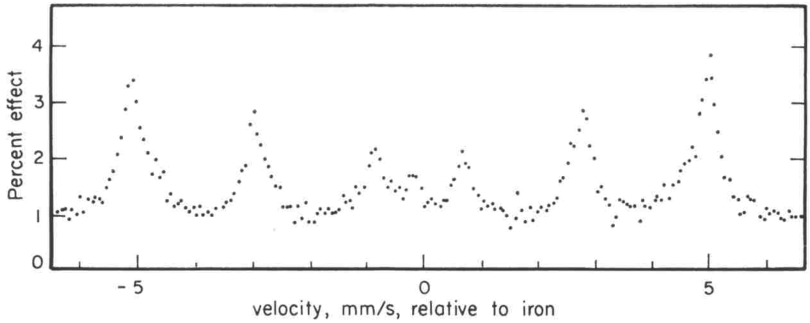

Figure 9. 4340 steel, austenitized at 1,550 °F., cleaned of surface scale with wet sandpaper.

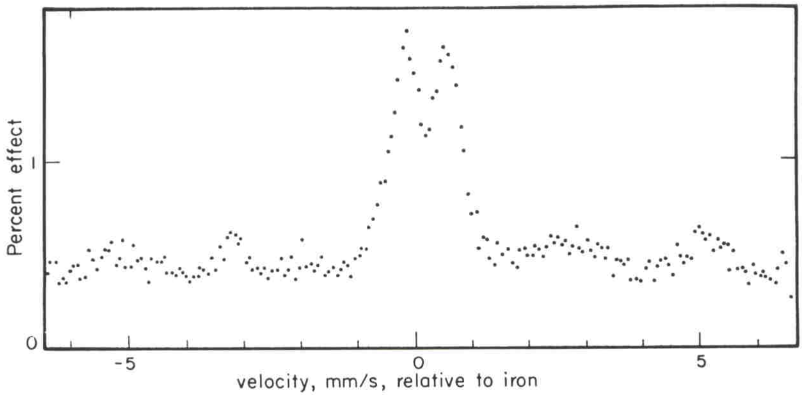

Figure 10. Rusty window-sash weight.

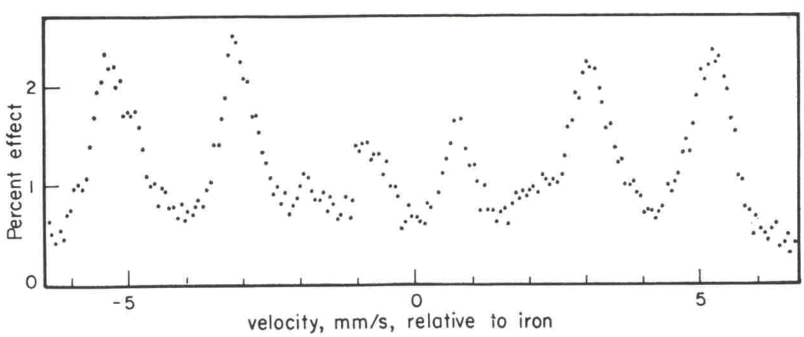

Figure 11. Window-sash weight, fresh-cut surface.

flanks of the resonance. Stress then increases one count rate and decreases the other, as is shown in Fig. 12.

7. Theory

A theoretical description is needed, in order that the changed count rates be converted into stress. Consider the use of transmission geometry and assume the Lorentzian line shape (Fig. 13).

The most sensitive spots, C and B, are those for which the slope is a maximum. This occurs at $x - \delta = \pm 0.5774(\Gamma/2)$. Literature compressibility data[2] indicate that, for ferrite,

$$\frac{1}{\nu}\left(\frac{\partial \nu}{\partial P}\right)_T = -2.6 \times 10^{-18}/\text{Kg/cm}^2$$

which leads to a shift for the center of the resonance of -0.00565 mm/sec for 100 K psi. We now define ϵ_T as:

$$\epsilon_T = \frac{N(T)_p - N(T)_0}{N(T)_0}$$

That is, ϵ_T is the relative change of count rate, at any point along the resonance as determined by the temperature of the source, due to the applied stress.

8. Experimental

Stress tests within the Mössbauer apparatus were conducted with 99.99% Fe foil, 0.0005 in. × 1.00 in., in uniaxial tension. A plot of $\epsilon_{100} - \epsilon_{-80}$ vs. tension is shown next. Each point represents one or more counting period of 2,000 sec (Fig. 14).

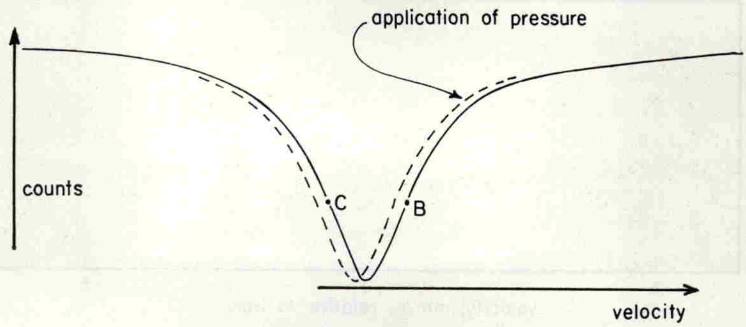

Figure 12. Effect of pressure on isomer shift.