An elastic-plastic material which is also polymorphic, such as iron, has a complicated release path in the pressure-particle plane. Rigidity of the material and kinetics of the reverse transformation help determine the value of u_r. Treatment of the release of stress for shocked elastic-plastic solids has been fairly successful. Measurements of the reverse transformation reported by Barker and Hollenbach[15] show that even in this case Eq. (2.7) is a good approximation. Equation (2.7) has been used throughout the present work to convert free surface velocities to particle velocities.

2.2. Wave Propagation

Plane shock waves are generated in the iron sample by impact of a flier plate or a plane detonation wave. After traveling a short distance, the initial shock develops into elastic, plastic I, and plastic II waves described in the introduction. These proceed through the sample and each interacts in turn with its plane free surface. A map of the process in space time is shown in Fig. 2.1. The space coordinate is Lagrangian, being the undisturbed x coordinate denoted h. The Lagrangian wave propagation velocity is denoted by a prime: U_1' for elastic wave, U_2' for plastic I, and U_3' for plastic II. Final stress behind the plastic II shock front is greater than transformation stress. Initial time-dependent effects involved in the formation of the three waves are not shown in the diagram. Reflected wave velocities are denoted R' and wave paths in Fig. 2.1 are labeled according to their slopes; e.g., $dt/dh = 1/U_1'$ for the

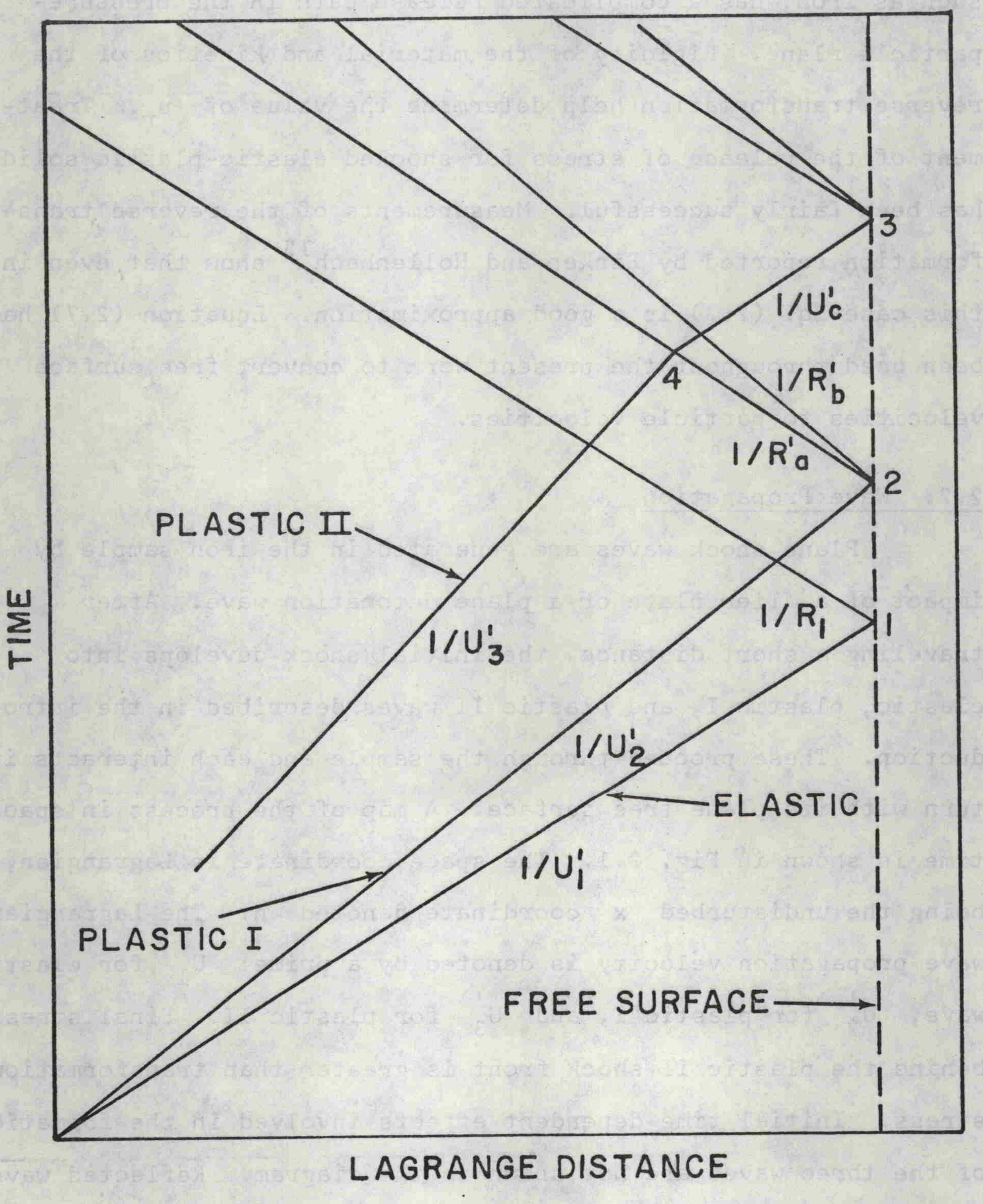

Fig. 2.1.--Lagrangian distance-time diagram of shock wave propagation in iron.