typically 154 amperes, 1.27 cm, and 4.1×10^{-4} cm^2, respectively, so that the resistance $R_o = 5$ mΩ and $E_o = 0.76$ volts. The change in voltage under shock compression is given by $\Delta E = I \, \Delta(\rho \frac{L}{A})$ and in these experiments turned out to be as much as 20% of E_o.

Current density in the experiments was as high as 0.4×10^5 A/cm^2; this is still below the 10^6 A/cm^2 at which Bridgman (1921) observed non-ohmic effects in noble metal foils. To avoid ohmic heating of the specimen, current was supplied in pulses of 50 microsecond duration.

We want to measure bulk properties in the shock experiments so foils should not be so thin that a significant part of electron scattering is by the foil surfaces. Electron mean free path in silver at room temperature is 0.05 μm, less than 1/300 of the foil thickness. Consequently, surface scattering of electrons at room temperature will be an insignificant fraction of the total scattering, and the resistivity measured will be a bulk property. At 4.2°K, however, the mean free path will be 7 to 21 μm and surface scattering will be very important. Fuchs-Sondheimer theory would imply that surface scattering accounts for 20 to 35% of the resistivity at that temperature (Sondheimer, 1952).

The thin foils cannot be impacted directly but must be sandwiched in a suitable anvil material. The foil will not reach the final pressure state by a single shock but by shock-wave reverberations traversing it and being partially reflected at the foil-anvil interfaces. For simplicity, it is desirable to reach the final state in as few wave transits as possible so that deviation from the state reached by a single shock to the final state is small. This requires that the shock impedance U_s/V_o be nearly the same in foil and anvil; in these experiments the silver foils were placed between synthetic sapphire (Al_2O_3 single crystal) anvils. The longitudinal elastic stress limit in uniaxial shock compression (Hugoniot elastic limit) in sapphire is about 120 kbar for the orientations used, placing an upper limit on pressures in these experiments, in order to avoid complications due to yielding and double waves in sapphire.

The high currents in the foil couple inductively with a moving metal plate. To avoid such induced voltages in the foil, it is necessary to use non-conducting impactors. Impactors chosen were fused quartz and sapphire. Both are good insulators and have well-characterized shock response.

C. Impact Arrangement

High pressures for the experiments are generated by high-velocity impact (Fowles, 1972). Figure 1 represents schematically the experimental configuration. The 4-inch diameter projectile is shown emerging from the launching tube. The non-metallic impactor, clamped to the projectile face is also shown. The aluminum projectile shoulder strikes a series of accurately spaced, electrically charged pins, shorting each in turn. The shorting signals from these pins are monitored in time on an oscilloscope, providing a measurement of velocity.