This design is convenient and reliable. Its only disadvantage is the restriction on projectile weight imposed by the requirement of sufficient strength to stand-off the initial pressure. The minimum projectile weight we have attempted with this breech is 1100 grams with a projectile constructed of 6061-T6 aluminum.

For the higher velocity range ($\sim$0.9 to 1.5 mm/μs) the double diaphragm breech is available. The diaphragms are selected to withstand half the reservoir pressure and to open cleanly and quickly when subjected to the full pressure. Firing is accomplished by exhausting the region between the diaphragms (initially pressurized to half pressure) so that each diaphragm in turn experiences the full pressure.

With this breech it is hoped that projectiles as small as about 450 grams can be fired. It has not been tested at the time of this writing but no serious problems are anticipated.

E. Projectiles

In order to reduce the costs of the projectiles it was decided to standardize on a design which would be usable for most of the shots and to have these made in quantity by a production shop (Fig. 9). The projectiles are machined from solid 6061-T6 aluminum so there are no joints to leak or fail when used in the wrap-around breech. Moreover, the Hugoniot of this material is well known so that impedance-match solutions can be readily obtained. The wall thickness was chosen to withstand an outside pressure of 3000 psi with a safety factor of 1.5; some of the projectiles have been tested to an outside pressure of 4500 psi.

The length of the projectiles is two diameters (8") and the outside diameter is $3.9975'' \pm \begin{smallmatrix} .000'' \\ .005'' \end{smallmatrix}$, which confines the maximum tilt to 0.5 milliradians or less when the projectile contacts the target (i.e. when the projectile protrudes two inches from the muzzle). The O-rings help to confine the projectile to the center of the barrel and close tolerances are held on these grooves, both in concentricity (.001 T.I.R.)