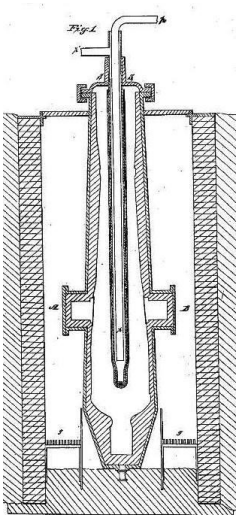
THE MUZZLE SWELL

When people think of a Civil War era cannon, the bronze Napoleon with its distinctive muzzle swell is often what comes to mind. Most people, including many Artillery reenactors, can't give a good explanation for its need.

The need for the muzzle swell on bronze cannons has to do with metallurgy, thermodynamics and how the tubes were casted.



The type of bronze used in Civil War cannons was called Bell metal bronze. It consisted of 78% Copper and 22% Tin. The tubes were cast in vertical molds and required a single pouring of the metal, any disruption in the casting process would create major flaws in the tube. Throughout the 18th Century foundry workers had a hard time keeping the bronze alloy in the proper proportions of Copper to Tin throughout the hearth.

As can be seen in the diagram on right, the tube was cast in a vertical mold, the breech end at the bottom. The walls of the tube tapered down from the thick breech to the thinner muzzle. In cooling down the thinner walls at the muzzle end would cool more quickly than the material at the breech end which would lead to thermo stress fracturing. To alleviate this, wider then needed walls were cast from the mid-chase area to the muzzle. This extra material would later be turned off. The wider casted walls at the muzzle area did not preclude the formation of thermally induced internal flaws in the muzzle area, for this reason the when the tube was turned down the bell was created at the muzzle as a reinforcement.

The bell also served other purposes. During use the tube would heat up with a decreasing heat distribution along the tube towards the muzzle, this would stress any flaws and cause cracking beginning at the muzzle. The softer bronze would also be more prone to mechanical damage from the process of repeated loading, which again would stress any internal flaws.

By the time the M1857 Light 12 pound cannon, The Napoleon, was manufactured in the 1860's casting techniques and control of the bronze alloy had advance sufficiently to eliminate the need for the bell, but the U.S. Ordnance department keep it as a safety precaution, the explosion of the Rodman gun in 1841 killing the Secretaries of State and the Navy always in the back of their minds.

The Confederates did manufacture their own Light 12 pounders and they eliminated the bell on their tubes.