Office of Ord & Hdy.
January 27th 1862

Sir.

Your letter of the 20th inst has been received,

The proof to which you subjected the guns at N. Orleans, although not satisfactory shows conclusively, that cannon made from a Cupulo or blast furnace cannot be relied on, The cavities mentioned no doubt exist throughout the iron, and any cavity, however small in the bore, is to be considered fatal & the piece rejected.

The iron from which our best cannon are made, is a strong, coarse grained, No 1. cold blast charcoal iron, of the 1st fusion. In the pig, its fracture is a dark grey with coarse crystals in the centre, growing finer towards the edges, it is irregular in its structure, and very difficult to break, Its density is about 7.3 and its tenacity about 25.000 lbs to the square inch,

When the air furnace is charged with about 15000 lbs of metal, it requires about two tons of Coal & about five hours to melt it, After the metal is "down" it generally boiled from 40 to 55 minutes, (practice will soon enable you to judge of its fluidity).

From the furnace a trough should convey the metal into a receiver at the lower end of which should be a gate to raise or lower at pleasure. When the gate is raised just high enough to permit the metal to run freely into another short trough which conveys it into the runner, all the lighter iron & impurities including most of the gas remains in the Receiver & nothing but pure iron passes through the gate. The Runner which conveys the molten iron into the mould should be about 2 inches in diam. & should enter the mould (the mould being placed perpendicular in a pit) at or about the base ring of the gun. After the cascable & breech is filled the metal flows upwards, bringing to the surface all impurities & other impurities lighter than iron. When the molten iron reaches the trunnions it should be stirred from above with wooden paddles in order that the slag if there is any may rise above the trunnions, after this, with an occasional stirring with the paddles, it may be permitted to fill the mould & run into the sinking head. The sinking head should be not less than 24 in long.

The top of the mould should be covered with charcoal (about 2 pecks) & the top of the pit with sand & earth to retard the cooling —

In this state the casting should remain not less than four days.

When taken out chipped & hammered all external imperfection should be noted & the diameters measured with a pair of founders Callipers.

When the gun is placed in the boring mill & the sinking head cut off, the appearance & fracture of the metal should be noted & recorded.

In boring the Cylinder bit. should be used, It is a cast iron Cylinder 3 diameters in length the lower end of which is fitted to receive four to seven Chisels, In large guns it cuts at the rate of about an inch per hour. When the Core which is enclosed in the cylinder is about 30 in long, the Cylinder should be withdrawn & the Core broke off, The fracture of the core is to be noted & its soundness observed. If any Cavities exist it is probable that they extend through the gun at the point where they exist.

If the gun is to be a Chambered one, the Chamber is to be bored with a Piece a Parallel & a finishing Reamer, the last being exactly the diameter, length & size of the Chamber

In turning, planing & chipping the working of the metal under the tools should be noted.

A "Star Gauge" will be sent to New Orleans to measure the diameters of the bore. To one familiar with the use of the instrument they can measure as certain the One thousand part of an inch.

The other instruments needed in the inspection & proof of guns * are described in the "Instructions of 1850 & can be made at New Orleans.

* such as "graduated Sliding callipers graduated Cylinder gauges, trunnion gauges, trunnion gauges. rules (to measure the distance from the base ring to the trunnions, profile boards & measuring rods