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Laminated Explosive Charges for FM and Rala Experiments.

1. A few days ago it occurred to the writer that since it is possible to cast high quality one- to two-inch thick slabs of almost any desired explosive composition, it would be entirely feasible to tailor large-size high quality segments for the Fat Man, or for the Ra La Experiment, by bonding together one- and one-half-inch thick slabs having a trapezoidal cross-section in a vertical plane and a pentagonal or hexagonal cross-section in a horizontal plane.

2. The details of the procedure as visualized at present are:

a. The slabs would vary progressively in size and would have the same contour as horizontal sections cut from a casting made in the Fat Man, or Ra La, molds.

b. The slabs would be assembled in the existing FM, or Ra La, molds and would be bonded together either by coating each flat surface with shellac, Aspheno1, or Duco cement, or by melting enough of the TNT in each surface with a heated plate to obtain bonding upon solidification. Small irregularities along the sides of the laminated charge would be ironed out and bonding along these planes obtained by heating the side-walls of the molds to 85° C. Pressure would be applied during the bonding operations in a manner similar to that used in book-binding.

c. The top and bottom slabs, because of their spherical surfaces, would be cast in the FM, or Ra La, molds, the bottom slab prior to beginning to assemble the charge, and the top slab as a cast top-off in the assembly operation; whereas, the intermediate slabs would be cast in separate slab molds having all plane surfaces, a procedure which would facilitate the construction of molds and make maximum use of a large amount of cooling surface.

3. The proposed procedure has the following advantages:

a. It provides a great deal of flexibility in the construction of explosive charges since any composition which can be cast in slab molds can be used without regard to whether it contains sufficient solid component of the optimum particle size or size range to stack well or not settle badly.

b. It simplifies the problem of obtaining uniform quality, as slabs free from cavitation and of uniform composition and density can be made comparatively easily. It permits thorough X-ray examination of every section of the charge prior to assembly, and if imperfections such as air bubbles are detected they can be distributed uniformly throughout the charge by careful placement of slabs of known quality. In this connection, it is noteworthy that occasionally imperfections such as cavities which escaped detection in the routine X-ray examination of large charges have been found when the charges were sectioned. There would be less likelihood of this happening if thin slabs are examined.

c. In addition, it would permit constructing a charge in which the detonation rate increases or decreases progressively in steps as the detonation wave travels inward in the gadget. This might be a useful technique in studying the problem of jet formation

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and might aid in securing a high velocity symmetrical collapse of the metal tamper, since the use of baronal pads already offers promise in this direction.

d. Lastly, it should increase the rate of production per mold of FM and Ra La charges, that is, if a sufficient number of slab molds is used, as the time required to assemble a laminated charge is estimated to be only a fraction of that required to make a satisfactory casting by a one-pour or incremental pouring method.

4. It is thought that eight slab molds, four having a regular pentagonal cross-section and four having an irregular hexagonal cross-section, would be required to make the 32 segments comprising the inner charge of the latest FM design. Any number of these molds could be cast from Cerrobase, or a similar alloy, around a pattern which should be comparatively easy to machine.

5. It is requested that, if this idea is considered to have sufficient merit to warrant an early trial, Henderson's section or Stout's section be asked to design and have constructed one set of four regular pentagonal slab molds. These molds should be risered along one edge preferably, but for the initial trials it may be more satisfactory to provide a riser hole in the top face. The riser opening should be four inches in diameter or four to six inches wide.

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cc: Kistiakowsky
Henderson
Stout
Bradbury
Price
Lab Files