

CHAPTER 7

MANUAL SAMPLING DEVICES

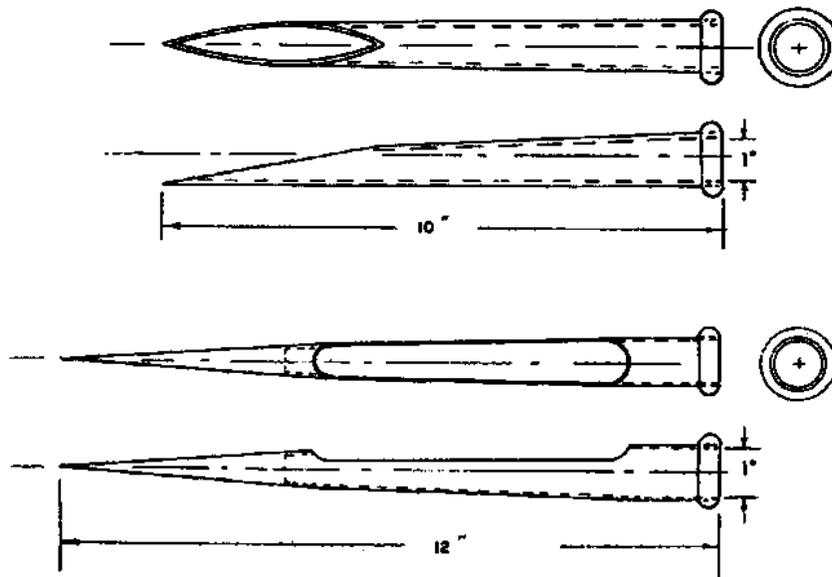
1. INTRODUCTION

For official purposes, only use manual sampling devices that are (1) a type and model approved by FGIS; (2) maintained in good operating condition; (3) properly adjusted; and (4) examined at the prescribed intervals, in the proper manner, and found to be within tolerance.

2. BAG TRIERS

a. Tapered Bag Triers.

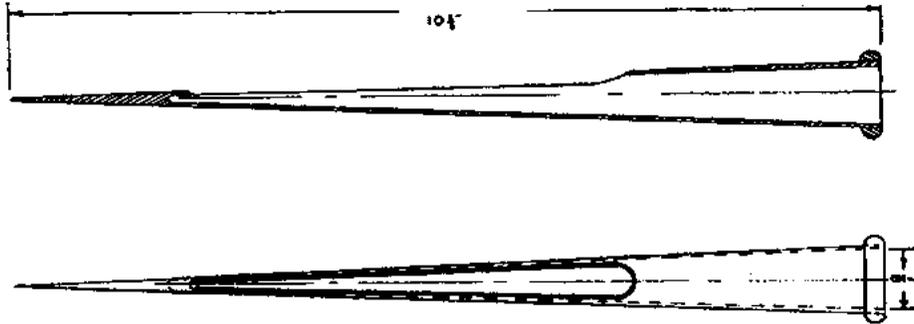
- (1) Description. Tapered bag triers are constructed of stainless steel and are characterized by a sharp point, a tapered body, and an open throat. These triers are available in lengths from 6 to 12 inches. See figure 1.
- (2) Usage. Tapered bag triers are used to sample closed bags of powdered and granular commodities.



**Figure 1, Tapered Bag Triers**

b. Rice Bag Triers.

- (1) Description. Rice bag triers are similar in appearance to tapered bag triers. The filling ports of the rice bag triers, however, have specially designed milled edges which reduce bag damage. See figure 2.
- (2) Rice bag triers are used to sample closed bags of rice.



**Figure 2, Rice Bag Triers**

c. Double-Tube Bag Triers.

- (1) Description. Double-tube bag triers are constructed of stainless steel or chrome plated brass. These triers are available in various lengths and diameters, and in both closed-ended and open-ended models.
- (2) Usage. Double-tube bag triers are used to sample closed and open bags of powdered and granular commodities.

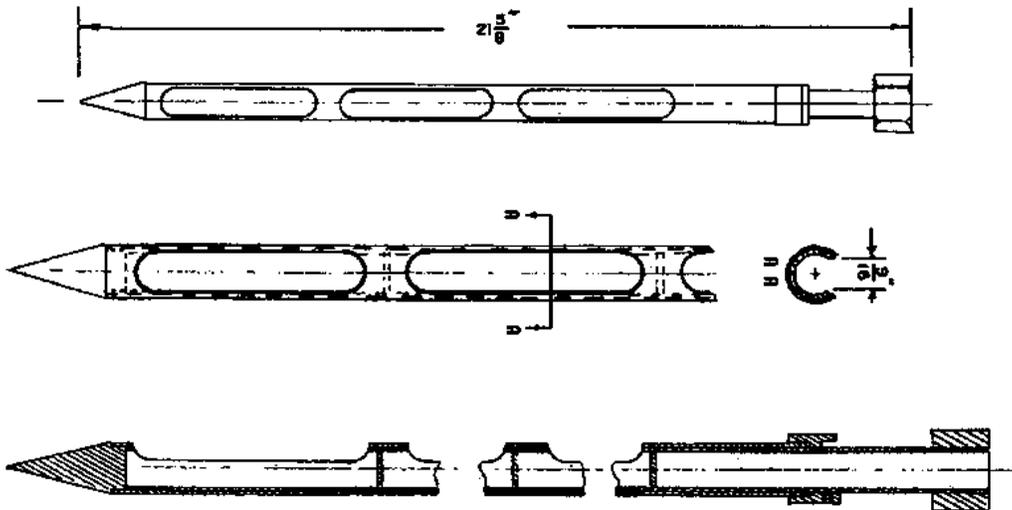
d. Single-Tube Open-Ended Bag Triers.

- (1) Description. Single-tube open-ended bag triers are constructed of stainless steel tubing.
- (2) Usage. These triers are used to sample open bags of dry, powdery commodities when removal of a core of material is desired.

e. Maintenance.

- (1) Cleanliness. Keep very clean to prevent product contamination.
- (2) Keep points sharp and smooth.

- (3) Protection. Store in sheaths or other suitable containers to protect the triers from damage.



**Figure 3, Double-Tube Bag Trier**

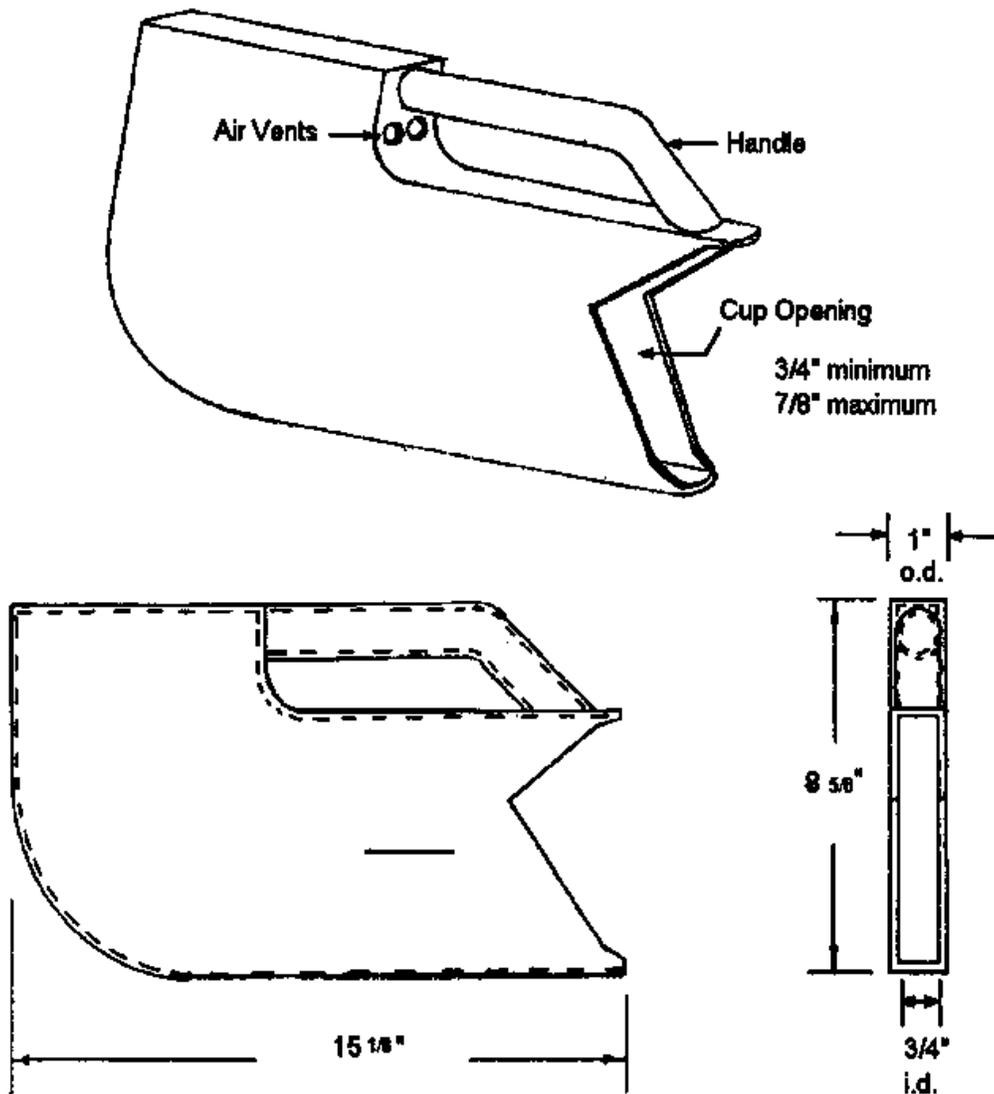
### 3. LADLES

- a. Description. Ladles are constructed of polyethylene and are available in various sizes.
- b. Usage. Ladles are used to sample small granular or fine powdery commodities in open bags.
- c. Maintenance.
- (1) Cleanliness. Clean after each use.
  - (2) Protection. Store ladles in clean containers or bags.

### 4. ELLIS CUP SAMPLERS

- a. Description. Ellis cup samplers are constructed of high tensile strength aluminum. Air vents, under the handle, exhaust trapped air as the cup fills.

- b. Usage. Ellis cup samplers (figure 4) are used to sample grain as it moves on conveyor belts. When properly used, the cup will obtain a vertical cross section sample at the point where the cup is inserted into the grain.
- c. Maintenance.
- (1) Cleanliness. Keep air vents clean and open.
  - (2) Lip. When the front lower lip of the cup becomes sharp or is broken off, replace the sampler.

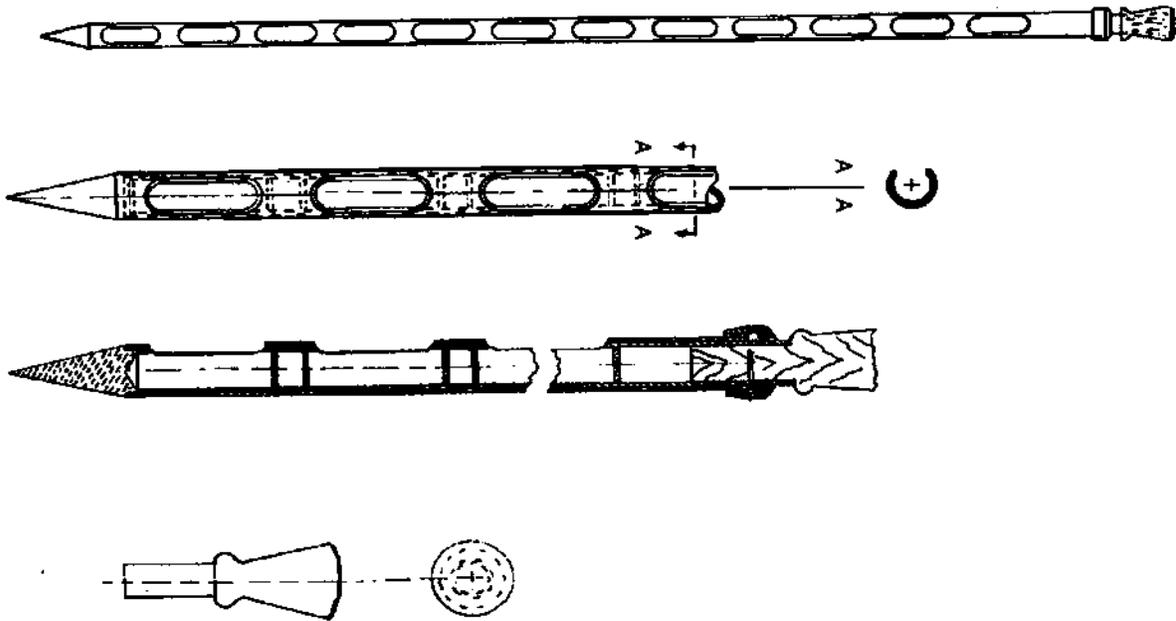


**Figure 4, Ellis Cup Sampler**

**5. BULK-LOT TRIERS**

a. Grain, Rice and Commodity Triers.

- (1) Description. These triers (figure 5) are commonly manufactured from brass or aluminum, but they may also be fabricated from stainless steel. They are of double-tube construction with the inner tube being compartmented and are available in various lengths; e.g., 5 foot-11 compartments, 6 foot-12 compartments, 8 foot-16 compartments, 10 foot-20 compartments, 12 foot-20 compartments.
- (2) Usage. These triers are used to sample bulk stationary lots (e.g., trucklots, railcar lots, and bargelots) of grain, rice, and commodities.



**Figure 5, Grain, Rice and Commodity Trier**

b. PVC Flour Triers.

- (1) Description. PVC triers are constructed of PVC pipe of various diameters, cut to the length required to reach the bottom of the carrier.
- (2) Usage. These triers are used to sample bulk-lots of flour and other powdered commodities.

c. Maintenance.

- (1) Trier Handles. Protect the handles to avoid chips and cracks which can cause blistering of the sampler's hands.
- (2) Locking Pins. Do not remove the pins which secure the inner tube within the outer tube. If broken, replace the pin. Replacement locking pins can be easily made from size 1 (one) steel taper pins.
- (3) Dents. Severe dents in the outer tube will usually render a grain trier useless. If the tubes can be separated and the dent is in an accessible location, the dent may be removed using a rounded hardwood dowel and mallet. Tube expanders, which are available in some machine shops, may also remove dents.
- (4) Protection. Carry or store triers with their openings facing downward. Triers are more rigid in this position and less susceptible to bending.

**6. OIL SAMPLERS**

a. Tank Car Samplers.

- (1) Description. Tank car samplers are constructed of 2-inch diameter, rigid aluminum tube sections. When assembled, the sections form a tube 10 feet long. The tip section is fitted with a tight fitting aluminum valve that is controlled by an aluminum rod attached to the outside of the tube sections.

- (2) Usage. Tank car samplers are used to draw a core sample of oil from tank cars. The samplers are inserted into the car. Upon reaching the bottom of the car, the valve is closed trapping the core within the tube. Some models of this device are fitted with a discharge valve in each section to facilitate removal of the sample from the tube as the tube is withdrawn from the tank.

b. Blust Drum Samplers.

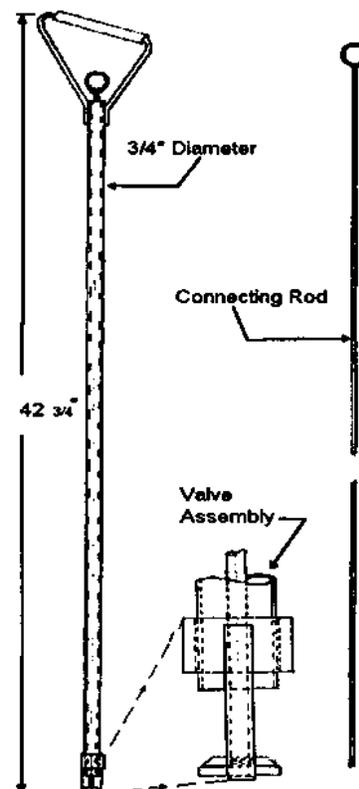
- (1) Description. Blust drum samplers are constructed of stainless steel. They have a valve in the tip end of the trier that is controlled by a stainless steel rod running through the center of the tube between the valve and the handle. Operation is the same as the tank car samplers.

- (2) Usage. These samplers (figure 5) are used to draw core samples from oil in drums of 55 gallon capacity or less.

c. Glass Tubes (Pipettes).

- (1) Description. Pipettes are constructed of laboratory glass. They are available in various lengths.

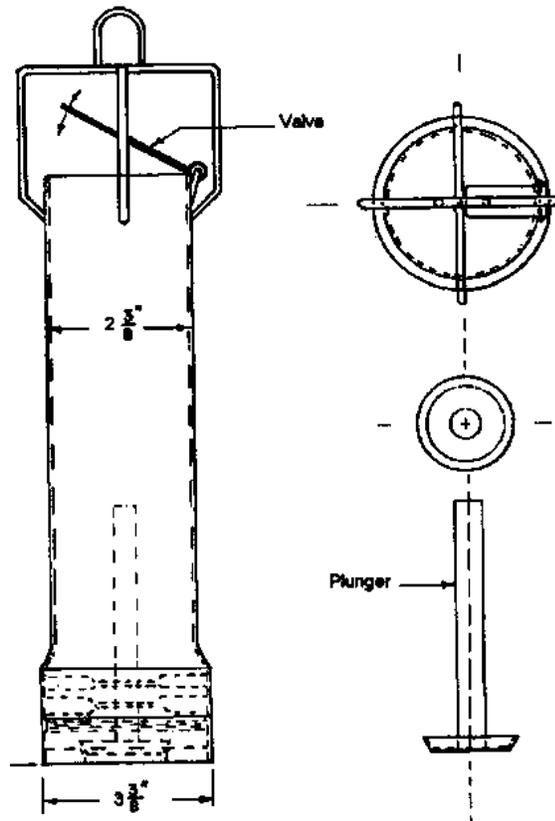
- (2) Usage. Pipettes are used to sample fluid in small containers.



**Figure 6, Blust Oil Sampler**

d. Curtis and Tompkins Samplers.

- (1) Description. These samplers use a single suspending chain or tape. The plunger and valve of this device open as the sampler is lowered into the oil and close when the unit is stopped or raised.
- (2) Usage. These samplers are used to obtain samples of oil at various levels within storage tanks or other large containers.

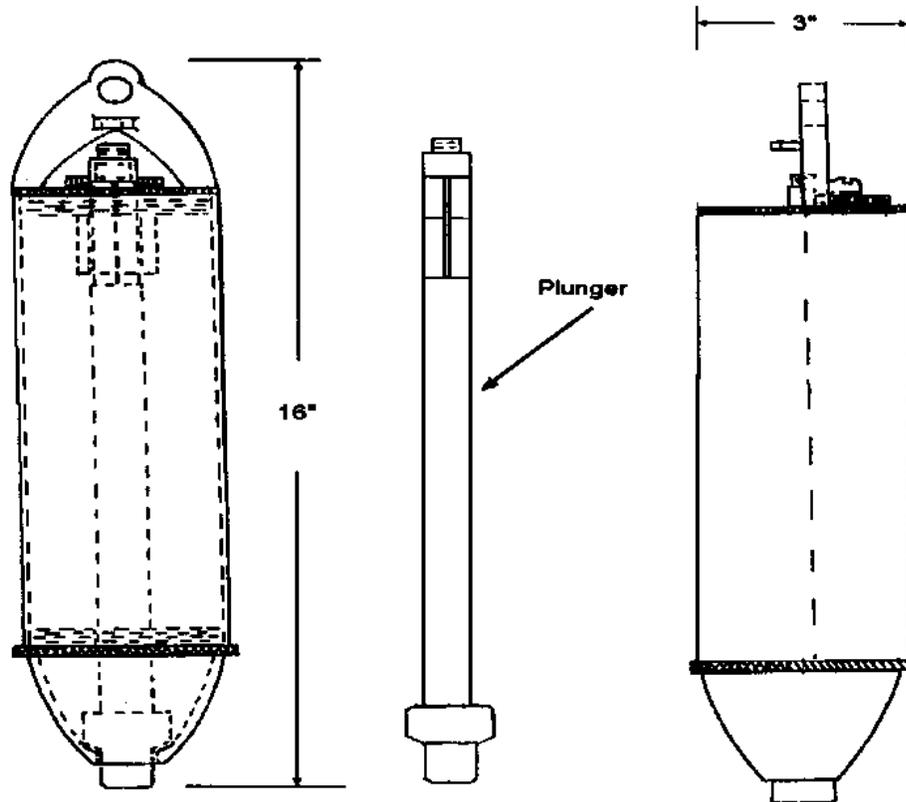


**Figure 7, Curtis and Tompkins Oil Sampler (1 quart capacity)**

e. Bacon Bomb Samplers.

- (1) Description. These samplers, which are similar to the Curtis and Tompkins samplers, are actuated by pulling a chain that is attached to a plunger.
- (2) Usage. These samplers are used to obtain samples of oil at various levels within storage tanks or other large containers.

- (3) Maintenance. To function properly, oil sampling devices must be kept clean by washing after each use with a mild solvent or detergent. If a detergent is used, thoroughly rinse the sampler in clean water.



**Figure 8, Bacon Bomb Oil Sampler**

**7. PELICAN SAMPLERS**

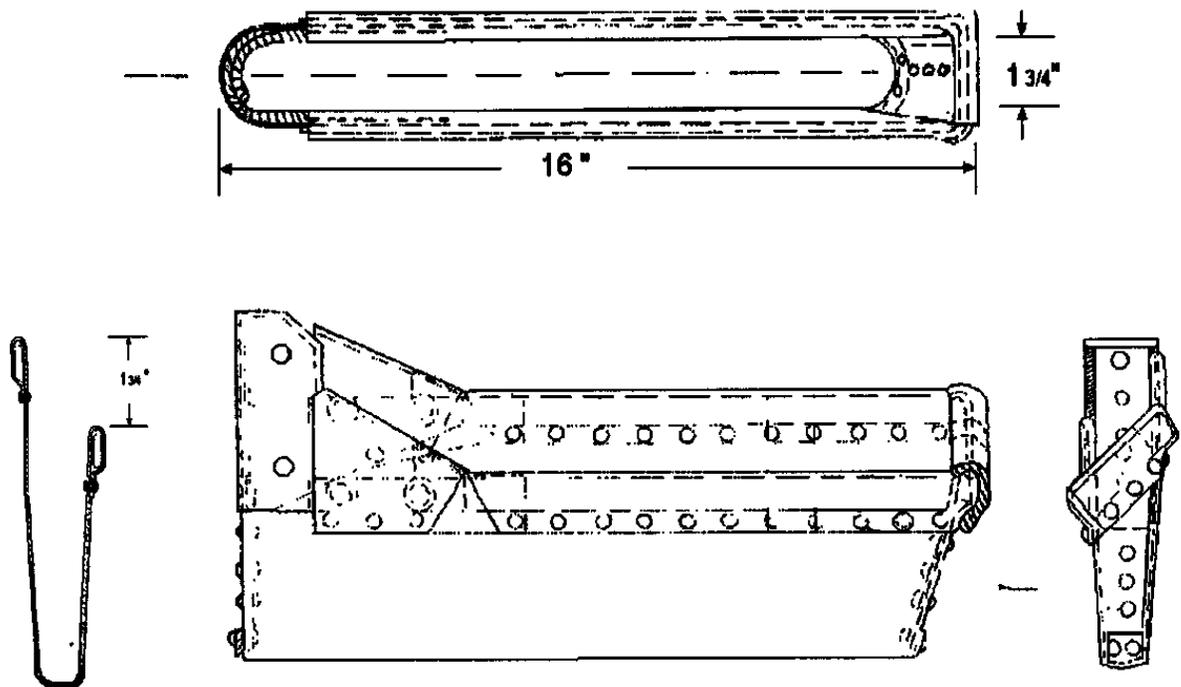
a. General.

- (1) Description. Pelican samplers are constructed of a russet, top-grade cowhide pouch attached to a metal frame. The frame is designed to accept a wood or metal handle of suitable length to facilitate reaching the grain stream.

- (2) Usage. Pelican samplers are used to obtain samples from a free-falling stream of commodities.

b. Maintenance.

- (1) Storage. Pelican samplers should be stored in a manner to avoid distorting the leather pouch or frame.
- (2) Pouches. Pouches shall not be treated with leather preservatives since the preservative may impart an oil odor to the grain sampled with the pelican.
- (3) Pelican Handles. Pelican handles shall be kept smooth and be secured to the pouch frame with suitable bolts.
- (4) Mounting. When mounting the pelican sampler on a handle, the mounting bolt ends should be peened over after the nuts have been tightened.



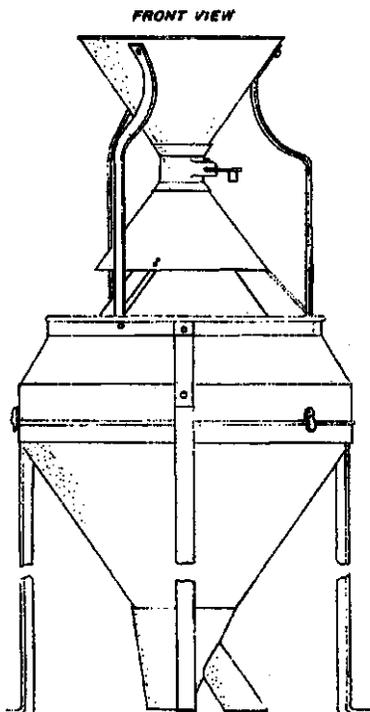
**Figure 10, Pelican Sampler**

## 8. DIVIDERS

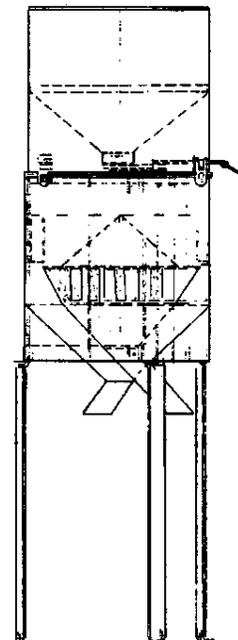
Dividers are used to proportionately reduce large samples of grain, rice, beans, peas, and lentils to smaller representative portions to facilitate their inspection. For official purposes, only use dividers that are (1) a type and model approved by FGIS, and (2) maintained in good operating condition. Divider discharge quantities should be adjusted as necessary, to meet the manufacturers' designated target weights. There is no requirement to "test" the dividers, since there is little evidence that small deviation from target weights will affect the percentage of various components in the sample. Adjustment of quantities is for convenience of use.

### a. Boerner Dividers.

- (1) Description. Boerner dividers utilize alternating ducts and spaces to divide a sample while maintaining the representativeness of each portion.

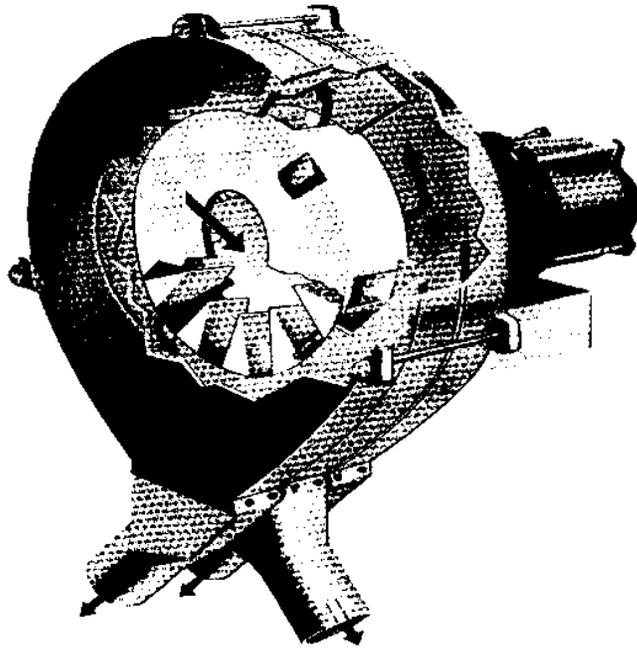


**Figure 11, Boerner  
Laboratory Divider**



**Figure 12,  
Boerner Cargo  
Divider (inside  
view)**

- b. Rotary Dividers. Motorized rotary dividers utilize an internal rotor (drum) with cut-outs that lead to different spouts. Various arrangements of the drum cut-outs are available, yielding sample portions of the desired sizes.



**Figure 12, Rotary Divider  
(inside view)**

- c. Noise Reduction Modification.
- (1) General. Excessive noise, caused by dividing corn and soybeans samples, can be reduced significantly by fitting a divider with acoustic material and a baffle. (Only Boerner-type dividers can be so modified at this time.)
  - (2) Preparation. Dividers are covered with a thin layer of clear enamel that must be removed prior to applying acoustic material.
    - (a) Disassemble the divider; remove the legs and hanger assemblies.

- (b) Apply a thick coat of paint remover to all areas of the divider on which acoustic material will be attached. Do not strip enamel from areas that will not be covered with material.

**CAUTION:** When using paint remover, wear goggles and gloves, and ventilate the work area.

- (c) Allow the paint remover to sit for 10 minutes, then wipe it off.
- (d) Remove any remaining enamel with coarse steel wool, emery paper, or nylon scrub pads.
- (e) Wash the divider with a mild cleanser and dry.
- (f) Check the divider and reclean, if necessary.

Note: If the affected areas are not clean and enamel-free, the acoustic material will fall off.

(3) Application of Acoustic Material.

- (a) Group each set of acoustic material with the part of the divider that will be covered by it.
- (b) Before removing the paper backing, form each set of material around the pertinent part.
- (c) Trim any excess material so that the material will fit properly.
- (d) Remove the backing from the material and apply the material. When working on divider vanes, carefully center the material so that it does not disrupt the flow of material through the divider.
- (e) Using a roller, push out any trapped air.
- (f) Punch out holes in the acoustic material where the material is covering bolt holes.

- (g) Reassemble the divider.
- (4) Application of Baffle.
- (a) Place the plastic ring over the top of the divider until it rests on the upper part of the divider body.
  - (b) Fit the plastic top over the ring. The top piece is designed to fit very snugly and only one way.
- d. Maintenance and Alignment. Dividers must be maintained in good operating condition. Check and adjust them prior to initial use and periodically thereafter, as needed. Each maintenance check shall encompass the following:
- (1) Level Condition. Examine and, if necessary, adjust the divider so that it is level.
  - (2) Support. Check the table or desk on which the divider is mounted. If it is not stable, move the divider to another surface.
  - (3) Cone Alignment (Boerner-types only). Ensure that the peak of the cone is aligned with the center of the hopper.
  - (4) Cone Condition (Boerner-types only). Examine the tip of the cone; if a hole has developed, repair or replace the divider. Holes may be soldered closed or filled with epoxy putty.
  - (5) Valve Operation. Check the valve for ease of movement. Adjust or repair, if necessary.
  - (6) Cleanliness. Clean the divider vanes of any straw, seed pods, or other refuse that has accumulated.
- e. Adjustments.
- (1) General. Adjust each divider whenever necessary, to meet the manufacturer's designated target weights.
  - (2) Procedures.
    - (a) Prepare a 1000-gram sample of dockage-free wheat. When adjusting a 3- or 4-way divider use an appropriate amount, such as 1,200 grams, so target values are easy to calculate.

- (b) Determine the target value for each pan (separation) of the divider by multiplying the fraction of the total sample that will be delivered to a particular separation of the divider times 1,000.
  - (c) Determine the allowable deviation for each separation of the divider by multiplying the target value times 0.01.
  - (d) Note the target values and allowable deviations on the form FGIS-903 or other worksheet.
  - (e) Thoroughly clean the divider.
  - (f) Close the divider's hopper valve, pour in the sample, turn it on if motorized, and then open the hopper.
  - (g) After the sample has been completely divided, weigh each pan and record the weight. Use any approved scale.
  - (h) Repeat the trial two more times using the same sample.
  - (i) After performing the trial separation three times, average the results.
  - (j) For each side of the divider, determine the variation between the average test results and the target values. If the variation for all sides are within the allowable deviations, the division is acceptable.
- (3) Record. Use the form FGIS-903 as a worksheet, however no record of adjustment needs to be kept on file. Do not apply an "Approved Label" to the divider.
- (4) Vane Adjustment (Boerner-type only). The usual cause for incorrect division size is misaligned divider vanes. Adjustment of the vanes to provide for delivery of equal portions can be made by narrowing the openings leading to the "heavy" side of the divider. This is accomplished as follows:

- (a) Determine which openings flow right and which flow left by dropping a kernel of grain into a selected opening and noting which pan collected the kernel.
- (b) If the kernel of grain went into the left pan, mark the opening "Left" or "L." Also mark every alternate opening around the circumference "Left" or "L." If the kernel went into the right pan, mark the appropriate openings "Right" or "R".
- (c) Determine which side, right or left, is heavy (out of tolerance) by dividing a sample of known weight and then weighing the right and left pans.
- (d) Gently pinch the vanes corresponding to the heavy side to decrease the size of the openings. A small adjustment to a few openings should produce the desired results. (To get the most uniform results, make a very small adjustment to all of the applicable openings around the entire circumference of the divider.)
- (e) Check the divider and readjust, if necessary.

## **9. EXAMINATIONS**

Give manual sampling devices a cursory examination prior to each use. In addition, thoroughly examine and check the operation of each manual sampling device and divider according to the testing schedule (periodic examinations) and whenever the accuracy is in question, including after all repairs (supplemental examinations). No record of these examinations is required.

FORM FGIS-903, "DIVIDER TEST"<sup>1</sup>

OMB NO. 0590-0013

UNITED STATES DEPARTMENT OF AGRICULTURE FEDERAL GRAIN INSPECTION SERVICE <b>DIVIDER TEST</b>		Public reporting burden for this collection of information is estimated to average 16 hours per response and 6173 hours per recordkeeper, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to USDA, OPM, Clearance Officer, Room 404-W, Washington, DC 20250. When replying refer to the OMB number and Form Number in your letter.	
FIELD OFFICE/OFFICIAL AGENCY <b>1</b>		LOCATION <b>2</b>	
TYPE (Check) <input checked="" type="checkbox"/> BOERNER		<input type="checkbox"/> CARGO	
		<input type="checkbox"/> MOTORIZED <b>4</b>	
		SERIAL NUMBER <b>3</b>	

PRELIMINARY EXAMINATION: Before starting, insure that divider is clean, dry, and resting firmly on a level base.

For Boerner and Cargo-type dividers, check the following:

- Funnel Gate - Should operate freely, completely sealing off discharge from funnel.
- Funnel - Should be symmetrical and perfectly centered over apex of dividing cone.
- Dividing Cone - Should be sound, no dents or holes worn into apex.
- Divider Bars - Dividing bars at the base of the cone should be free of obstruction, equally spaced, and firmly anchored.
- Collector Pans - Should be clean, sound and tight of seam.
- Legs - Leg bolts should be tight to prevent movement.

ACCURACY TEST: Divide a 1000-gram sample three times. Record the results of each test. Calculate the average and determine if the divider is within tolerance.

BASE WEIGHT .....	<input type="text"/>	<b>5</b>	For Use In Testing 3 and 4-Way Dividers	
FIRST TEST .....	LEFT SIDE <input type="text"/>	RIGHT SIDE <input type="text"/>	<b>6</b>	<input type="text"/>
BASE WEIGHT .....	<input type="text"/>			
SECOND TEST .....	LEFT SIDE <input type="text"/>	RIGHT SIDE <input type="text"/>		<input type="text"/>
BASE WEIGHT .....	<input type="text"/>			
THIRD TEST .....	LEFT SIDE <input type="text"/>	RIGHT SIDE <input type="text"/>		<input type="text"/>
TOTAL GRAMS (Sum of 1st, 2nd, & 3rd test) .....	<input type="text"/>	<b>7</b>	<input type="text"/>	<input type="text"/>
AVERAGE (Total grams divided by 3) .....	<input type="text"/>	<b>8</b>	<input type="text"/>	<input type="text"/>
TARGET VALUE (½ base weight average) .....	<b>9</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>
DEVIATION (Difference between target value and average) .....	<input type="text"/>	<b>10</b>	<input type="text"/>	<input type="text"/>
TOLERANCE .....	<b>11</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>

(Check appropriate block)

WITHIN TOLERANCE
  EXCEEDS TOLERANCE

TEST PERFORMED BY	DATE	REVIEWED BY	DATE
	<b>12</b>	<b>13</b>	

FORM FGIS-903 (8-82) (Replaces FGIS-903 (8-84) which may be used until exhausted.)

<sup>1</sup>Testing of dividers has been discontinued. Use this form as a worksheet. This worksheet does not need to be kept on file.

INSTRUCTIONS FOR COMPLETING FORM FGIS-903, "DIVIDER TEST"

- 1 FGIS field office or agency that performed the adjustment, when applicable.
- 2 Location of the field office or agency that performed the adjustment.
- 3 Property number or serial number assigned to the divider.
- 4 Type of divider.
- 5 "1000" or more, if appropriate for 3- or 4-way dividers.
- 6 Results of each trial separation.
- 7 Total number of grams for all three trials, by side.
- 8 Average number of grams for each side. Round to the nearest whole gram.
- 9 Target value, based on manufacturer's recommended division. Express to the nearest whole gram.
- 10 Difference between the target value and the average test result for each side. Show any plus or minus deviation from the target value, including the appropriate sign (whole grams.)
- 11 Target value x .01 = allowable deviation between the target value and the average test result (whole grams.)
- 12 - 13 Name of person who adjusted the divider and the date.