



UNIVERSITY OF MISSOURI

Research Reactor Facility

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November 17, 1982

Director of Licensing  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Reference: Docket 50-186  
University of Missouri  
License R-103

Subject: Flux Trap Sample Hold Down Device

Description:

On October 21, 1982 during a scheduled shutdown for changing flux trap samples, it was determined that the flux trap sample hold down device had been improperly installed on the previous shutdown, October 18, 1982. This resulted in samples in the center test hole not being rigidly held in place during reactor operation, which is a deviation from Technical Specification 3.6.e.

Analysis

The center test hole at the University of Missouri Research Reactor (MURR) is a high flux region used for the irradiation of 1 inch diameter samples which vary in length from 2 to 5 inches. The flux trap is made of three 1.334 inch I.D. tubes welded together in a triangular arrangement with a vertical sample profile of 30 inches.

MURR Technical Specification 3.6.e requires that experiments in the center test hole shall be removed or inserted only with the reactor shutdown and that such experiments shall be rigidly held in place during reactor operations. These requirements are met by loading individual samples to be irradiated into the aluminum flux trap described above and depicted in attached Figure 1. A three pronged hold down device is pinned in place preventing movement of the samples in the flux trap (Figure 2). The flux trap is loaded vertically into the center test hole with two steel spring clips latching onto the inner pressure vessel to hold the entire apparatus rigid. To remove the holder from the reactor a remote tool engages the holder, expanding the latching clips. The flux trap is then removed from the center test hole and handled in the reactor pool with a nylon rope.

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On October 21, 1982 at 0730, the reactor was shutdown by manual scram for a scheduled flux trap sample change. The operator on the reactor bridge found that he could not insert the removal handling tool far enough into the flux trap head to unlatch the spring clips holding the flux trap in place. This was due to the sample hold down device being pinned improperly. The pin had been placed beneath the hold down rod device head rather than above it as shown in Figure 3.

The flux trap was removed by first pulling the hold down rod pin with a remote tool and allowing the hold down device to return to its normal position. This allowed the flux trap to be unlatched with its normal remote tool and the flux trap was moved to its in-pool unloader for inspection.

Examination of the flux trap showed that the hold down rod assembly had been pinned 2-5/16 inches higher than normal and could have moved to a position 8-7/8 inches higher than the normal latched position, when its vertical travel would be stopped by a positioning lug located on one hold down rod. This condition resulted in the flux trap samples and spacers having a free space of 2-5/16 inches and the possibility of an additional 6-9/16 inches of travel if the hold down device is pushed up against the force of gravity and the downward coolant flow. This is in violation of Technical Specification 3.6.e, requiring samples in the center test hole to be rigidly held in place during reactor operations.

The reactor was operated from 2008 on October 18, 1982 to 0730 on October 21, 1982, or a period of approximately 59.5 hours, with the flux trap samples not rigidly secured. The outward travel of the samples during this time was limited to 8-7/8 inches. If the samples had moved up in one of the tubes by 8-7/8 inches, the effect would have been less than 25 cents ( $.00167 \Delta K/K$ ) of reactivity change. Forces due to gravity and the downward flow of the pool cooling system through the center test hold held the samples down against the bottom of the flux trap tubes. Additionally, a review of nuclear instrument charts for the period of time in question shows no variance in reactor power which would have resulted if the samples had shifted during critical operations.

No unreviewed safety questions existed during this period of operation. The reactivity of all samples in the flux trap is restricted by Technical Specification 3.1.h to less than that which would cause fuel element failure.

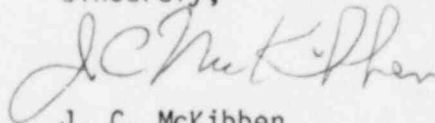
Corrective Action:

The flux trap sample hold down device was properly repinned. Personal interviews were held with operators who had conducted the flux trap loading, emphasizing the seriousness of their error. This error was also reviewed with the remainder of the operating staff to reiterate its significance and ways to prevent its recurrence. Additionally, the importance of the two operators involved in flux trap loading monitoring each other's actions was also addressed.

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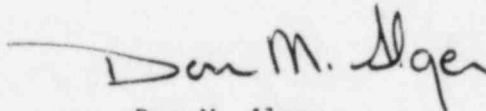
A plate will be welded to the hold down device so that the pin can only be inserted with it in the proper position.

Sincerely,



J. C. McKibben  
Reactor Manager

Endorsement:  
Reviewed and Approved



Don M. Alger  
Associate Director

JCMK:vs  
Attachments (4)

cc: U. S. Nuclear Regulatory Commission  
c/o Document Management Branch

James Keppler, Regional Director  
Region Operations - Region III

Reactor Advisory Committee

Reactor Safety Committee

John H. Tolan, Radiation Safety Officer

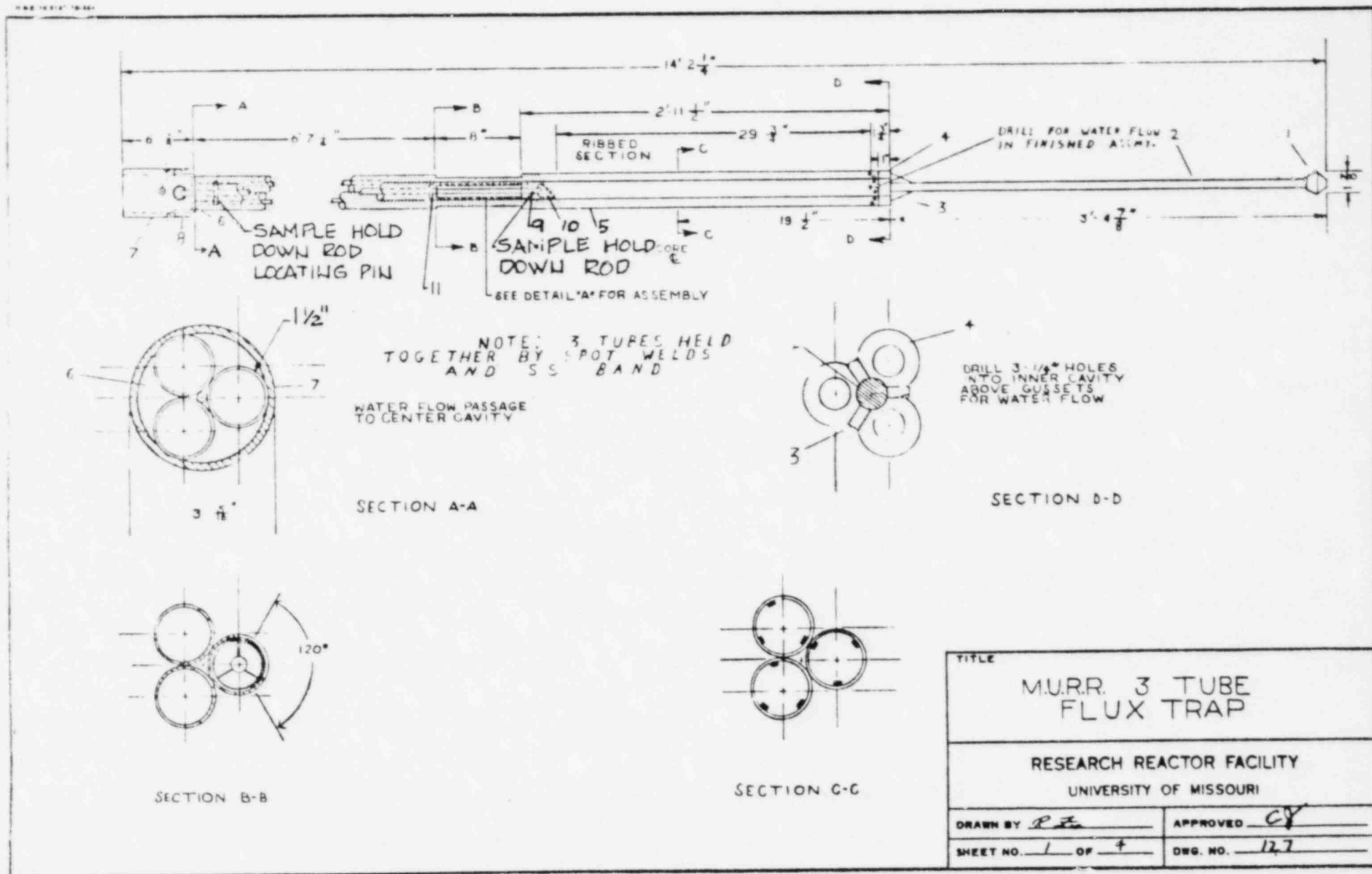
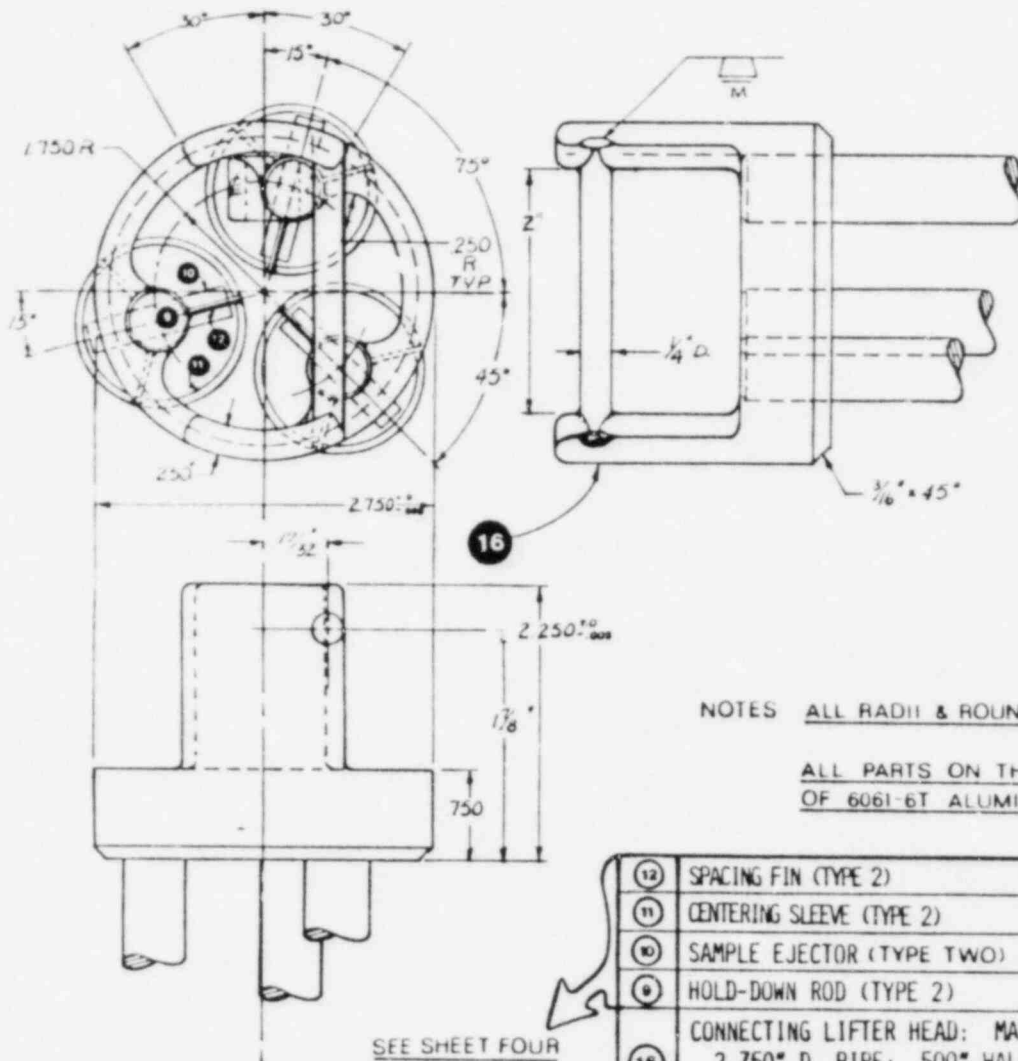


Figure 1  
Flux Trap Holder



NOTES ALL RADII & ROUNDS  $\frac{1}{16}$  R

ALL PARTS ON THIS SHEET  
OF 6061-T ALUMINUM

SEE SHEET FOUR


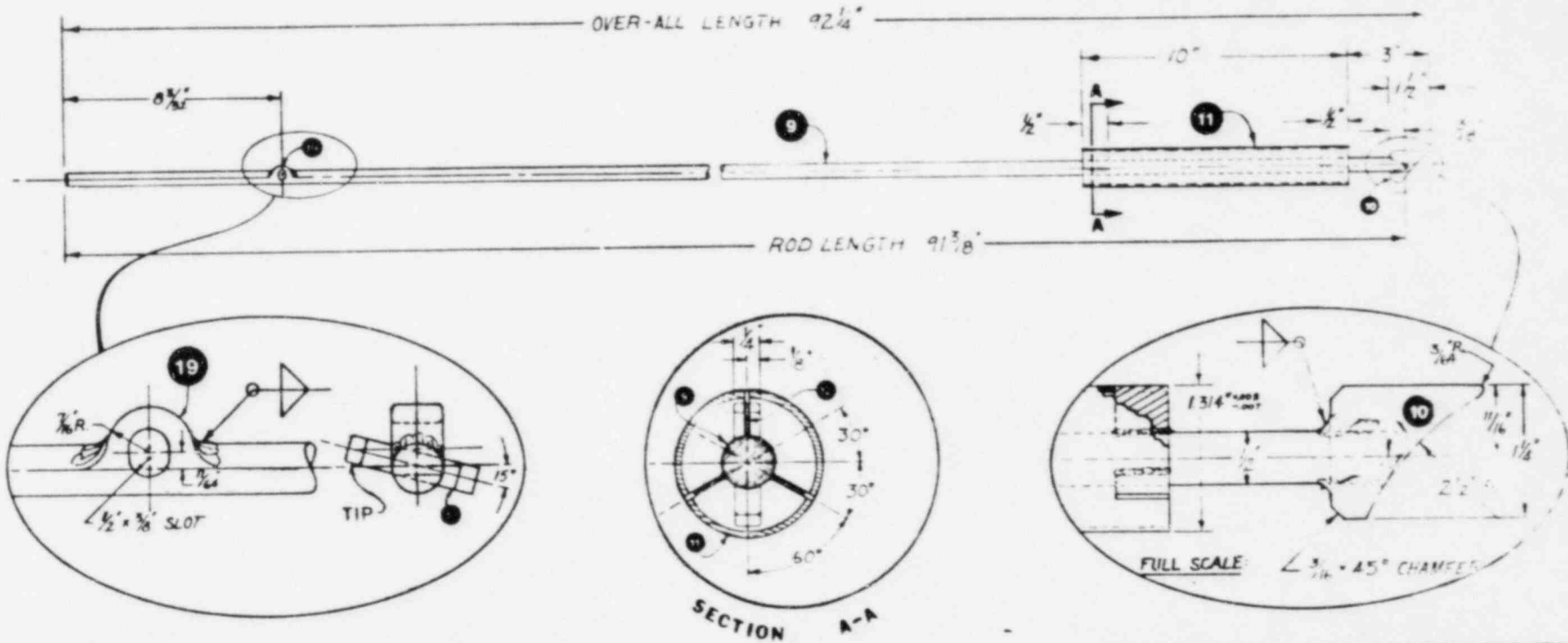
⑫	SPACING FIN (TYPE 2)	18	TITLE THREE TUBE FLUX TRAP HOLD-DOWN ROD CONNECTING LIFTER HEAD				
⑪	CENTERING SLEEVE (TYPE 2)	3	DATE: 10-9-79	TOLERANCES (Except Where Specified)	FRACTIONAL $+\frac{1}{64} - \frac{1}{64}$	DECIMAL $+.005$ $-.005$	ANGULAR $+2^\circ - 2^\circ$
⑩	SAMPLE EJECTOR (TYPE TWO)	3	SCALE: FULL				
⑨	HOLD-DOWN ROD (TYPE 2)	3	 <b>RESEARCH REACTOR FACILITY</b> UNIVERSITY OF MISSOURI				
①⑥	CONNECTING LIFTER HEAD: MACHINE FROM 2.750" D. PIPE; .500" WALL, 2.250" LONG ALINE WE D TO HOLD @ 1.750"	1					
PART NO	PART NAME & DESCRIPTION	NO. EQ'D	DRAWN BY <i>David L. Card</i>		APPROVED _____		
			SHEET NO. <i>5</i> OF <i>5</i>		DWG. NO. <i>1253</i>		

Figure 2, Sheet 1

NOTE: CENTERING SLEEVE SLOTTED AT EACH END TO RECEIVE SPACING FIN. TURNS TO 1 3/4" O.D. AFTER WELDING.



PART NO.		PART NAME & DESCRIPTION		MATERIAL	NO REQUIRED	TITLE		
#19	POSITIONING LUG	WELDED TO ONE HOLD-DOWN ROD	ALUMINUM	1	DATE	9-14-79	TOLERANCES	FRACTIONAL DECIMAL ANGULAR
#12	SPACING FIN (TYPE 2)	1/16" SHEET, 1/4" X 43/32" TACKWELDED BETWEEN #9 & #11	ALUMINUM	18	SCALE	1/2" = 1"	FRACTIONAL DECIMAL ANGULAR	1/16" 1/32" 1/64" 1/8" 1/4" 3/8" 1/2" 1" 2" 3" 4" 6" 8" 12" 18" 24" 36" 48" 60" 72" 96" 120" 144" 180" 240" 360" 480" 600" 720" 960" 1200"
#11	CENTERING SLEEVE (TYPE 2)	1.375" O.D., .083" WALL TUBE, 10" LONG. TURNED TO 1.314" O.D.	ALUMINUM	3	RESEARCH REACTOR FACILITY UNIVERSITY OF MISSOURI			
#10	SAMPLE EJECTOR	MACHINED FROM 1/4" PLATE, 1 3/4" X 1 1/2" WELDED TO #9	ALUMINUM	3				
#9	HOLD-DOWN ROD (TYPE 2)	1/4" ROD, 91 3/8" LONG / SLOT FOR #10 IN END, NO HOLES	ALUMINUM	3	DRAWN BY	David L. Card	APPROVED	
					SHEET NO.	4	OF	5
					DWG NO.	1253		

Figure 2, Sheet 2

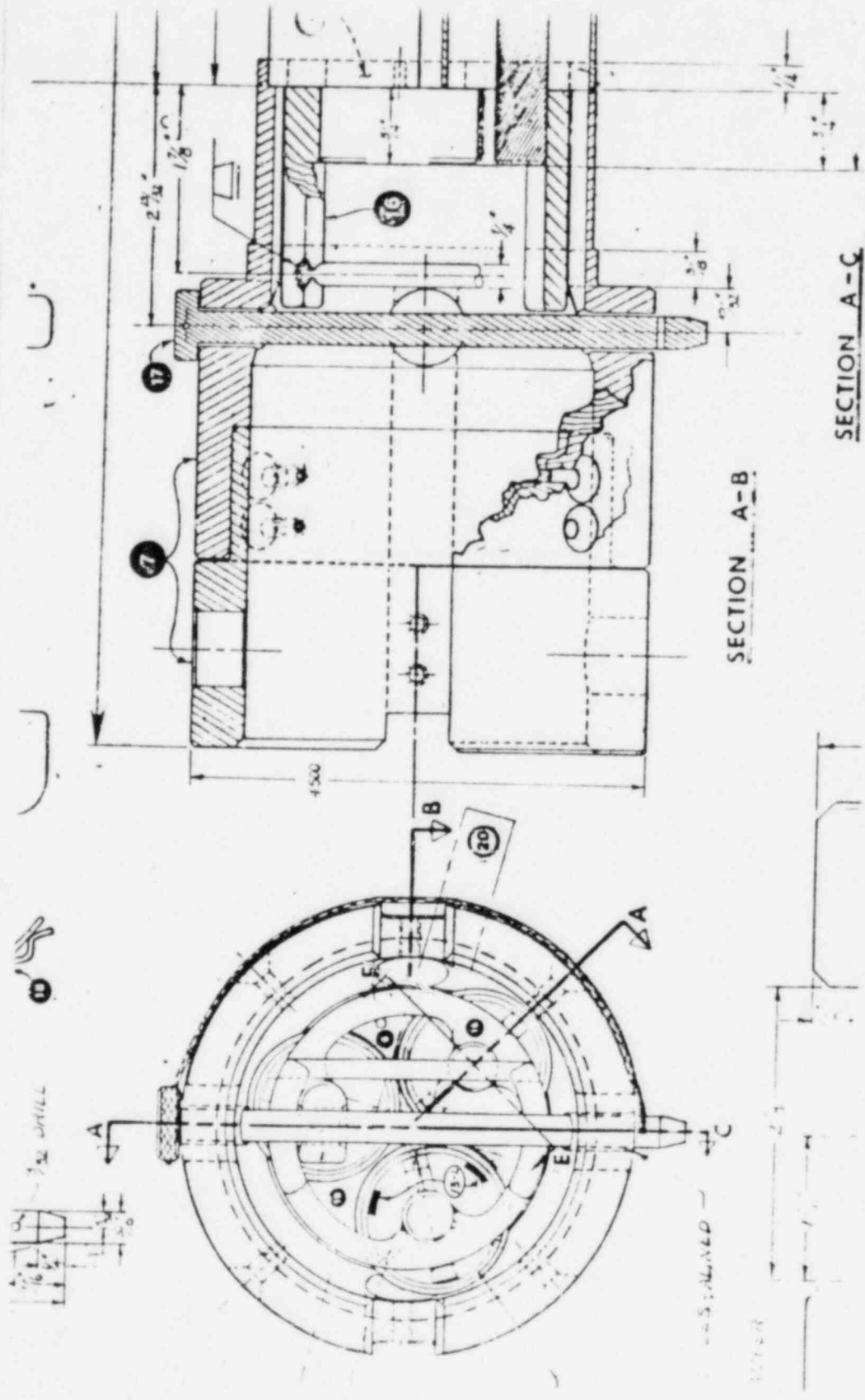


Figure 3