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Major R G Hiley
Office of Chief Ord.

REPORT NO. 710/20

MANUFACTURE OF BULLET-RESISTING BALL MOUNT CASTINGS FOR MEDIUM TANKS, T3E2

By

D. J. MARTIN
1st Lt., Ord.Dept.

1934.

MANUFACTURE OF BULLET-RESISTING BALL MOUNT CASTINGS FOR MEDIUM TANKS, T3E2

Contents

Abstract

This arsenal undertook to manufacture ball mounts for 5 T3E2 Medium Tanks made at the American La-France and Foamite Corporation, Elmira, New York, in 1933 and 1934.

Due to the small number of pieces involved it was decided to make steel castings of bullet-resisting composition for these parts.

Difficulty was experienced in obtaining sound castings. It is now felt that satisfactory casting practice has been established and that the percentage of rejections would not be above normal for any of the castings except the outer shield. A truly successful casting practice for this part has not yet been established.

Introduction

This arsenal was directed to manufacture the ball mount parts for the T3E2 Medium Tanks built by the American La-France and Foamite Corporation, These parts were required to have a resistance to bullet penetration equal to that of 1/2" rolled armor plate. If a large number of parts were to be made it would have been economical to forge them from armor plate steel. This order, however, for 5 tanks, was so small that the cost of forging dies would have been prohibitive. It was decided, therefore, to make steel castings of suitable armor plate composition.

Cast Plate vs. Rolled Plate

No information was available upon which to prescribe the thickness of such castings in order that they might have the requisite bullet-resisting qualities. In order to determine what thickness was necessary several flat plates were cast and machined to 3/8" and 1/2" in thickness. These plates were of the following homogeneous armor plate composition:

C	Mn	P	S	Si	Cr	Mo	Va
.25/.35	.40/.60	.03	.02	.15/.35	1.10/1.30	.60/.80	.20/.30

They were normalized and annealed, then machined to thickness, and then quenched in oil and drawn, in accordance with the following schedule:

Treatment	Time at Temp.	Temp.
(a) Normalize	6 hrs.	1150°C
(b) Normalize	4 hrs.	950°C
(c) Anneal	4 hrs.	850°C
(d) Machined		
(e) Oil Quench	1 1/2 hrs.	870°C
(f) Draw	1 1/2 hrs.	540°C (furnace cooled)

The plates were then subjected to ballistic test at this arsenal. The 3/8" plate showed a ballistic limit (Tent. Spec. 31) of 2100-2300 f.s., using pre-loaded Frankford Arsenal cal. .30 A.P., M1922 ammunition, at 100 yards. The 1/2" plate withstood impacts of service velocity cal. .30 A.P., M1922

ammunition at 100 yards (approx. striking velocity 2490 f.s.). Photographs of the front and back surfaces of these plates are shown in Figures 1 to 4. These plates showed evidences of a large number of blowholes when subjected to radiographic examination and some of the impacts were obtained on metal containing these blowholes. In such cases it was evident that the blowhole deflected the bullet to some extent. Impacts on the 1/2" plate were obtained in metal that was shown by radiographic test to be sound. On this basis, the ball mount castings were designed to finish 5/8" thick.

ORDNANCE DEPT U.S.A
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FIG. 1.

WATERTOWN ARSENAL.

FIG. 2.

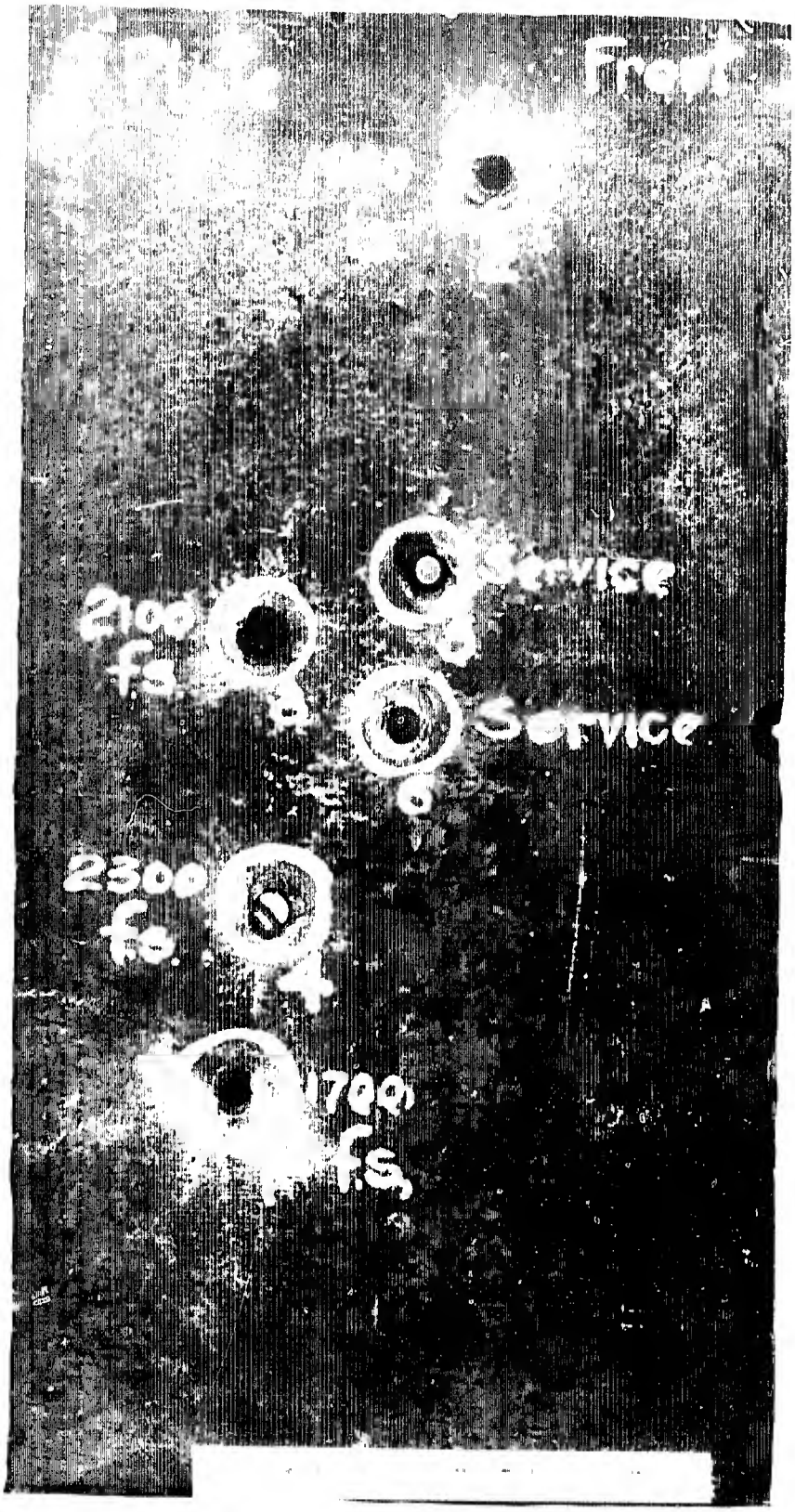
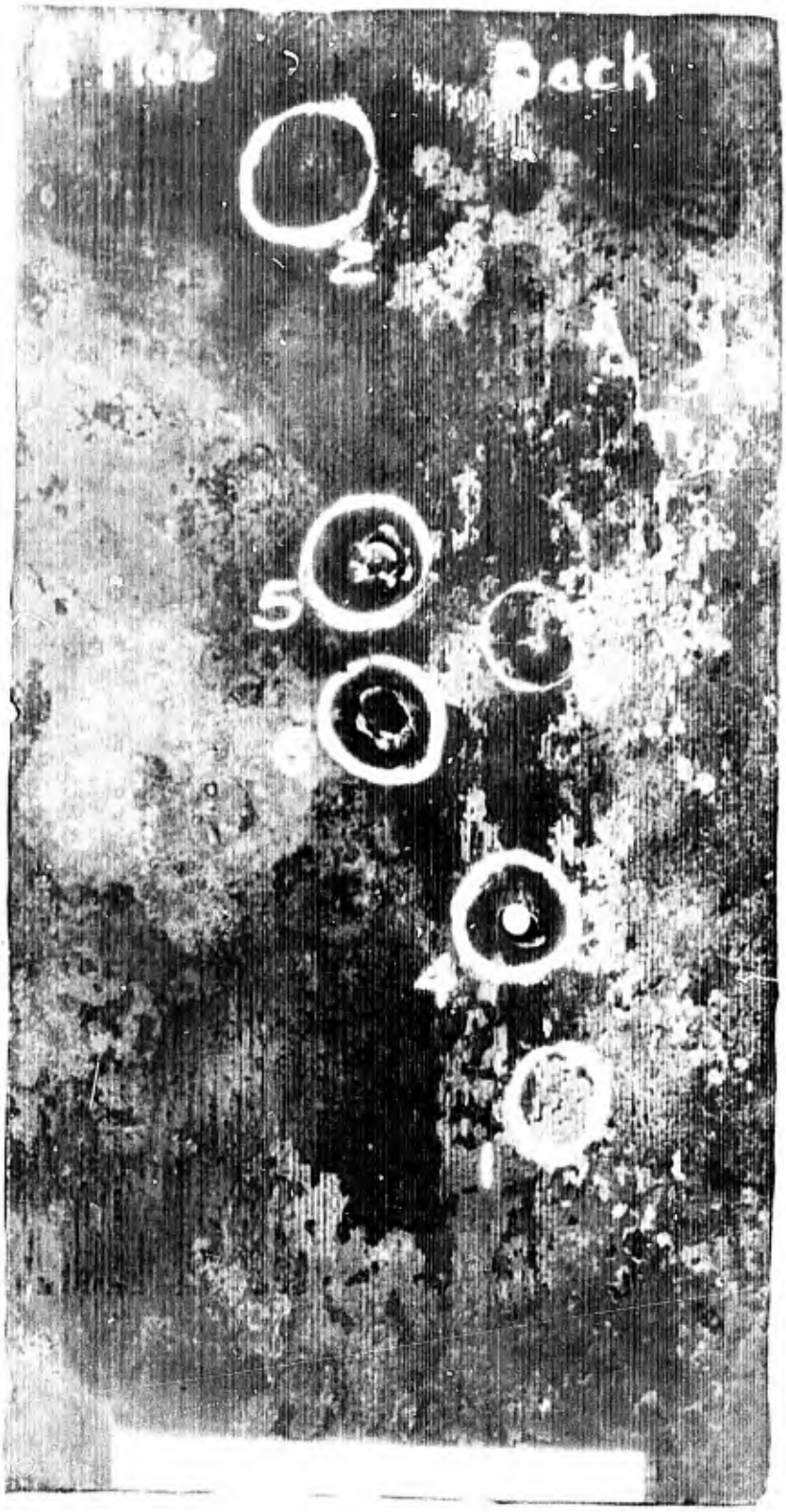


FIG. 3.



ORDNANCE DEPT. U.S.A.
WATERTOWN ARSENAL.

FIG. 4.

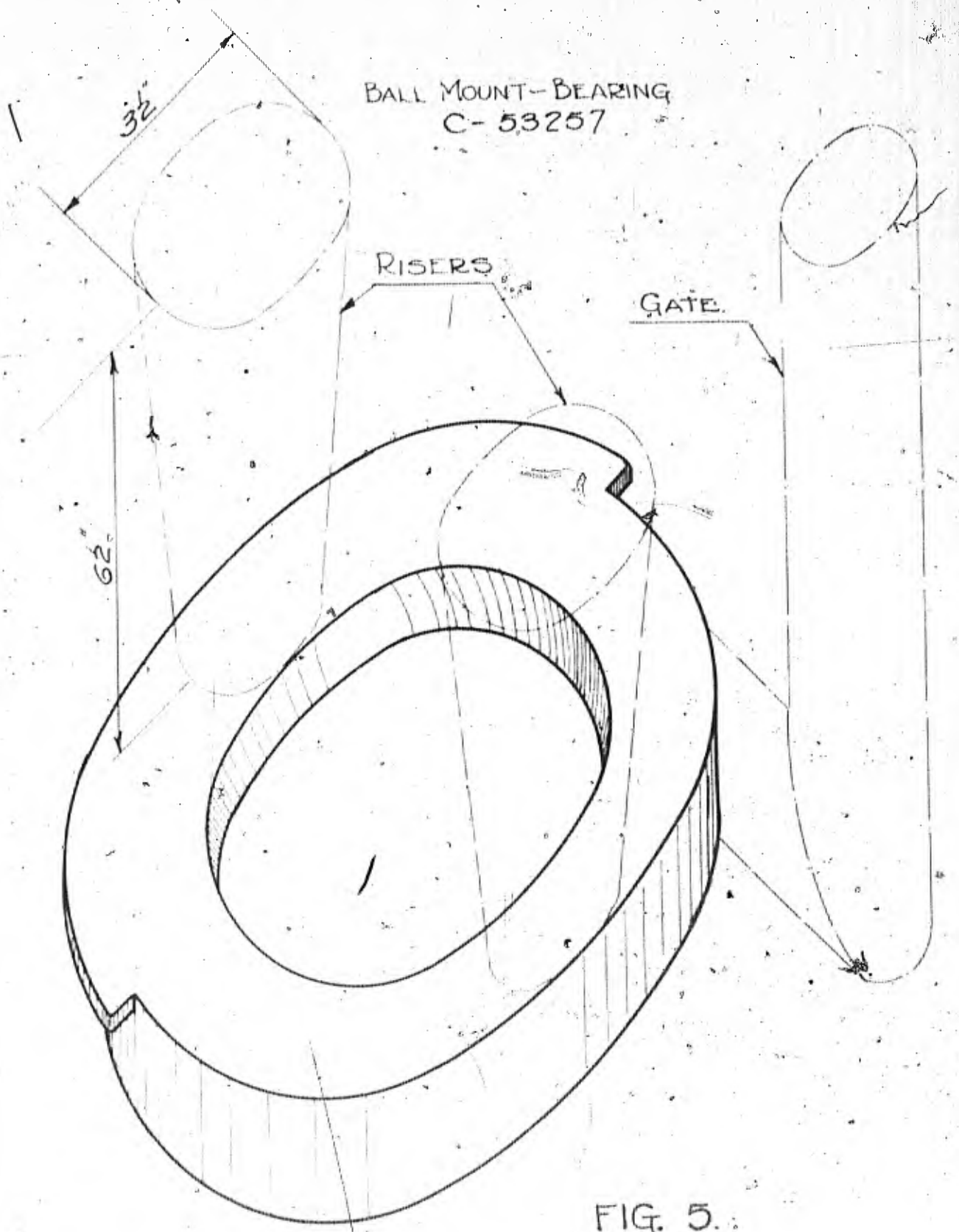


FIG. 5.

SK. 710/25-

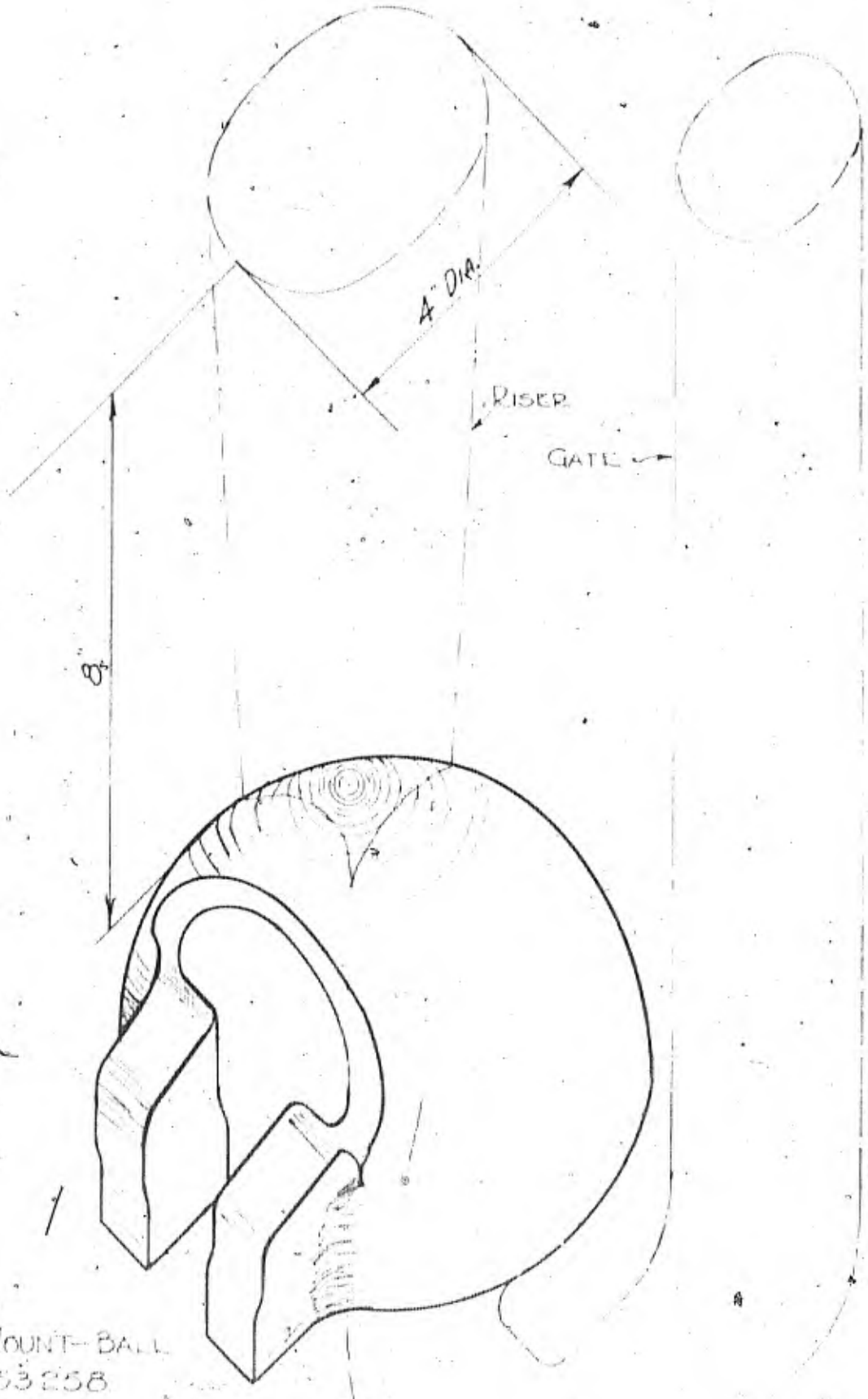


FIG. 6.

SK. 710/26

BALL MOUNT-BEARING
C-53259

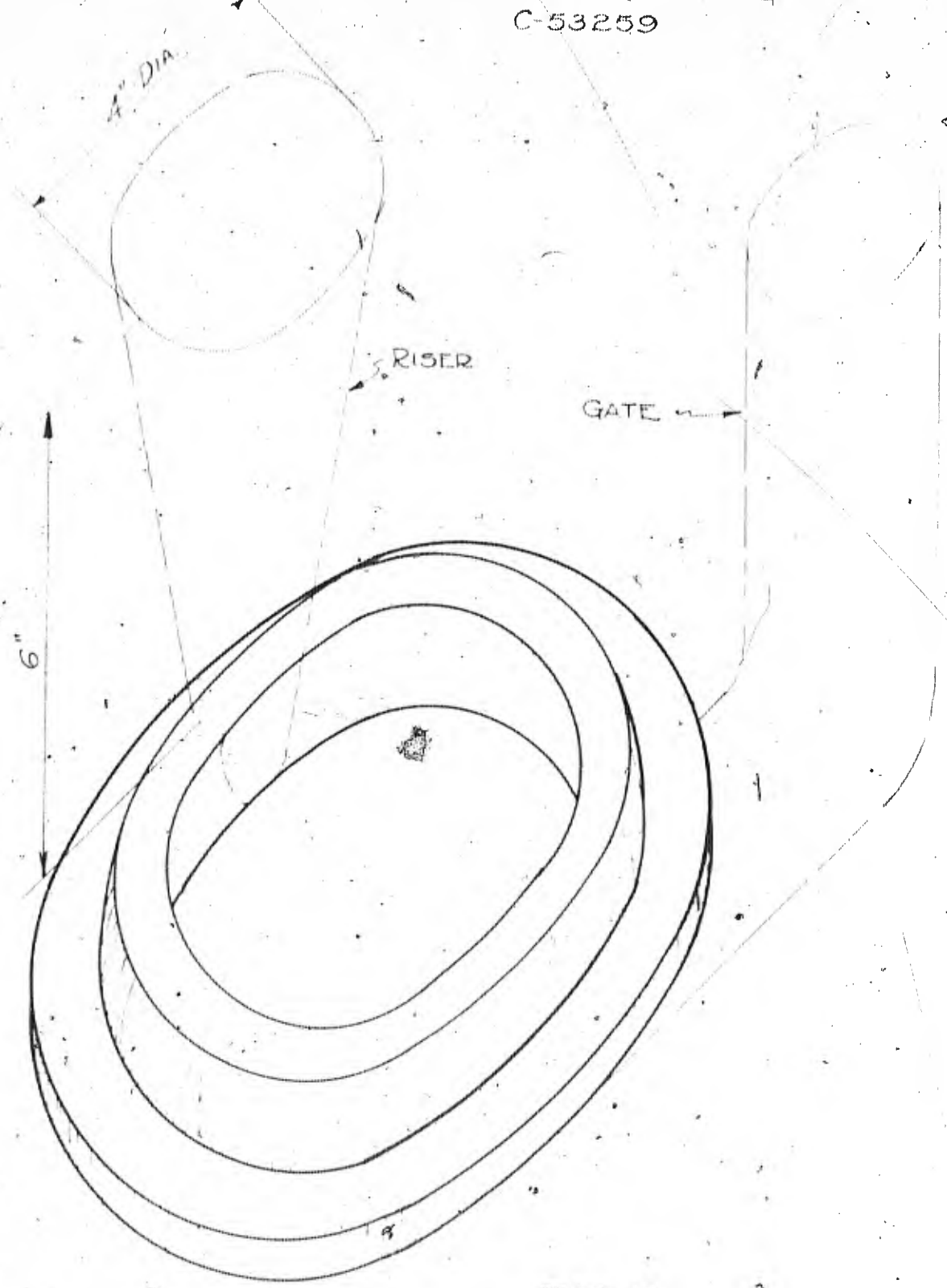
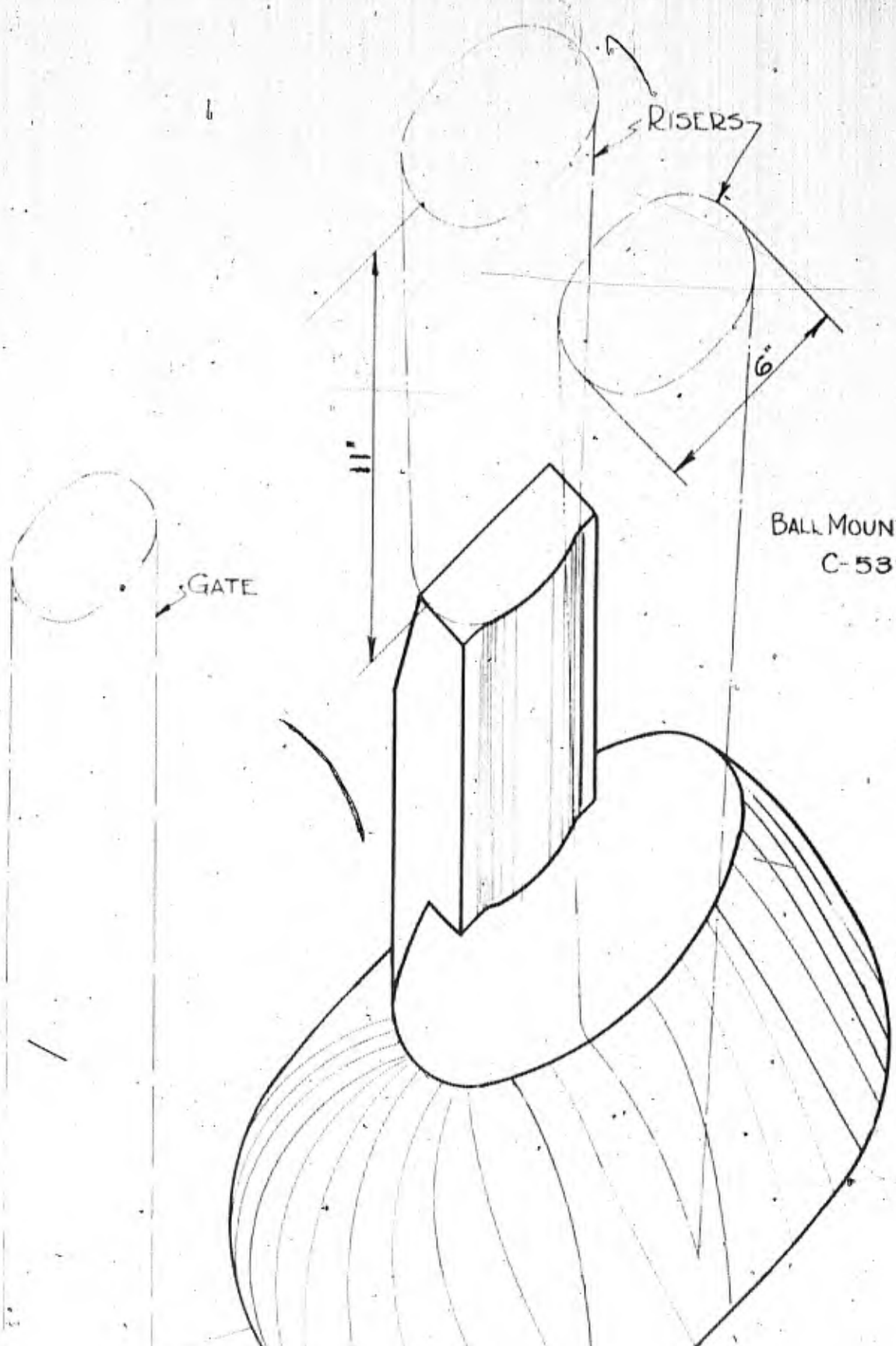


FIG. 7.

SK. 710/27



BALL MOUNT— OUTER SHIELD
C-53260

FIG. 8.

SK. 710/28

BALL MOUNT – INNER SHIELD
C-53261

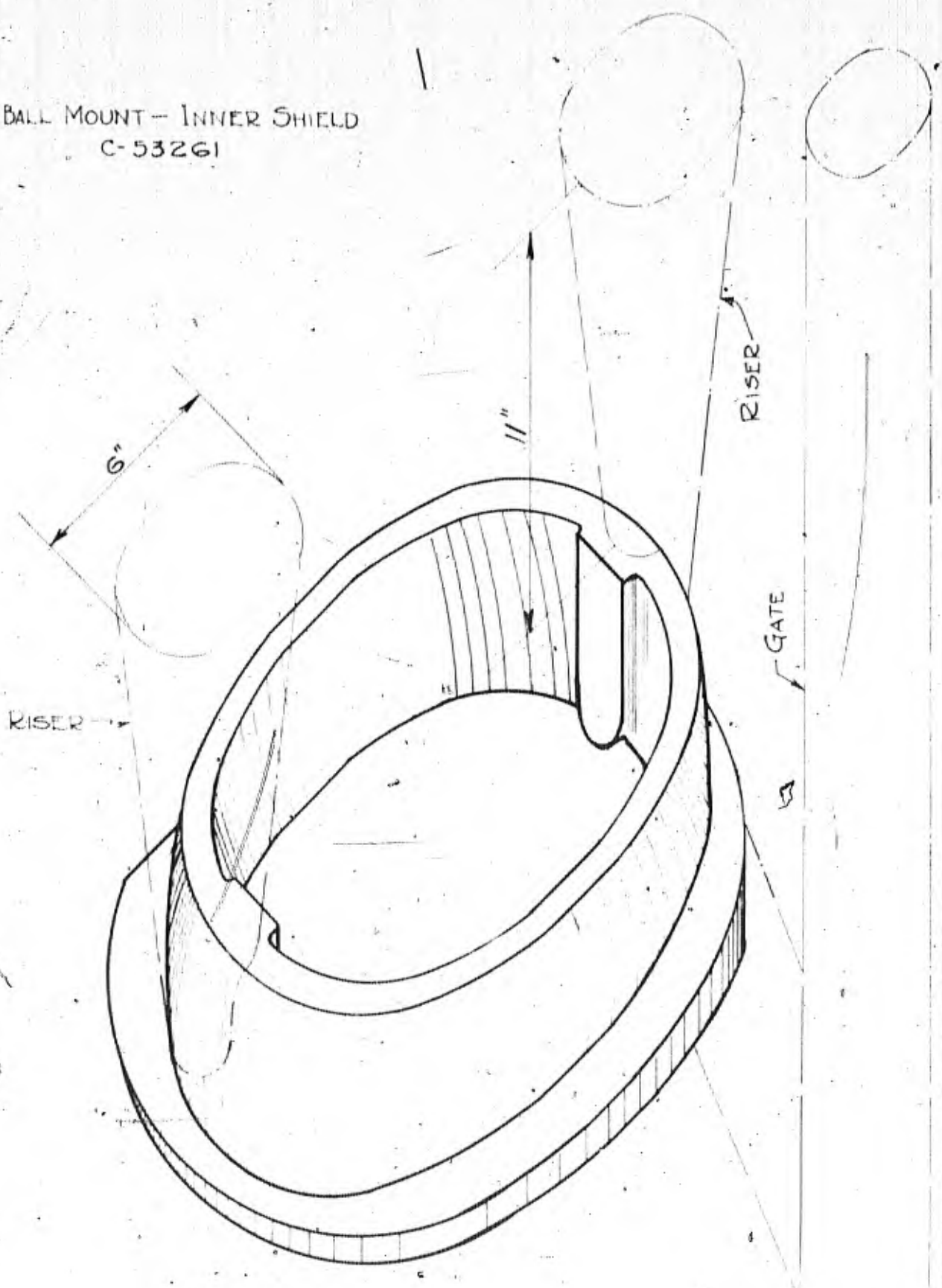


FIG. 9.

SK. 710/29

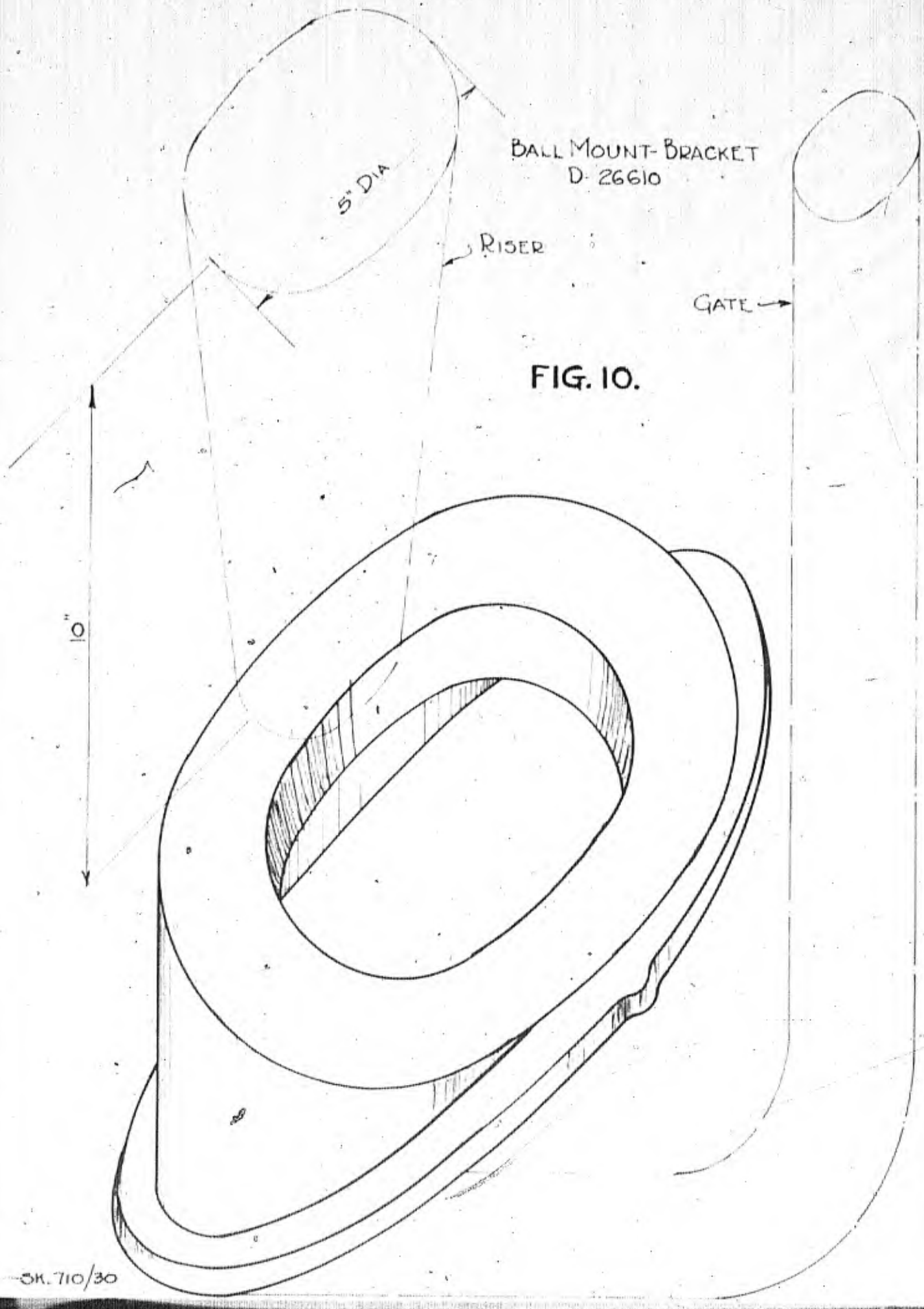


FIG. 10.

SK. 710/30

Foundry Practice

Due to a shortage of trained molders at this arsenal a cooperative arrangement was made with the Boston Navy Yard whereby this arsenal furnished the melting stock and melted the steels in the high frequency induction furnaces at the Navy Yard and the Navy Yard personnel did the molding. The castings were then brought to this arsenal for X-ray examination. As is very evident from the casting records, great difficulty was experienced in developing a suitable foundry practice for the particular composition of steel and type of casting.

Many different types and positions of the gates and risers were used in an effort to obtain sound castings. Methods that proved satisfactory are shown by sketches in Figures 5 to 10. Sand and metal conditions being satisfactory, these layouts should produce good castings in all of the pieces except the outer shield. A satisfactory practice for the outer shield casting was not definitely established. The layout shown in Figure 10 is that used for most of the accepted outer shield castings.

All of the castings were made in dry-sand molds. Analysis of the facing sand, as determined by the

Naval Research Laboratories, Anacostia Station, Washington, D.C., was as follows:

	Green	Dry
Permeability	170	146
Compression (lbs.)	1.85	94
Shear (lbs.)	0	13.2
Tensile (lbs.)	0	2.11
Moisture	6.65%	
Bond 13.40%		

Screen Analysis

On	6	Mesh	0%	On	65	Mesh	21.10
	10	"	0.2		100	"	8.84
	20	"	4.2		150	"	1.86
	28	"	7.46		200	"	1.40
	35	"	16.76		270	"	0.70
	48	"	21.8		-270	"	0.90

These tests were made for the undersigned through the courtesy of Mr. C. W. Briggs, Department of Physical Metallurgy, at the Naval Laboratories who reported that the sand, in his opinion, was satisfactory. Since it was used for facing sand only, it was Mr. Brigg's suggestion that the backing, if not good, might have been the cause of some of the troubles encountered. The sand tests were made in accordance with the recommended practice of The American Foundrymens' Association.

Records of Castings Made

Sixteen heats of steel were made in the 600# and 1000# Ajax-Northrup high frequency furnaces at the Boston Navy Yard. All heats except the last one were made in magnesia crucibles. The last heat was made in a rammed silica lining of the type described in Experimental Report No. 382, Watertown Arsenal, by Lt. S. L. Conner, Ord. Dept. In addition to the usual deoxidation with manganese and silicon all heats except E54, E56, E98D, and E113, were further "killed" by the use of ferro-carbon-titanium in the ladle. Heats E98D and E113 were further deoxidized with silicon-zirconium instead of titanium.

Chemical analyses of all heats are shown below:

Heat No.	C	Mn	P	S	Si	Cr	Mo	Va	
E54	.29	.50	.007	.020	.23	1.20	.74	.24	
E56	.35	.51	.008	.020	.35	1.13	.70	.23	
E58	.32	.42	.008	.015	.28	1.25	.70	.25	
E60	.33	.51	.009	.020	.28	1.27	.62	.27	
E61	.32	.69			.22	(Navy Yard Analysis)			
E65	.31	.56	.007	.016	.25	1.27	.67	.23	
E66	.32	.56	.007	.016	.25	1.27	.66	.23	
E70	.32	.57	.010	.016	.34	1.30	.66	.23	
E71	.31	.59	.007	.016	.32	1.29	.65	.23	
E83	.35	.60	.008	.016	.33	1.18	.66	.26	
E97	.38	.70	.006	.020	.45	1.30	.63	.25	
E98	.37	.68	.006	.020	.30	1.26	.65	.26	Zr
E98D	.38	.68	.006	.019	.41	1.25	.66	.26	.041
E112	.36	.43	.009	.014	.17	1.08	.60	.24	
E113	.39	.57	.012	.018	.30	1.17	.65	.24	.039
E150	.34	.53	.009	.020	.30	1.19	.70	.26	

(All analyses except E61 by A. Sloan, Chemist, Watertown Arsenal).

A list of the castings made, with pertinent information concerning each, is presented herewith. Drawings for these pieces are included at the end of this report.

Piece	Drwg. No.	Heat No.	X-ray Neg. No.	Remarks	Accepted
Bracket	C53259	E54	B48	Porous	No
			B49	Porous	No
			B50	Porous	No
			B51	Porous	No
		E56	B55	Porous	No
		E58	B63	Sound	Yes
		E59	B62	Sound	Yes
		E88	---	Sound	Yes
		E97	---	Sound	Yes
		E150	---	Sound	Yes
		E60- to E71	(16 pcs O.K.)		Yes
Total -- Made:- 26: Required:- 20: Accepted:- 21					
Bracket (w/flange)	C53257	E58	B65	Sound	Yes
			B66	Sound	Yes
		E59	B64	Sound	Yes
		E60- to E71	(3 pcs. O.K.)		Yes
Total -- Made:- 6: Required:- 5: Accepted:- 6					

Piece	Drwg. No.	Heat No.	X-ray Neg.No.	Remarks	Accepted
Bracket	D26610	E54	B52	Porous	No
(offset flange)			B53	Porous	No
		E56	B56	Porous	No
			B57	Doubtful	Yes
			B58	Porous	No
		E58	B67	Sound	Yes
		E61	B71A	Porous	No
			B72	Sound	Yes
			B73	Doubtful	Yes
		E71	B81	Sound	Yes
			B82	Sound	Yes
			B83	Sound	Yes
			B84	Porous	No
		E71	B85	Bad Pipe	No
		E87	B102	Porous	No
			B103	Doubtful	Yes
		E88	B104	Sound	Yes
		E97	B124	Doubtful	Yes
		E98	B122	Doubtful	Yes
		E98D	B123	Sound	Yes
		E112	B136	Sound	Yes
			B137	Doubtful	Yes
		E113	B134	Sound	Yes
			B135	Doubtful	No

Total: Made:- 24: Required:- 15: Accepted:- 15

Piece	Drwg. No.	Heat No.	X-ray Neg.No.	Remarks	Accept
Ball		E56	B59	Doubtful	Yes
(2 different finishes req'd.- Both made from same casting)			B60	Porous	No
		E58	B71	Sound	Yes
		E61	B78	Sound	Yes
		E70	B86	Doubtful	Yes
			B87	Doubtful	Yes
			B88	Porous	No
			B91	Porous	No
		E70	B92	Porous	No
			B93	Doubtful	Yes
			B94	Doubtful	Yes
			B95	Porous	No
		E83	B99	Cracked	No
		E87	B109	Sound	Yes
			B110	Sound	Yes
			B111	Sound	Yes
		E88	B112	Sound	Yes
			B113	Sound	Yes
		E98	B125	Doubtful	No
			B126	Doubtful	Yes
			B128	Sound	Yes
		E98D	B127	Sound	Yes

Piece	Drwg. No.	Heat No.	X-ray Neg.No.	Remarks	Accept
Ball			B129	Doubtful	Yes
		E112	B140	Doubtful	Yes
			B141	Doubtful	Yes
			B144	Porous	No
			B145	Porous	No
		E113	B142	Sound	Yes
		E113	B143	Sound	Yes
Total -- Made:- 29: Required:- 20: Accepted:- 20					
Inner Shield	C53261	E54	B54	Porous	No
		E58	B69	Sound	Yes
		E61	B75	Doubtful	No
		E60	B74	Doubtful	Yes
		E83	B96	Sound	Yes
			B97	Doubtful	Yes
		E87	B105	Sound	Yes
Total -- Made:- 7: Required:- 5: Accepted:- 5					
Outer Shield	C53260	E56	B61	Porous	No
		E58	B70	Doubtful	No
		E61	B77	Doubtful	No
		E60	B76	Doubtful	No
		E83	B98	Porous	No
		E87	B108	Doubtful	Yes
		E88	B106	Porous	No
			B107	Doubtful	No

Piece	Drwg. No.	Heat No.	X-ray Neg.No.	Remarks	Accepted
Outer Shield	C53260	F97	B130	Doubtful	Yes
			B131	Doubtful	Yes
			B133	Porous	No
		F98D	B132	Cracked Doubtful	Yes
		F112	B138	Porous	No
		F113	B139	Cracked Doubtful	Yes

Total -- Made:- 14: Required:- 5: Accepted:- 5

Castings marked as "doubtful" were those that showed a small amount of porosity under radiographic examination in such position that it was felt that the defects might be removed in machining operations. In some cases porous areas were chipped out and welded up with material of the same composition. The two outer shields marked "cracked" were cracked on the inside at the head of the dome. These cracks were also chipped out and welded. In every case where welding was performed the casting was annealed carefully at 950°C and then X-rayed again to make sure there were no cracks or other defects in or adjacent to the weld. These castings were again X-rayed after complete heat treatment as a further

precaution. The welds were found to be sound and no further defects developed as a result of heat treatment.

A porous ball was machined, heat treated as described above, and subjected to ballistic test. The results obtained were very satisfactory. Records of this test are shown in Report No. 710/9, Watertown Arsenal, September 29, 1933.

All of the rough castings that were accepted, or tentatively accepted, were subjected to the following heat treatment:

Treatment	Time at Temp.	Temp.
(a) Normalize	28 hrs.	1150°C
(b) Normalize	9 hrs.	950°C
(c) Anneal	9 hrs.	850°C
(d) Machined as required.		
(e) Oil Quench	3 hrs.	870°C
(f) Draw	3 hrs.	540°C
(g) Ground to finish as required		

All of the castings finished for assembly were subjected to Brinell hardness test and showed a hardness of 400-430.

This order afforded the arsenal much valuable information in connection with the manufacture of castings of this nature. In the first place, it is interesting to note that cast plate, if properly heat treated, is equal to rolled plate of similar composition in its efficiency as armor. Further, it was found that steel of this composition is difficult to use for steel castings. It has a tendency to "die" quickly from high temperatures and does not shrink well. In addition to these points it is felt that satisfactory practices have been developed for all of the castings except the outer shield and that future work of this nature could, therefore, be done at a much smaller expense.

Respectfully submitted:

D. J. Martin,
1st Lt., Ord.Dept.

PHYSICAL PROPERTIES	
Y. P.	
T. S.	
EL. 2	
RED.	
HT. T.	
BR.	
SCL.	
C. C.	

REVISIONS

DRG. PERTAINS TO	

D'FT

CHE

SUB

C

5 TO 16 ON ALL SURFACES

SYMBOL		
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CHECKER	CHECKER	CHIEF D'FTSMAN
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		ORD. DEPT. U.S.A.
APPROVED:-		
		ORD. DEPT. U.S.A.

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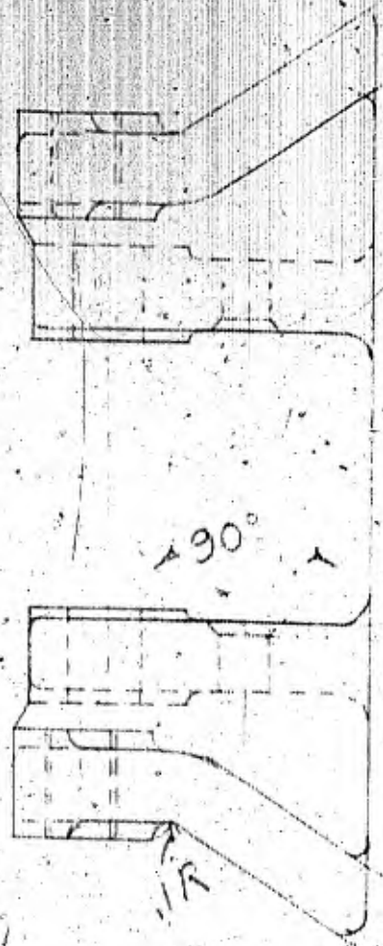
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REVISIONS			

DRG. PERTAINS TO	

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D'FTSMAN	TRACER
CHECKER	CHECKER
SUBMITTED	
APPROVED	

$\sqrt{}$ 125 ON ALL SURFACES

SYMBOL		
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CHECKER	CHECKER	CHIEF D'FTSMAN
SUBMITTED:		
		ORD. DEPT. U.S.A.
APPROVED:		
		ORD. DEPT. U.S.A.

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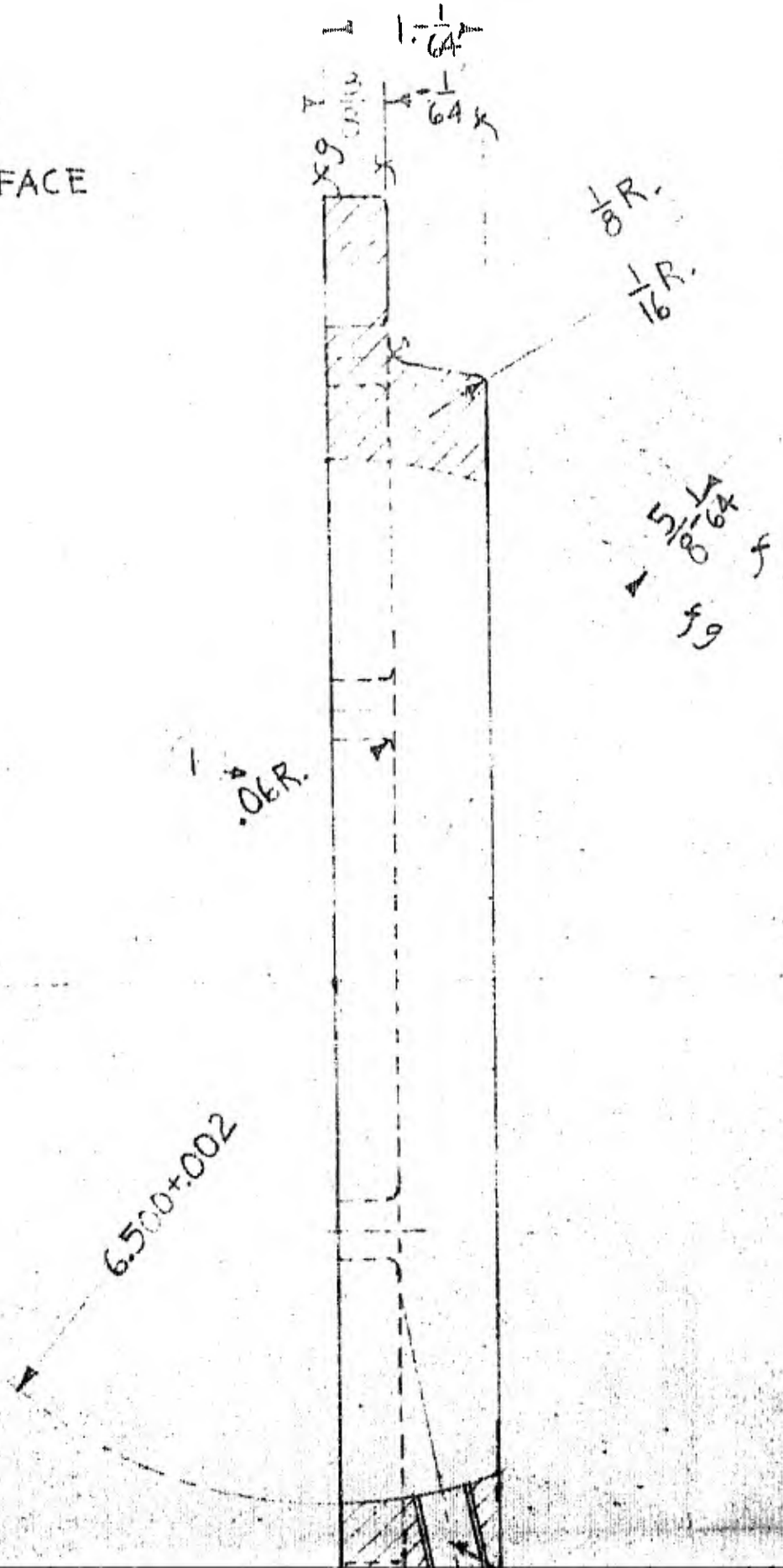
45°

.375+.001, 8 HOLES, $\frac{3}{4}$ C'BORED SURF

D SURFACE



PROPERTIES	
Y. P.	
T. S.	
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RED.	
HT. T.	
BR.	
SCL.	
C. C.	

REVISIONS			
1	7-26-33		

DRG. PERTAINS TO	
D26625	

4 3/16 R.
45°
9 3/4

BEARING, MOUNT
ARMOR, HARDENED

20

APPROS. CA

$\frac{3}{8}$-24-NF-2 $\frac{3}{4}$ C'BORED SURFACE

12"

NOTE: PATTERN MAKER TO ALLOW $\frac{1}{16}$ & $\frac{1}{8}$
MARKED $\frac{1}{16}$ & $\frac{1}{8}$ FOR SCALING &
AND $\frac{1}{8}$ ON ALL OTHER SURFACES

OUNT
ENED

C53259

D'FTSMAN
CHECKER
SUBMITT
LT. CO.
APPROVE

APPROX. CAST WEIGHT 1% LB

SCALE 1

C53259

BALL MOUNT, TANK GUN

4 - NF-2 $\frac{3}{4}$ C'BORED SURFACE

NOTE: PATTERN MAKER TO ALLOW $\frac{1}{16}$ ON ALL SURFACES MARKED $\sqrt{}$ & $\sqrt{9}$ FOR SCALING & FINISHING AND $\frac{1}{8}$ ON ALL OTHER SURFACES FOR SCALING

259

SYMBOL		
D'FTSMAN	TRACER	L'D'G. D'FTSMAN M. F. M.
CHECKER	CHECKER	CHIEF D'FTSMAN

SUBMITTED:-

LT. COL. ORD. DEPT. U.S.A.

APPROVED:-

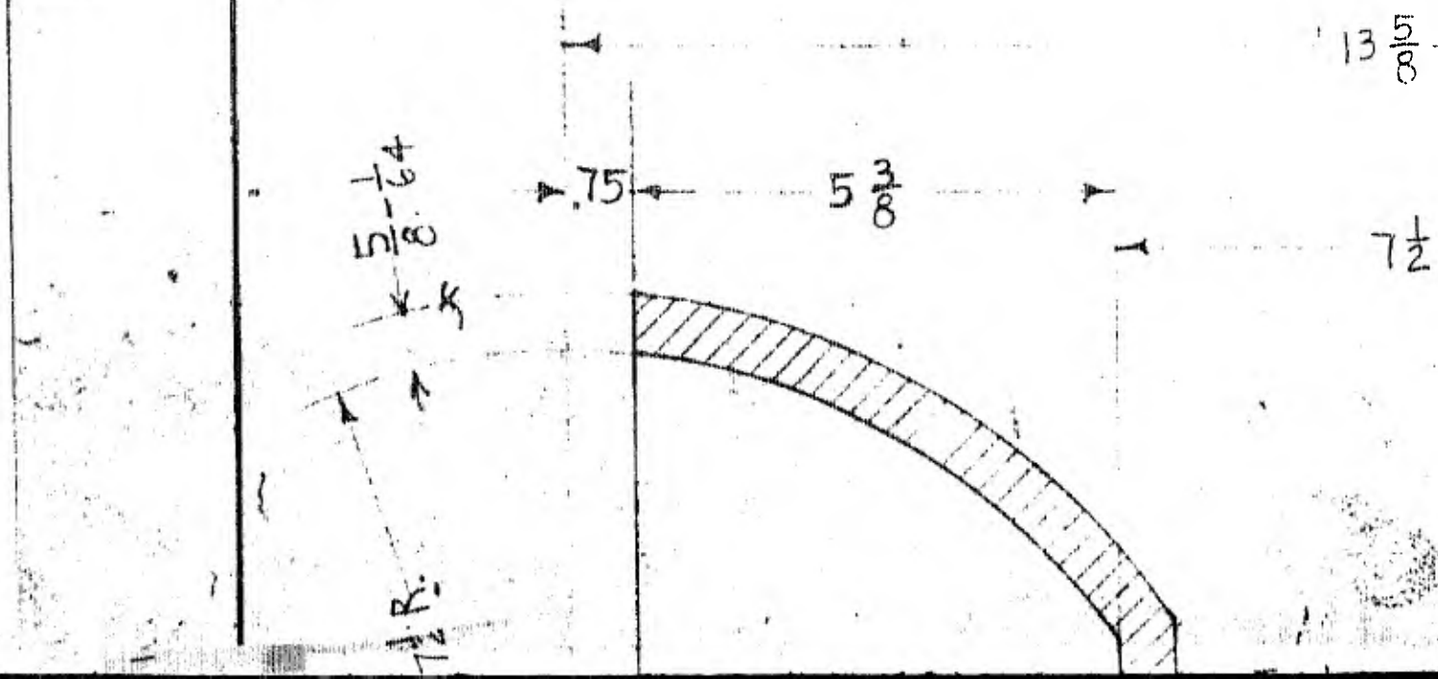
ORD. DEPT. U.S.A.

ROCK ISLAND ARSENAL

SCALE 1

C 53259

BALL MOUNT, TANK GUN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15/16
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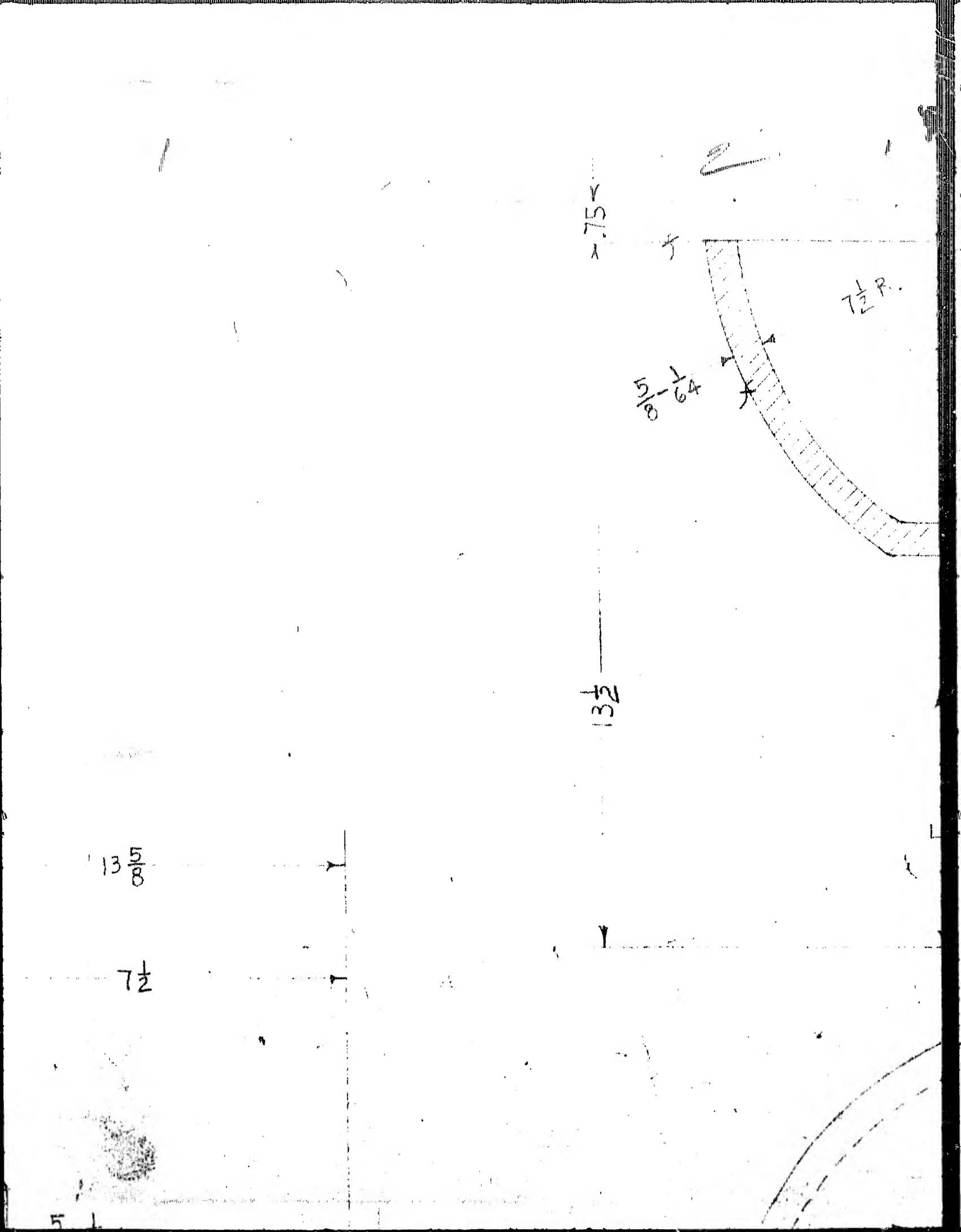
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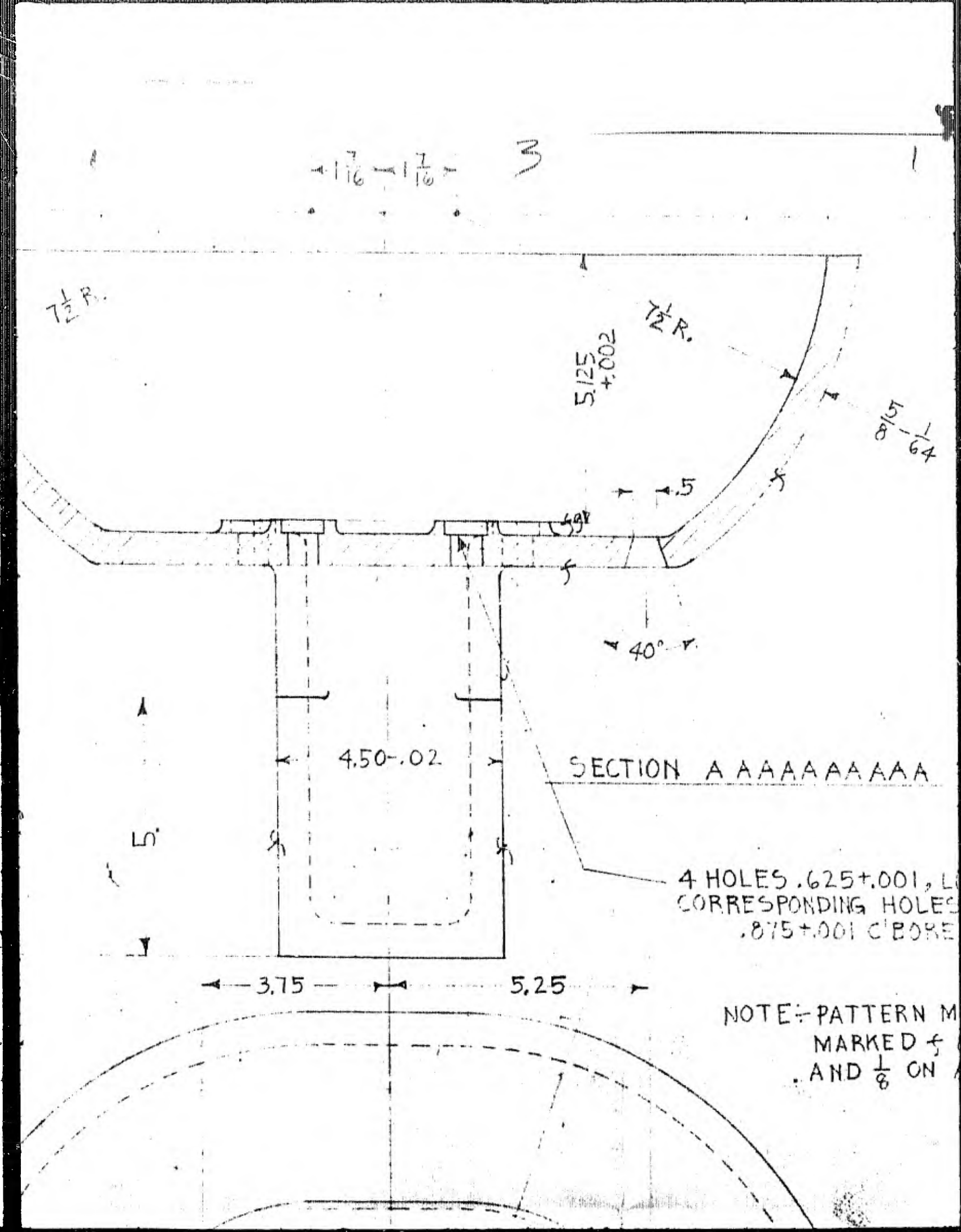
13 2/32
13 5/8
7½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1 7/16
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7½ R.
5.125 +.002
2½ R.
8.57
6 1/4
.5
40°
4.50-.02
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4 HOLES .625+.001, L
CORRESPONDING HOLES
.875+.001 C'BORE
3.75
5.25
NOTE:- PATTERN M
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AND 1/8 ON

PHYSICAL PROPERTIES		JULY 10, 1933 REVISIONS			
Y. P.					
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BR.					
SCL.					
C. C.					

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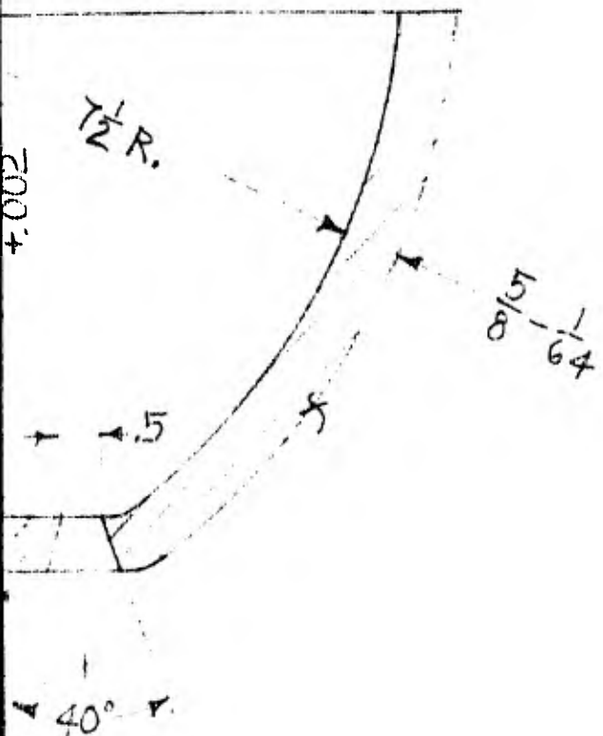


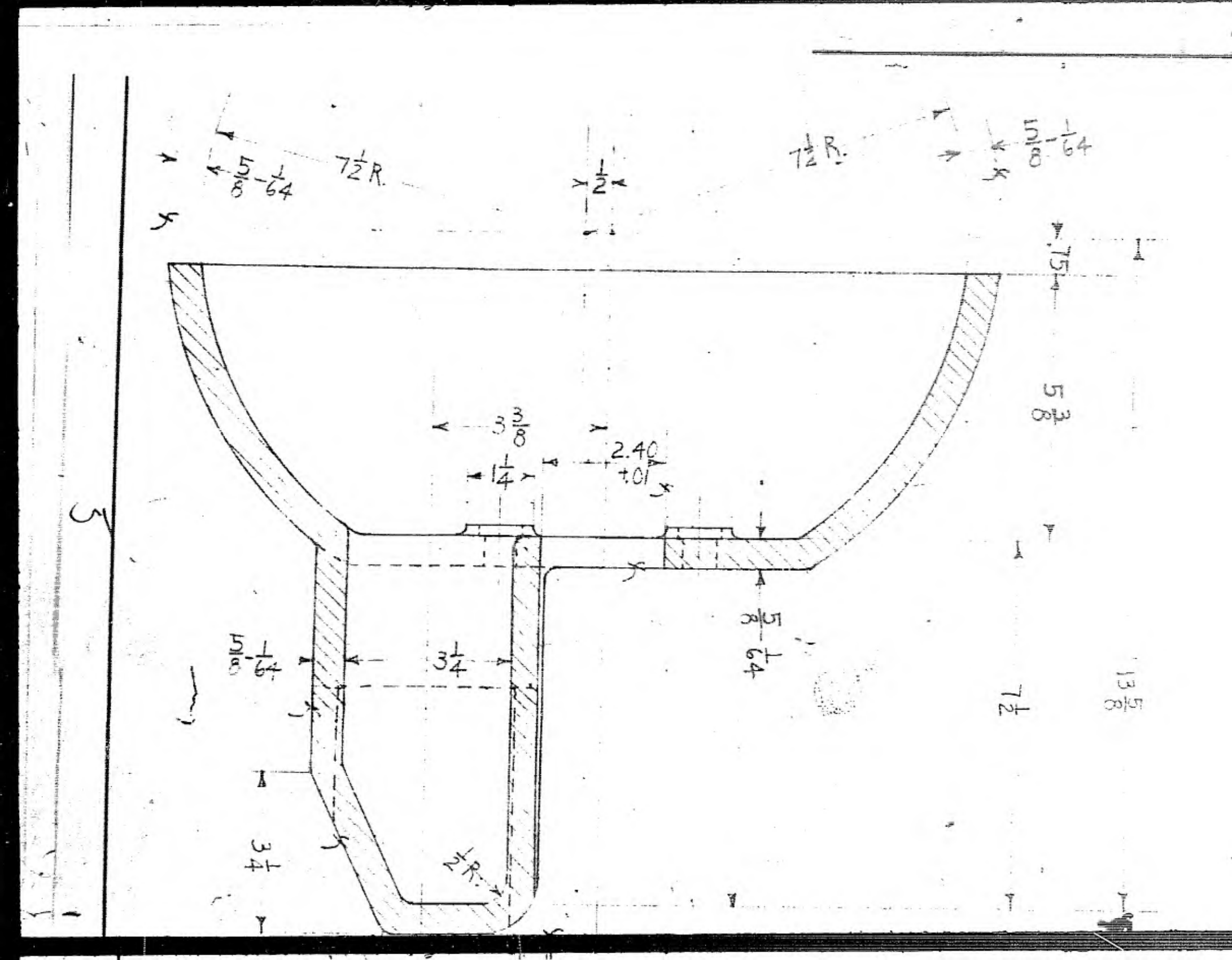
+.002

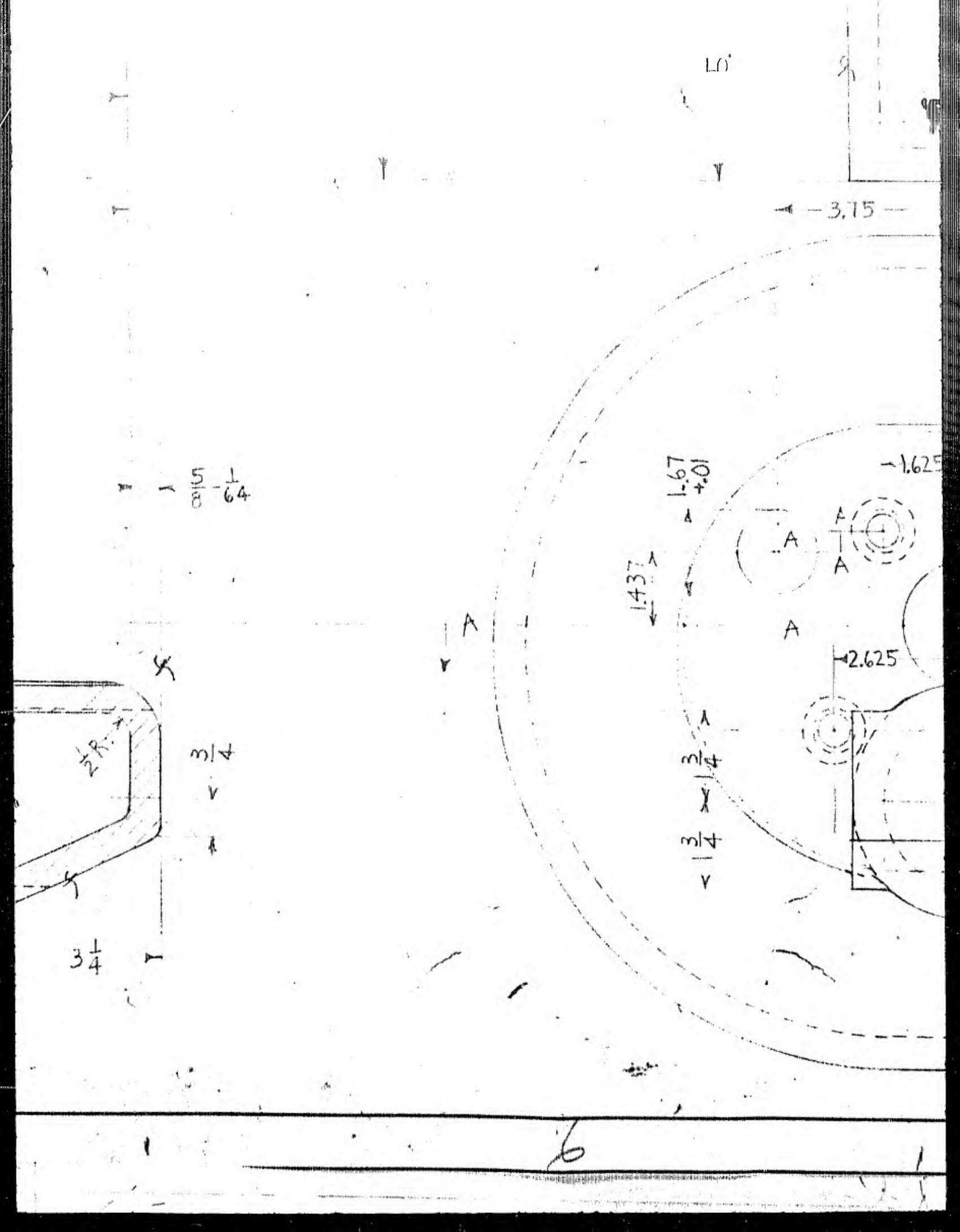
ECTION A A A A A A A A A A

4 HOLES .625+.001, LOCATE FROM CORRESPONDING HOLES IN GUN BRACKET .875+.001 C'BORE .25+.01 DEEP, FAR SIDE

NOTE:- PATTERN MAKER TO ALLOW $\frac{3}{8} \pm \frac{1}{16}$ ON ALL SURFACES MARKED ⌀ & ⌀9 FOR SCALING & FINISHING AND $\frac{1}{8}$ ON ALL OTHER SURFACES FOR SCALING.

SHIELD, OUTER (C-53260)
ARMOR, HARDENED


7½ R.
5/8 - 1/64
7½ R.
5/8 - 1/64
1/2
.75
5 3/8
3 3/8
1 1/4
2.40
+.01
5/8 - 1/64
3 1/4
7/8
13/16
3 1/4
2 1/2 R.

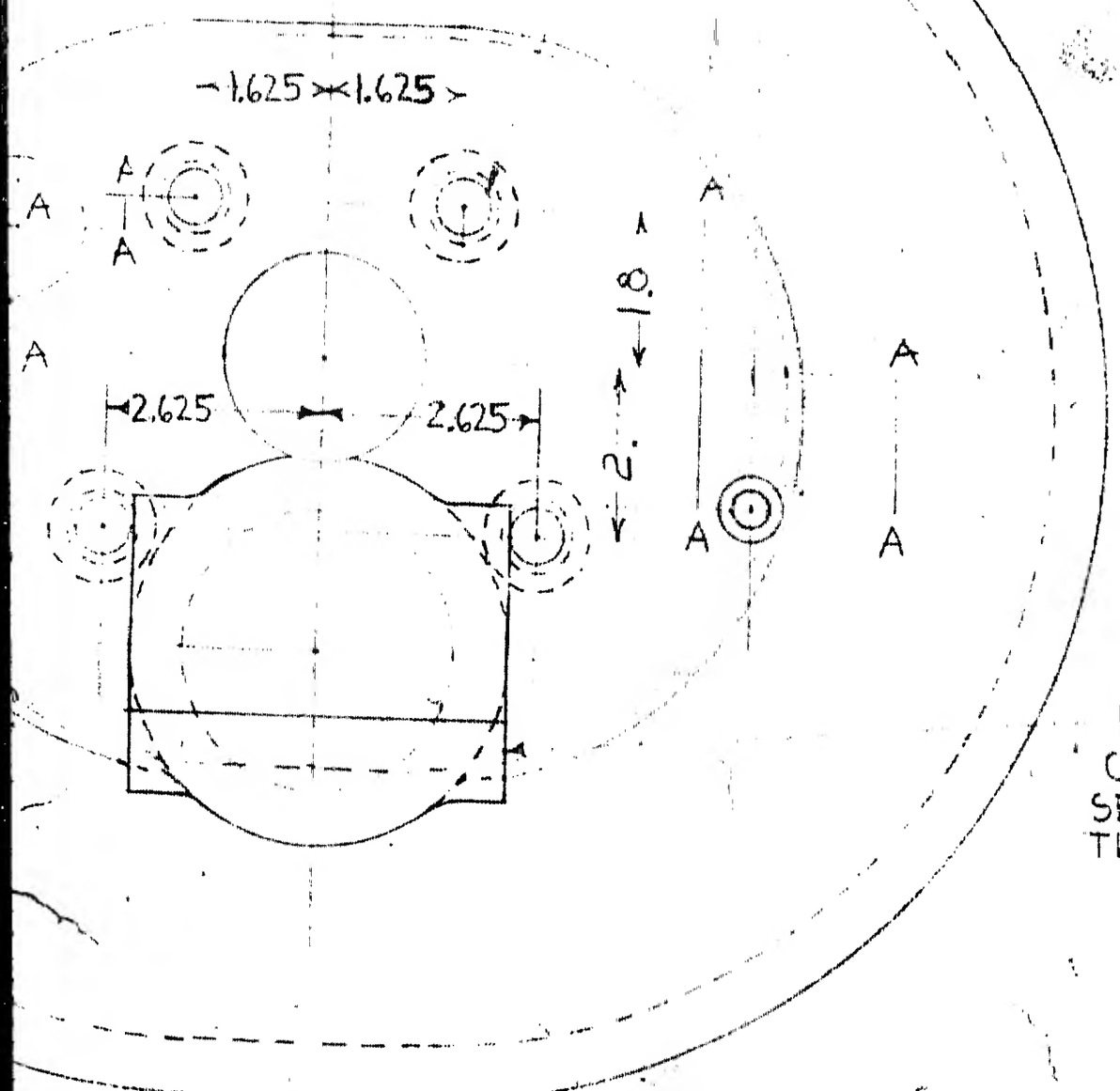

3.75
1.67 +.01
1.437
1.625
2.625
A
A
A
A
3/4
3/4
3/4
2 1/2 R.
5/8 - 1/64
3 1/4

4 HOLES .625±.001, LOCATE FROM
CORRESPONDING HOLES IN GUN BRA
.875±.001 C'BORE .75±.01 DEE

3.75 — 5.25

NOTE:- PATTERN MAKER TO ALL
MARKED ∮ & ∮9 FOR SC
. AND 1/8 ON ALL OTHER S

SHIELD
ARMOR. HA



PADS TO WHICH
COUNTERWEIGHTS CAN
SECURED TO BALANCE
TIPPING PARTS

APPROX. CAST WEIGHT 140. LB.

SCALE 1/2

C 53260

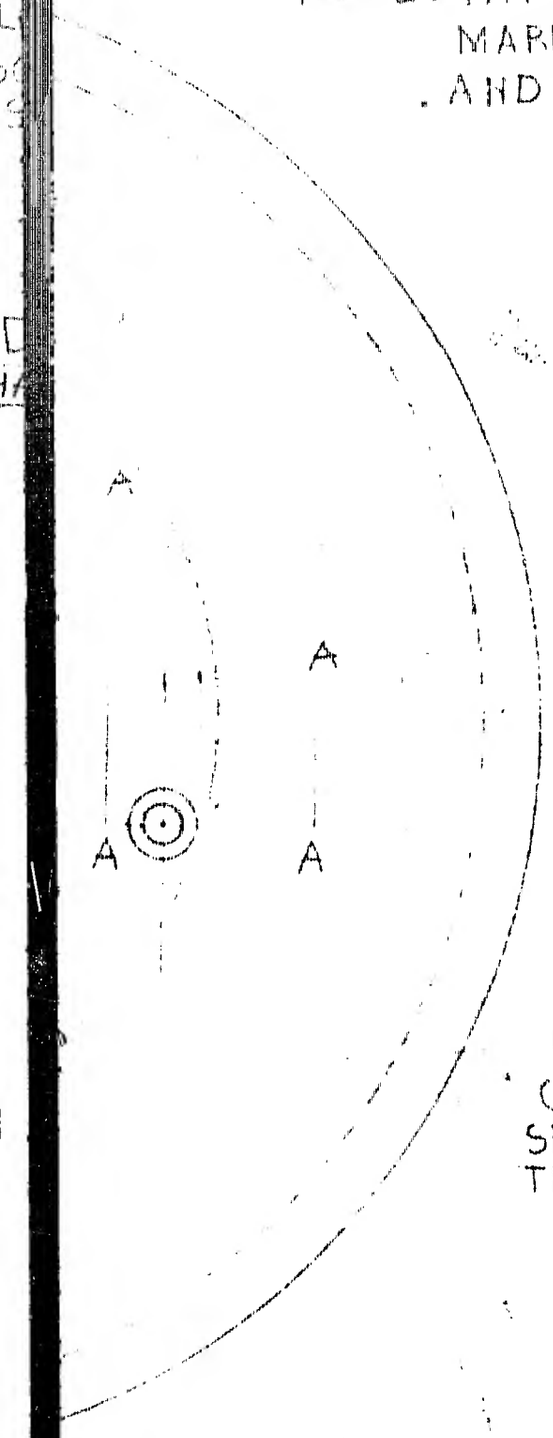
BALL MOUNT, TANK GUN

4 HOLES .625±.001, LOCATE FROM CORRESPONDING HOLES IN GUN BRACKET .875±.001 C'BORE .75 DEEP, FAR SIDE

NOTE: PATTERN MAKER TO ALLOW $\frac{3}{8}\pm\frac{1}{16}$ ON ALL SURFACES MARKED ↑ & ↓ FOR SCALING & FINISHING AND $\frac{1}{8}$ ON ALL OTHER SURFACES FOR SCALING.

SHIELD, OUTER
ARMOR, HARDENED

C-53260



PADS "C" WHICH COUNTERWEIGHTS CAN BE SECURED TO BALANCE TIPPING PARTS

SYMBOL		
D'FTSMAN G.S.	TRACER	L'D'G. D'FTSMAN M.F.H.
CHECKER J.B.G.	CHECKER	CHIEF D'FTSMAN

SUBMITTED:-

LT. COL. ORD. DEPT. U.S.A.

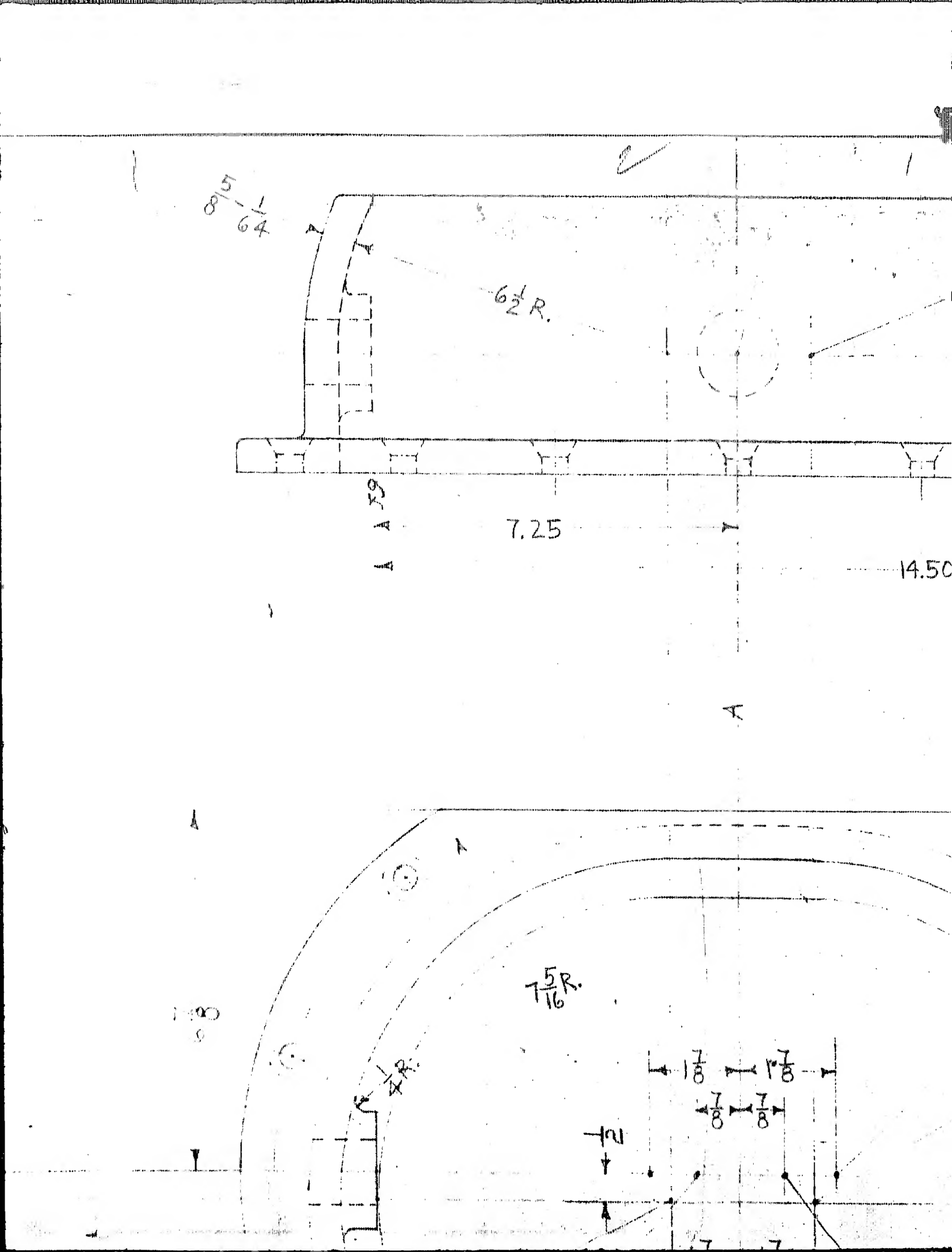
APPROVED:-

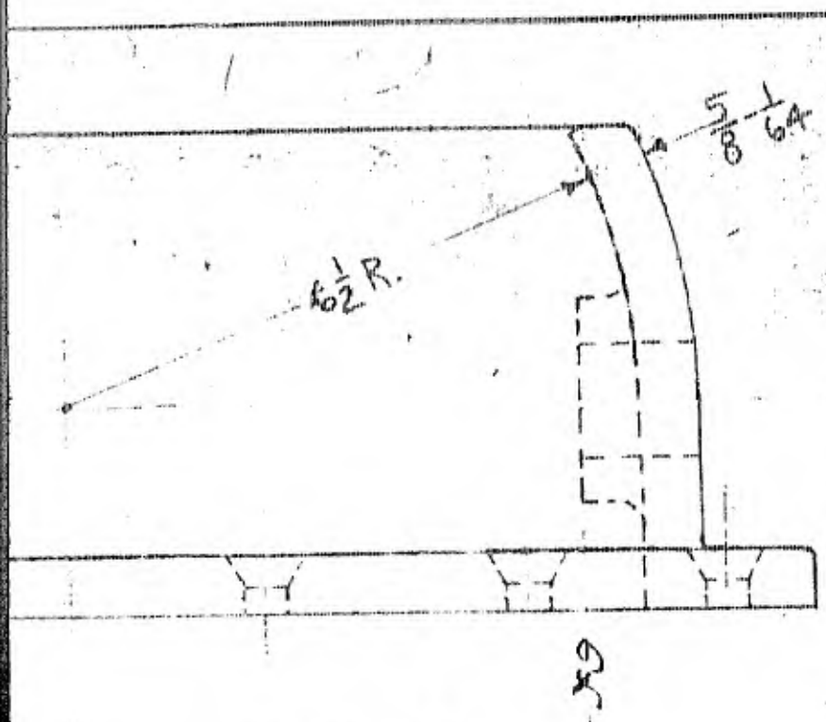
ORD. DEPT. U.S.A.

WGHT 140. LB. SCALE 1/2 C 53260

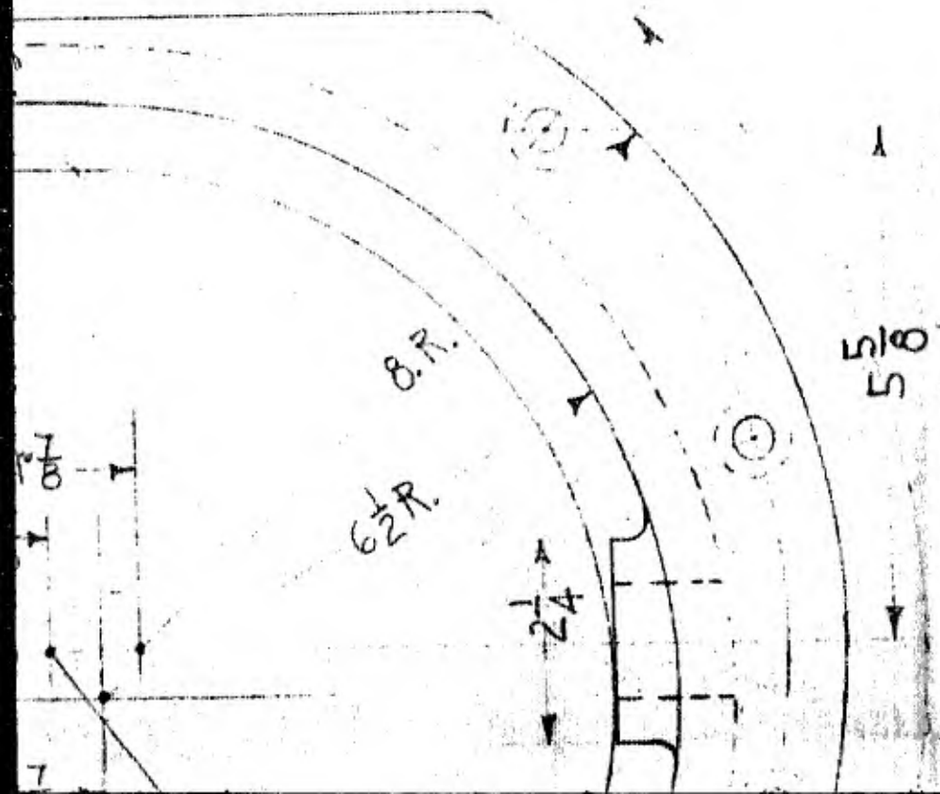
BALL MOUNT, TANK GUN

5.250-.015
3.
2.25
1.250+.001
1/64
1/2 R.


8 5/8
1/64
6 1/2 R.
9/16
7.25
14.50
7 5/16 R.
1/4 R.
1 1/8
1 7/8
7/8
7/8
1/2



14.500±.005

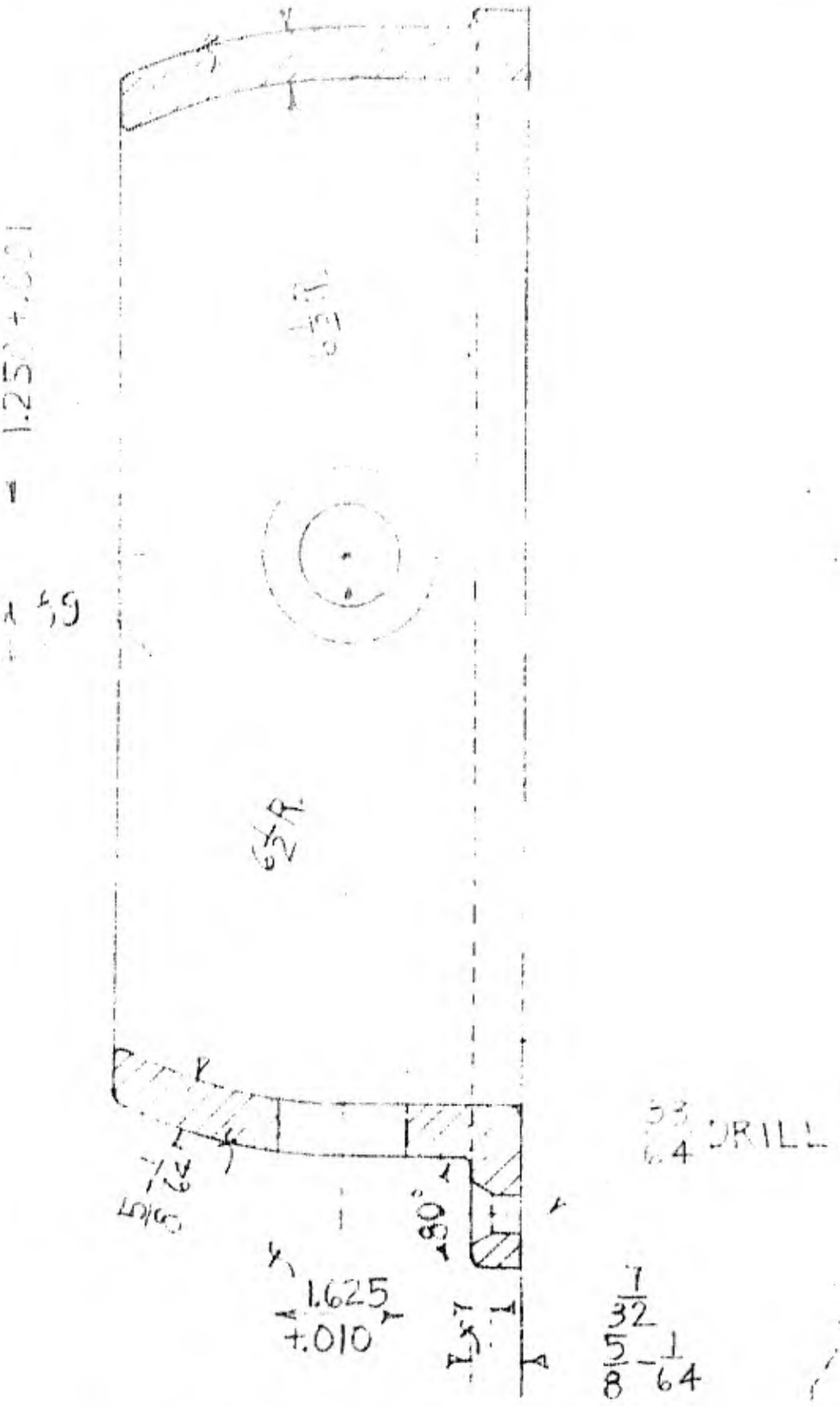


NOTE:- PATTERN M
MARKED ⅝
AND ⅛ ON

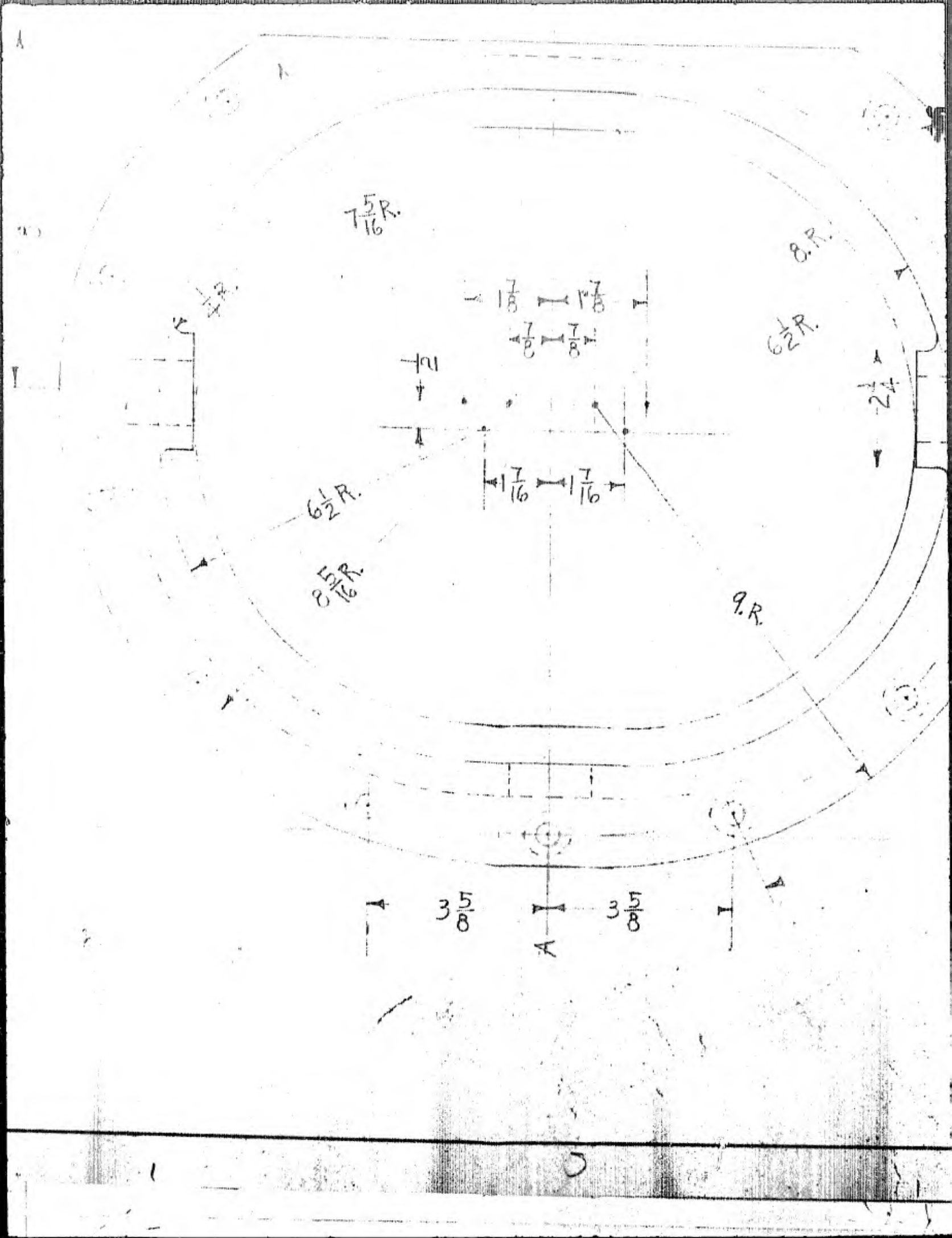
PHYSICAL PROPERTIES		JULY 10, 1935 REVISIONS			
Y.P.					
T.S.					
EL-2					
RED.					
HT.T.					
BR.					
SCL.					
C.C.					

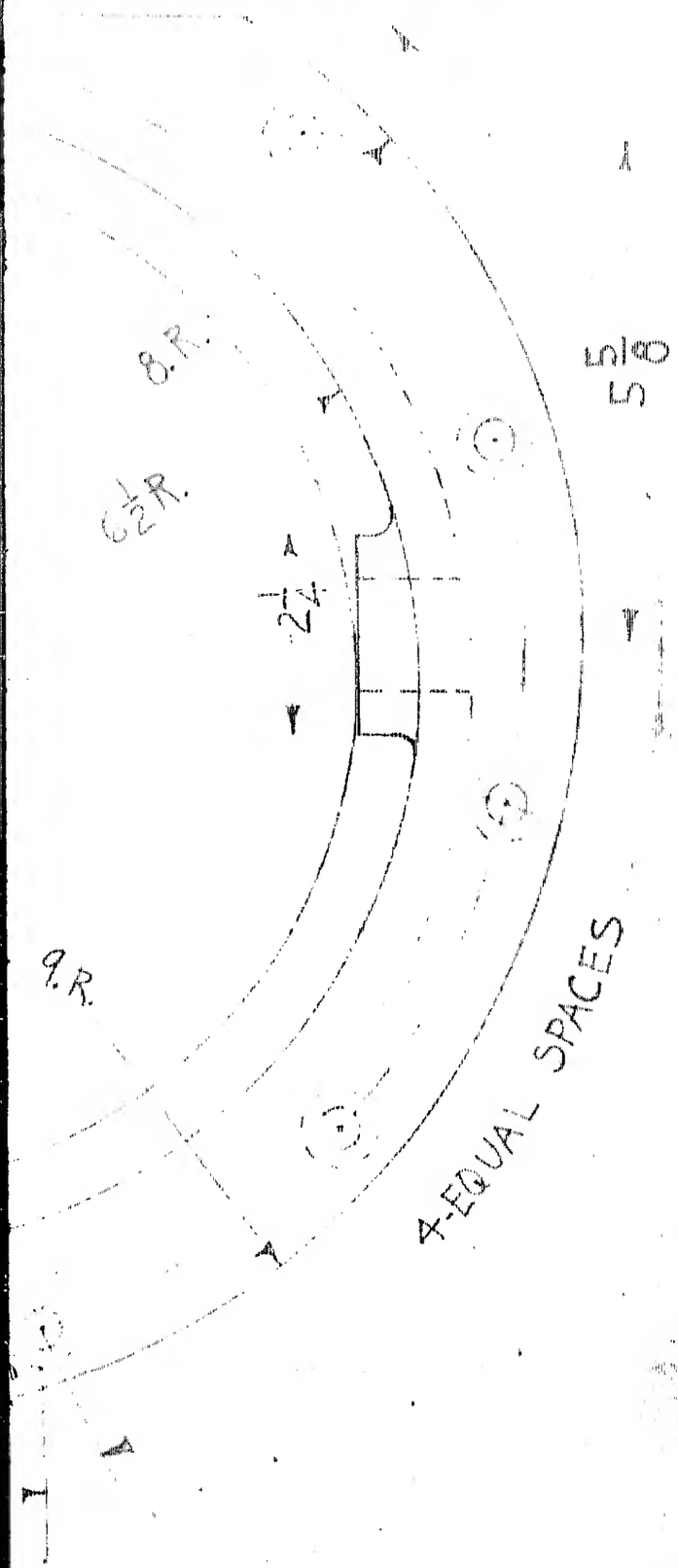
DRG. PERTAINS TO	
D26652	

NOTE:- PATTERN MAKER TO ALLOW $\frac{3}{8} \pm \frac{1}{16}$ ON ALL SURFACES MARKED ℄ & ℄9 FOR SCALING & FINISHING AND $\frac{1}{8}$ ON ALL OTHER SURFACES FOR SCALING



SECTION A-A


7 5/16 R.
8 R.
6 1/2 R.
1 7/8
1 7/8
7/8
7/8
1 7/16
1 7/16
6 1/2 R.
8 5/16 R.
9 R.
3 5/8
3 5/8



NOTE:- PATTERN MAKER TO
MARKED 5 & 9 FOR
AND 8 ON ALL OTHE

SHIELD, INNER
ARMOR. HARDENED

APPROX. CAST WEIGHT 6 LBS. SCALE ½

C 5326

BALL MOUNT, T

NOTE: PATTERN MAKER TO ALLOW $\frac{3}{8}$ ± $\frac{1}{16}$ ON ALL SURFACES MARKED ± & ±9 FOR SCALING & FINISHING AND $\frac{1}{8}$ ON ALL OTHER SURFACES FOR SCALING

SHIELD, INNER ARMOR, HARDENED C53261

SYMBOL		
D'FTSMAN G. E.	TRACER	L'D'G. D'FTSMAN M. F. H.
CHECKER JEL	CHECKER	CHIEF D'FTSMAN

SUBMITTED:-

LT. COL. ORD. DEPT. U.S.A.

APPROVED:-

ORD. DEPT. U.S.A.

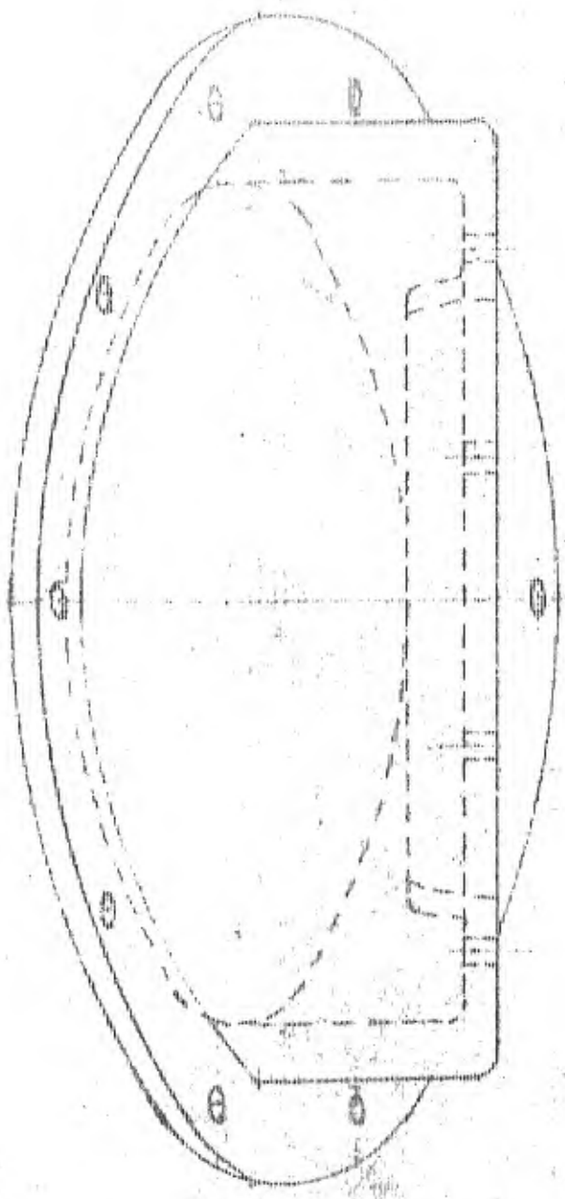
T'GRLH. SCALE $\frac{1}{2}$

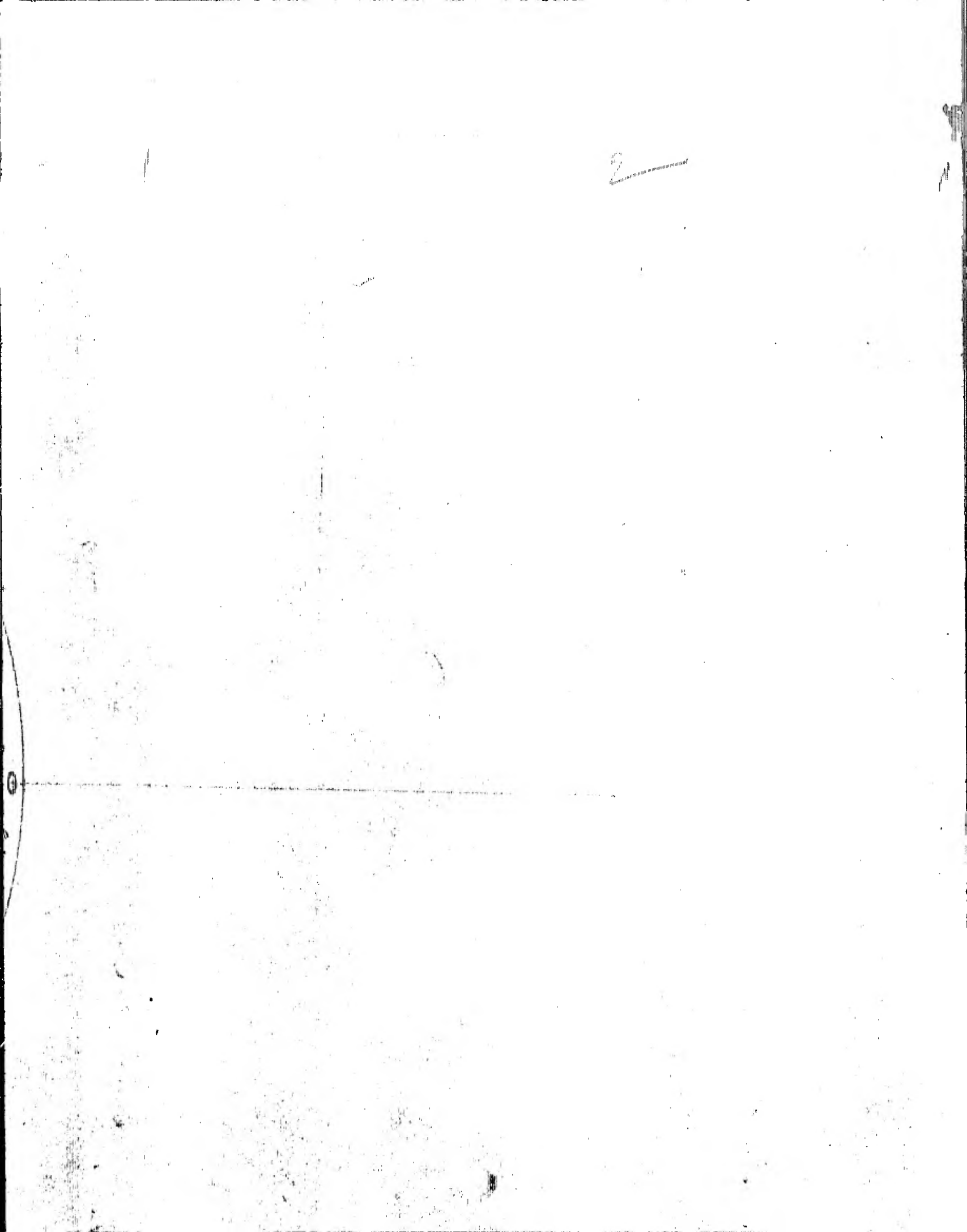
C 53261

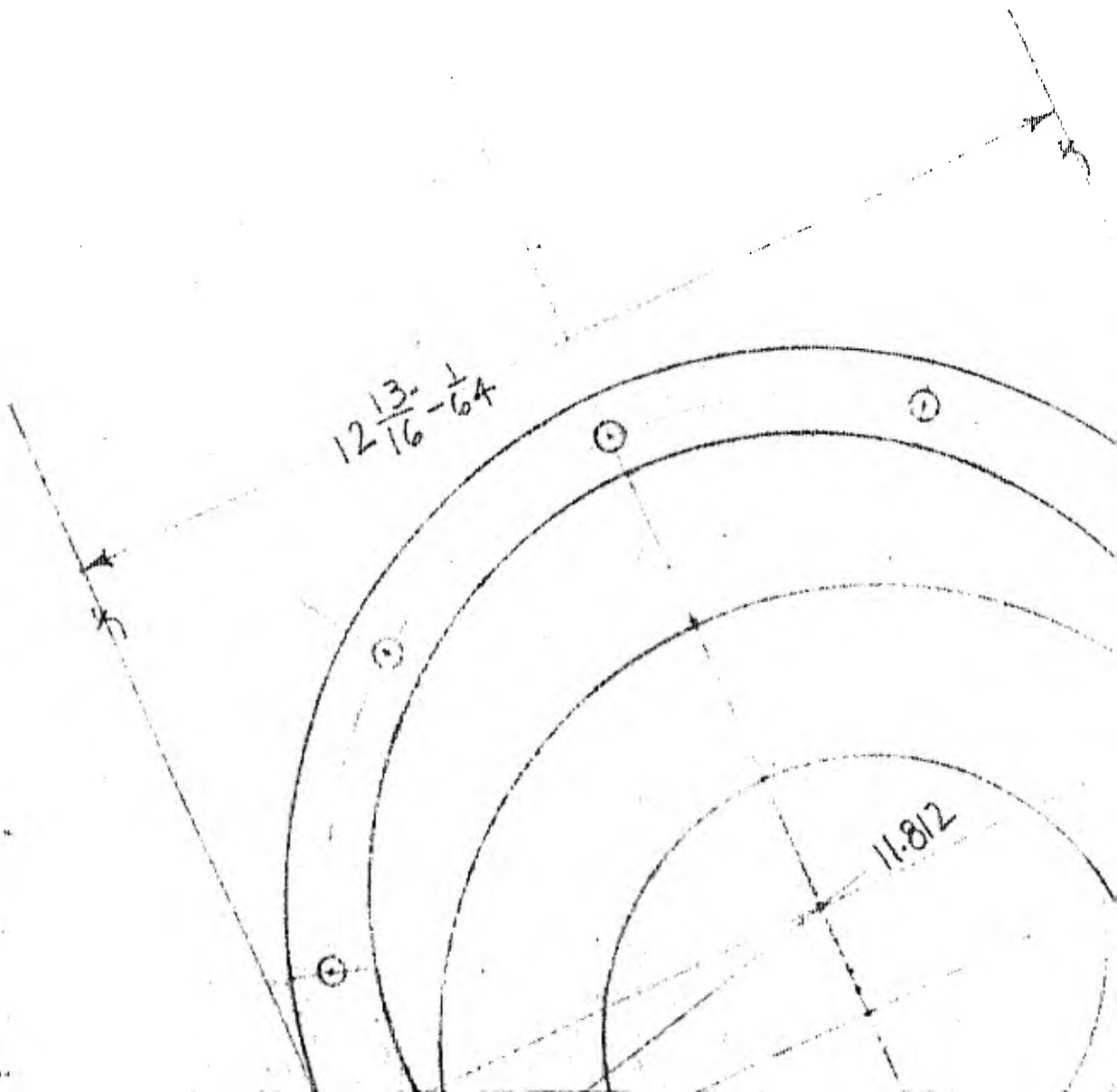
BALL MOUNT, TANK GUN

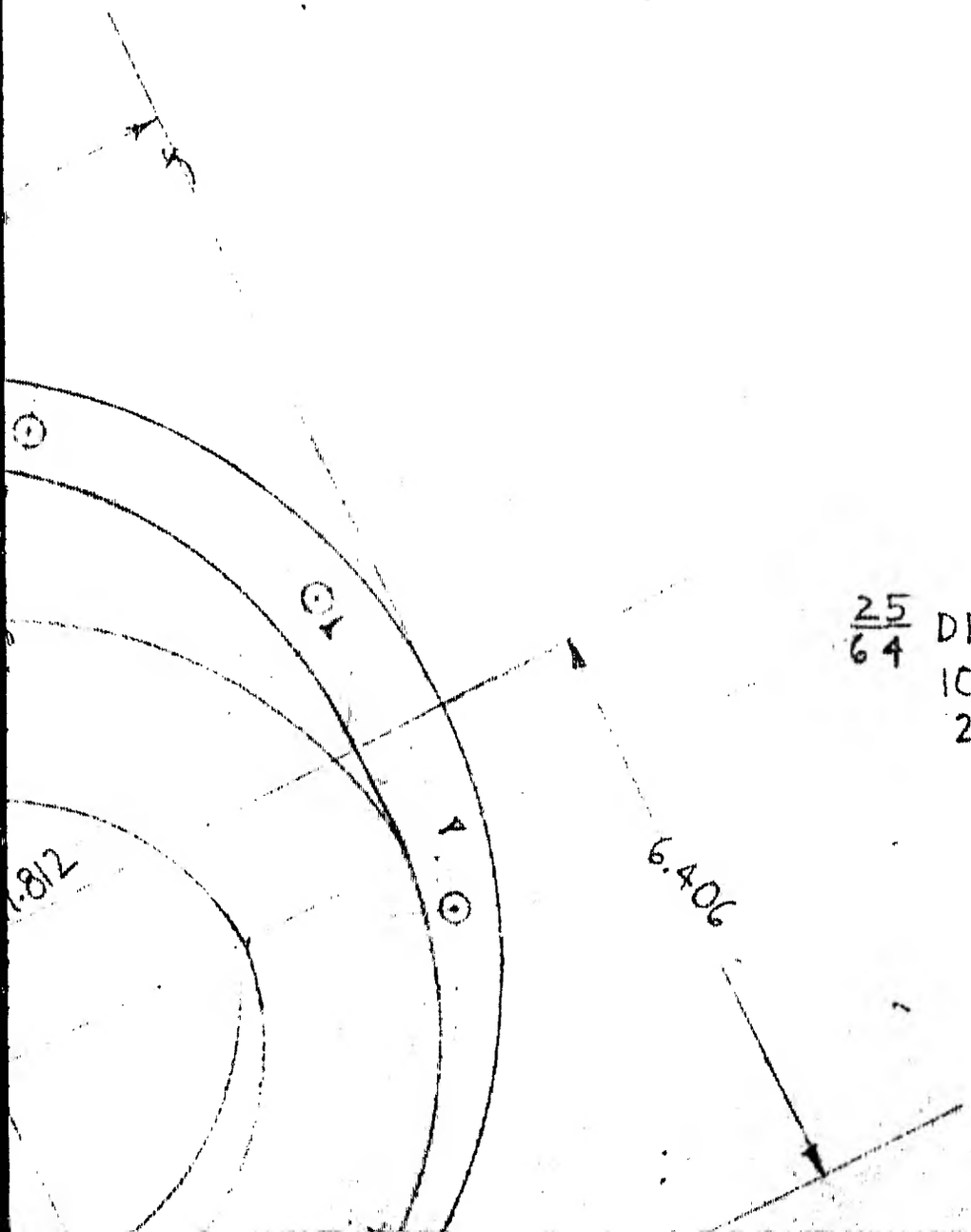
1

2





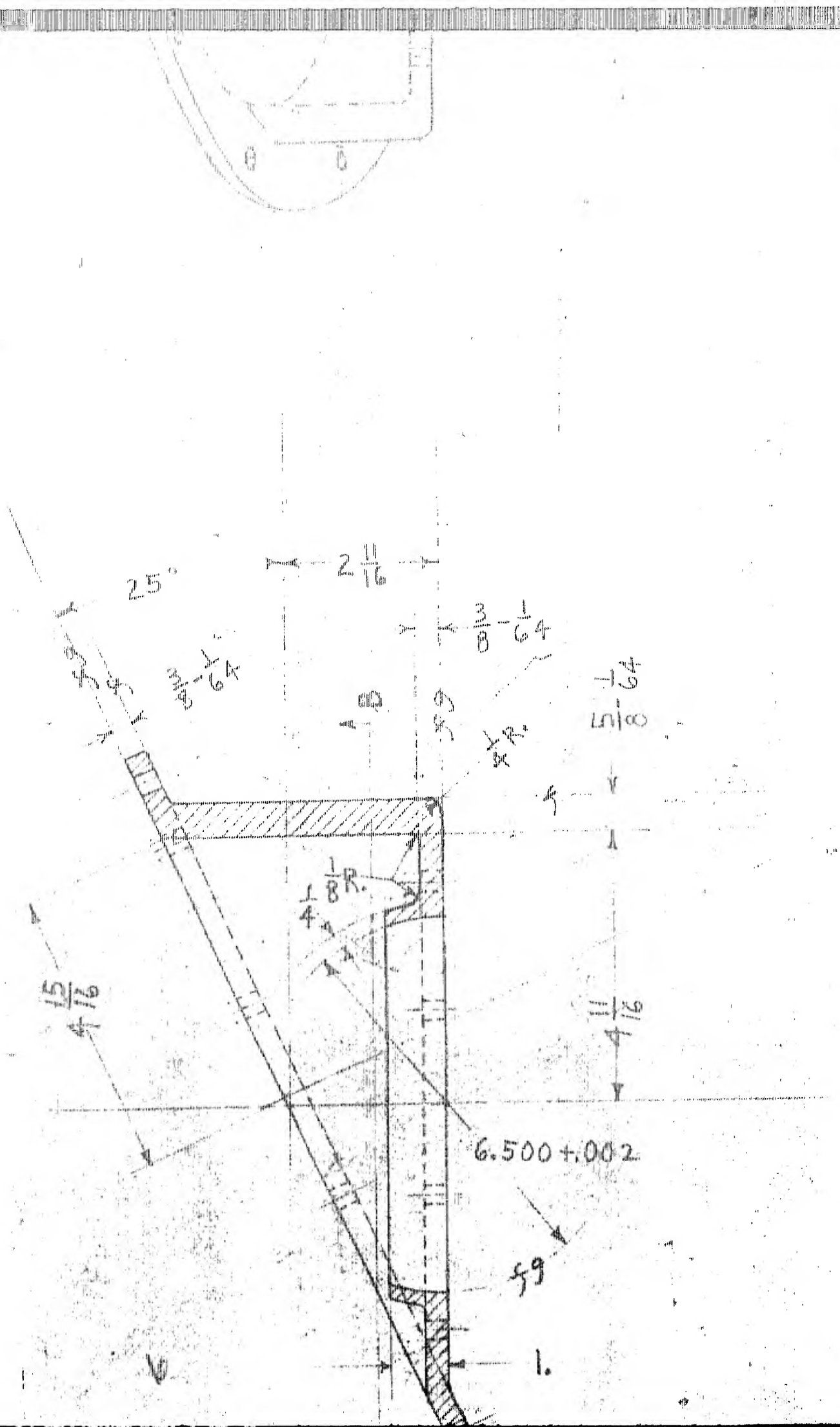

12 13/16 - 1/64
11.812



$\frac{25}{64}$ DRILL, 8 HOLES
10 EQUAL SPACES
2 HOLES OMITED

PHYSICAL PROPERTIES	
Y. P.	
T. S.	
EL. 2	
RED.	
HT. T.	
BR.	
SCL.	
C. C.	

8 HOLES
L SPACES
S GIMITED


25°
2 11/16
3/8 - 1/64
3/8 - 1/64
1/64
5/16
1/8 R.
1/4
15/16
11/16
6.500 +.002
59
1.

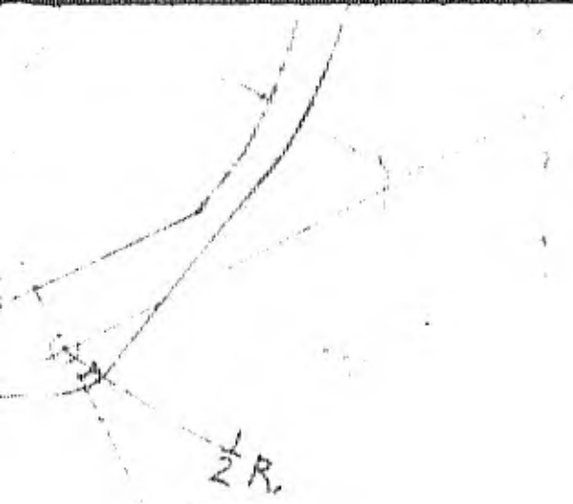
45°
22½°
4.181 R.

SECTION B-B

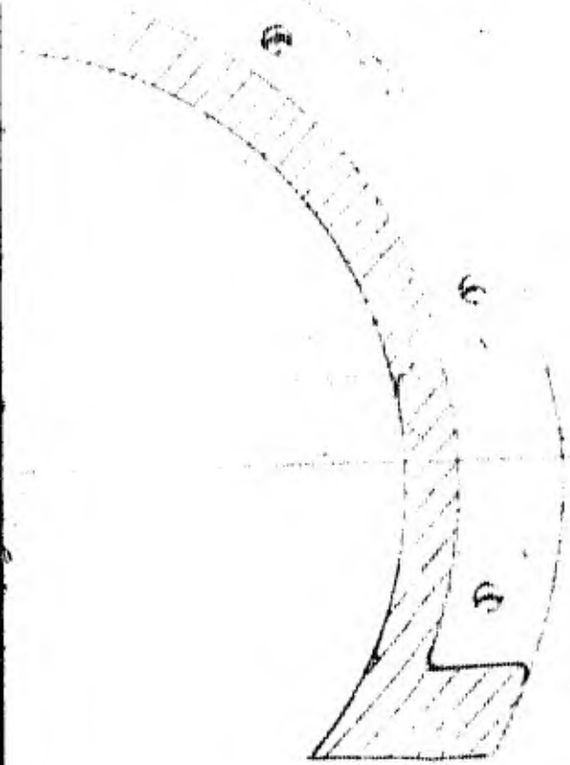
BRACKET, BALL MO
ARMOR, HARDENED

1

15



NOTE:- PATTERN MAKER TO ALLO
MARKED ± & 59 FOR 56
AND ± ON ALL OTHER S



B-B

9

ET. BALL MOUNT
OR, HARDENED

D26610

1

JULY 10,
REVIS

DRG. PE
D26630

NOTE: PATTERN MAKER TO ALLOW $\frac{5}{16} \pm \frac{1}{16}$ ON ALL SURFACES MARKED 5 & 59 FOR SCALING & FINISHING AND $\frac{1}{8}$ ON ALL OTHER SURFACES FOR SCALING

JULY 10, 1933	CLASS	DIVISION	DRAWING	FILE
REVISIONS				
	SYMBOL			
	D'FTSMAN G. L.	TRACER	L'D'G. D'FTSMAN M. F. H.	
	CHECKER J. F. C.	CHECKER	CHIEF D'FTSMAN	

SUBMITTED:-

Lt. Col. ORD. DEPT. U.S.A.

EXAMINED:-

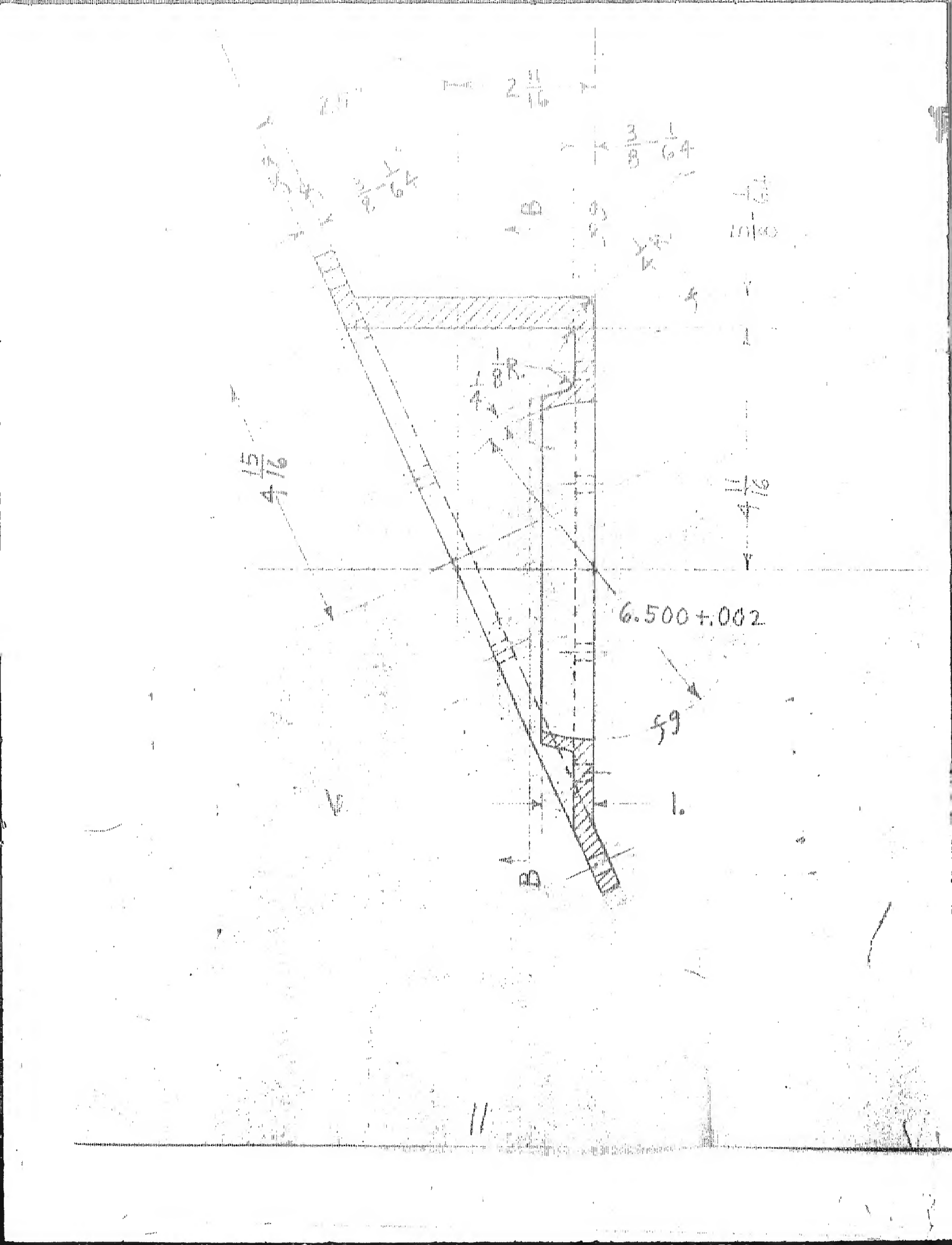
ORD. DEPT. U.S.A.

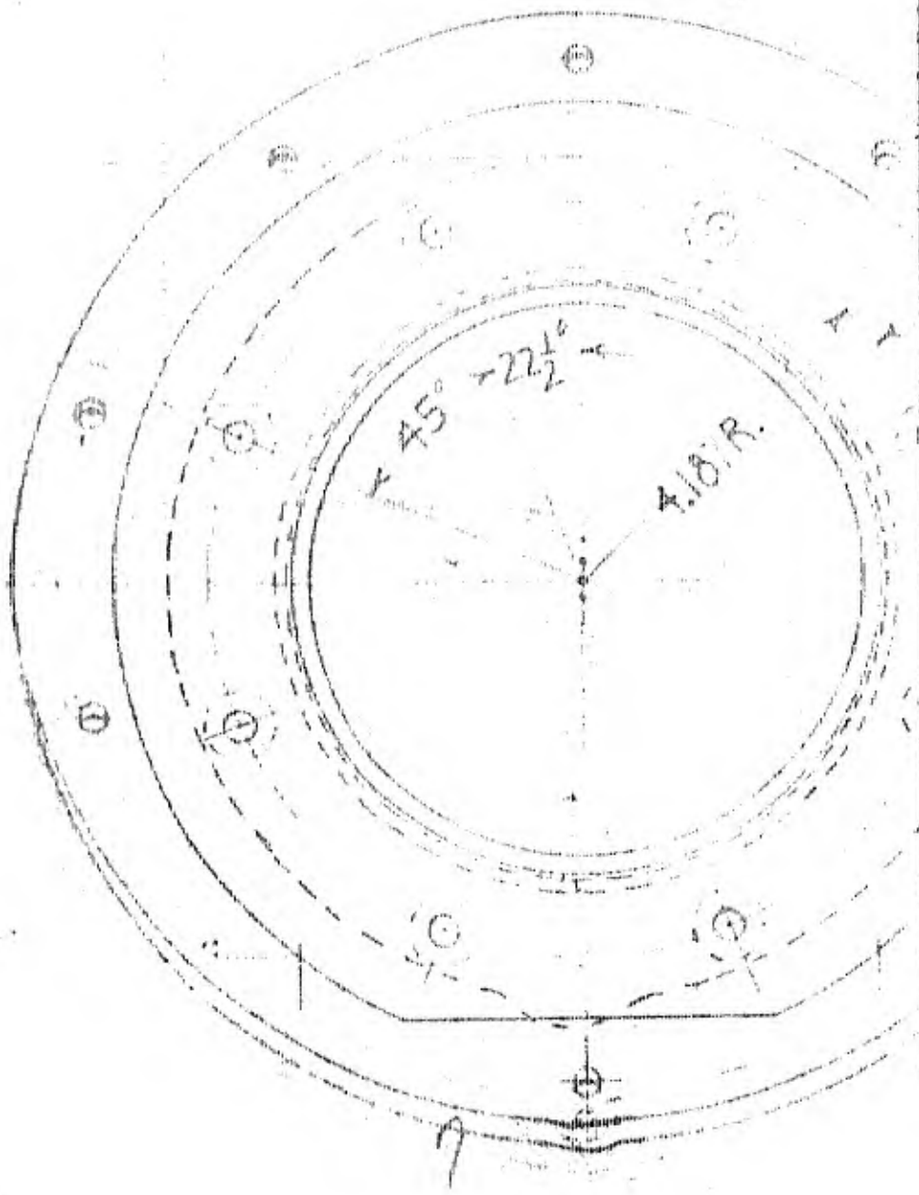
APPROVED:-

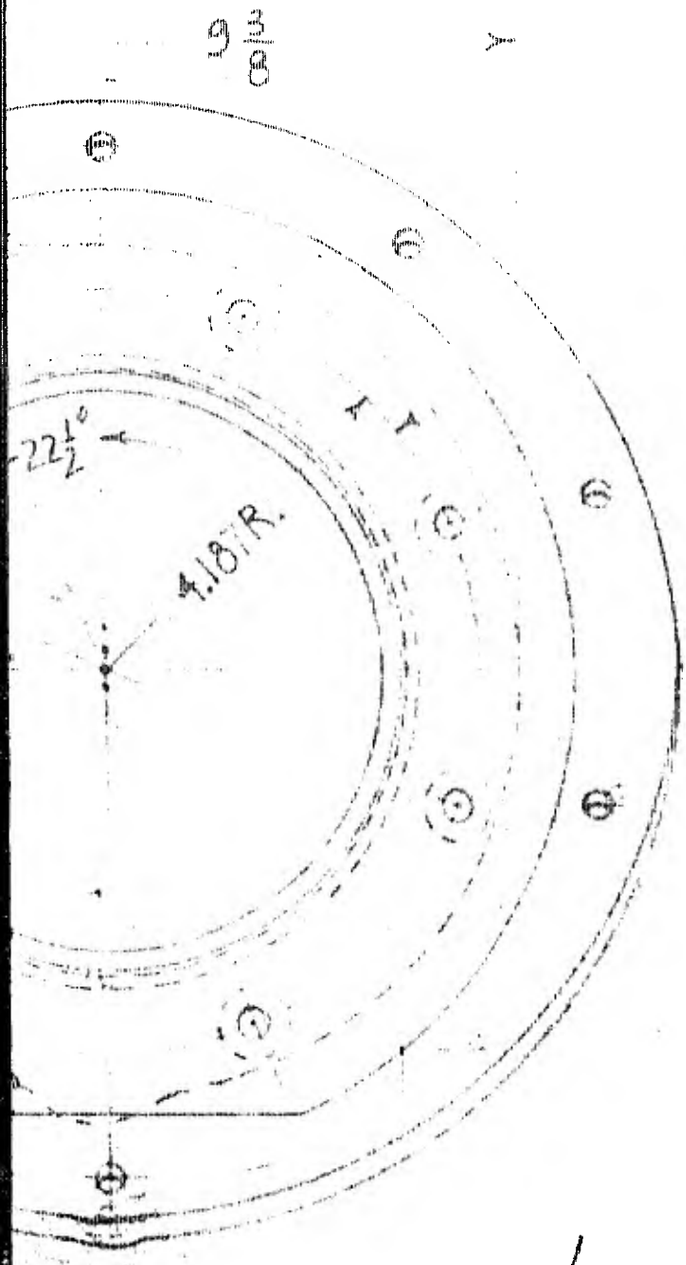
ORD. DEPT. U.S.A.

DRG. PERTAINS TO	
D26630	

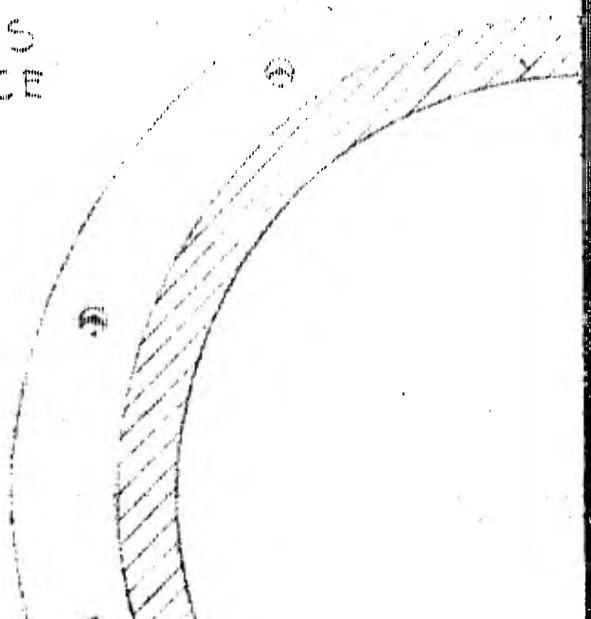
D26610


6.500±.002


45°
22½°
4.10 R.



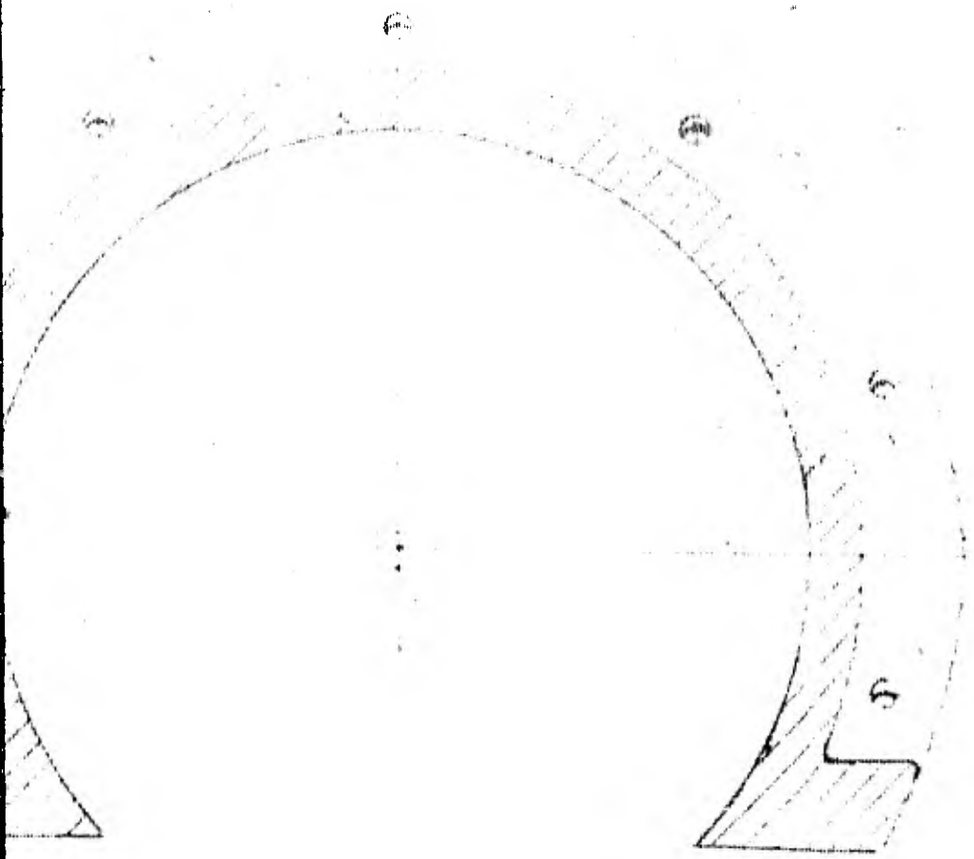
.375±.001, 8 HOLES
BORED SURFACE



SECTION

BRACKE
ARM

NOTE: PATTE
MAP
AND



SECTION B-B

BRACKET, BALL MOUNT
ARMOR, HARDENED

D26610

APPROX. WEIGHT 3 LBS. 14 OZS.

SCALE 1/2

NOTE:- PATTERN MAKER TO ALLOW 5/16 ± 1/16 ON ALL SURFACES MARKED ± & ½ FOR SCALING & FINISHING AND ½ ON ALL OTHER SURFACES FOR SCALING

JULY 10, 1933	CLASS	DIVISION	DRAWING	FILE
REVISIONS				
	SYMBOL		
	D'FTSMAN G. A.	TRACER	L'D'G. D'FTSMAN M. F. H.
	CHECKER J. F. C.	CHECKER	CHIEF D'FTSMAN

SUBMITTED:-

LT. COL. ORD. DEPT. U.S.A.

EXAMINED:-

ORD. DEPT. U.S.A.

APPROVED:-

ORD. DEPT. U.S.A.

DRG. PERTAINS TO	
D26630	

D26610 · 15

ORDNANCE OFFICE, WASHINGTON, D.C.

L/E ½