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23 October 1956

MEMORANDUM FOR: Chief,

ATTENTION :

SUBJECT : Transmittal of Balloon Information

The enclosed report is in answer to oral requests from an for information concerning the 263 P personnel balloon. No stock exists of this balloon although small quantities may be made available through TSS/ED upon approximately four weeks' notice.

Chief,  
TSS/Engineering Division

TSS/ED

Attachment: General Mills report

Distribution:

- Original and 1 - Addressee
- 1 - TSS/SBS
- 1 - ED Chrono
- ✓ 1 - 263 P file

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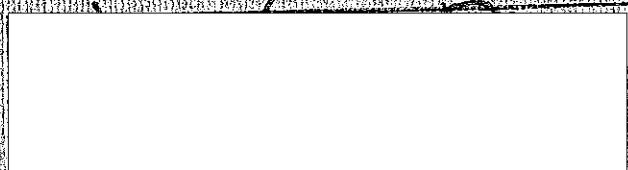
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# General Mills, Inc.

## Mechanical Division



### ENGINEERING RESEARCH & DEVELOPMENT DEPARTMENT

2003 EAST HENNEPIN AVENUE  
MINNEAPOLIS 13, MINN.

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This document consists of 5 pages and is number 3 of 13 copies, series A, and the following attachments. *appendix 3 photos*

263P TECHNICAL REPORT

Contract No. Nonr 875(00)  
Annex IV

PREPARED FOR  
THE OFFICE OF NAVAL RESEARCH  
WASHINGTON, D. C.

Prepared by: J. C. Warren

Date: 30 September 1954

Report No. 1332

GENERAL MILLS, INC.  
Mechanical Division  
ENGINEERING RESEARCH AND DEVELOPMENT  
2003 E. Hennepin Ave.  
Minneapolis 13, Minn.

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APPENDIX

Time/Altitude Flight 1140

Trajectory Flight 1140

Gross Load vs. Altitude 263P

263P Drawings

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A personnel-carrying balloon with a volume of 8000 cubic feet was designed according to "Natural Shape" specifications. The design was subjected to a hangar test on 17 February 1954 and was flown successfully on 6 May 1954. This report will cover both experiments.

I. INTRODUCTION

A study of the sphere cone envelopes previously used resulted in the finding of both horizontal and vertical stress concentrations in the envelopes. In the "Natural Shape" balloon, circumferential stresses are eliminated. This concept motivated the redesign of personnel-carrying balloons.

II. THE NEW DESIGNA. Theory of the Natural Shape

Since balloons can be manufactured in any desired shape of closed surface, it is clear that there is a most desired shape.

The principal consideration was stresses, the consequent strain and the relationship between surface area and volume contained. Stresses on the surface area arise from (1) supporting the payload and (2) gas pressure. Those stresses which have a direction which is tangent to the surface and which lie in a vertical plane are called meridional stresses. Tests have shown that the meridional stresses are transferred from the tapes onto the surface area uniformly.

Curvature in a stresses surface produces an inward force per unit area. In a balloon, this force is opposed by the difference in pressure of gas inside and outside. If the inward force created by the meridional stress is nullified everywhere by the gas pressure, the balloon is said to have a "Natural Shape" and has zero circumferential tension.

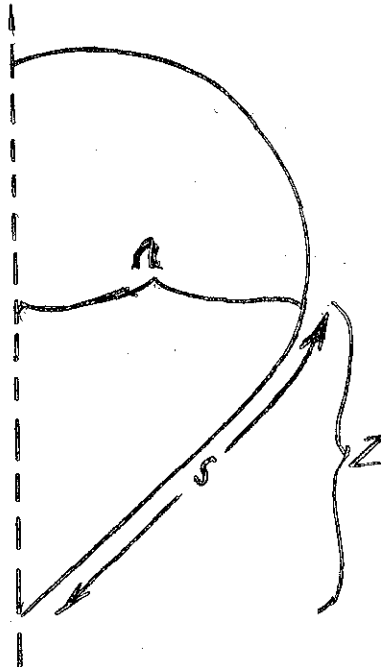
These ideas were conceived and reduced to practice by General Mills, Inc. under Air Force sponsorship in 1951. Since then, much of the work done on balloon design has been implemented by the University of Minnesota Balloon Physics Group development of design nomographs from use of the analog computer.

Each shape is characterized by a value of the "balloon fabric parameter  $\Sigma$ ", where  $\Sigma$  is a dimensionless parameter that enters the differential equations when the effect of finite fabric weight is taken into account. The method of obtaining the shapes from the differential equations is as follows:

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Nine different values of  $\Sigma$  were chosen, and for each value the differential equations were solved using the analog computer. These nine shapes were then normalized to give the shape coordinates T, Z, S for balloons of unit gore length, where r and Z give the profile of the balloon and S is the distance of a point on the profile from the bottom apex (measured up along the gore).



Since the  $\Sigma$  value is a ratio of the gross load to balloon weight, the design becomes unique for each case. The following design is based on a maximum load and provides ample material for the envelope to assume its natural shape.

#### B. Selection of Proper Shape

1. Each shape is characterized by a value of  $\Sigma$ , where  $\Sigma = 0$  corresponds to the so-called "weightless natural shape", and larger corresponding to the more oblate shape with heavier fabric weight. The proper value of  $\Sigma$  is uniquely determined by the following quantities.

V = Volume

L = Payload suspended from bottom apex.

W = Weight of fabric material per unit area.

$$= .344 \frac{W}{L} \left[ 1 + \frac{W}{L} \right]^{3/2}$$

$$= .028$$

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Using the University of Minnesota nomograph, curve #2 was selected where  $\Sigma = .05$ . This  $\Sigma$  value produces an envelope profile as shown in Figure

Note: The nine different values of  $\Sigma$  chosen were from zero to .40 in .05 increments. Since the optimum value (.028) lies between curve for 0 and .05, .05 was selected. This means there is slightly more material than needed for the envelope to assume its natural shape with existing loads.

2. Tailoring of the shape selection consisted of the following.

a. The gore layout was modified at stations #19 and #29 so that the profile would be symmetrical.

b. To provide for a two point suspension at the bottom apex of the balloon, two gores were tailored in the following manner. A line was drawn from a point, corresponding to the desired width at the base of the balloon, tangent to the gore. The resulting pattern provided the necessary width at the balloon base and precluded the inclusion of separate wedge gores. This device in no way affected the balloon diameter, and the minimum addition had only a negligible effect on the volume of the balloon.

### III. THE HANGAR TEST

1. Objectives

A balloon was fabricated on the basis of the foregoing specifications and hangar-tested on 17 February 1954. Objectives of the test were as follows:

- a. Test the new design.
- b. Determine effects of tailored gores to provide a two point suspension.
- c. Measure Ml plastic value capacity in a stable atmosphere.
- d. Confirm the design volume.

2. Details of Testing

The following pictures show the balloon at 200 pounds of lift, 400 pounds of lift and when full at 517 pounds of lift.

At full inflation the system was lifted off the ground and thrown down again several times sending shock waves up and down the fabric and creating a whipping action.

Two tests of the value, one for one minute and the other for five minutes, were made.

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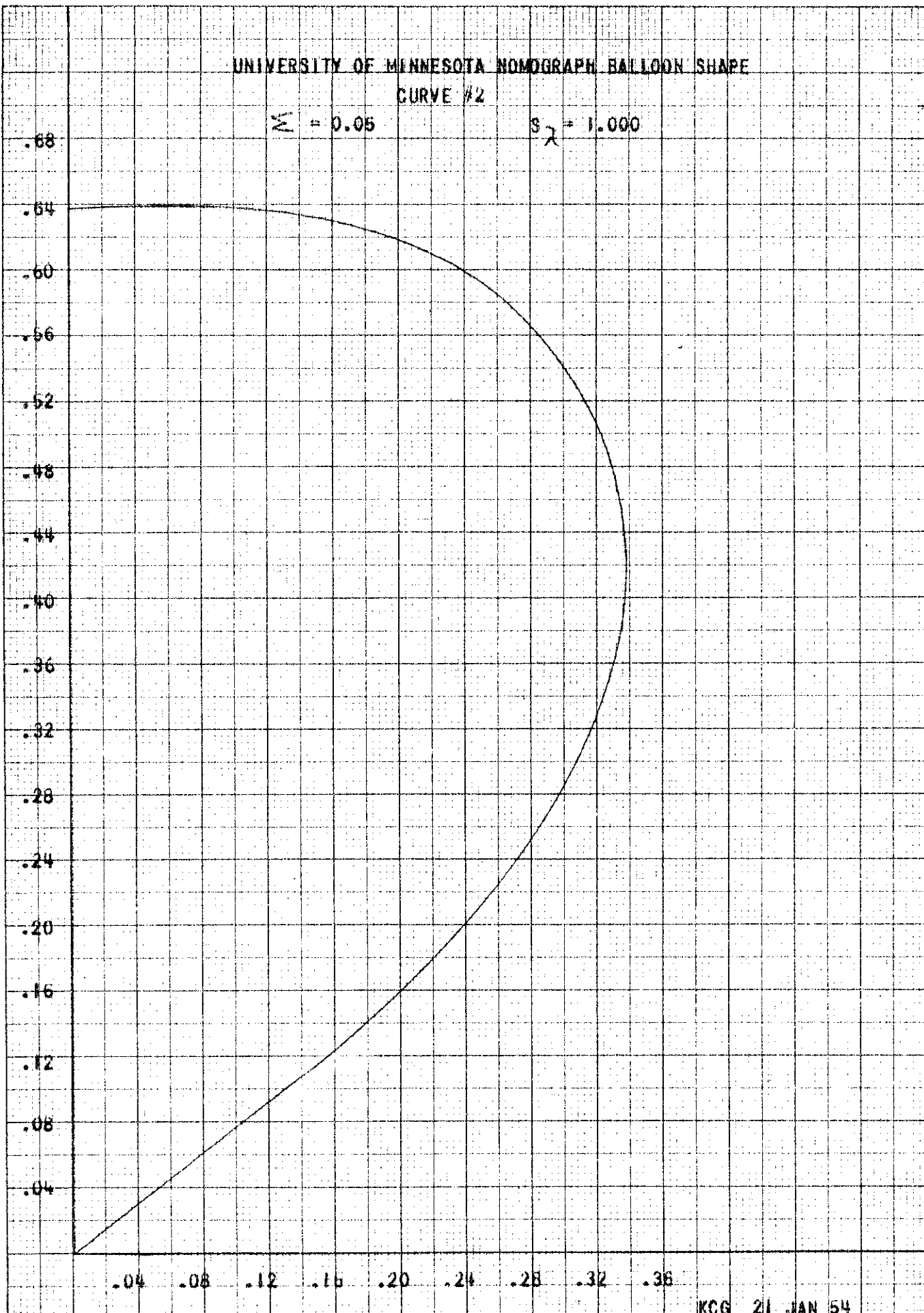
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UNIVERSITY OF MINNESOTA NOMOGRAPH BALLOON SHAPE

CURVE #2

$M = 0.05$

$S_{\lambda} = 1.000$

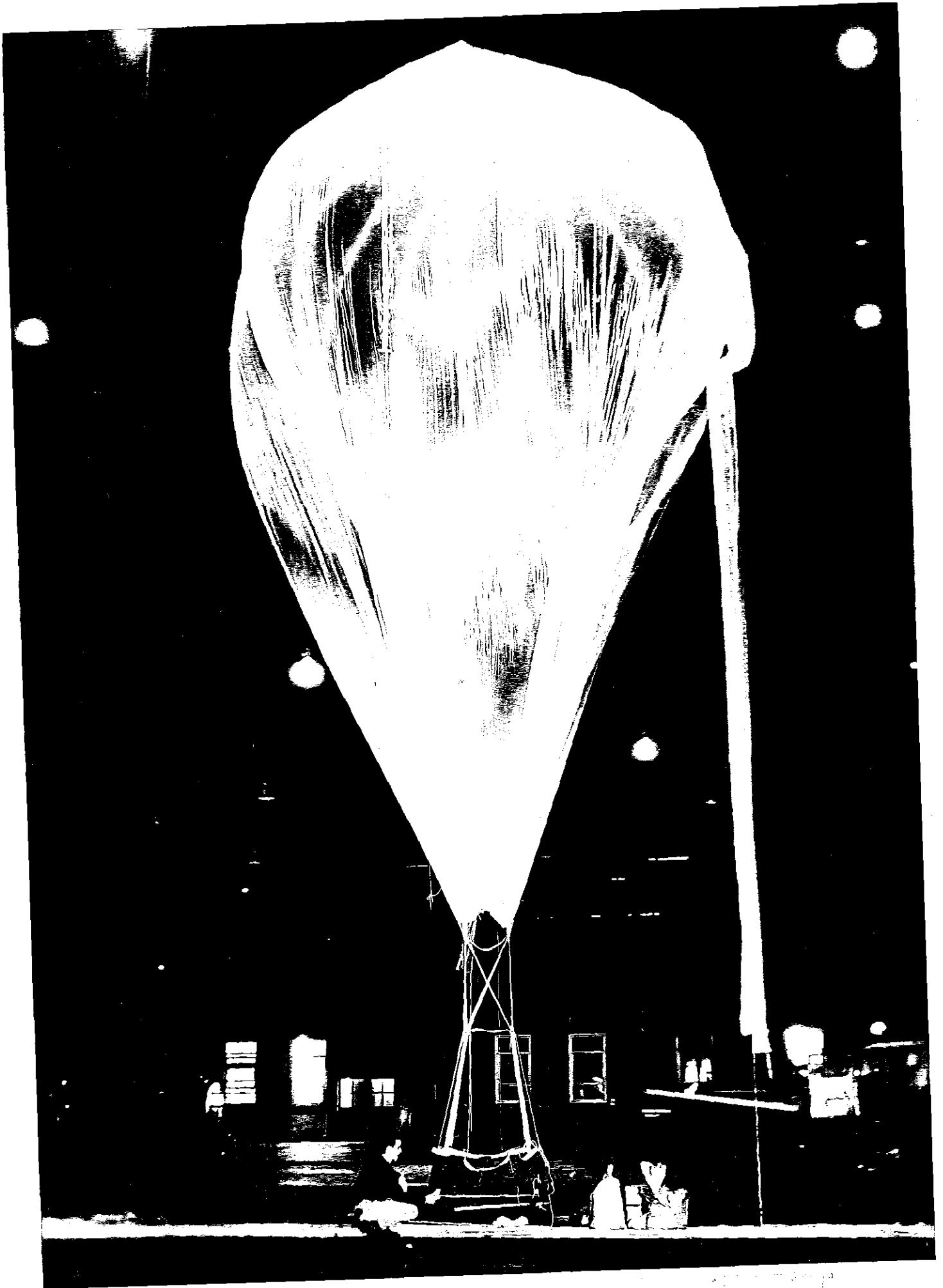


K&E 10 X 10 TO THE 1/2 INCH KEUFFEL & ESSER CO. MADE IN U.S.A. 359-11

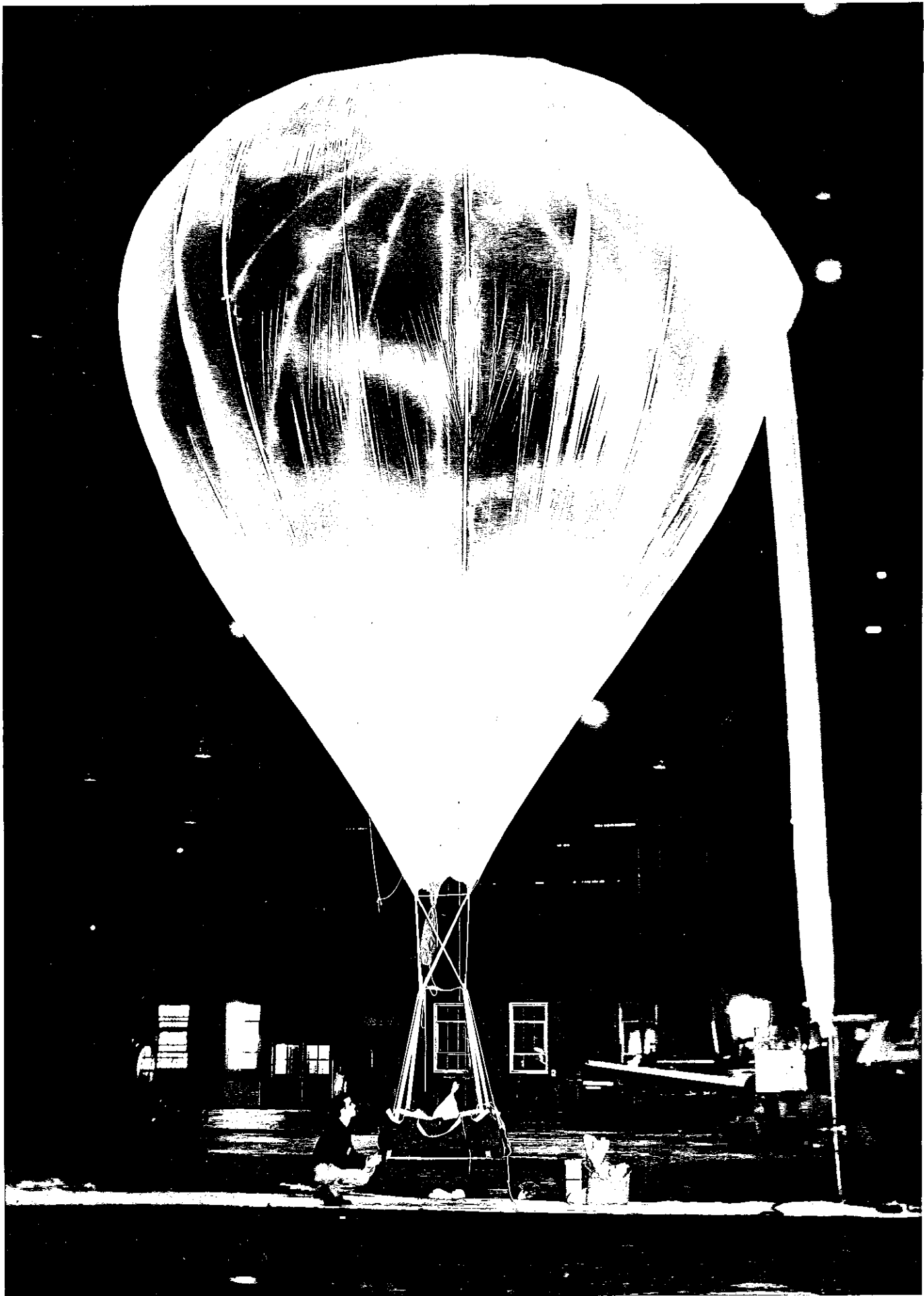
KCG 21 JAN 54

1 150 9 11 OCT 1 1954

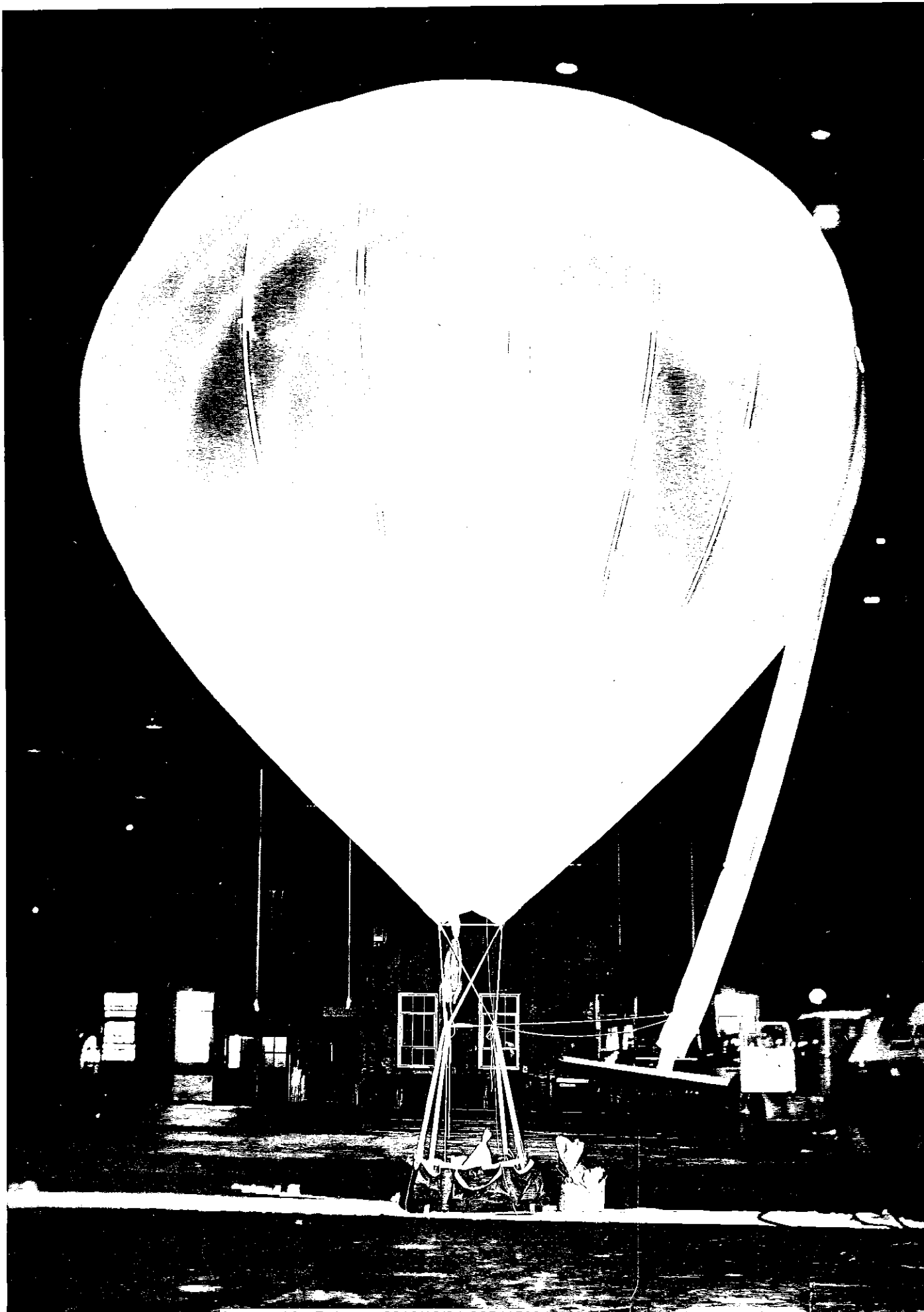




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### 3. Conclusions and Recommendations

- a. Generally, the new design proved very efficient, remaining undamaged under conditions more severe than those expected in flight.
- b. It was decided to apply tapes to the wedge gore. This will provide symmetry to load-bearing members on the balloon.
- c. The MI plastic value loss of lift in pounds per minute was consistent in both testing periods at 14 lbs./min.
- d. The gross load of 517 pounds, using helium as the lifting gas, confirmed the design volume at 7900 cubic feet.

## IV. THE FLIGHT TEST

### 1. Objectives

A manned balloon flight, GMI #1140, was made on 6 May 1954. Objectives of the flight were as follows:

- a. To flight-test the new 263P balloon.
- b. To determine the flight capabilities of the 263P balloon.
- c. To approve the 263P balloon for production.
- d. To test the hydroneal generator.

### 2. Details of Testing

The inflation and launching was accomplished without any real difficulty except that it was not possible to meet the time schedule because of difficulties with the hydroneal generator. Surface winds remained less than 5 MPH during most of the period which simplified handling the balloon over the three and one-half hour inflation period.

Take-off was made at 0750 with the balloon rising at 400 F.P.M. to its ceiling of 5000 feet. The flight was characterized by the instability that was evidenced shortly after the balloon had reached its ceiling. The pilot was kept busy riding out the series of up and down drafts. A total ballast of 29 pounds was required to keep the system in a safe altitude range. Total valving time for the four hour duration was only 1 1/4 minutes with the major portion of this being required for landing. Indicative of the instability was the pilot's notation at 1130. "Small brown leaf observed in air near balloon - altitude 3200 feet". The first attempt at a landing resulted in the balloon being caught in a downdraft over a wooded area. The balloon descended into tree tops approximately 10 feet above the base of the balloon. Numerous tears in the balloon were observed. The balloon then rose above the tree and was valved to landing a few minutes later.

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3. Conclusions and Recommendations

a. The 263P balloon withstood a severe test flight and performed excellently under existing conditions.

b. The 263P, as designed, is an acceptable item and ready for production.

c. The hydroneal generator did not produce the 4000 CFH as indicated but gave 3000 CFH, prolonging inflation over 1 1/2 hours.

d. That the hydroneal gas has a distinct ammonia odor was evidenced by the pilot in flight and the crew members during inflation.

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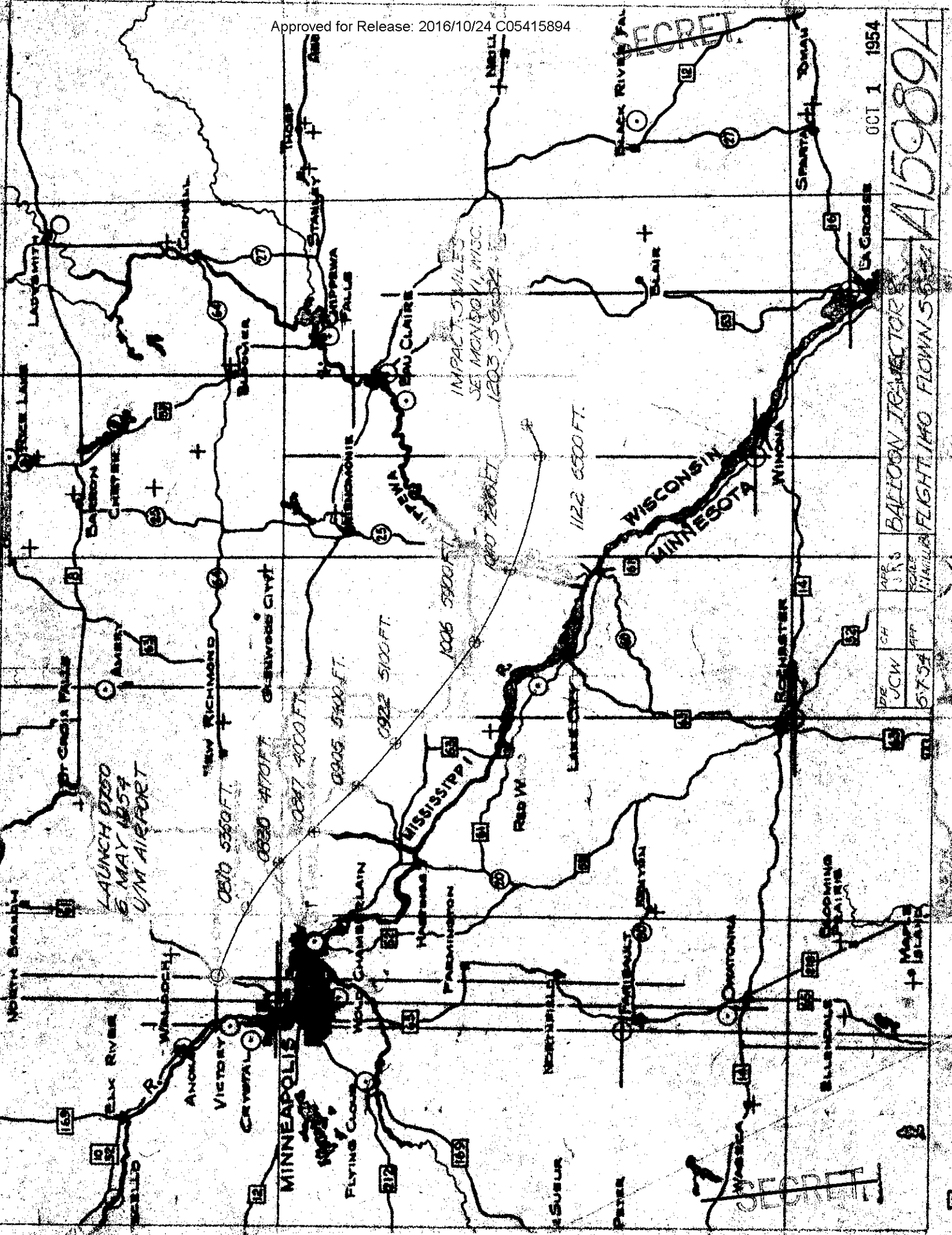
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**APPENDIX**

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OCT 1 1954

15989A

BALLOON TRAJECTOR

FLIGHT INFO FLOWNS

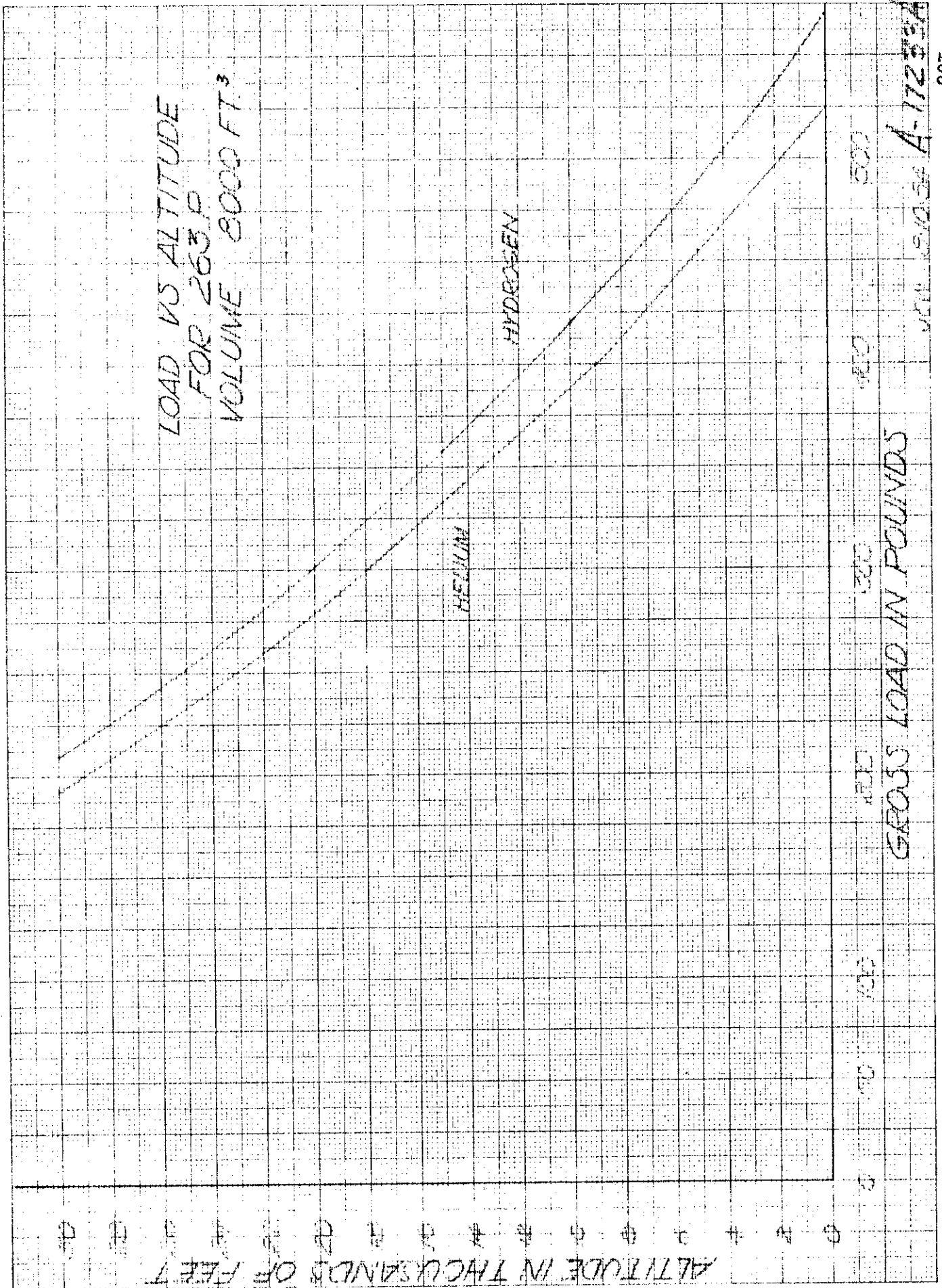
DR	JCW	CH	APP	SR	SCALE
0754					MINNAPOLIS

SECRET

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OCT 1 1954

K&E 10 X 10 TO THE CM. 359-14 KEUFFEL & ESSER CO. MADE IN U.S.A.



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## 263P DRAWINGS

A-15352-B	Inflation Tube and Duct
A-15351-B	Duct Installation
A-15394-B	Reefing Sleeve
A-15350-B	Duct Attachment
A-16596-B	Gore Pattern
A-16749-B	Location of Wedge Gore Tapes
A-16621-C	Valve and Rip Panel Installation
A-17232-C	263P Assembly
A-30004-A	Rip Panel Bolt
A-30005-A	Rip Panel Nut
A-30006-A	Rip Panel Gasket
A-11877-A	Suspension Harness
A-30704-B	Fibre Bushing Installation
A-11876-B	Attachment Pad
A-30708-B	Balloon Base
A-12072-B	Seal thru Balloon Base
A-16883-A	One Way Clip
A-16619-B	Device for Securing Duct
A-16618-C	Rip Device for Balloon Base

## Valve Drawings

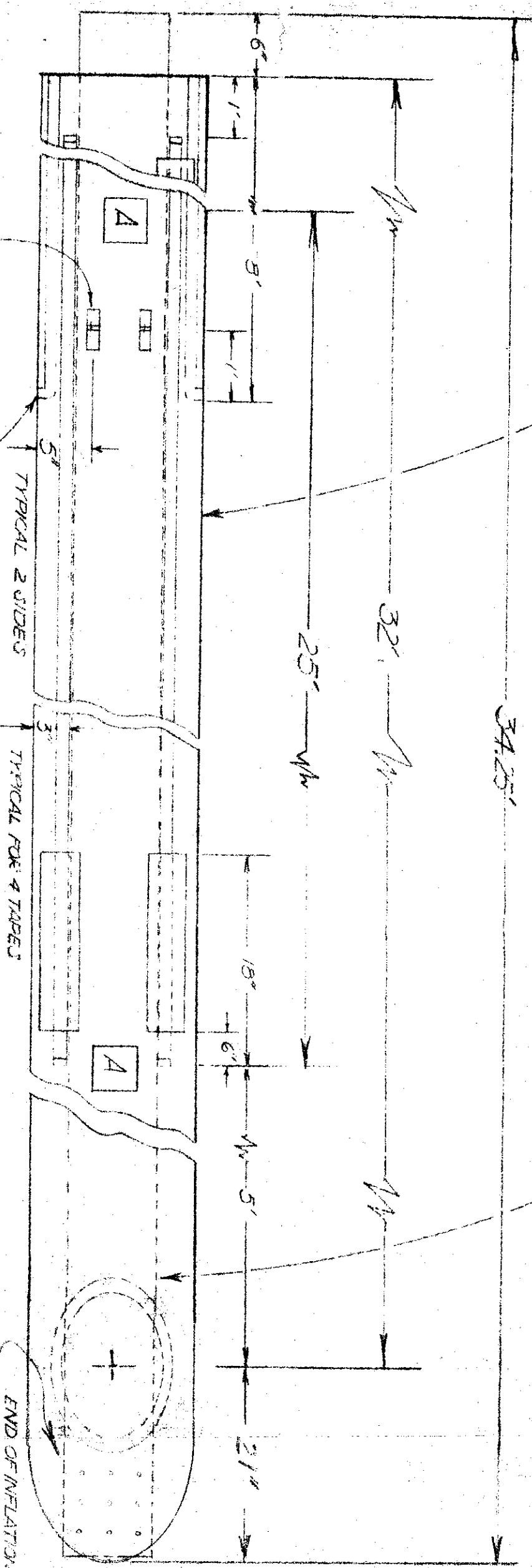
A-16525-A	Valve Spring
A-16524-A	Stud
A-16523-B	V Seat Mtg. Disk
A-16553-B	Valve Seat
A-16521-C	Valve Plate
A-16554-C	Valve Screen
A-16552-C	Valve Gasket
A-16551-C	Valve Ring
A-16555-C	Valve Assembly

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REVISED

OUTER DUCT SHALL BE 23 FEET OF 20.6" LAYFLAT 2 1/2 MIL WHITE POLYETHYLENE TUBING

INNER DUCT SHALL BE 23 FEET OF 9" LAYFLAT 2 1/2 MIL WHITE POLYETHYLENE TUBING



2 GROMMETS ATTACHED AS SHOWN ON BALLOON SIDE OF DUCT 10 FEET OF 100" TEST LINE (NOT SHOWN) SHALL BE TIED TO EACH GROMMET

GLASS FIBRE EMBEDDED POLYETHYLENE TAPE HEAT SEALED ON INSIDE OF DUCT. CONTINUOUS STRANDS UP AND DOWN

SHALL TUBE HEAT SEALED DOWN CENTERLINE (ON BALLOON SIDE OF DUCT) WITH VERTRONIDE SEALER TO LARGE TUBE EVERY 10" FOR 10" OVER THE 37" AREA ABOVE 4" POLYETHYLENE TAPE PLACED OVER ENDS OF SEAL 2 PLACES DENOTED BY 'A'

SEE DETAIL A45350-E FOR ATTACHMENT TO BALLOON

NOTE: NO ROLL HEAT SEAL ON DUCT EXCEPT FOR SEALING FIBRE EMBEDDED TAPE

END OF INFLATION TUBE HEAT SEALED. 18 5/8" HOLES IN LAST 12 INCHES

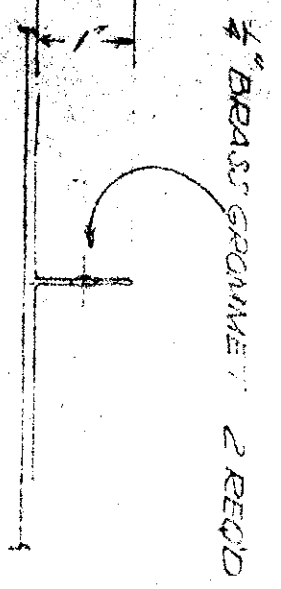
DUCT MATERIAL

HEAT SEAL OR CREASE

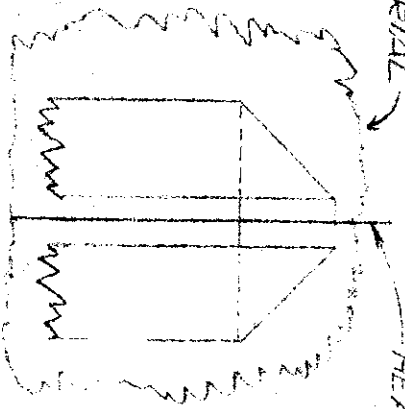
DETAIL OF TAPE ENDS TYPICAL 3 PLACES

DETAIL ON A 30704 B

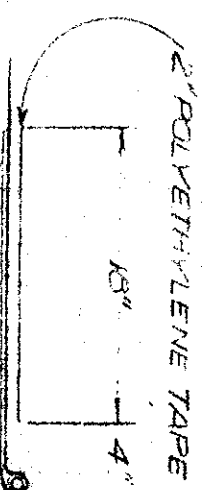
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ONE HALF" SIZE



ONE HALF" SIZE



900 TAPE BROUGHT BACK 10" ADHESIVE TO ADHESIVE

FIBRE BUSHING AND TAPE LOOP

001 1 1952

REVISIONS

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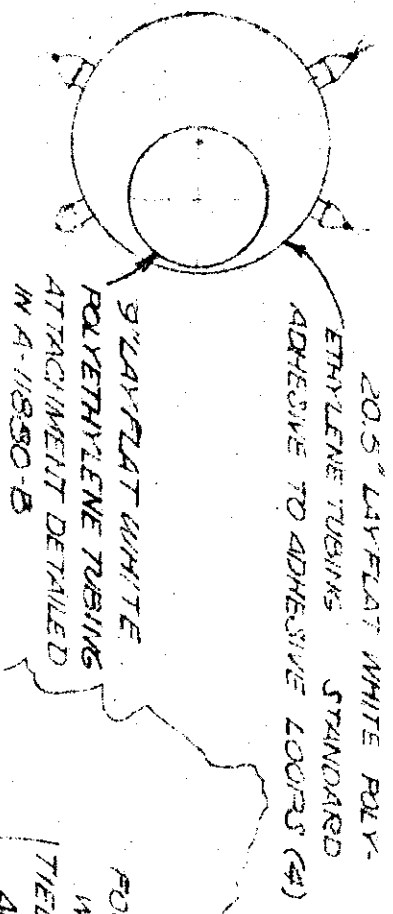
DATE	BY	APP	REV
2/26/54	HEP		1

INFLATION TUBE & DUCT

A-153522B

415551B

SECTION A-A



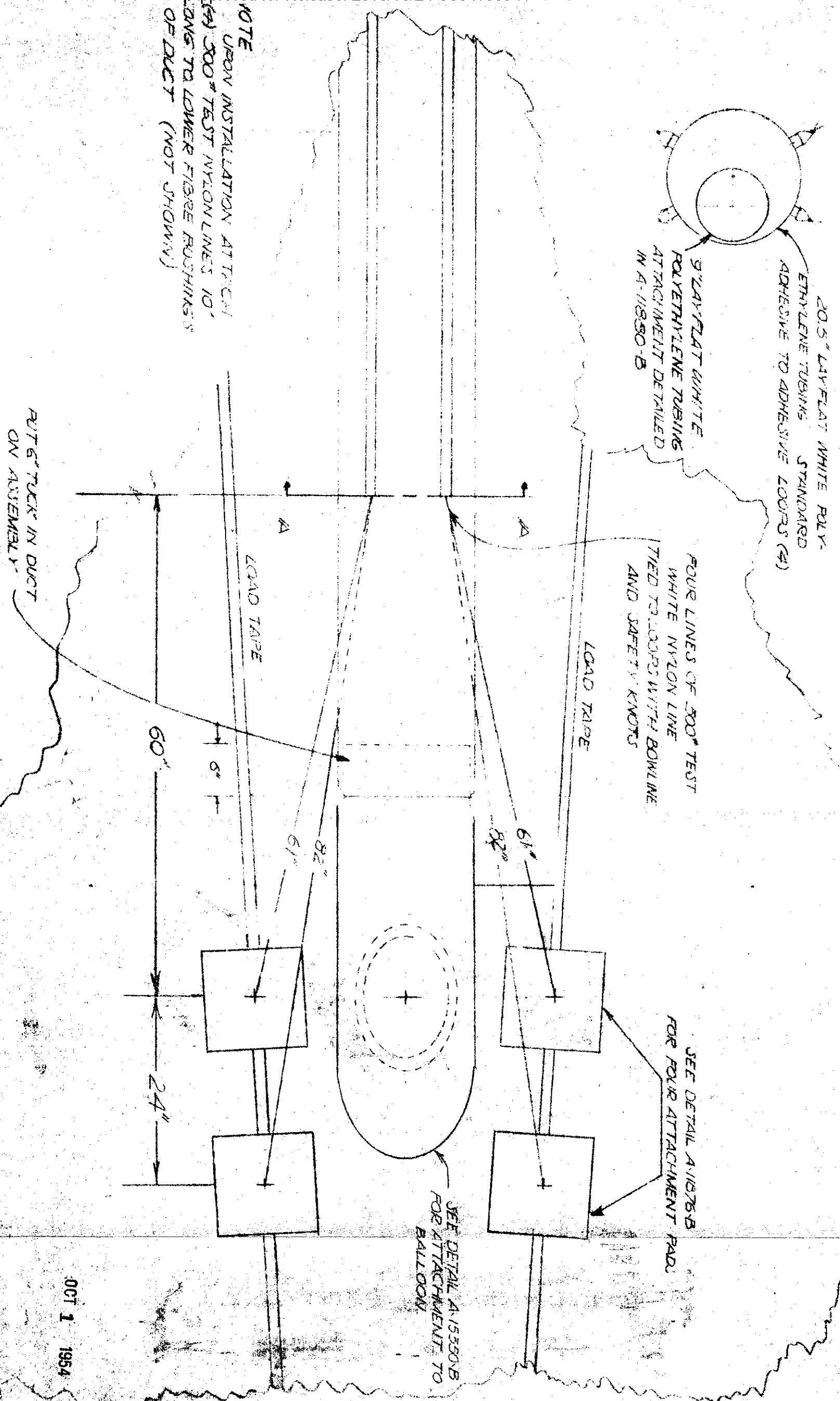
FOUR LINES OF 300" TEST WHITE NYLON LINE TIED TO LOOPS WITH BOWLINE AND SAFETY KNOTS

LOAD TAPE

LOAD TAPE

PUT 6" TUCK IN DUCT ON ASSEMBLY

NOTE  
UPON INSTALLATION AT TIGHTEN (A) 300" TEST NYLON LINES 10' LONG TO LOWER FIGURE BUSHINGS OF DUCT (NOT SHOWN)



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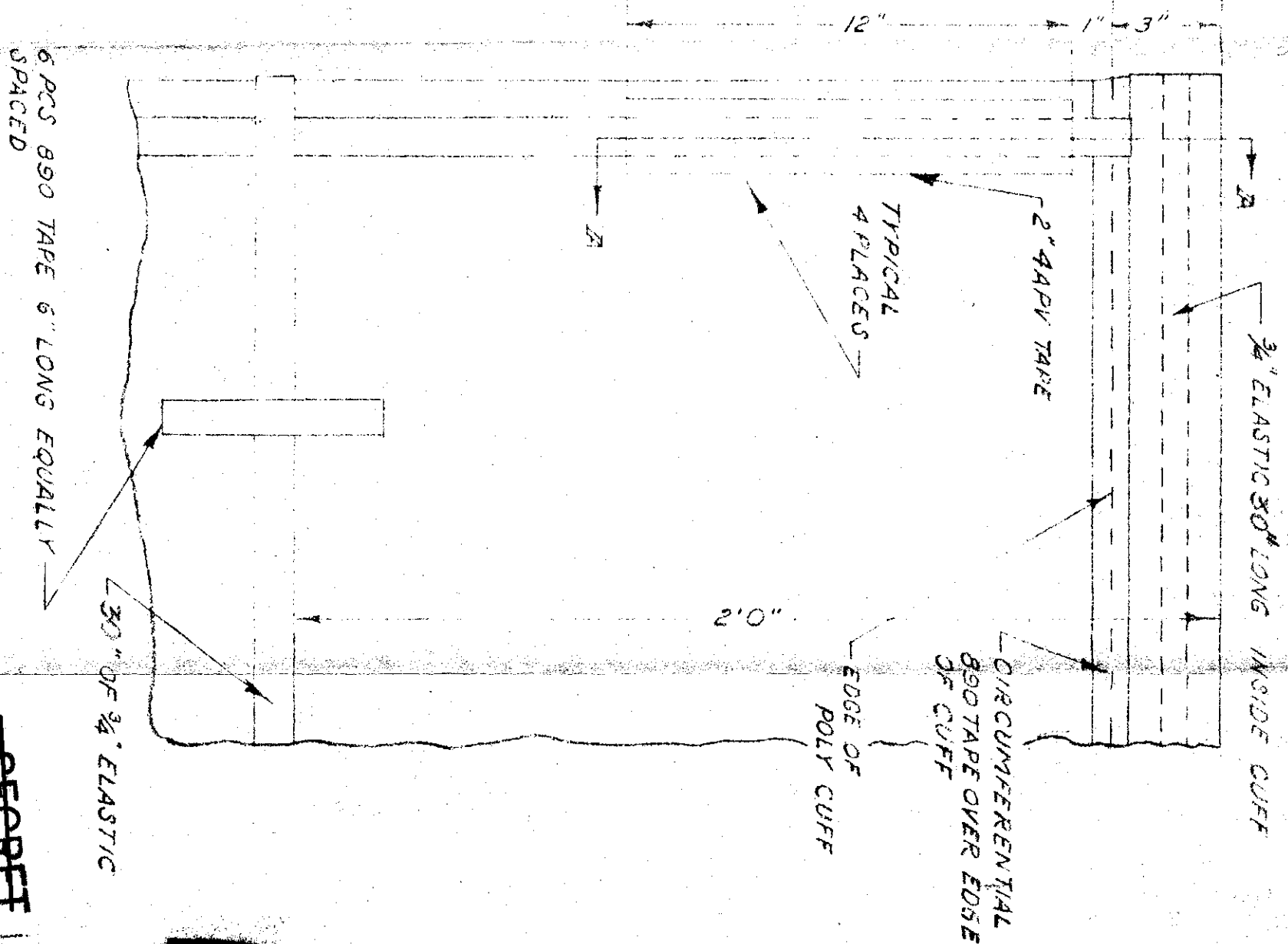
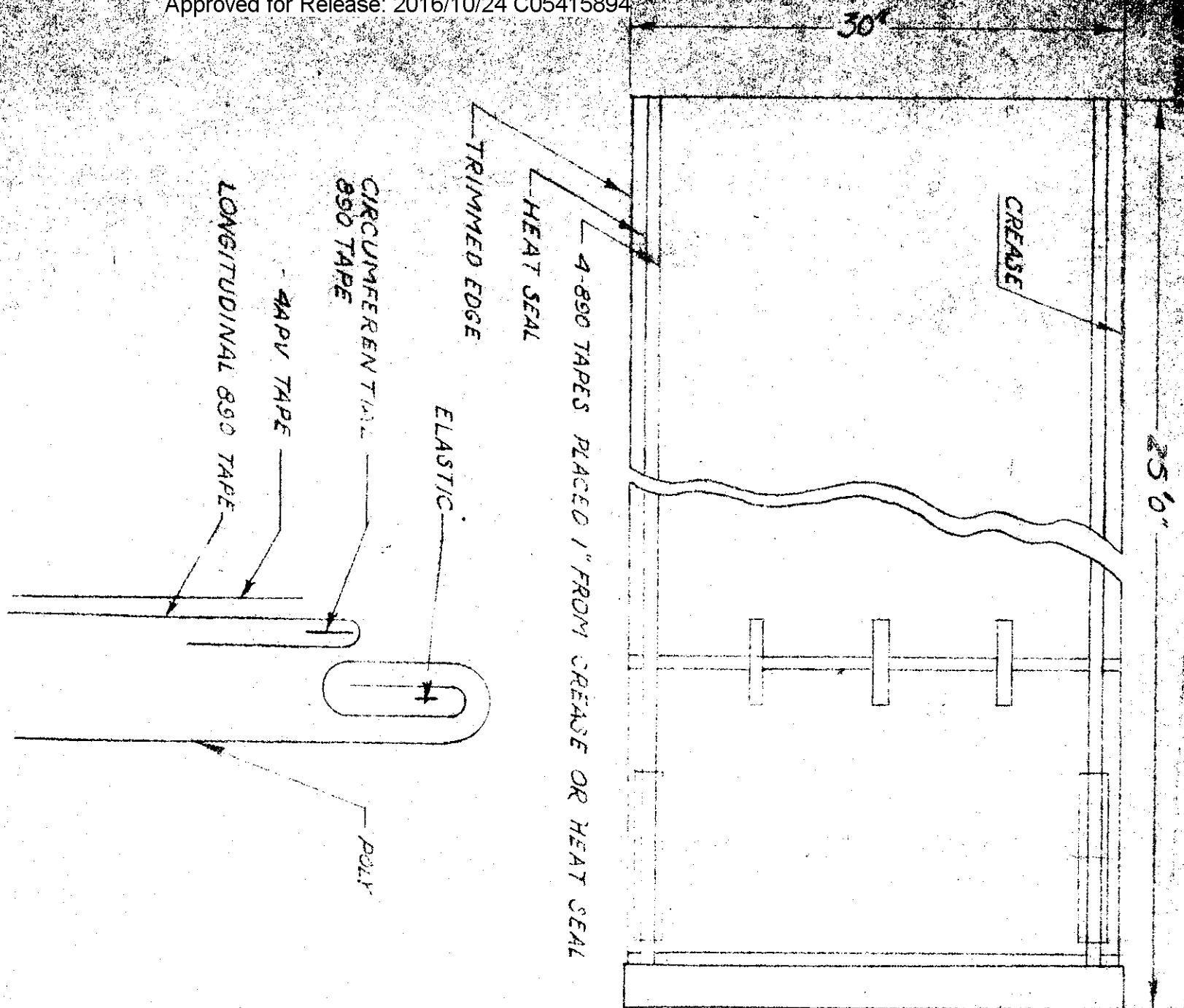
OCT 1 1954

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NO.	DATE	BY	CHK
21654			

415551B





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OCT 1 1954

MATERIALS:	
3/4" POLYETHYLENE SOLARFLAT TUBING	
DR. JCW	APP. JEF
CH. JCW	APP.
DATE 3-3-54	SCALE NONE
NAME	

REFFING OFFICE

1-15394B

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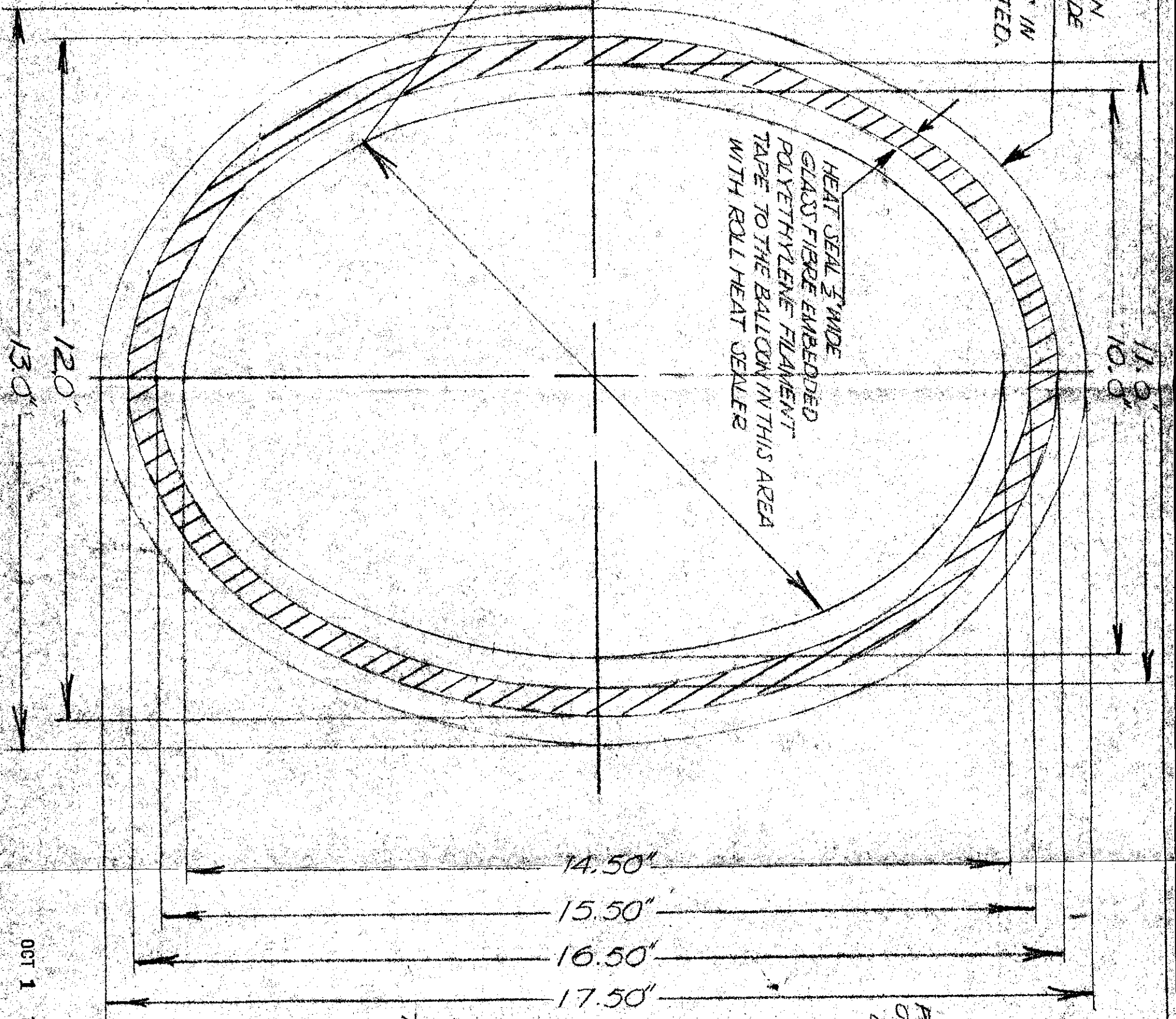
REVISIONS

HEAT SEAL DUCT TO BALLOON  
WITH 3" x 1/2" LONG VERTICALLY  
SEAL SEGMENTS ON THIS  
CIRCUMFERENCE. NO VOIDS IN  
THE SEAL CAN BE TOLERATED.

HEAT SEAL 1/2" WIDE  
GLASS FIBRE EMBEDDED  
POLYETHYLENE FILAMENT  
TAPE TO THE BALLOON IN THIS AREA  
WITH ROLL HEAT SEALER

OPENING IN BALLOON AND DUCT

NOTE  
HOLE TO BE LOCATED 12 FEET FROM  
TOP OF BALLOON. MINIMUM BETWEEN  
LOAD TAPES ON GORE AS SHOWN ON  
DRAWINGS NO. A-



1" WIDE BY 2" LONG  
POLYETHYLENE TAPE  
OVER HEAT SEAL OF  
DUCT TO BALLOON

EXCEPT AS NOTED ALL  
TOLERANCES ±.1 EACH

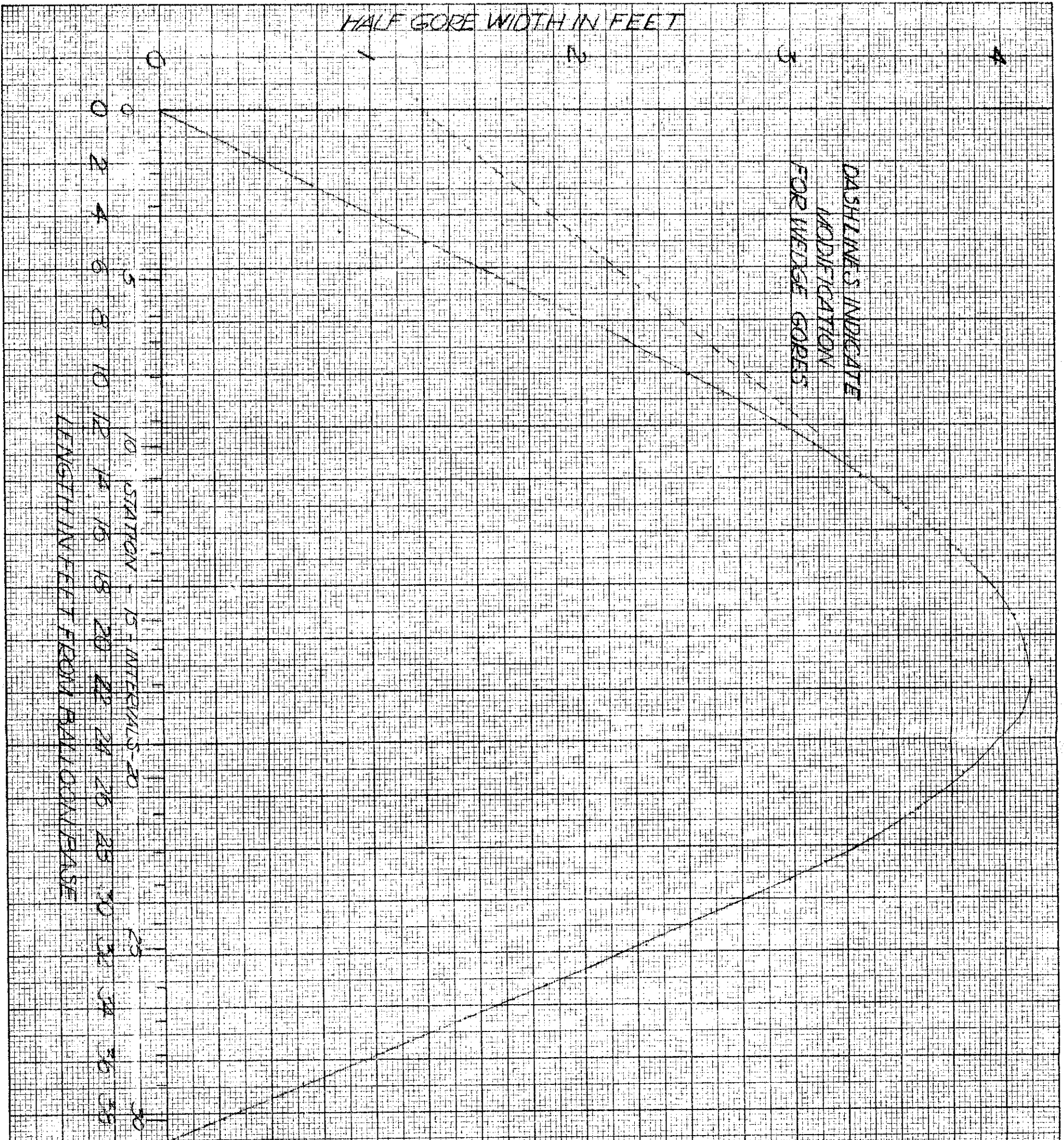
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A-15350-B





DASH LINES INDICATE  
MODIFICATION  
FOR WEDGE GORGES

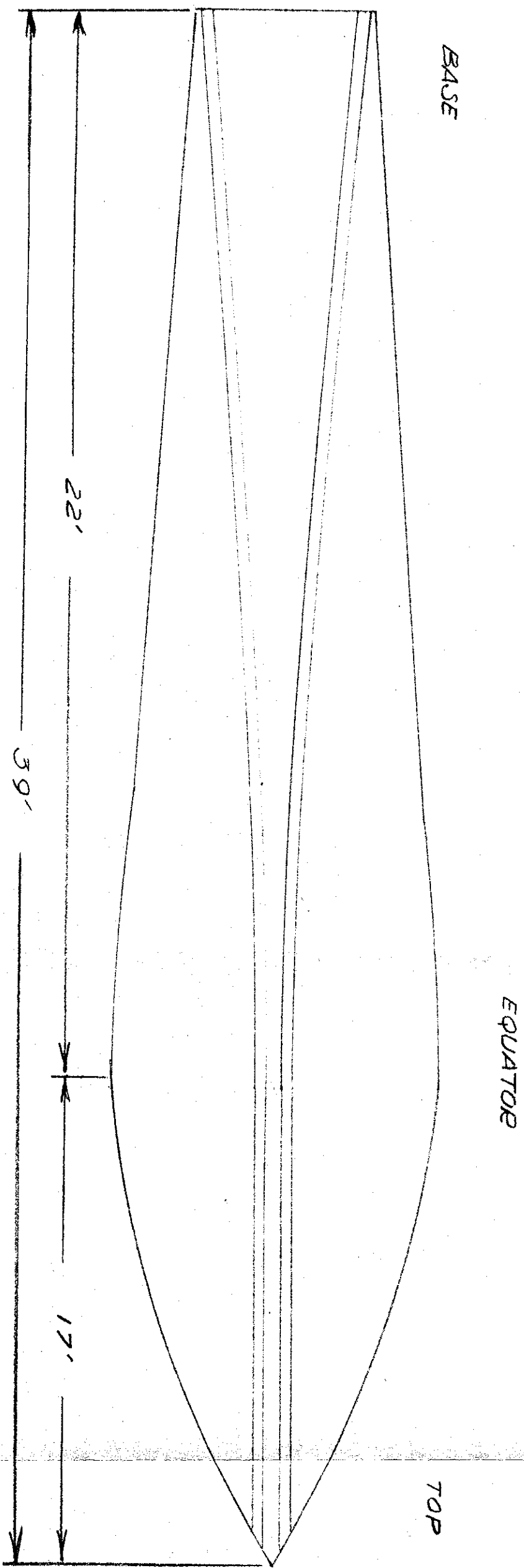
STATION LENGTH IN FEET FROM BALLON BASE

STATION	DIST IN FEET	EG W IN FT
1	1.4547	0.3063
2	2.4024	0.6016
3	3.6274	0.9054
4	5.0137	1.2632
5	6.3255	1.5977
6	7.9075	1.9616
7	8.8586	2.2146
8	10.0269	2.3937
9	11.7117	2.8766
10	12.8510	3.1096
11	14.0425	3.3326
12	15.0591	3.5352
13	16.7666	3.7287
14	17.8152	3.9125
15	19.3089	4.0616
16	20.3502	4.1753
17	21.6340	4.1351
18	23.0256	4.0577
19	24.0591	3.9902
20	25.3451	3.8117
21	25.6727	3.5945
22	25.0275	3.2970
23	23.3124	2.9259
24	30.5412	2.5407
25	31.2504	2.2856
26	32.2651	1.8047
27	34.4643	1.4212
28	34.7435	1.0647
29	34.5345	0.6502
30	34.2582	0.2583
31	39.0500	0

**SECRET**

A 15598-B  
JCN  
6/1/54

**SECRET**



TWO 890 LOAD TAPES TAPER TOWARDS  
 CENTER OF WEDGE GORE AT THE BALLOON  
 EQUATOR THEN STRAIGHT TO TOP OF BALLOON

REVISIONS

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MAT'L. SPEC.

NOTED

DR. J C W APP.

CH. APP.

DATE 8/9/54 SCALE 1/36

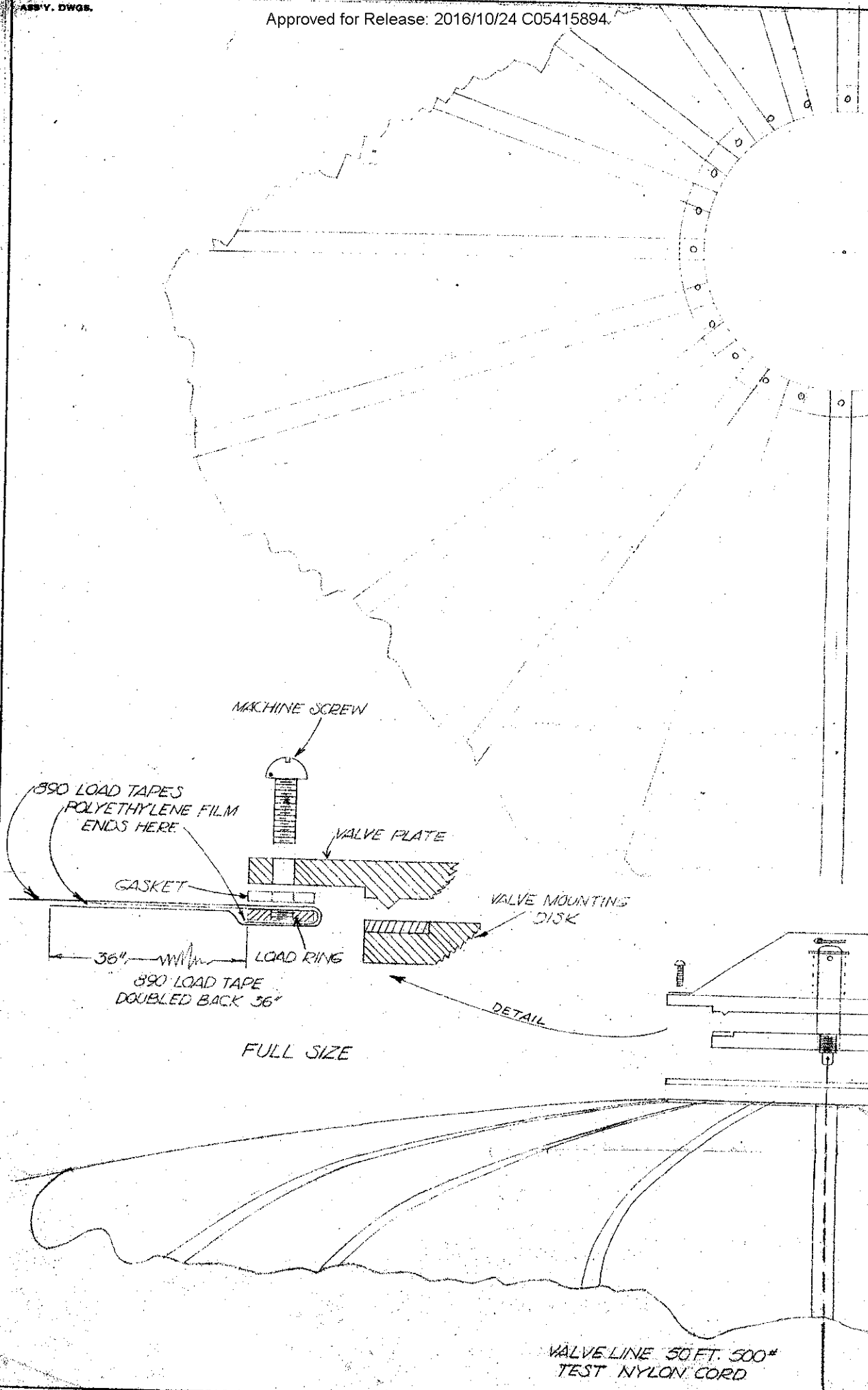
NAME

LOCATION OF WEDGE GORE TAPE

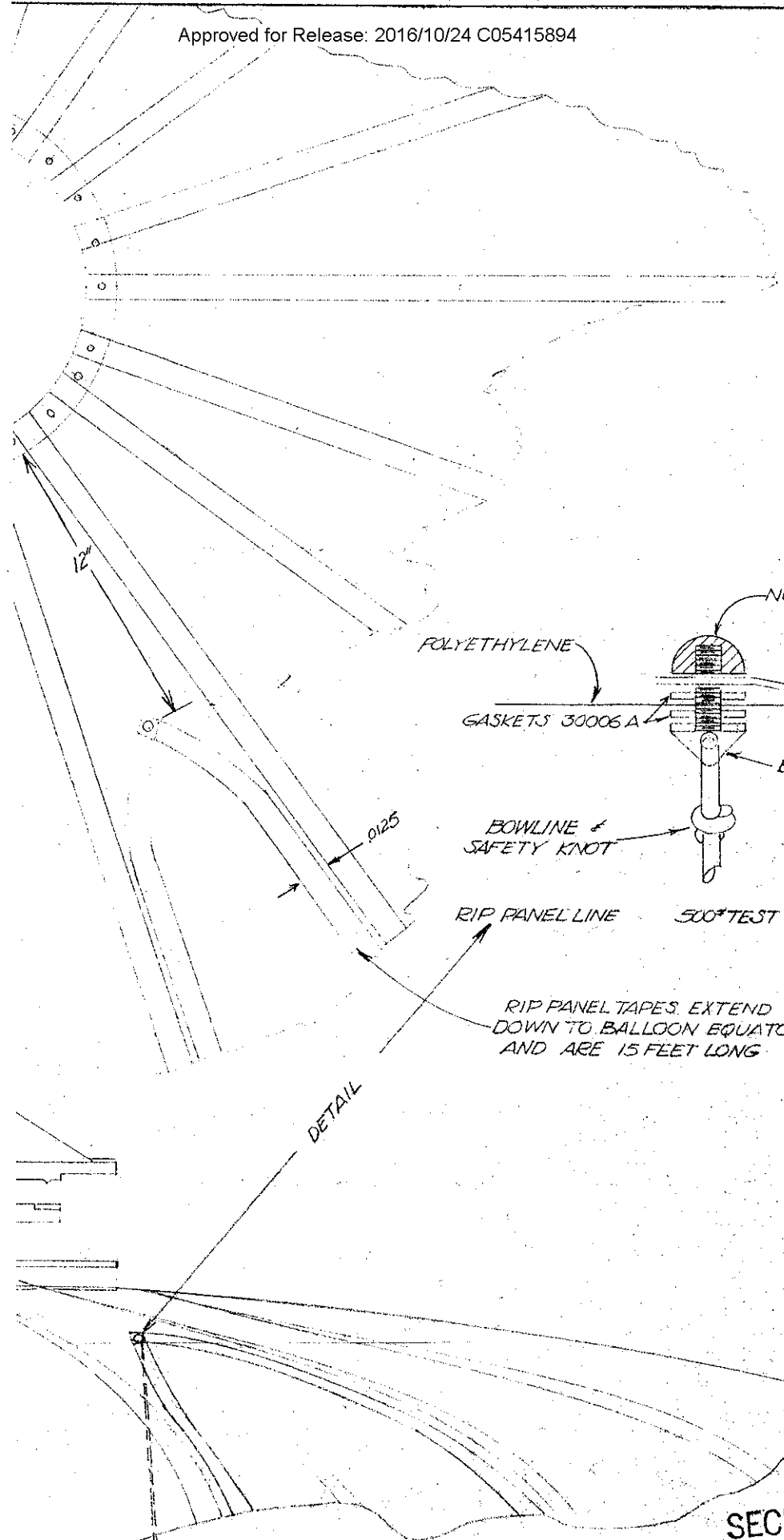
A16749B

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RIP PANEL LINE 500# TEST NYLON

RIP PANEL TAPES EXTEND DOWN TO BALLOON EQUATOR AND ARE 15 FEET LONG

DETAIL

RIP PANEL LINE 50 FT.  
500# TEST NYLON CORD

OCT 1 1954

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A16621C	
REVISIONS	
MAY'L SPEC. NOTED	
DR. JCW	APP.
CHK.	APP.
DATE 8/12/54	SCALE 1/2
NAME VALVE & RIP PANEL INSTALLATION	
A-16621C	

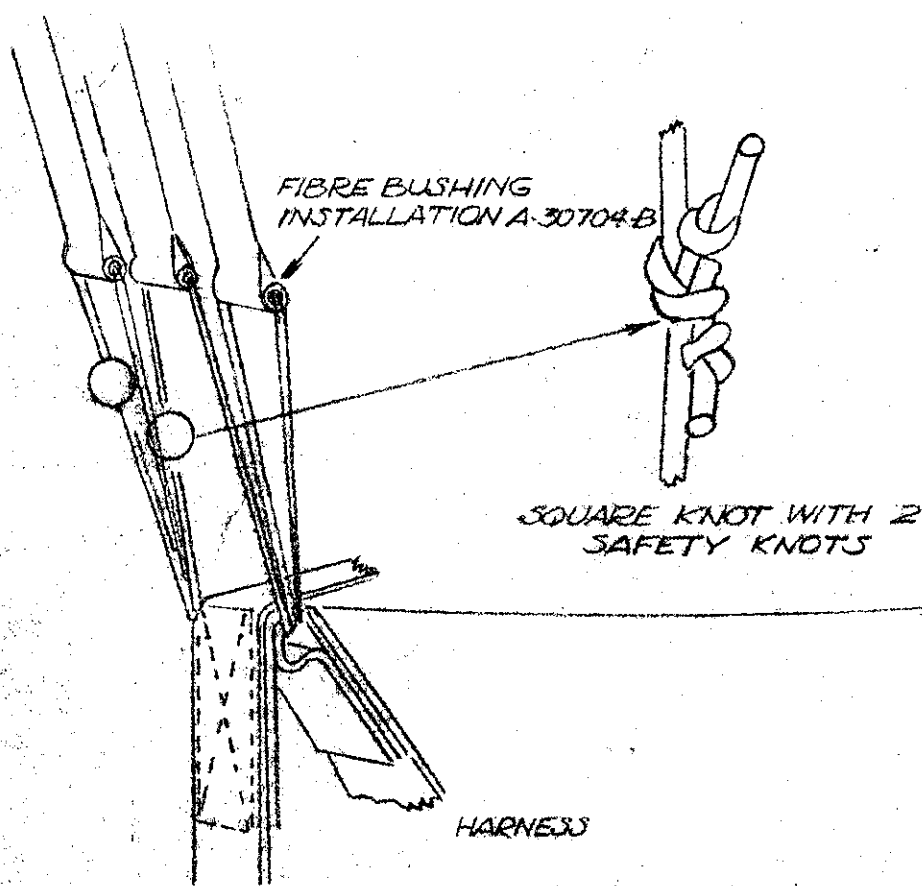
LIST OF COMPONENTS			
ITEM	NAME	DR. NO.	REQ'D
1	PLASTIC GORES	A-16596	10
2	LOAD TAPES	-	22
3	DUCT INSTALLATION	A-15351	1
4	ATTACHMENT PAD	A-11876	4
5	PLASTIC VALVE	A-16555	1
6	LOCATION OF WEDGE GORE TAPES	A-16749	-
7	RIP PANEL	A-16621	1
8	HARNESS	A-11877	1
9	BALLOON BASE	A-30708	1
10	RAIN DEFLECTOR	-	1

2

1

NYLON LINES TO BE 42" LONG (34" DEVELOPED LENGTH) OF 500 LB. TEST NYLON EXCEPT FOR 2 CENTER LINES THAT WILL BE 26" LONG (18" DEVELOPED LENGTH)

NOTE: 500 LB. NYLON LINE THROUGH 2 BUSHINGS & HARNESS EXCEPT CENTER LOAD TAPE. THERE TH 500 LB. NYLON LINE CONNECTS WITH HARNESS & LOAD TAPE



DUCT & INFLATION TUBE  
A-15352-B

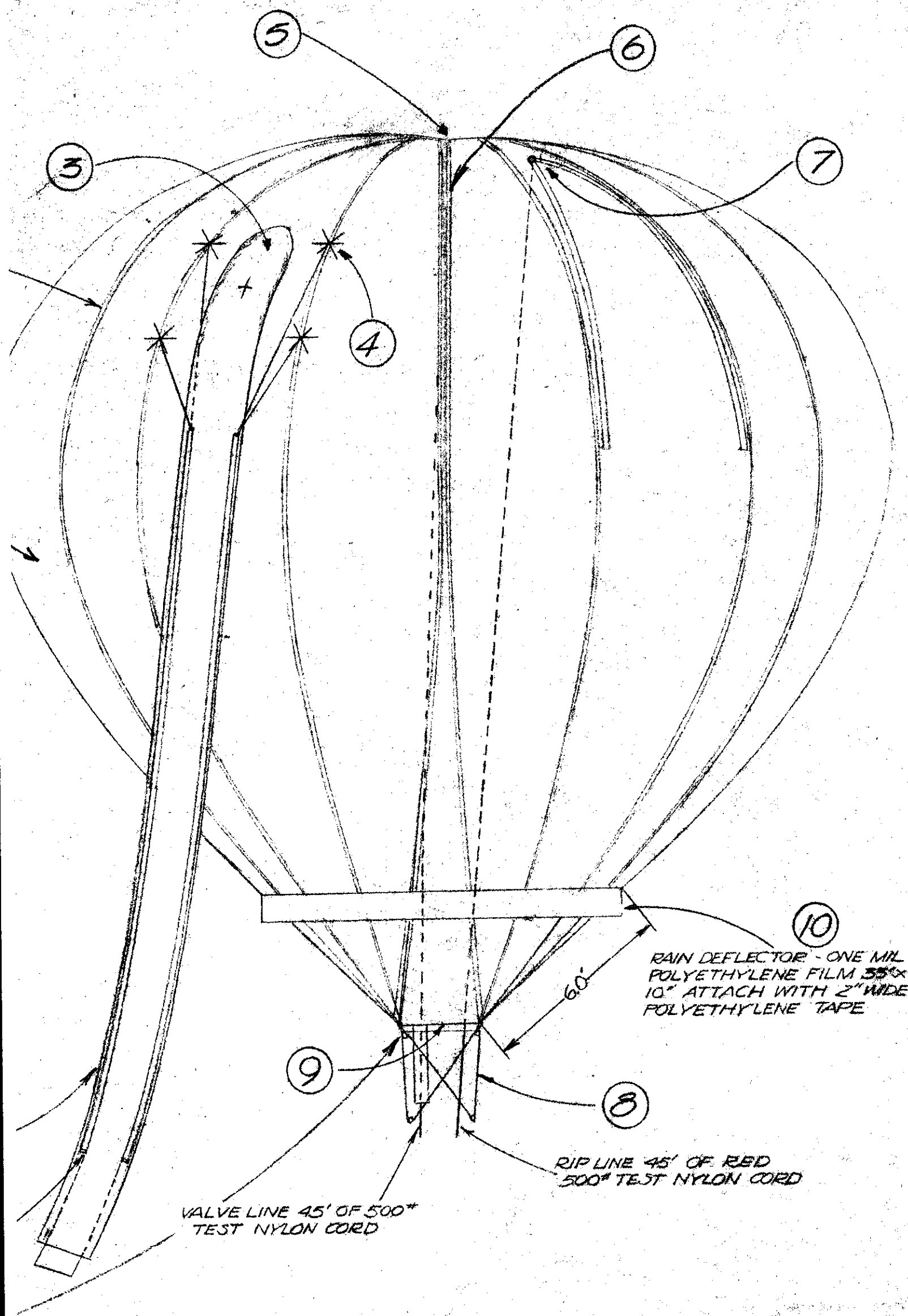
10' OF 500# TEST NYLON LINE TIED TO EACH DUCT TAPE FURNISHED ON BALLOON

DETAIL

DETAIL OF HARNESS ATTACHMENT



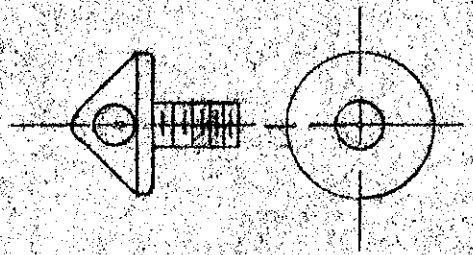
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A-17232C	
REVISIONS	
EXCEPT AS NOTED ALL TOLERANCES ± .030 GENERAL MILLS MSCP, DIV. ENGINEERING RESEARCH AND DEVELOPMENT DEPT. MACHINING SPECIFICATIONS APPLY MAT'L SPEC.	
NOTED	
DR. JCW	APP.
CH:	APP.
DATE 9-30-54	SCALE 1/8" = 3'
NAME 263P ASSEMBLY	
A-17232C	

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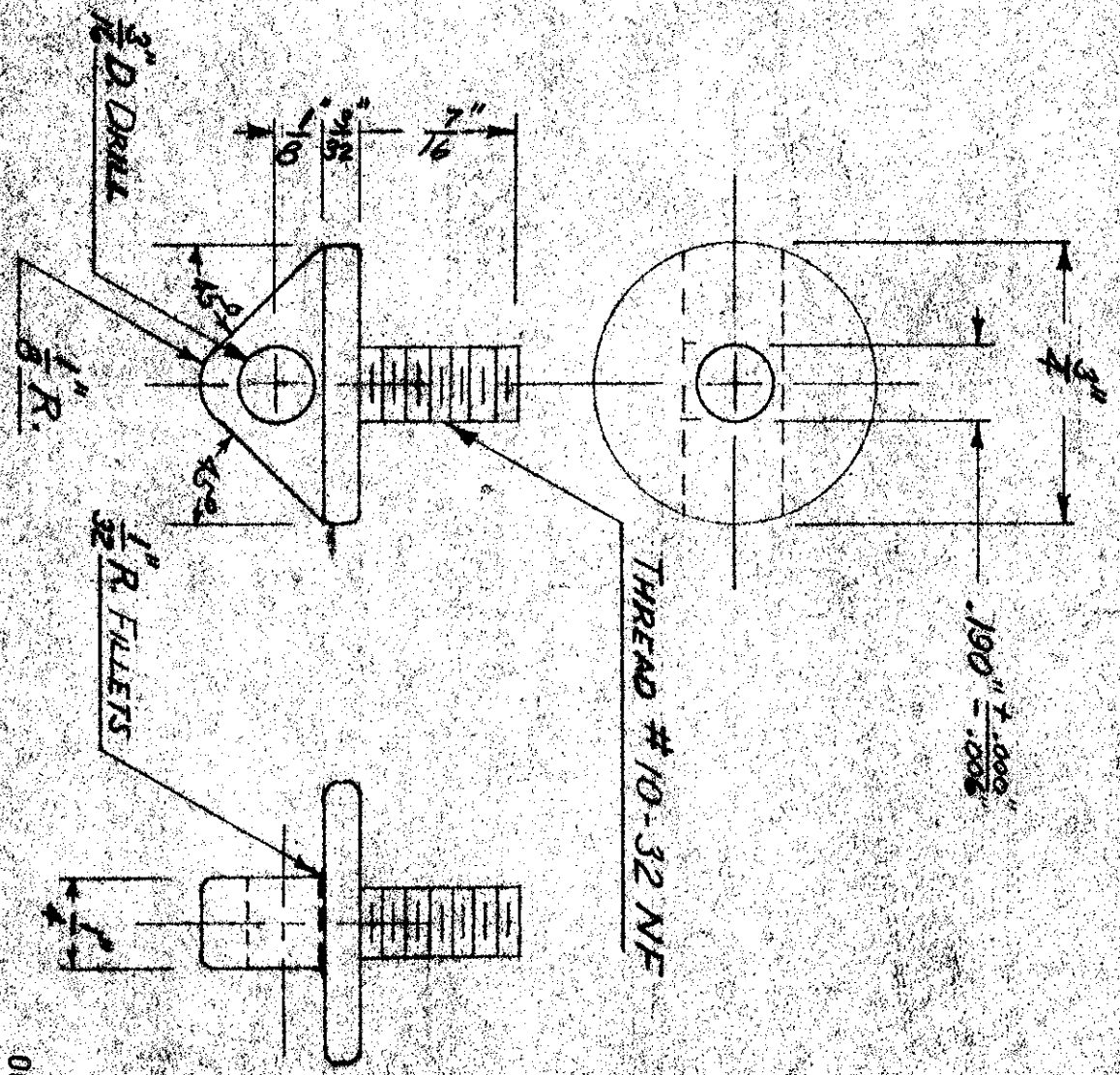
OCT 1 1954



ACTUAL SIZE

POLISH FINISH  
ROUND ALL EDGES

~~SECRET~~



THREAD #10-32 NF

OCT 1 1954

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IF NOT SPECIFIED TO THE CONTRARY ALL DIMENSIONS ARE TO BE HOLDING DIMENSIONS UNLESS OTHERWISE SPECIFIED  
ALL DIMENSIONS ARE TO BE HOLDING DIMENSIONS UNLESS OTHERWISE SPECIFIED  
ALL DIMENSIONS ARE TO BE HOLDING DIMENSIONS UNLESS OTHERWISE SPECIFIED

DESIGN	DATE	BY	CHECKED	APPROVED
DIA	9-2-53	DR	DR	DR
REV	DATE	BY	CHECKED	APPROVED
A	9-2-53	DR	DR	DR

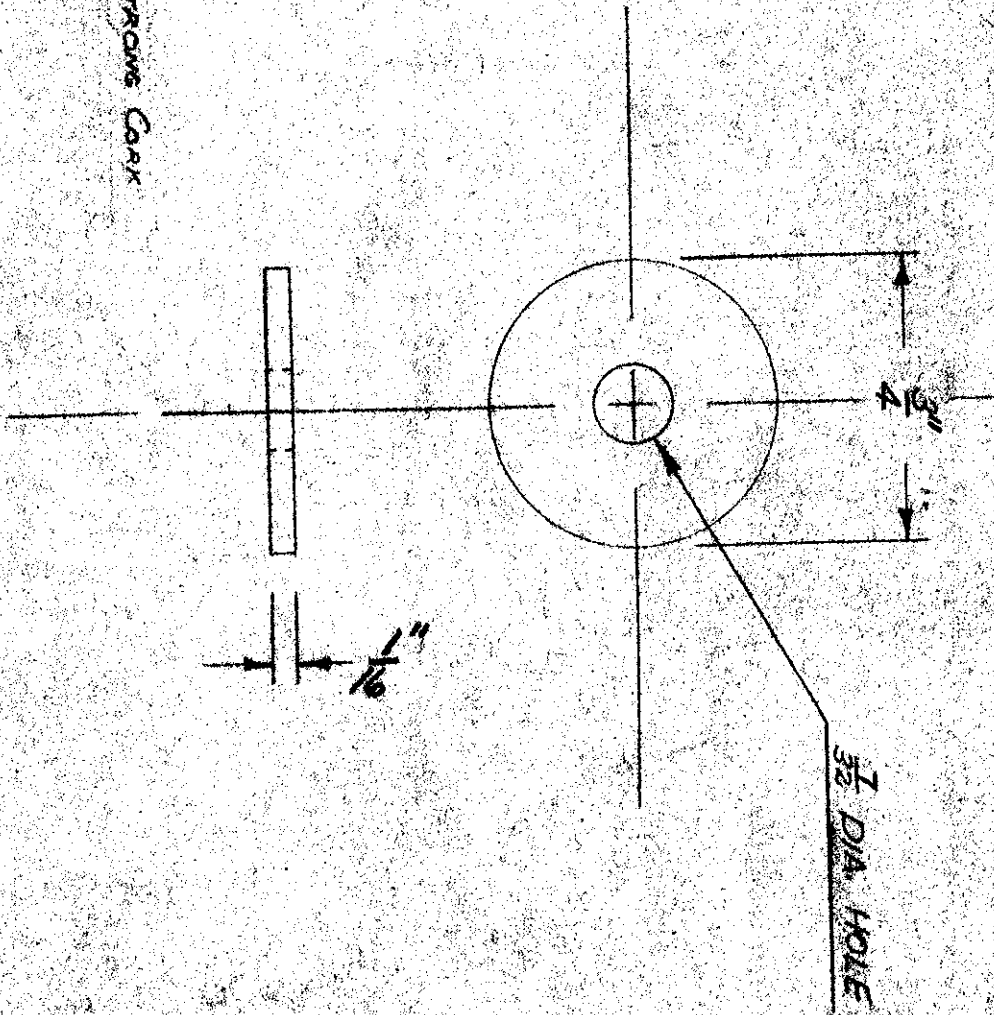
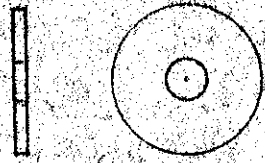
A-30004-A



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MATERIAL: NC-710 ARMSTRONG COAK  
1/8" THICK

ACTUAL SIZE



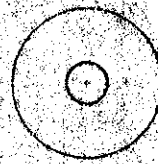
DR	DATE	SCALE	BY	CHECK	DATE	SCALE	BY	CHECK	DATE	SCALE	BY	CHECK	DATE
DICK	15	DOUBLE	COAK		9-27-51	DOUBLE	COAK		9-27-51	DOUBLE	COAK		9-27-51
OK													

DO NOT REPRODUCE THIS DRAWING ANYWHERE WITHOUT THE WRITTEN PERMISSION OF THE ENGINEER. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

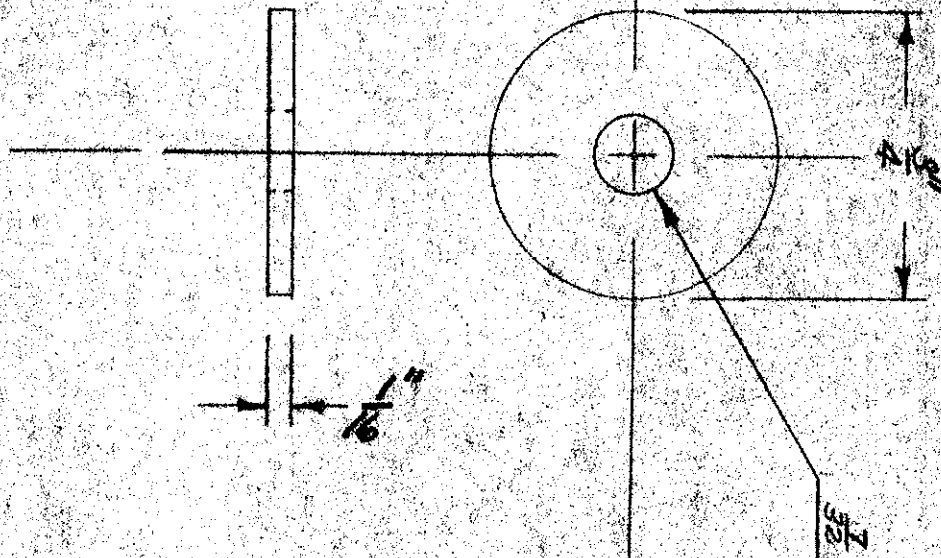
OCT 1 1951

~~SECRET~~

A-30006-A



ACTUAL SIZE



MATERIAL: NC-710 ARMSTRONG CARB  
1/2\"/>

~~SECRET~~

QTY	DRUCK	REV	DATE	SCALE	BY	CHKD	DATE	APP	DATE
		1E		DOUBLE			9-27-51	NC-710	

OCT 1 1954

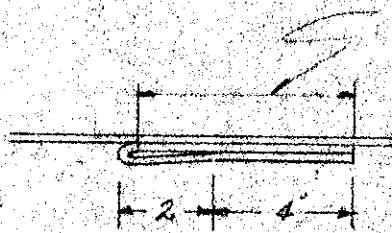
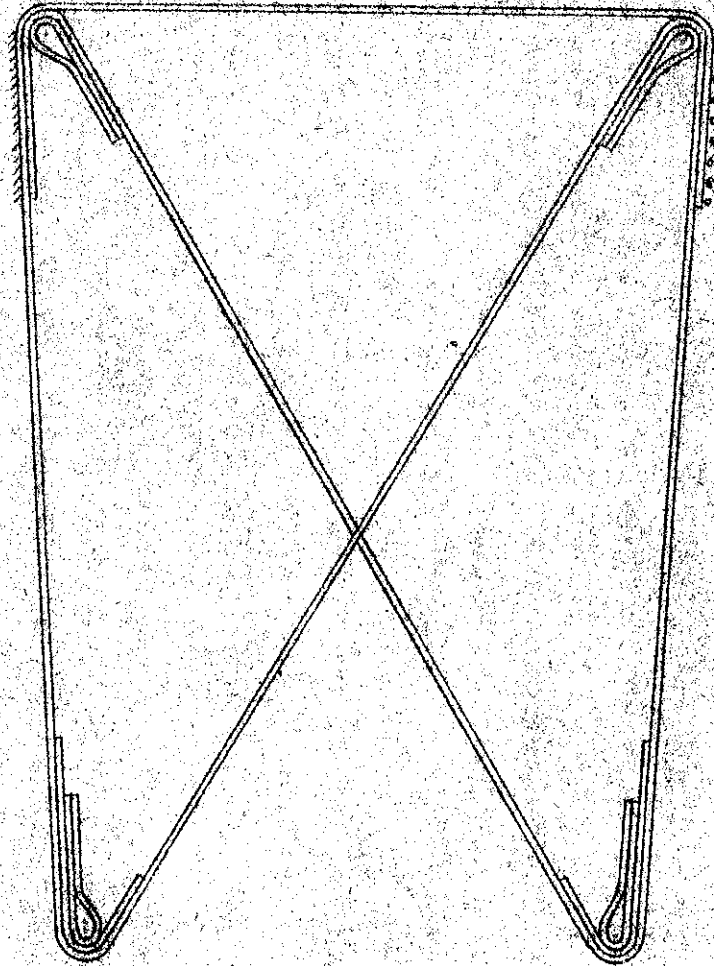
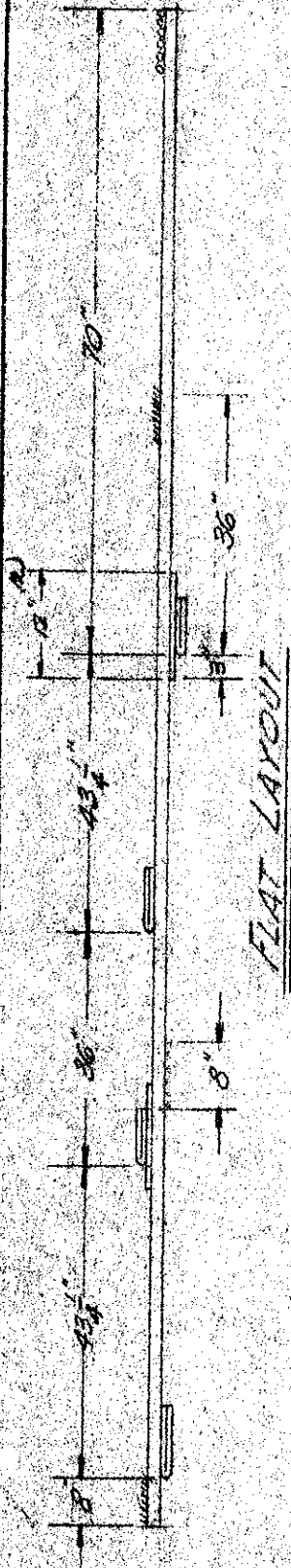
~~SECRET~~

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE

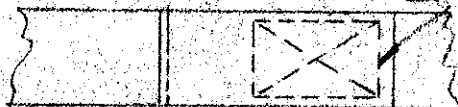
A-30006-A

~~SECRET~~

NOTE: MATERIAL SHALL BE 1500 LB. TEST (OR BETTER) 1 1/2" WOVEN WEBBING. 10' REQUIRED



SEW THIS PORTION OF STRAP FIRST & THEN MAKE LOOP (USING NO. 6 COTTON CORD)



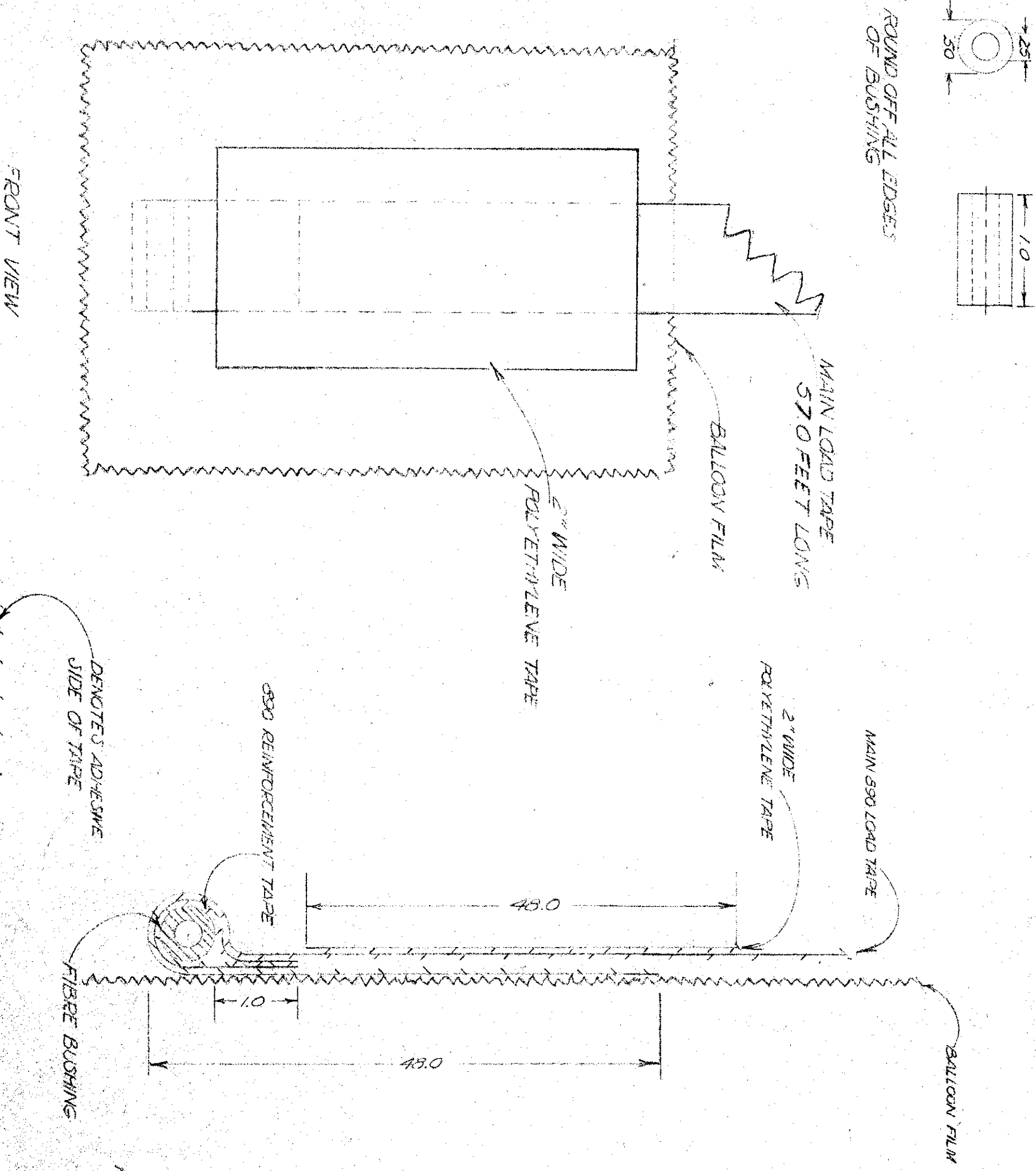
SEW THIS PATTERN WITH NO. 6 COTTON CORD

~~SECRET~~

DETAIL OF EYE ATTACHMENTS

OCT 1 1954

REV	GT	DATE	11-28-53	NAME	302 P SUSPENSION HARNESS	A-11877-A
REV	HEF	DATE				



FRONT VIEW

DENOTES ADHESIVE SIDE OF TAPE

NOTE: CENTER OF FIBRE BUSHING TO BE LOCATED 5" FROM BASE OF BALLOON

~~SECRET~~

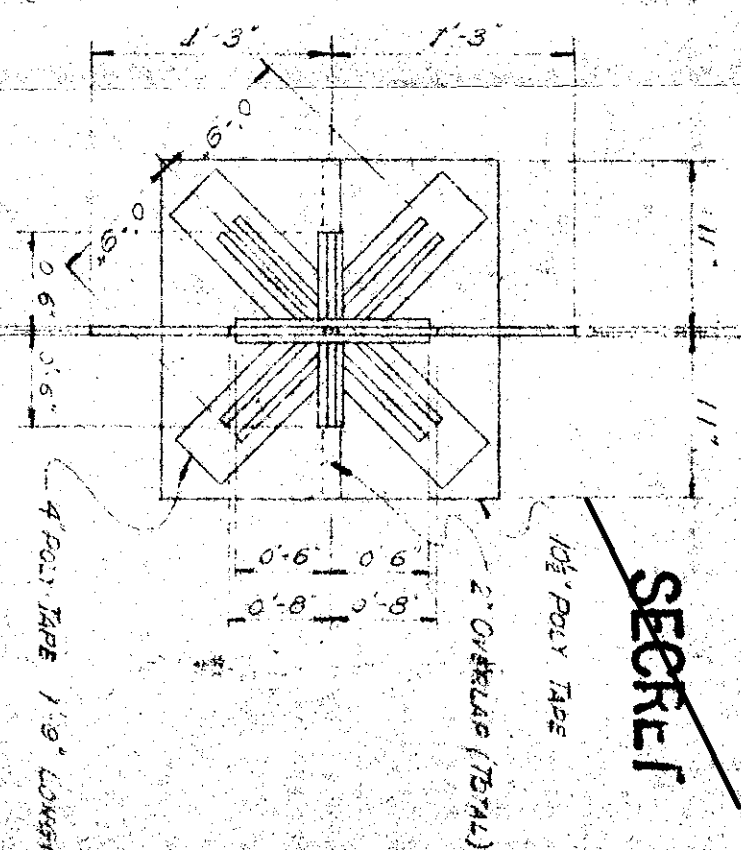
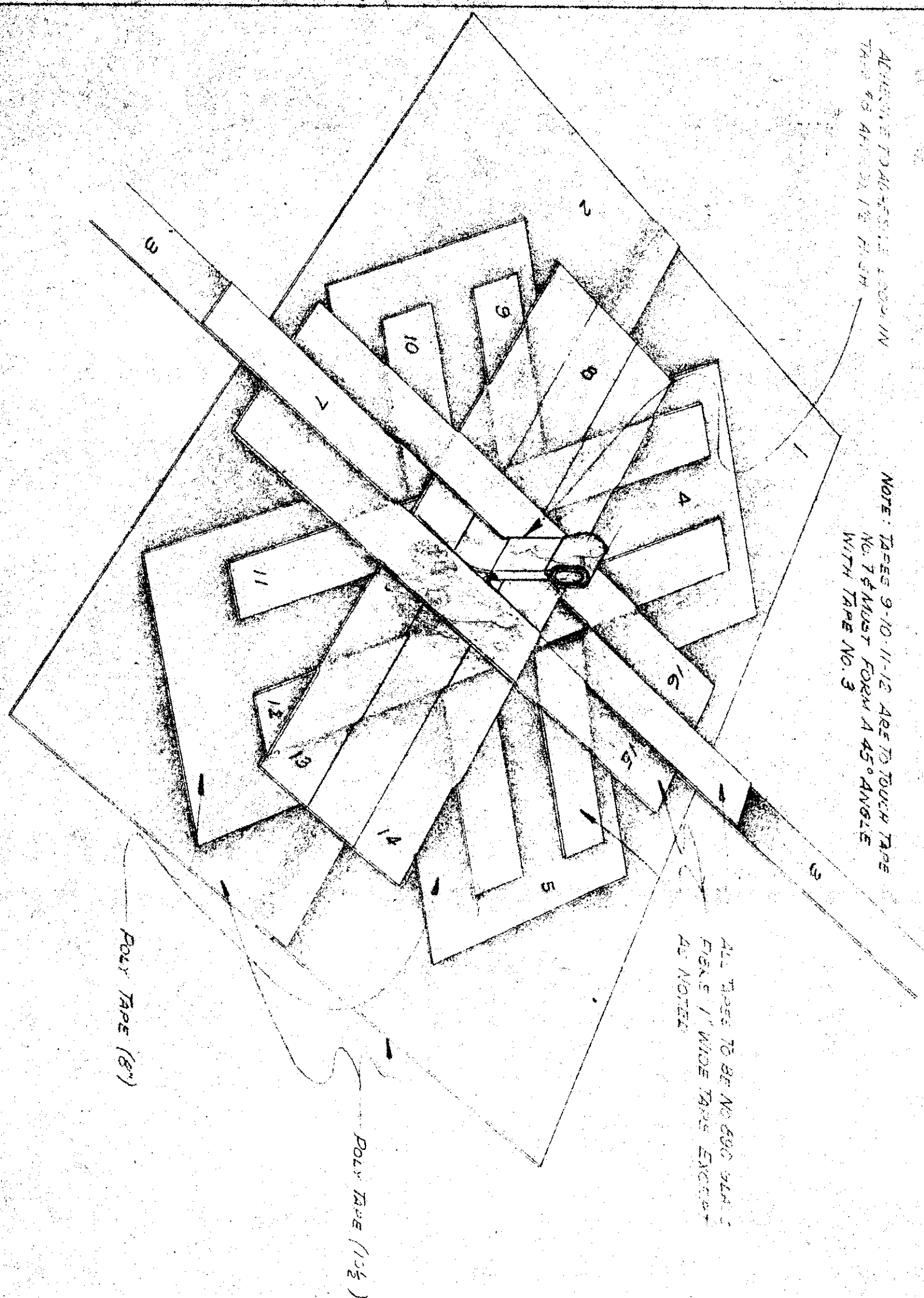
REVISIONS

DR. JCW	APP. HEF
CH. HEF	APP. HEF
DATE 5-5-53	SCALE
NAME	

FIBRE BUSHING INSTALLATION

A.30704-B





~~SECRET~~

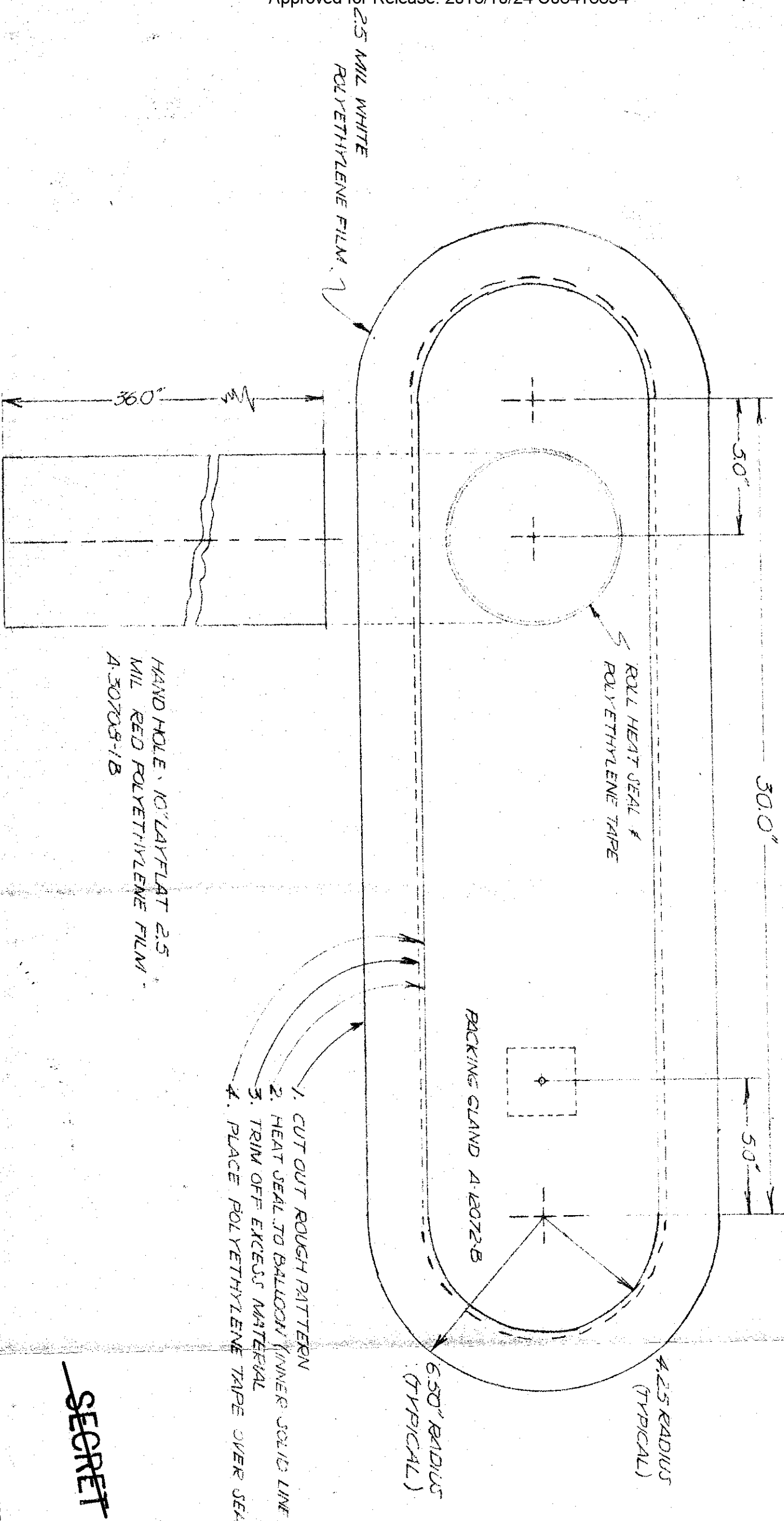
~~SECRET~~

DR - THOMPSON  
APP - HEF

ATTACHMENT PAD

A-11976 - 8

OCT 1 1954



1. CUT OUT ROUGH PATTERN
2. HEAT SEAL TO BALLOON (INNER SOLID LINE)
3. TRIM OFF EXCESS MATERIAL
4. PLACE POLYETHYLENE TAPE OVER SEAL

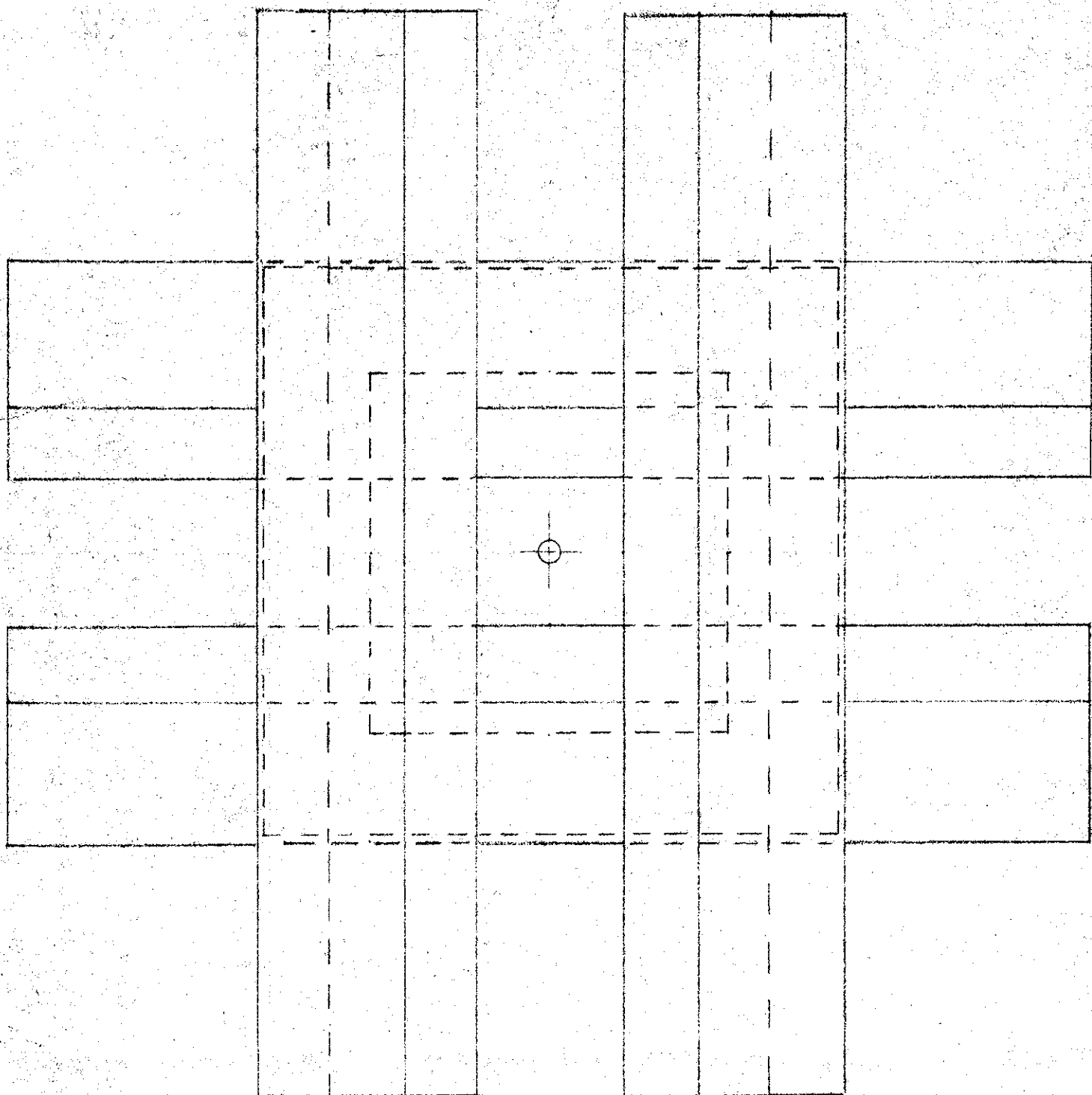
REVISIONS

~~SECRET~~

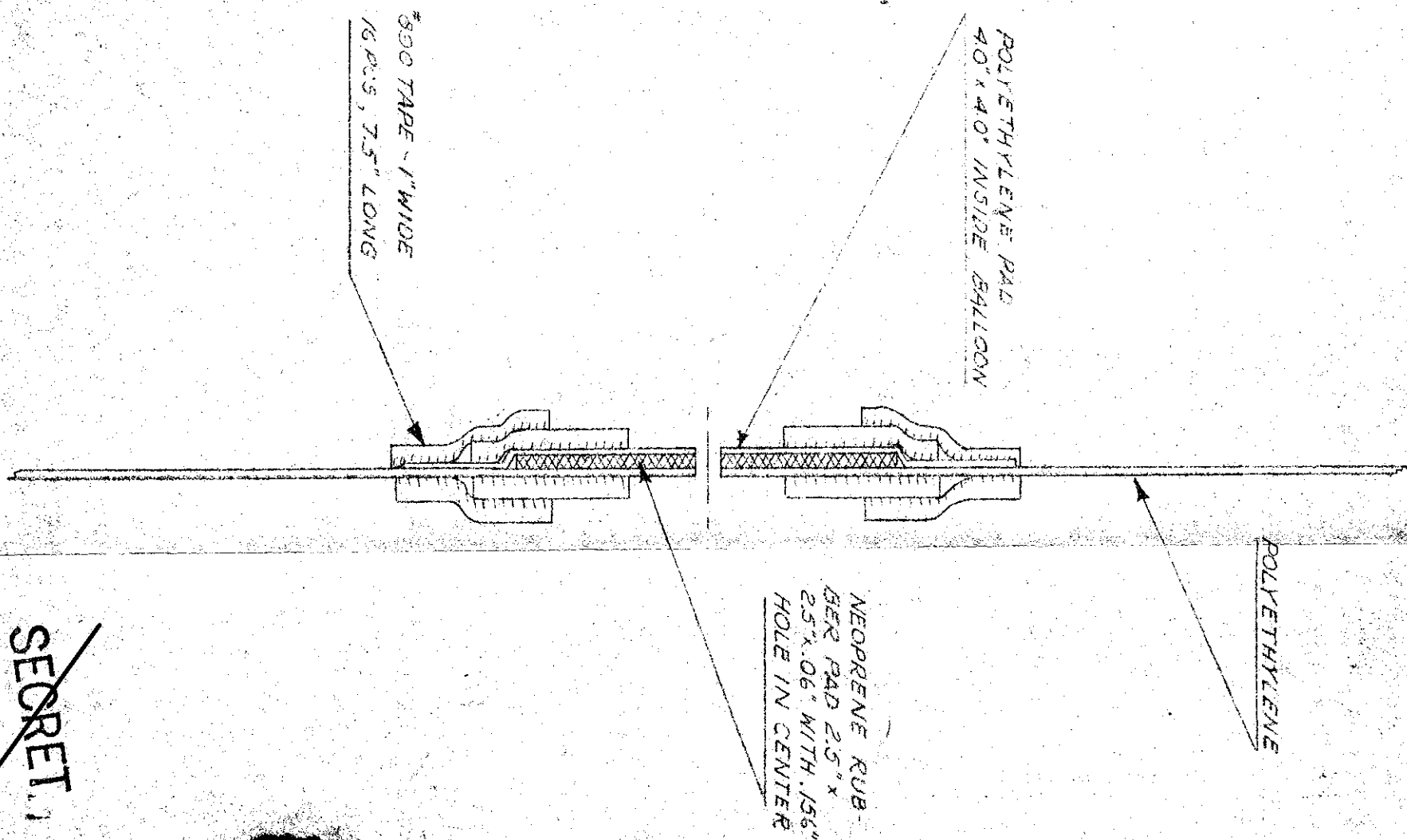
~~SECRET~~

OCT 1 1954

MATERIAL SPEC.		SPECIFIED	
DR.	JCW	APP.	HEE
CH.	HEE	APP.	HEE
DATE	5-27-53	SCALE	1/4
NAME	BALLLOON BASE		
A-30708B			



NOTE: A SMALL HOLE SHOULD BE PIERCED THRU POLY MATERIAL IN LINE WITH HOLE IN NEOPRENE PAD BEFORE GOOD (500 POUND TEST RED NYLON LINE) IS INSERTED.



~~SECRET~~

001-1 1954

REVISIONS

~~SECRET~~

NOTED

DR.	JPD	APP.	HEF
CH.	HEF	APP.	HEF
DATE	3-9-53	SCALE	FULL
NAME	SEAL THRU BALLOON ENVELOPE		

A-12072-B



~~SECRET~~

A16883A

REVISIONS

MATERIAL SPEC

015 SPRING  
STEEL

DR. JCW

CHK.

APP. JRS

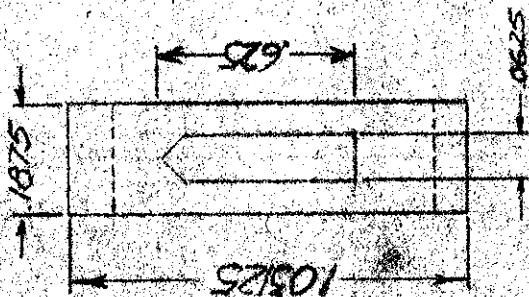
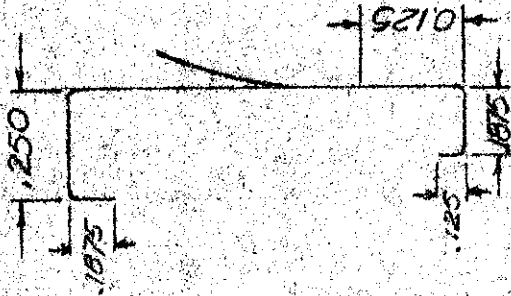
APP.

SCALE NONE

DATE 8-51-54

NAME

ONE WAY  
CLIP



REV. ENGS

OCT 1 1954

~~SECRET~~

STEEL BARB PLACED IN BUSHING  
PREVENTS LINE FROM OPENING

← DETAIL OF ONE WAY  
CLIP

.015 SPRING STEEL

BUSHING  
LOCATED 10  
FEET FROM  
BASE OF DUCT

890 REINFORCING TAPES

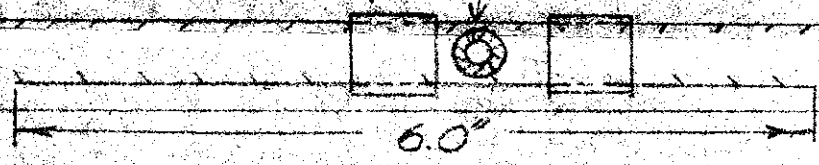
FIBRE BUSHING

MAIN DUCT TAPE  
A11880B

890 REINFORCEMENT TAPE

ADHESIVE TO ADHESIVE

DUCT MATERIAL



~~SECRET~~

OCT 1 1954

NOTED

DR. JCW	APP. JIEH
CH. JIEH	APP.
DATE 8/26/54	SCALE NONE

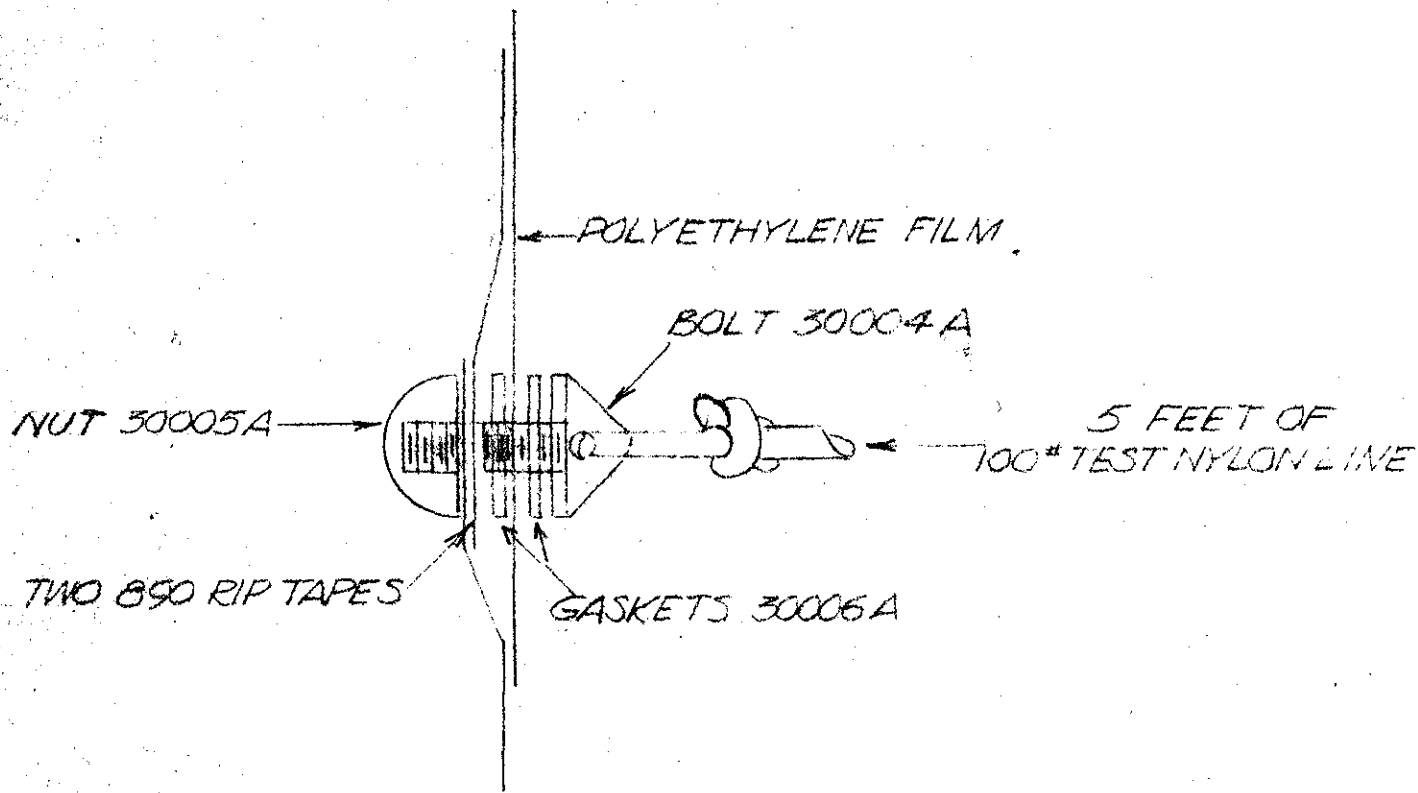
NAME  
DEVICE FOR  
SECURING DUCT

A16619-B

REVISIONS  
A16619-B

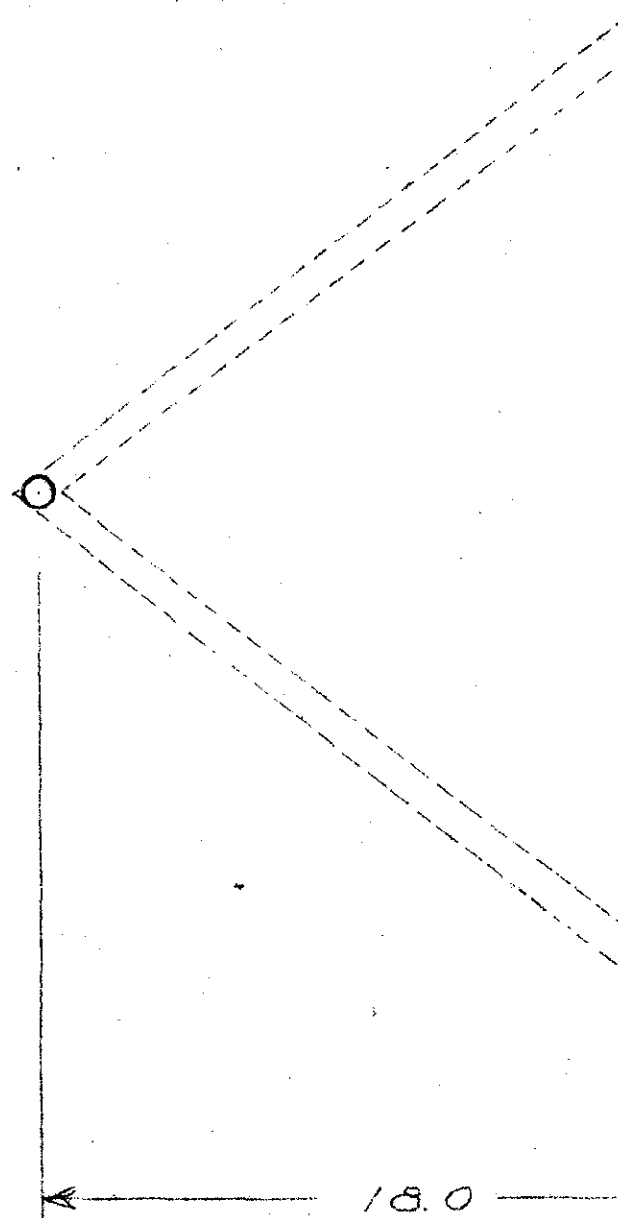
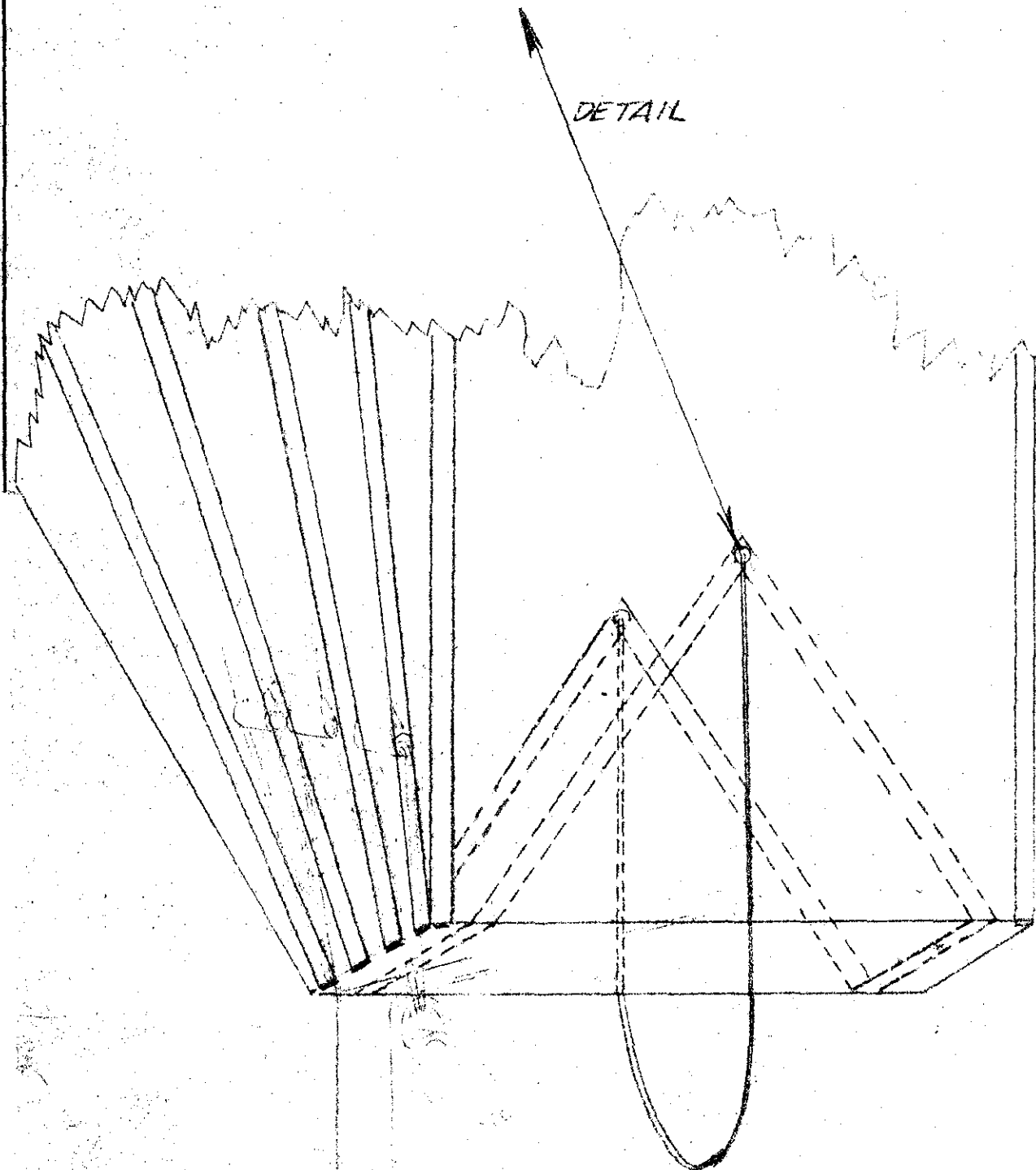
~~SECRET~~

ASS'Y. DWGS.



TWO REQUIRED

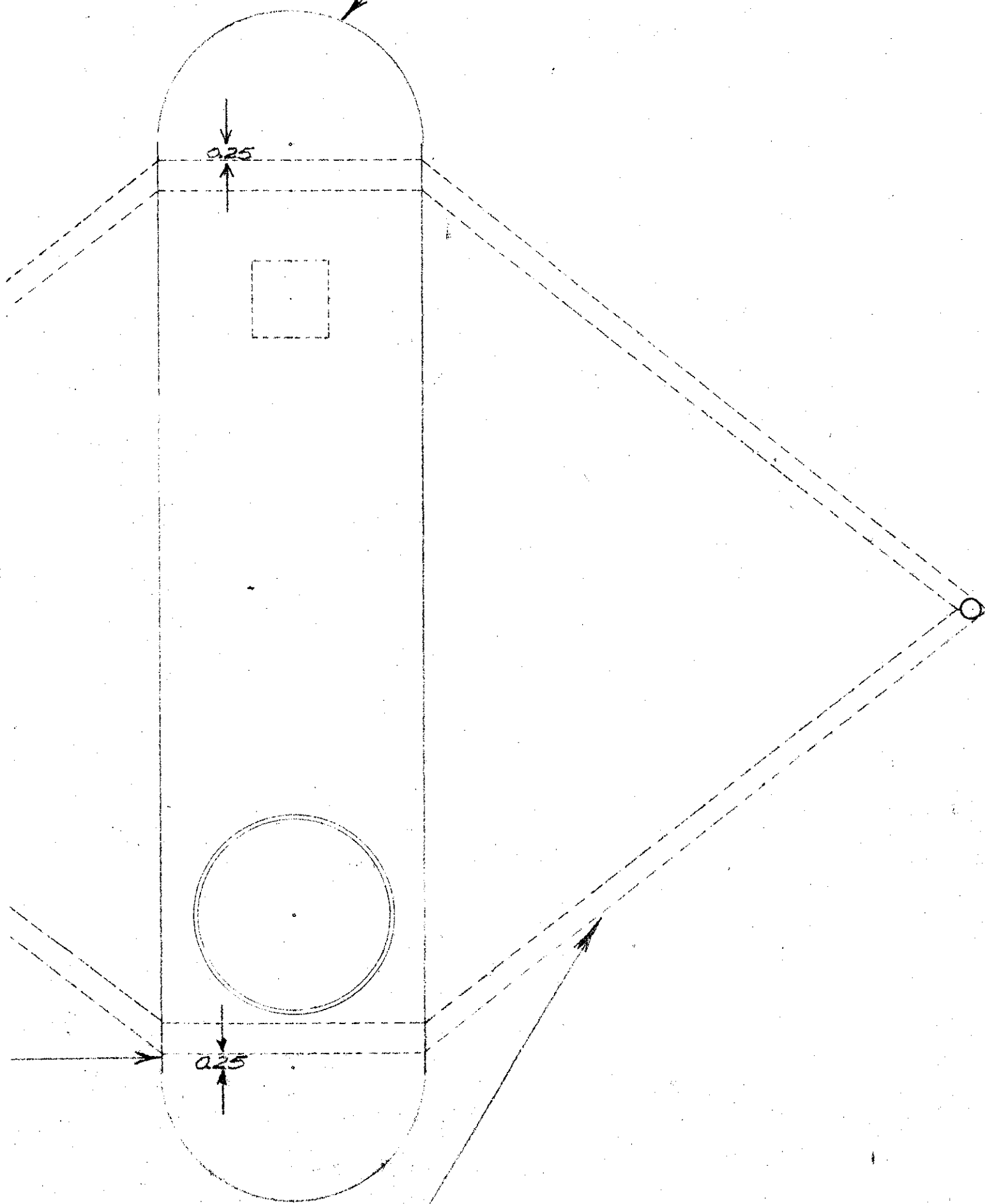
DETAIL



VIEW SHOWS HOW TAPES APPEAR ON INFLATED BALLOON

~~SECRET~~

BALLOON BASE A-30708-B



TWO 890 RIPTAPES DEVELOPED  
LENGTH 55.5 INCHES

A-16618C

REVISIONS

REVISIONS	

MAT'L SPEC.

NOTED

DR. JCW APP. NEF

CH. APP.

DATE 8/17/54 SCALE 1/4

NAME

RIP DEVICE FOR  
BALLOON BASE

A-16618C

~~SECRET~~

OCT 1 1954

A16525A

REVISIONS

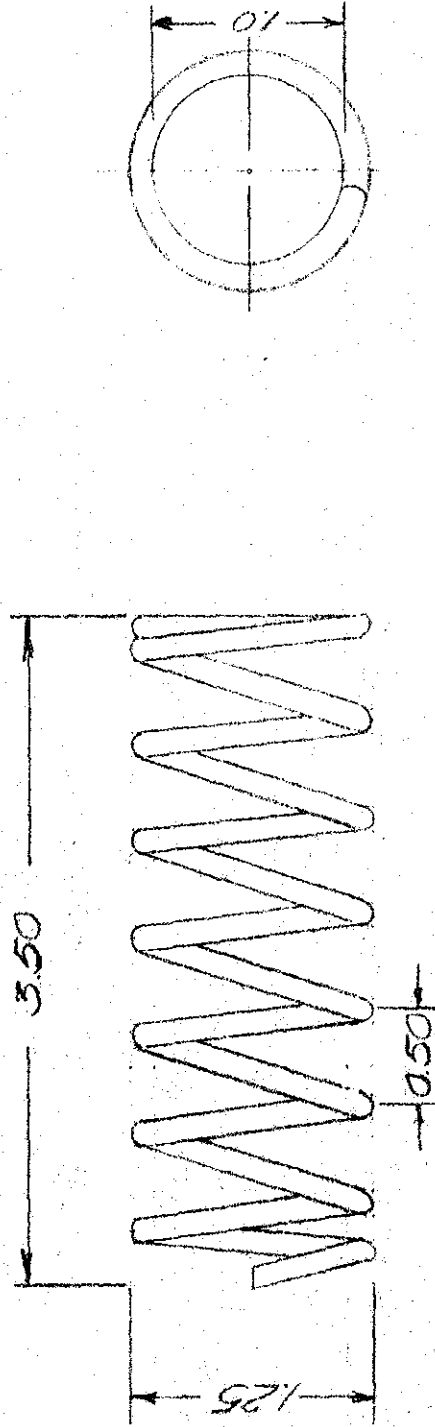
~~SECRET~~



MATERIAL SPEC		APP. HEF	
CADMIUM PLATED WIRE		APP.	
DR. JCW	CH. HEF	DATE 8 3 54	SCALE FULL
NAME M3 VALVE SPRING			

A16525A

ASSY. DWGS.



SPRING DATA

WIRE DIAMETER 0.125  
 SPRING CONSTANT 30 LBS/INCH  
 NO. OF ACTIVE COILS 7  
 ENDS GROUNDED & SQUARED

~~SECRET~~

OCT 1 1954

~~SECRET~~

A16524A

REVISIONS

MAT'L SPEC.

1" LINEN MICARTA  
ROD

DR. JCW

APP. HEF

CH. HEF

APP.

DATE 8-2-54

SCALE FULL

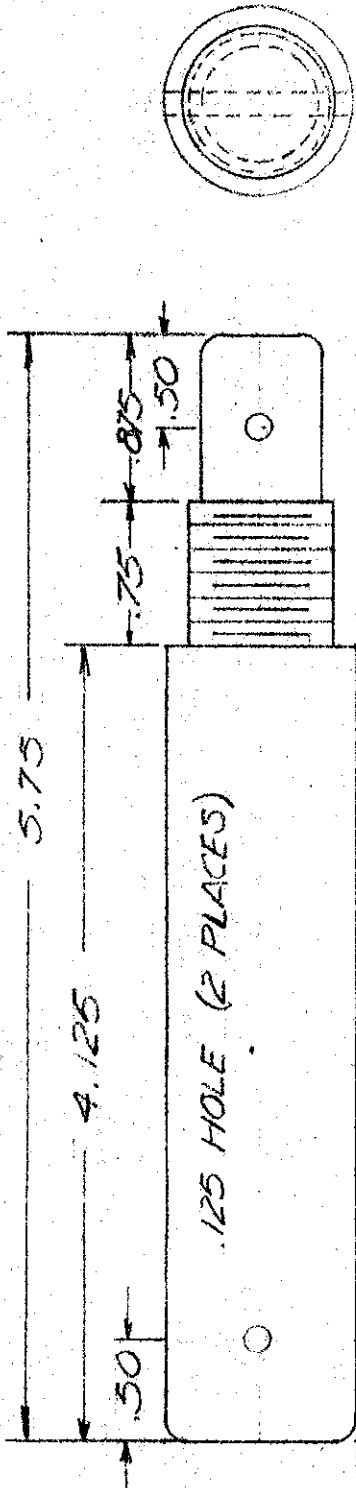
NAME

STUD FOR  
M3 VALVE

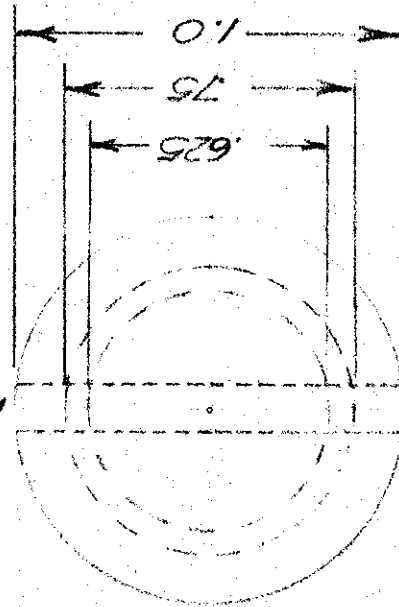
OCT 1 1954

A16524A

ASS'Y. DWGS.



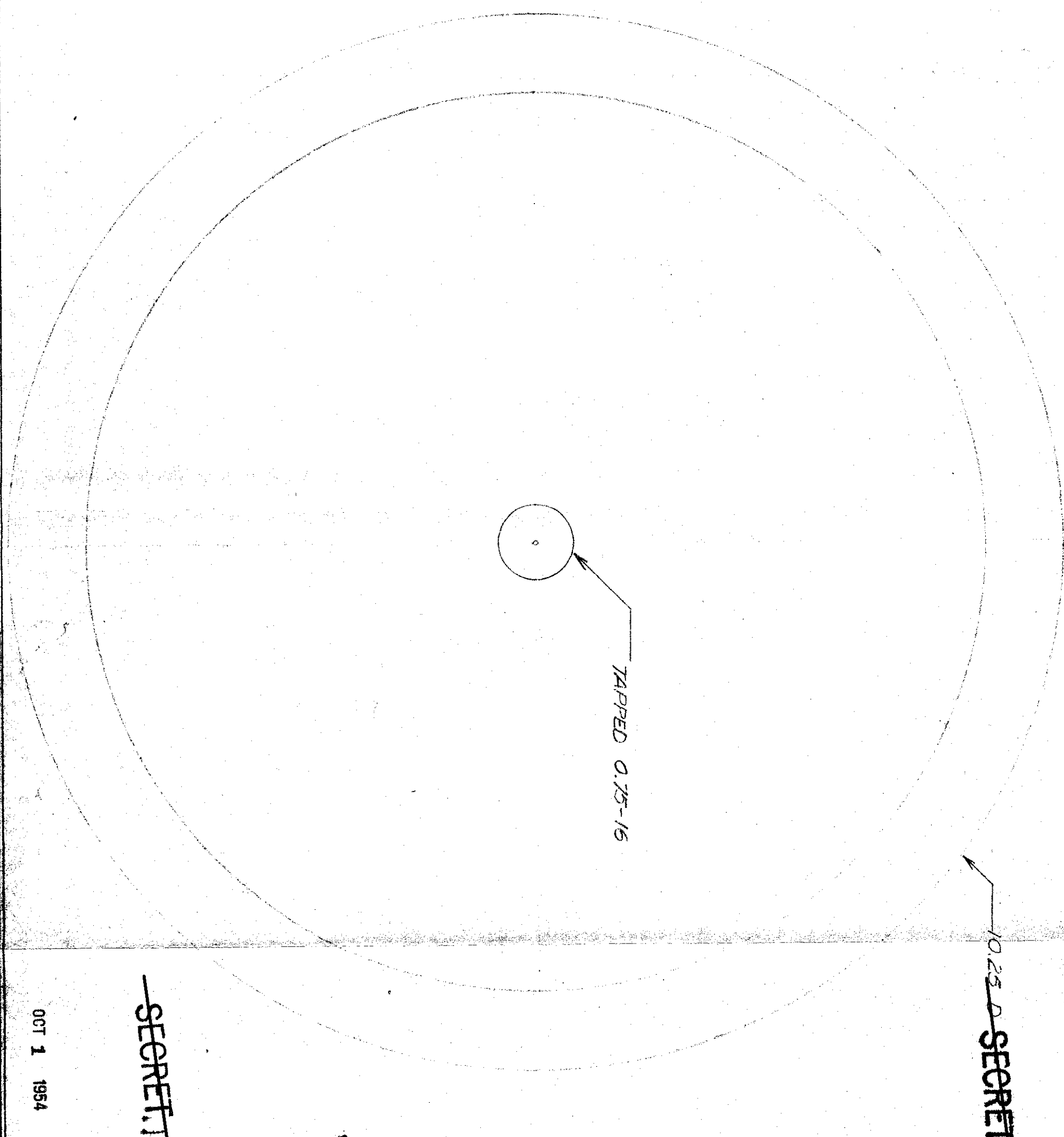
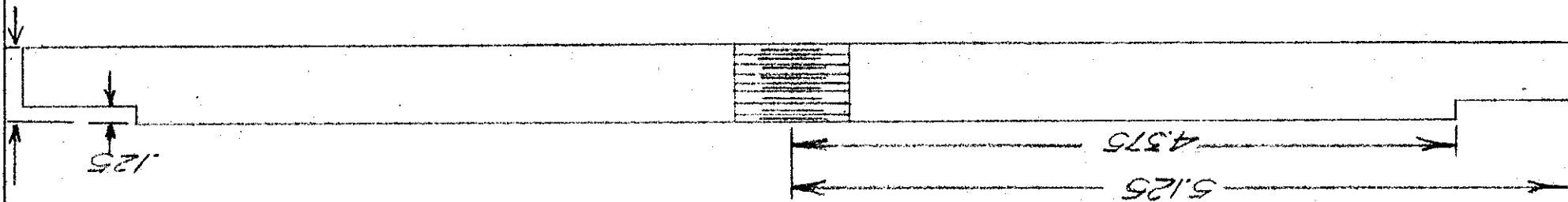
DETAIL



~~SECRET~~

DOUBLE SIZE

0.50  
LINEN MICARTA



~~1023 D~~ SECRET

~~SECRET~~

OCT 1 1954

REVISIONS

MAT'L SPEC:

NOTED

DR. JCW APP. HEF

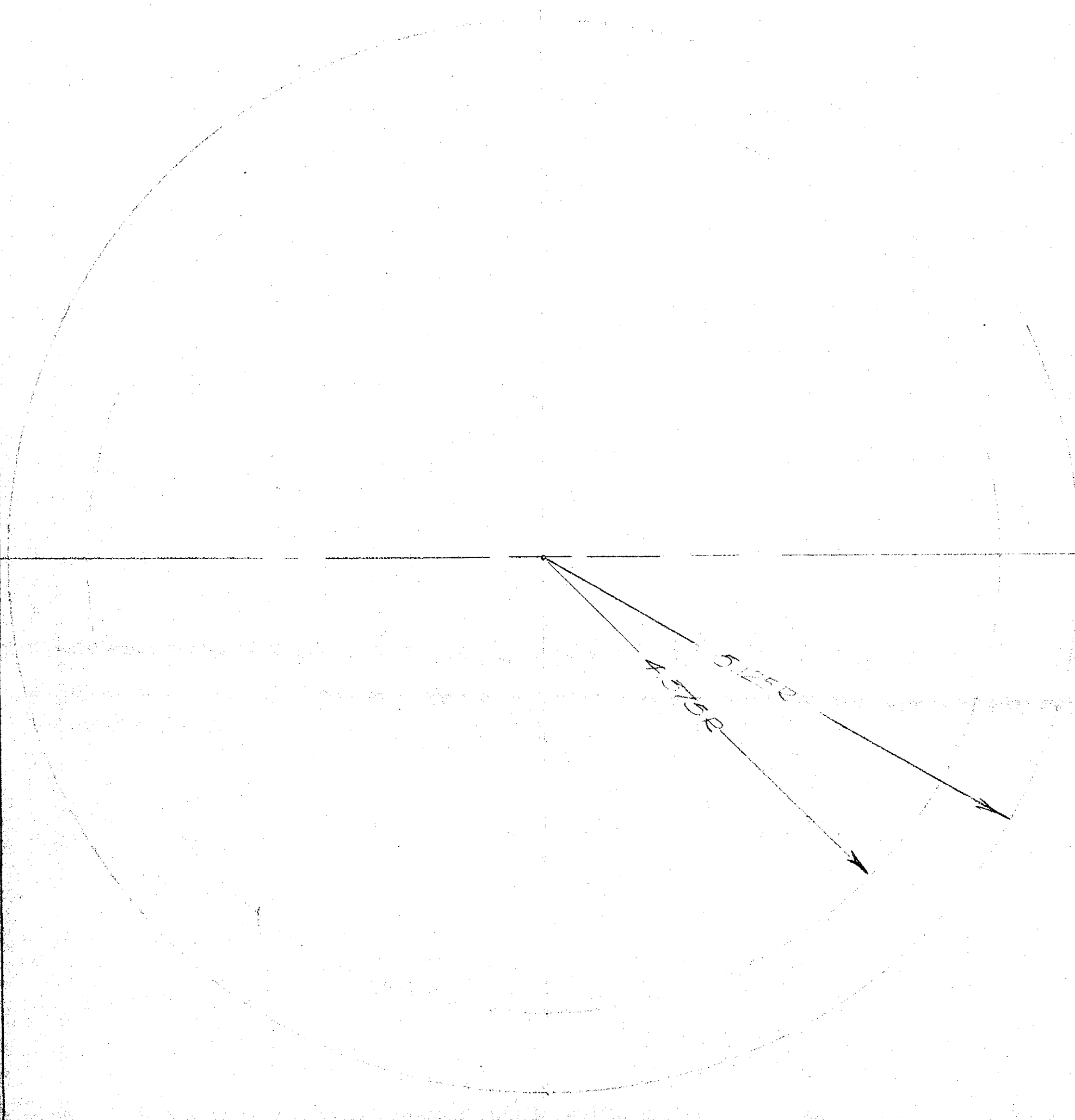
CH. HEF APP. HEF

DATE 254 SCALE FULL

NAME M S

VALVE SEAT  
MOUNTING DISK

116523B



~~SECRET~~

~~SECRET~~

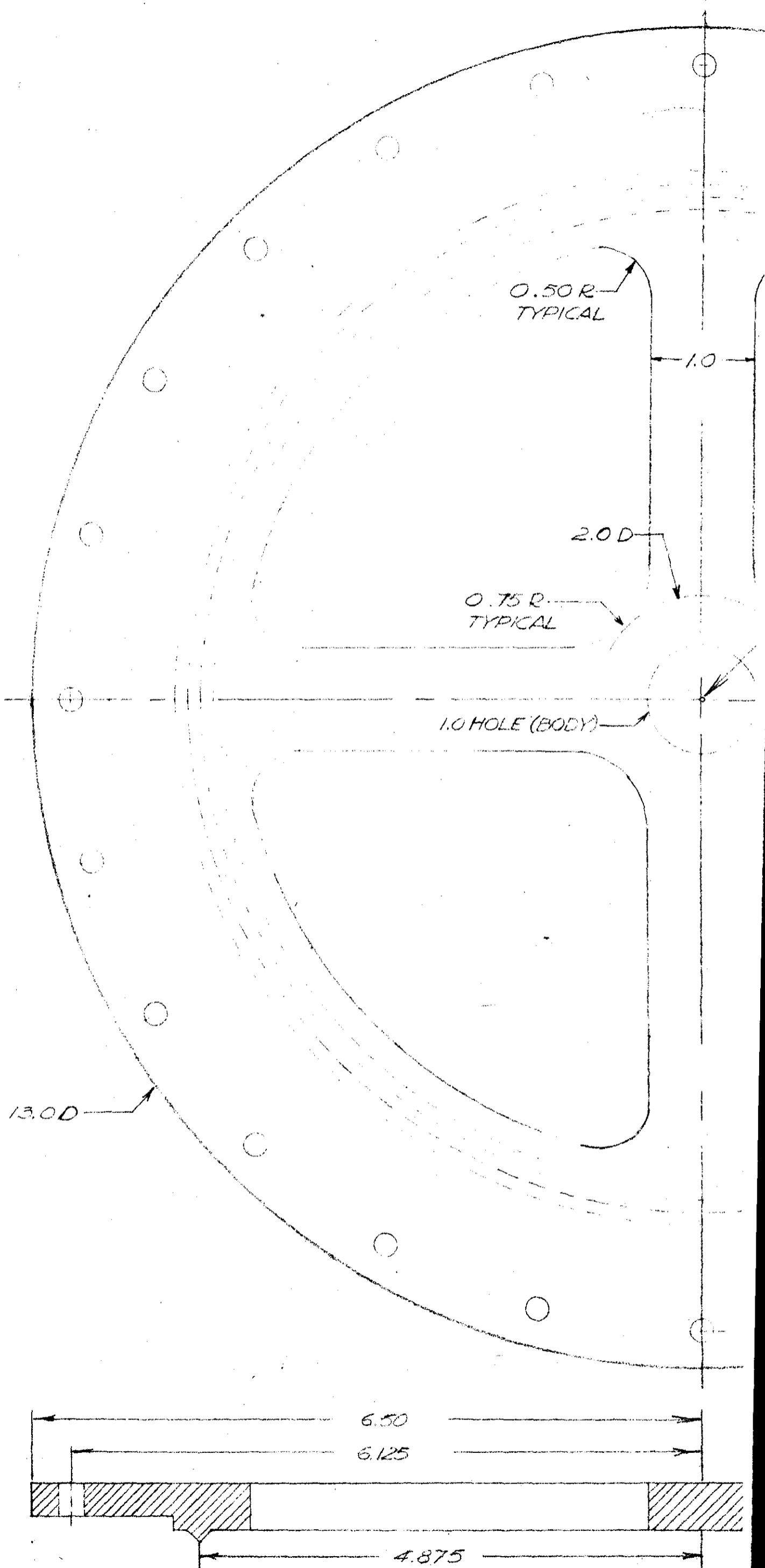
OCT 1 1954

REVISIONS

MATERIAL SPEC.	
1.25 THICK 60D	
CLOSED CELL NEO.	
DR.	APP.
UCW	
CH.	APP.
DATE	SCALE
8-54	FULL
NAME	
VALVE SEAT	
A/16553B	



ASS'Y. DWGS.

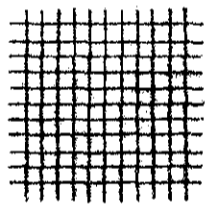




ASSY. DWG.

DRILL .250

A



12x12 MESH

.018 WIRE DIAMETER

.065 OPENING

2.00

A

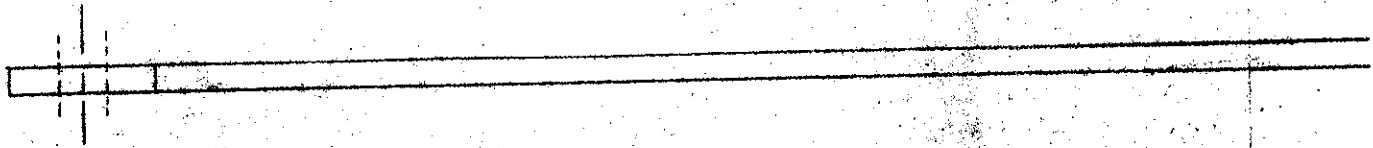
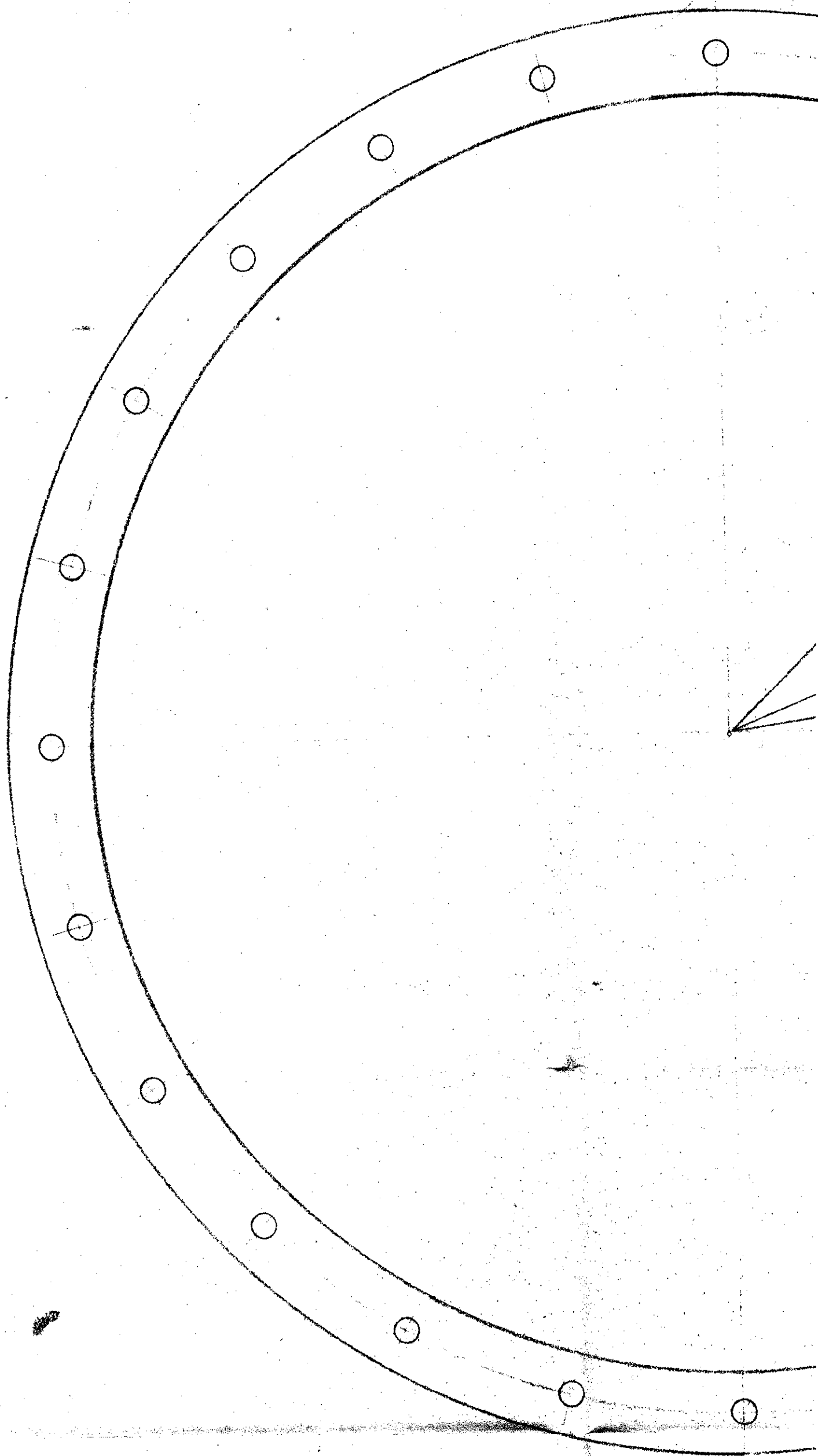
ENDS OF SCREEN  
SOLDERED ALONG THIS  
EDGE

0.375

13.00



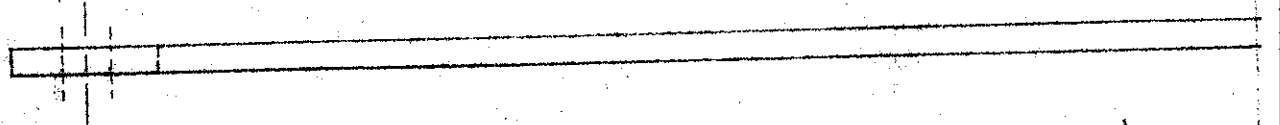
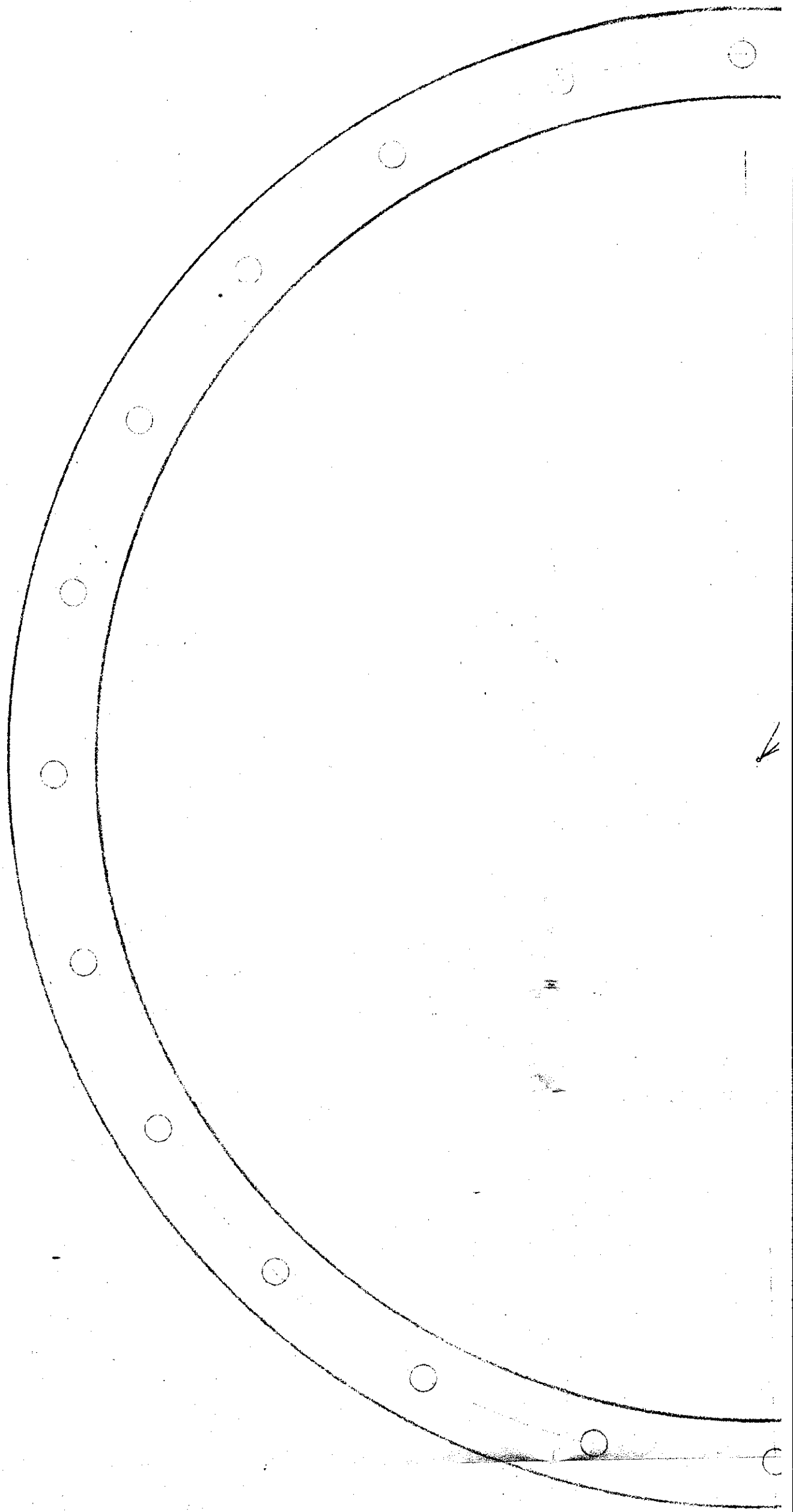
ASS'Y. DWGS.



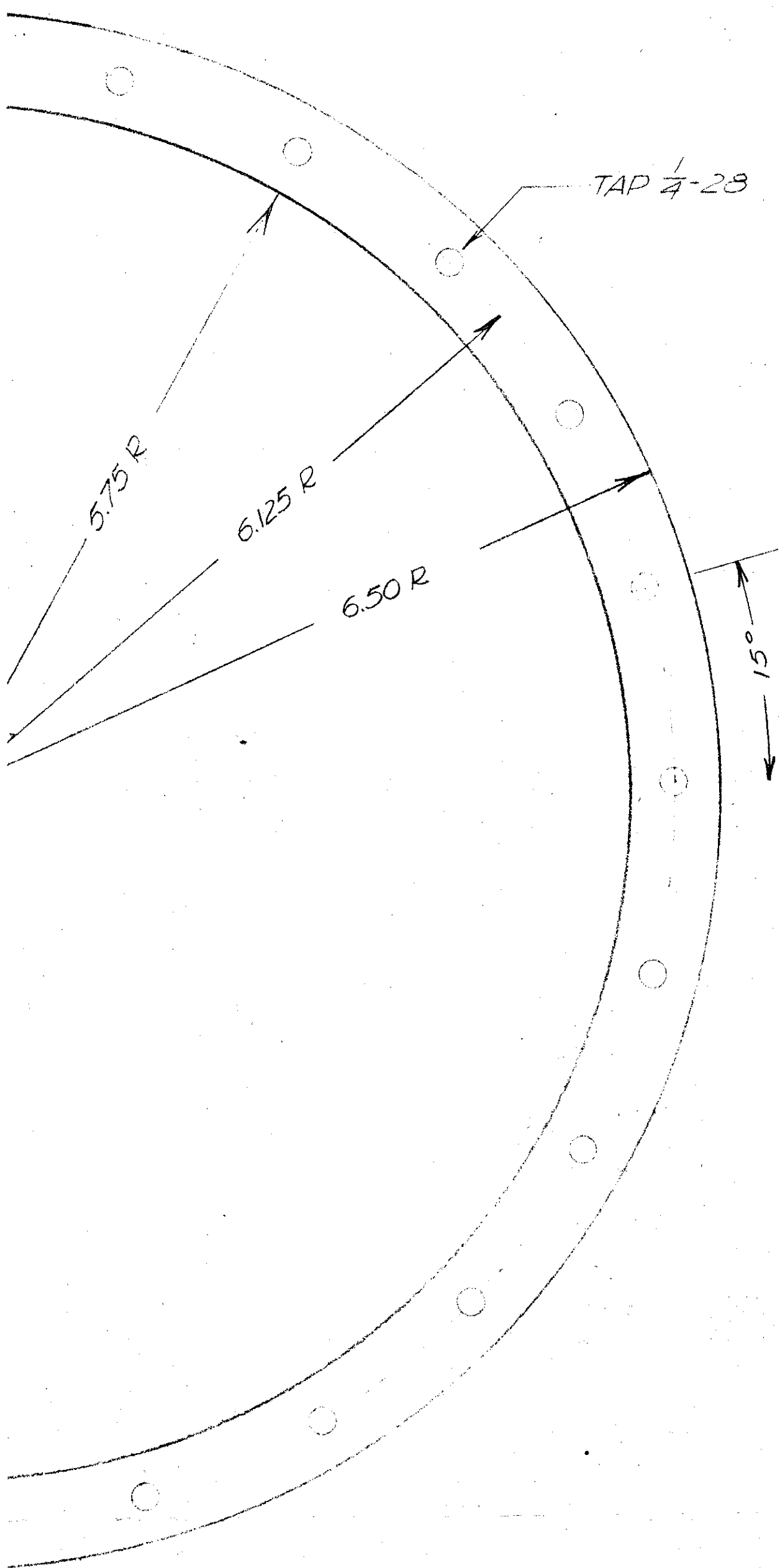




ASS'Y. DWGS.



~~SECRET~~

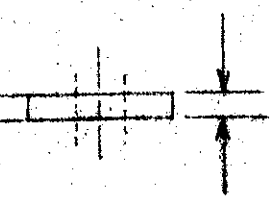


A16551 C

REVISIONS

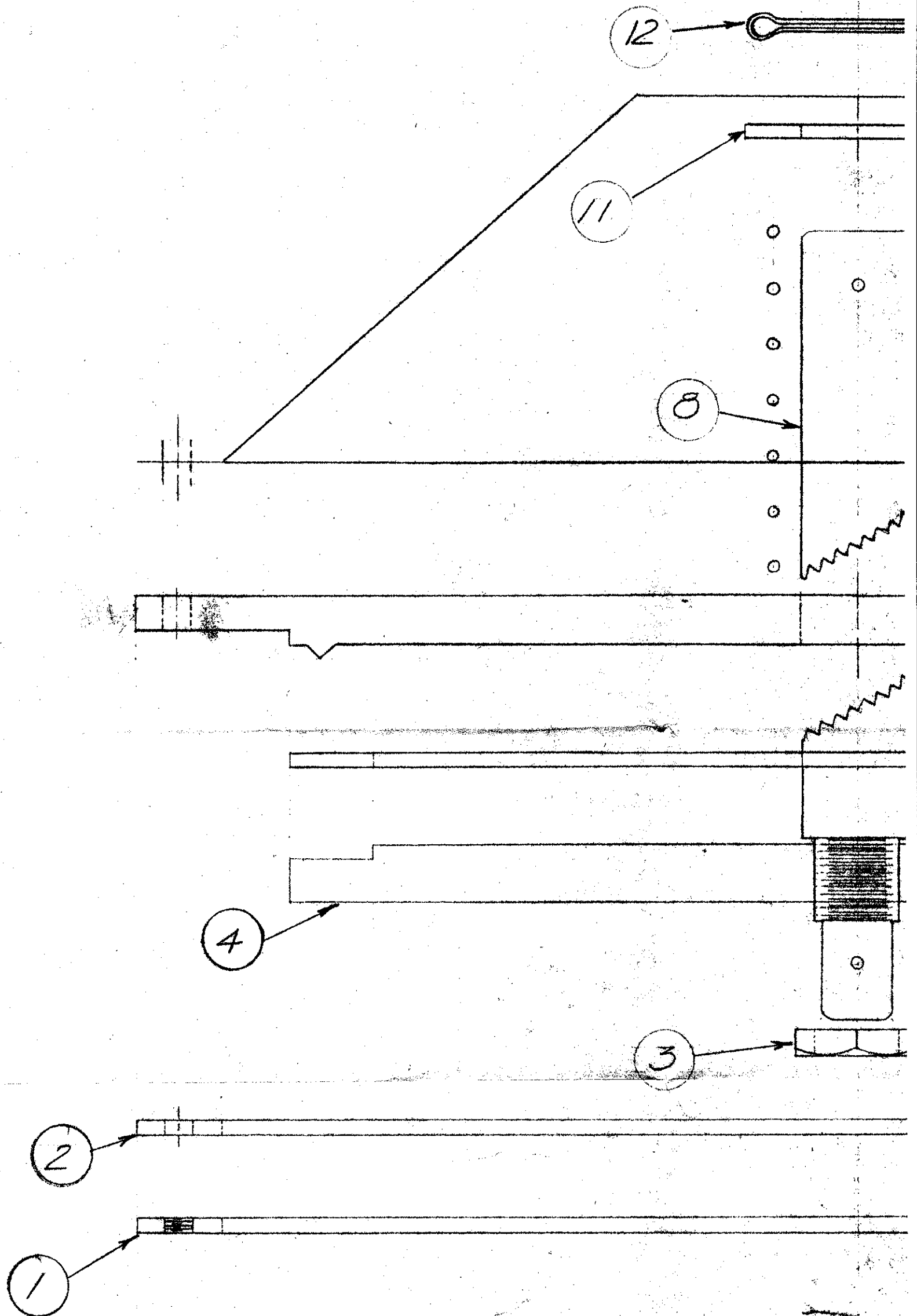
MATERIAL SPEC.	
0.125 24 ST. ALUMINIUM	
DR. JCW	APP.
CH.	APP.
DATE 8-5-54	SCALE FULL
NAME	
VALVE MOUNTING RING	
A16551 C	

0.125



~~SECRET~~

OCT 1 1954

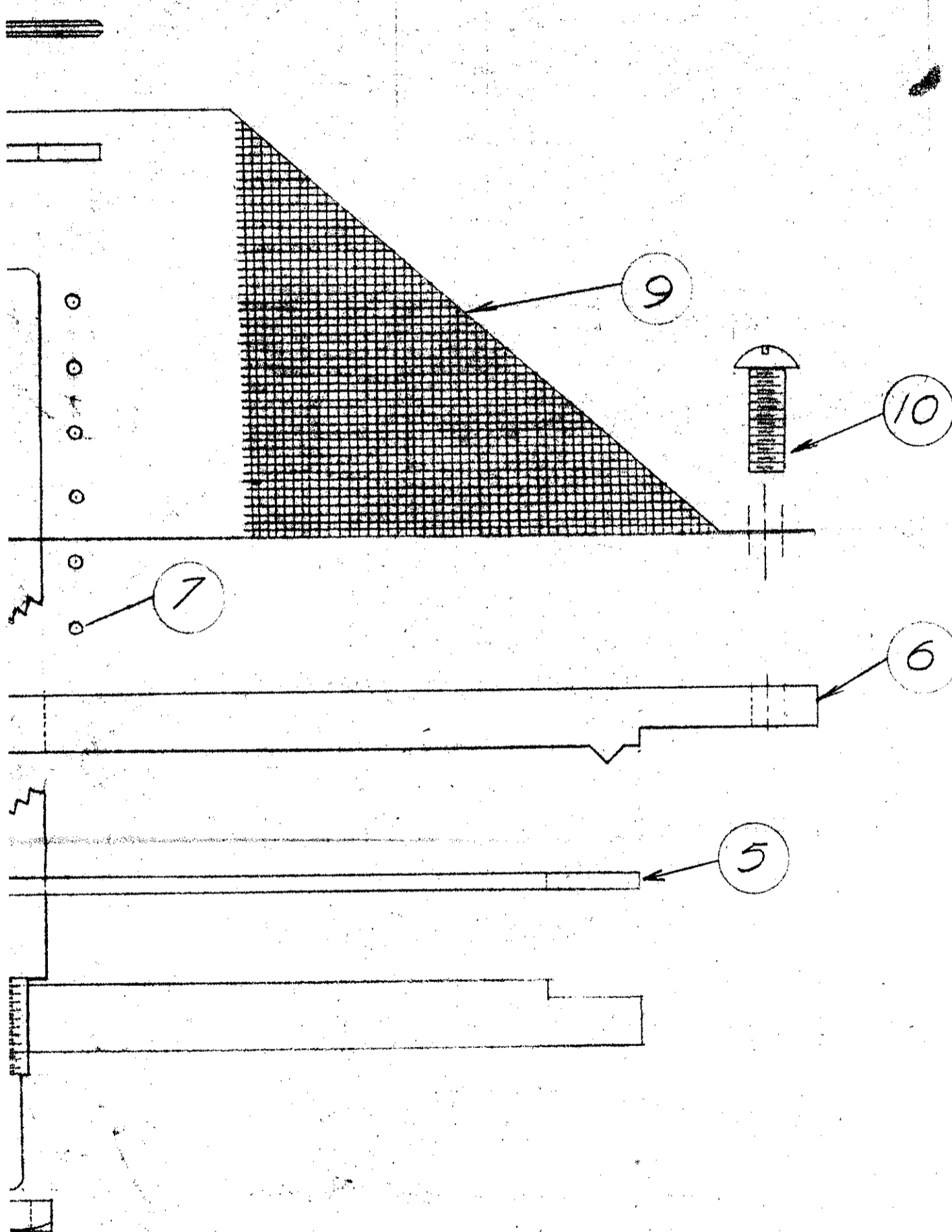


# BILL OF MATERIALS

ITEM	NAME	NO. REQ'D	DRAW. NO.
1	VALVE MOUNTING RING		A16551 C
2	VALVE MOUNTING GASKET		A16552 C
3	STUD NUT		
4	VALVE SEAT MOUNTING DISK		A16523 C
5	VALVE SEAT		A16553 B
6	VALVE PLATE		A16521 C
7	VALVE SPRING		A16525 A
8	VALVE STUD		A16524 A
9	VALVE SCREEN		A16554 C
10			
11	WASHER		
12	COTTER PIN		

~~SECRET~~

~~CONFIDENTIAL~~



A16555 C

REVISIONS	

MAT'L SPEC. NOTED

DR. JCW	APP. HEF
CH. HEF	APP.
DATE 8-5-54	SCALE FULL
NAME M3 VALVE ASSEMBLY	

A16555 C

~~CONFIDENTIAL~~  
~~SECRET~~

OCT 1 1954

~~SECRET~~

~~SECRET~~