

FORMULAE FOR STRENGTHS AT 180* WORKING PRESSURE

DATA FOR ONE BOILER

	U. S. GOV'T	LLOYD'S REGISTER
SHELL PLATE	PRESS = $\frac{62720 \times 1.25 \times 1.2}{6 \times 87} = 180.23^*$	PRESS = $\frac{22(20-2)84.6}{174} = 192.5^*$
HEADS IN STEAM SPACE	$\frac{175 \times 175^2}{171} = 185.5^*$	$\frac{175 \times 175^2}{151.5} = 199.6^*$
GIRDERS	$\frac{825 \times 8625^2 \times 1.5}{(31.375 - 7.5) \times 2.615} = 184.3^*$	$\frac{10863 \times 8625^2 \times 1.5}{(30 - 7.5) \times 8 \times 30} = 220^*$
TUBE PLATE (COMPRESSION)	$\frac{(4.25 - 2.954) \times 75 \times 27000}{31.375 \times 4.25} = 196.8^*$	$\frac{(4.25 - 2.954) \times 12 \times 1750}{30 \times 4.25} = 213^*$
(BENDING)		$\frac{135(10-8)^2}{132} = 182.8^*$
FRONT HEAD IN WATER WAY	$\frac{135 \times 10^2}{132} = 211^*$	$\frac{120(12-8)^2}{13.75} = 183.4^*$
REAR HEAD BTWN COMB. CHRS	$\frac{200(10-8)^2}{132} = 199^*$	$\frac{135(10-8)^2}{132} = 254^*$
TOP OF COMB. CHRS	$\frac{120 \times 10^2}{7.4375^2} = 217^*$	$\frac{135 \times 10^2}{8.5 \times 12} = 225^*$
SIDES & BACK OF COMB. CHRS	$\frac{900 \times 10^2}{10 \times 46} = 196^*$	$\frac{100 \times 10^2}{7.4375^2} = 180.8^*$
ROUNDED BOTTOM OF COMB. CHRS	$\frac{5625 \times 15600}{76} = 190.8^*$	$\frac{(9-2)1259}{74} = 183.6^*$
FURNACES	$\frac{54119 \times 9000}{17 \times 15.75} = 181.9^*$	$\frac{54119 \times 10400}{17 \times 15.75} = 210^*$
MAIN STAYS	$\frac{44301 \times 9000}{17 \times 12.75} = 184^*$	$\frac{44301 \times 10400}{17 \times 12.75} = 213^*$
12 THDS SCREW STAYS IN TOP OF COMB. CHAMBERS	$\frac{1474 \times 9000}{8 \times 7.5} = 221^*$	$\frac{1474 \times 8000}{8 \times 7.5} = 196.5^*$
12 THDS SCREW STAYS IN SIDES & BACK OF COMB. CHRS	$\frac{126 \times 9000}{7.4375^2} = 205^*$	$\frac{126 \times 8000}{7.4375^2} = 182.2^*$
12 THDS SCREW STAYS IN BACK AT VERT. EDGE OF COMB. CHRS	$\frac{1474 \times 9000}{13 \times 12.75 \times 6.25} = 208^*$	$\frac{1474 \times 8000}{13 \times 12.75 \times 6.25} = 184.6^*$
12 THDS SCREW STAYS IN BACK AT HORIZ. EDGE OF COMB. CHRS	$\frac{1312 \times 9000}{10.875 \times 7.4375 \times 6.75} = 215^*$	$\frac{1312 \times 8000}{10.875 \times 7.4375 \times 6.75} = 190.8^*$
12 THDS SCREW STAYS IN CORNERS OF COMB. CHRS	$\frac{18063 \times 9000}{13 \times 6.75 \times 10.875 \times 6.25} = 192^*$	$\frac{18063 \times 8000}{13 \times 6.75 \times 10.875 \times 6.25} = 192^*$
INSIDE BUTT STRAPS		THICKNESS $\frac{3 \times 125(8.5-1.325)}{4(8.5-2.625)} = 1.1469^*$
STRESS IN STAY TUBES		$\frac{(12.75 \times 8.25 - 6 \times 8.2958)180}{2.8832} = 34.53^*$ PER SQ. INCH

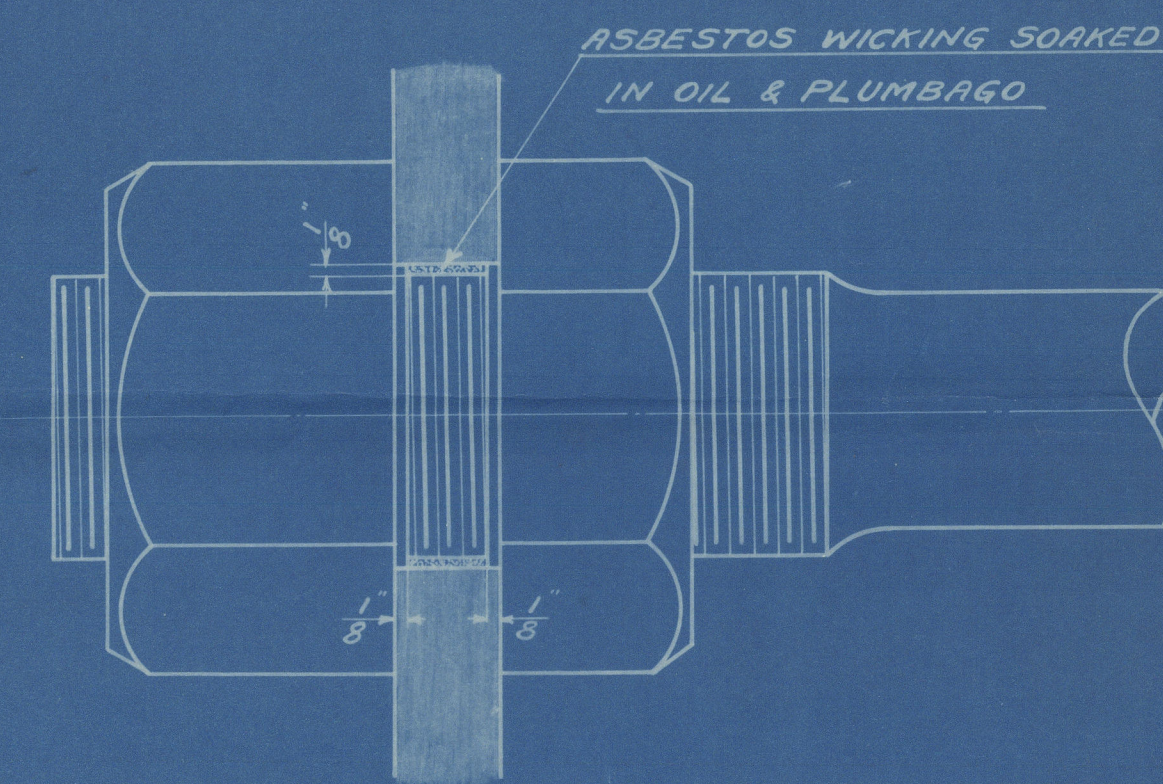
HEATING SURFACE OF TUBES	2143 SQ. FT.
COMB. CHAMBERS	245 "
FURNACES	142 "
TOTAL	2530 "
GRATE SURFACE - 6" O' GRATE BARS	66 "
RATIO HEATING SURFACE GRATE SURFACE	38.3
EVAPORATION (NATURAL DRAFT) PER SQ. FT. OF GRATE SURFACE PER HOUR	180 "
AREA OF SAFETY VALVES REQ'D - 181.66 - 12.6 SQ. IN.	
TWO 3" SAFETY VALVES REQ'D AREA = 14.14 SQ. IN.	

EFFICIENCY OF JOINT

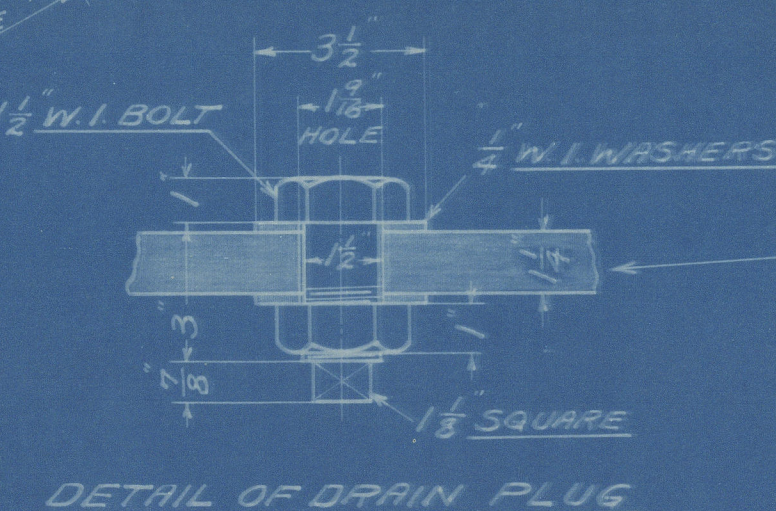
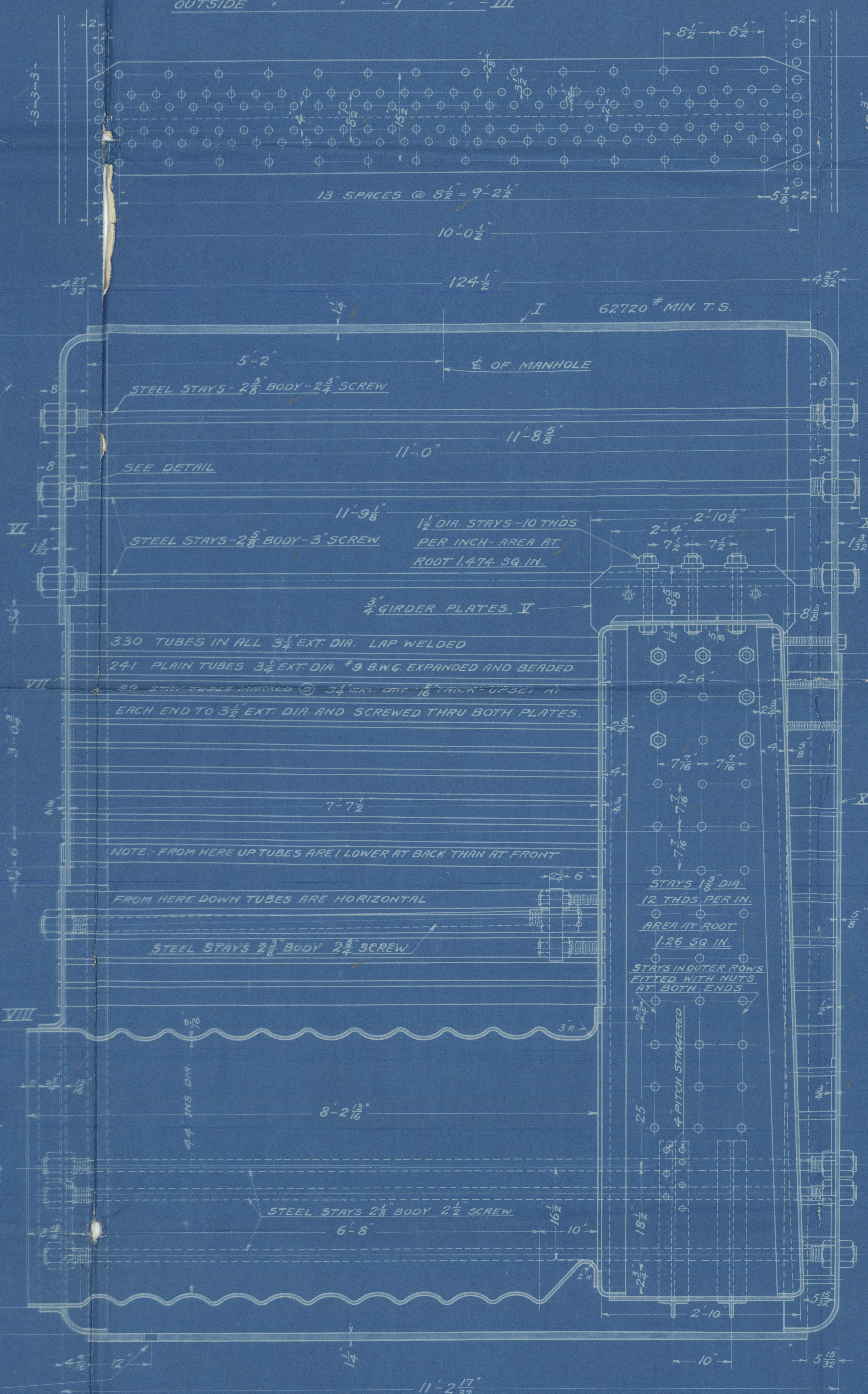
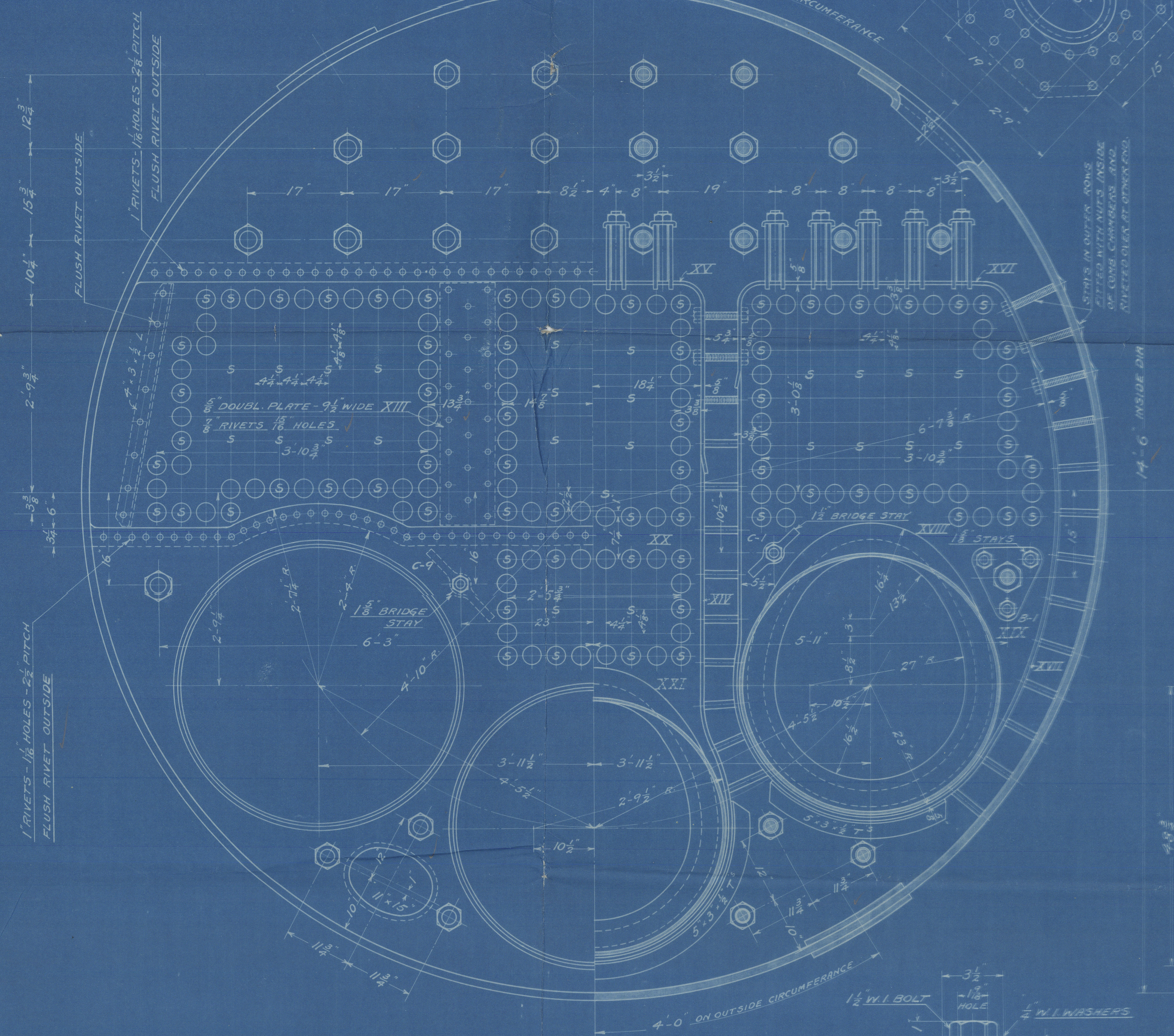
PLATE $\frac{(8.5 - 1.3125) 100}{8.5} = 84.6\%$

RIVETS $\frac{5 \times 1.353 \times 1.75 \times 85}{8.5 \times 1.25} = 94.7\%$

SHELL LONGITUDINAL JOINTS - 14" RIVETS - 1/8" HOLES
CIRCUMFERENTIAL - 1/8" - 1/8"
INSIDE BUTT STRAPS - 1/8" THICK - II
OUTSIDE - I - III



DETAIL OF STAY



DETAIL OF DRAIN PLUG

ALL STAYS AND RIVETS TO BE STEEL TESTED TO COMPLY WITH U.S. GOV'T AND LLOYD'S REGISTER REQUIREMENTS
ALL RIVET HOLES TO BE DRILLED

TO PASS INSPECTION OF U.S. GOV'T AND LLOYD'S REGISTER
FOR A WORKING PRESSURE OF 180 LBS. PER SQ. INCH.

TWO BOILERS REQ'D (RIGHT AND LEFT IN REGARD TO MANHOLE AND BUTTS)

INSIDE RIVETING AND RIVETING IN FURNACES
AT FRONT HEAD TO BE 5/8" DIA. - 1/8" HOLES - 2 1/2" PITCH
COUNTERSUNK ONE HALF THE THICKNESS OF EACH PLATE

20.5.16
J.P.R.

BOILER No. 1169	ALTERATIONS	ORDER No. 151
		BOILER
		14'-6" INS. DIA. x 11'-0" INS. HEADS x 180*
		THE AMERICAN SHIPBUILDING CO.
		CLEVELAND, O.
	SCALE 1" = 1 FT.	APRIL 27-1916
	DRAWN BY J.O.O.	CHECKED BY J.M.H.
	128-184	
DATE ISSUED MAY 1 1916	ISSUED TO	Lloyd's Register Foundation

CLEVELAND, OHIO. no 15
of Cleveland.

American Ship Co

Chain Boiler now named Else-Marie.

No 1169

180 lbs. W.P.

Superior Yard

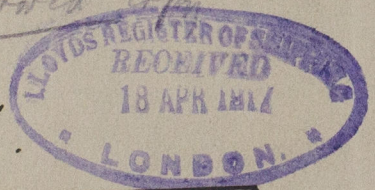
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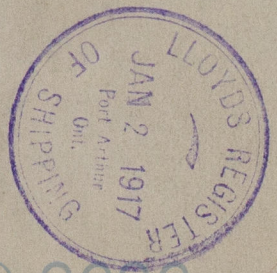
CLEVELAND, OHIO.

London Approved Copy

Mark.



No 62
Lloyd's test
270 lb.
5.8.16 W.L.



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